# "A" Business by Any Other Name: Firm Name Choice as a Signal of Firm Quality*

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**Abstract**

This paper presents a simple economic model of a firm's name choice. The model predicts that the content of a firm's name will be correlated with its service quality under certain conditions, which belies the intuition that a firm's name will represent only cheap talk about itself. Using unique data from markets for local plumbing services, the model's main result is confirmed empirically: plumbing firms with names that begin with an "A" or a number receive more than five times as many complaints regarding poor service, on average. Moreover, firms that attempt to conceal their reputations by using multiple names also provide lower-quality service. These qualitative results extend to paid listings on Internet search engines. Firms that advertise on Google receive more complaints, all else equal, which casts doubt on the validity of sorting equilibria commonly used in the theoretical literature on position auctions.

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# 1 Introduction

Firms often choose names that convey information to consumers. For instance, firms claim to provide high-quality service by including the word "quality" or "best" in their names, or to offer low prices by calling themselves "discount" providers. When consumers cannot verify the claims implied by firms' names, however, they will dismiss them as cheap talk. This paper considers the circumstances under which firms' names represent more than simply cheap talk about themselves. Specifically, we present a model of consumer search and firm name choice in which a separating equilibrium can obtain where low-quality firms use one type of name and high-quality firms use another.

To test the model's predictions empirically, we examine the market for residential plumbing services in Illinois. In this setting, the typical consumer enlists the services of a plumber infrequently and selects one without utilizing much information other than the business' name. In response, many plumbing firms strategically choose names to attract potential customers. In the city of Chicago, for instance, approximately 21% of plumbing firms use names that begin with an "A" or a number. Intuitively, plumbing firms choose this type of name to appear near the beginning of the plumbing category in the Yellow Pages, which increases the probability of being viewed by potential consumers.

The content of a firm's name, irrespective of its position in the Yellow Pages, also affects the probability consumers will contact it. For example, "Always Over Budget Plumbers" would appear before "Always Under Budget Plumbers" in the Yellow Pages, though it would perhaps fail to attract as many customers. To the extent that consumers have preferences over both the placement and content of a name, a firm must balance the relative gains from having a better position in the Yellow Pages with having a more attractive name if attractive names near the beginning of the plumbing category are scarce.

With this as motivation, we present a stylized model that explicitly incorporates the tradeoff between a name's attractiveness and its position in a directory into a firm's decision to select a name. In the model, a firm faces the opportunity cost of not attracting consumers with high relative search costs if it uses a particular type of name. If consumers with low relative search costs are more profitable for high-quality firms than low-quality ones, high-quality firms will prefer to use a different type of name than low-quality firms. As a result, the name a firm uses can be correlated with the quality of service it provides even when consumers cannot verify the claims implied by the firm's name *ex ante*.

The model's main predictions hold empirically in the market for residential plumbing services: plumbing firms in Illinois with names that begin with an "A" or a number receive more than five times as many complaints, on average. In this sense, the type of name a firm uses signals important information to consumers even though a low-quality firm could disguise itself as a high-quality firm by using a different type of name. Firms that do attempt to conceal their reputations by concurrently using both types of names provide starkly worse service: plumbing firms in Illinois that use both a name that begins with an "A" or a number and a name that does not receive more than fifteen times as many complaints, on average.

We also consider the relationship between a firm's name and its pricing policies. Using a

unique price survey of plumbing firms in Illinois, we find that firms with names that begin with an "A" or a number are more likely to charge a fixed service fee and to have higher prices overall. This result is consistent with ordered search models in which prices decline with order because consumers with positive search costs require incentives to search for firms (Arbatskaya 2007). We find that firms serving metro Chicago that use a name that begins with an "A" or a number command an 8.4% price premium, all else equal.

Our finding that plumbing firms sort by quality in the Yellow Pages extends to position auctions on Internet search engines. A common and striking result of the theoretical position auction literature is that advertisers will sort by quality and consumers will rationally search listings in a top-down manner. Contrasting with this result, we show that plumbing firms that advertise on Google receive more than thirteen times as many complaints, on average. Intuitively, this result can be explained by the relative value each type of firm places on consumers who use Google to search for plumbers. Because low-quality firms cannot attract customers through referrals or repeat business, they rely comparatively more on infrequent customers with high search costs. As a result, low-quality plumbing firms that strategically choose a name near the beginning of the Yellow Pages category also have a greater incentive to be among the top paid listings on Google.

This paper contributes to several strands of literature. First, it studies the economic implications of names. Previous work has considered many topics related to names, such as name trading (Tadelis 1999), labor market outcomes (Einav & Yariv 2006), voting behavior (Meredith & Salant 2007), and stock price returns (Cooper et al. 2001). No previous work (to our knowledge) has considered a model in which a firm's name is a primitive, strategic choice variable and tested the model's predictions empirically.

Second, this paper contributes to the literature on firm reputation.[1] A number of theoretical papers have examined the relationship between a firm's name and its reputation, including Tadelis (1999, 2003), Cremer (1986), Kreps (1990), and Mailath & Samuelson (2001). To motivate the primary research questions addressed in this strand of literature, consider the recent decisions made by AIG and GMAC Bank to change their names – to AIU and Ally Bank, respectively – following events that tarnished their reputations. This behavior arises naturally within the reputation literature in the sense that poor performance by a firm will cause its name (reputation) to lose value if consumers rely on a firm's track record to update their beliefs regarding the firm's quality. Once the value falls far enough, a firm will prefer to discontinue or change its name and start with a clean record with the hope of exploiting the ignorance of consumers as to who exactly is behind the new name. We consider a related question: Can the content of a firm's name signal credible information to consumers about its reputation?

Relatedly, our paper also contributes to the sparse empirical literature on the relationship between a firm's reputation and its name. Two recent papers within this vein are Cabral & Hortacsu (Forthcoming), who provide evidence that sellers on eBay (where a user name is associated with a seller's reputation) are more likely to exit after receiving negative feedback, and McDevitt (2009), who finds that plumbing firms that receive complaints are more likely to change

[1] Bar-Isaac & Tadelis (2008) provide a survey of the reputation literature.

their names. We continue in the spirit of these papers by establishing an empirical relationship between the content of firms' names and their reputations.

Third, this paper contributes to the theoretical work on consumer search. Specifically, Armstrong et al. (2009) examine the effects of prominence in search markets in which one firm is sampled first by all consumers. In their model, the firm with the highest-quality product has the greatest incentive to become prominent, which increases both consumer surplus and welfare. Relatedly, a growing theoretical literature has studied position auctions for advertisements on Internet search engines. For instance, Chen & He (2006) and Athey & Ellison (2009) develop models in which position auctions are welfare enhancing for consumers because high-quality firms submit higher bids for favorable listings on Internet search engines, which then enables consumers to search more efficiently. In contrast to these theoretical results, we find that plumbing firms that advertise on Google receive more complaints, on average. In this setting, the sorting equilibria proposed in the position auction literature is rejected empirically.

The remainder of this paper proceeds as follows. Section 2 develops a stylized model of firm name choice. Section 3 discusses the data used to test the model's predictions. Section 4 introduces the empirical setting of this paper and the empirical regularities found in the data. Section 5 presents the results from reduced-form estimates of our model. Section 6 provides an extension to Internet position auctions. Section 7 concludes.

# 2 Model

To fix intuition, a stylized model of consumer and firm behavior is considered below. In the model, consumers have exogenously determined project sizes and search behaviors, while firms have exogenously determined abilities. To further highlight the main results of the model, two examples are discussed in Section 2.2. Finally, Section 2.3 outlines two testable implications that follow directly from the model.

## 2.1 Stylized Model

Assume a firm operates exclusively in one market that consists of $J$ firms and $I$ consumer types.[2] Each $i$-type consumer arrives in the market with probability $\alpha_i \in (0,1)$ and has a project that consists of a discrete number of tasks, $B_i \in \{1,\ldots,\bar{B}\}$. Each task has a price, $p$, that is normalized to 1 and paid upon the successful completion of the task at the end of the project.[3] Each market has a directory that lists all operating firms in alpha-numerical order and from which consumers exclusively select firms. In addition, consumers search the directory in ascending (top-down) order and each $i$-type consumer has a strictly positive search cost, $c_i \in (0,\bar{c}]$, for obtaining each name in the directory.[4]

[2]Both $J$ and $I$ are assumed to be exogenous. That is, a richer model that allows for endogenous entry by both consumers and firms is not considered.

[3]While $B$ can be interpreted literally as the size of a consumer's current project, it can also be easily extended to represent the future business resulting from an ongoing relationship. For example, the repeat business stemming from a satisfied customer, or referrals to other customers.

[4]Consumers' search behavior is not endogenously derived in this model.

Each firm possesses an exogenous ability, $\lambda_j \in [0,1]$, which represents the probability that the firm can successfully complete a given task and is not observable by consumers. A firm can accept at most one project and receives a fixed fee, $FF \in \mathbf{R}_+$, for each project irrespective of a successful completion of the tasks.[5] A firm's expected revenue for a project with $B$ tasks is then

$$E[R_j] = FF + \lambda_j \cdot B, \tag{1}$$

and it immediately follows that

$$\frac{\partial E[R_j]}{\partial \lambda_j} > 0. \tag{2}$$

A firm's name, $n_j$, consists of two dimensions such that $n_j = (o_j, q_j)$, where $o_j \in \{1, \ldots, J\}$ represents the firm's unique position in the directory, and $q_j \in (0,1)$ represents the attractiveness of the firm's name. Let $F(q)$ denote the CDF of attractive names that could be selected by a firm.[6] Consumers hold preferences over firms' names (which affect their decision to select a firm) such that $(o,q) \succ (o',q)\ \forall\ o < o'$ and $(o,q) \succ (o,q')\ \forall\ q > q'$. Firms take these preferences as given. The preference for a lower-ordered name over a higher-ordered one follows directly from consumers' positive search costs. The intuition for why consumers prefer a more-attractive name to a less-attractive one is that they believe a firm's ability is correlated with the attractiveness of its name. That is, consumers map the content of a firm's name to an expectation about the firm's *ex post* service quality – say, $h : q \to E[\lambda]$ – that, in turn, influences their decisions to select the firm.

To find a firm, an $i$-type consumer conducts a sequential, top-down search of the directory and each consumer has a non-negative expected surplus for searching. After viewing a firm's name, a consumer decides whether or not to continue searching, where the expected gain from continuing to search after viewing a name with an attractiveness of $x$ is defined to be

$$G_i(x) = U_i\left[B_i \cdot h\left(\int_x^1 (q-x) f(q) dq\right)\right] = U_i\left[B_i \cdot h\left(\int_x^1 [1 - F(q)] dq\right)\right]. \tag{3}$$

Thus, a consumer's optimal policy has a "reservation attractiveness" property in the sense that an $i$-type consumer continues to search if the name he has viewed has an attractiveness such that

[5] Note that this simple model does not allow for price dispersion. Allowing for variation in prices across firms is an important and interesting extension of the model, but given the common practice of firms refusing to give detailed price information for a specific project prior to inspection, as a first pass the assumption of uniform prices still allows the model to capture a large portion of the desired intuition while remaining reasonably close to reality. This assumption can be interpreted as placing firms and consumers in an environment in which prices are exogenously fixed at a level conforming to the industry's standard (e.g., the prevailing union wage rate).

[6] How a consumer comes to hold a distribution of a name's attractiveness, $F_q$, is not considered explicitly. The distribution is assumed to be exogenously determined in the sense that consumers simply know a good name when they see one, and have an expectation regarding the likelihood that an even better name exists. For instance, "Joe the Plumber, Inc." might be considered a more-attractive name than "A#A-1 Plumbers." Note, also, that $F_q$ remains fixed throughout the directory, which some might consider unsatisfying given the later argument that less-attractive names are clustered towards the beginning of a category. This assumption can be relaxed in the obvious way by allowing for conditional distributions that depend on the position of a name in the directory, though at the expense of making the following analysis more cumbersome.

$x < q_i^*$, and stops otherwise; that is, $q_i^*$ solves (3) such that

$$U_i \left[ B_i \cdot h \left( \int_{q_i^*}^{1} [1 - F(q)] dq \right) \right] = c_i \tag{4}$$

for a given $B_i$ and $c_i$.

In this formulation of demand, consumers prefer more-attractive names, and those with larger projects prefer them even more so, which follows from the assumption that consumers believe that the attractiveness of a firm's name is correlated with the firm's exogenous ability to satisfactorily complete a given task. At the same time, however, a rational consumer will balance the expected benefit of obtaining a more-attractive name during his next search with his marginal cost of conducting an additional search. In other words, a consumer who has just found a firm with a name such that $q = x$ will continue to search if and only if he expects to find a firm with a name that is more attractive than $x$ and the benefit of finding such a firm – as measured by the increase in the expected probability of the firm successfully completing the consumer's tasks – outweighs the cost of finding it, $c_i$.

Assuming that $h(\cdot)$ and $U(\cdot)$ are both the identity mapping (for notational simplicity), the following comparative statics describe the relationship between $q_i^*$, $c_i$, and $B_i$:

$$\frac{\partial q_i^*}{\partial c_i} = \frac{-1}{B_i[1 - F(q_i^*)]} < 0, \tag{5}$$

and

$$\frac{\partial q_i^*}{\partial B_i} = \frac{\int_{q_i^*}^{1} [1 - F(q)] dq}{B_i[1 - F(q_i^*)]} > 0. \tag{6}$$

From (5), consumers who have higher search costs will have lower thresholds for the attractiveness of a firm's name. From (6), consumers who have larger projects will have a higher thresholds for the attractiveness of a firm's name.

Summarizing the description of consumer search outlined above, an $i$-type consumer begins his sequential search among the firms in the directory with the first firm listed and terminates his search once he uncovers a firm with a name above his attractiveness threshold. Thus, the probability that a firm with name $n_j = (o_j, q_j)$ is chosen by a consumer with a threshold of $q_i^*$ is

$$\pi_j = \alpha_i \left[ \prod_{l=1}^{o_j - 1} Pr(q_l < q_i^*) \right] Pr(q_j > q_i^*). \tag{7}$$

It immediately follows that

1. Holding a name's attractiveness constant, $\pi_j > \pi_{j'}$ if $o_j < o_{j'}$.
2. Holding a name's position in the directory constant, $\pi_j > \pi_{j'}$ if $q_j > q_{j'}$.
3. Holding both a name's attractiveness and position constant, $\pi_j$ is decreasing in the attractivenesses of the names of lower-ordered competitors.

These three implications capture the inherent tradeoffs faced by a firm when it chooses a

name; that is, the need to balance a name's attractiveness and its position in the directory in order to maximize the probability of being selected by a consumer, with the probability also directly tied to the choices of its competitors in the market.

Because a high-ability firm benefits more from a large project than a low-ability firm does due to (2), and because the size of a consumer's project is correlated with his threshold for a name's attractiveness due to (6), firms' names will be sorted by their abilities under certain conditions. Specifically, in the event that the proportion of consumers with large projects in a market is sizable enough to compensate high-ability firms for giving up the chance to attract consumers with smaller projects, but the proportion of consumers with large project is not sizable enough to entice the low-ability firms from also choosing more-attractive names, firms will find self-selecting names that reveal their unobservable ability-types optimal. In the next section, we present two examples in which certain conditions lead to this result.

## 2.2 Two Examples

Two examples help illustrate the intuition of the model presented above and highlight its key implications. In the first scenario considered, a firm may use only one name. In the second, a firm may choose to use multiple names.

For both scenarios, consider a setting in which a market has two types of consumers, $i \in \{m, M\}$, and at most one of each type arrives independently of the other with probability $\alpha_i \in (0, 1)$. In addition, two plumbers operate in this market, $L$ and $H$, where Plumber $H$ has ability $\lambda_H \in (0, 1]$ and Plumber $L$ has ability $\lambda_L \in [0, 1)$, with $\lambda_L < \lambda_H$. Consumers know the distribution of abilities in the market (i.e., a randomly chosen plumber will have ability $\lambda_L$ with probability 1/2 and ability $\lambda_H$ with probability 1/2). In this setting, assume that any plumber can successfully complete an $m$-type job, but Plumbers $L$ and $H$ will successfully complete an $M$-type job with probabilities $\lambda_L$ and $\lambda_H$, respectively. Suppose that, due to exogenous constraints, only two types of names are used in this market, $n_b$ and $n_g$. Consumers can view an $n_b$ name at no cost, but must pay a search cost, $c > 0$, to see an $n_g$ name, which is more attractive (i.e., $q_b < q_g$), and consumers know this distribution. In the event that no firm chooses to use an $n_b$ name, however, consumers can view an $n_g$ name at no cost.

Consumers hold beliefs regarding the correlation between a firm's name and its expected service ability, which is represented by the mapping $h(q) = E(\lambda)$, with $h(\cdot)$ increasing in $q$. Moreover, prices in this market are fixed such that the price of an $m$-type job is $FF$, while the price of an $M$-type job is $FF + P$ if the job is successfully completed, and $FF$ otherwise. In this setup, an $m$-type job represents a routine plumbing task such as fixing a leaky pipe or a clogged drain, while an $M$-type job represents a more complicated project, such as re-piping an entire house, that requires a fixed consultation fee even if the job is not completed successfully.[7]

Assume that each consumer-type has a utility function, $u_i(\cdot)$, such that $u_m(1) > FF$, $u_M(1) > P + FF$, and $u_i(0) < FF$, where – abusing notation – $u_i(1)$ is the utility from a successfully completed $i$-type job and $u_i(0)$ is the utility from an unsuccessfully completed $i$-type job. In this case, an $m$-type consumer will select the first name he uncovers since his expected utility from

[7] Fixed service or consultation fees are a common feature of pricing policies in this market, as discussed in Section 3.

selecting a firm with an $n_b$ name is the same as his expected utility from selecting a firm with an $n_g$ name, though he would have to pay a positive search cost to see a second listing and thus prefers to always stop by contacting the first name he uncovers.

Assume that consumers hold beliefs $h(q_b)$ and $h(q_g)$. In this case, an $M$-type consumer will not stop at a firm with an $n_b$ name if

$$[h(E[q_g|q_b]) - h(q_b)]\,[u_M(1) - P] > c. \tag{8}$$

If (8) does not hold, an $M$-type consumer will not be willing to incur the search cost to contact an additional plumber even if he expects the plumber will have a higher ability. That is, an $M$-type consumer will only be willing to search if he believes that the expected benefits of searching outweighs the costs.

The remaining assumptions concern the timing of the choices made by firms and consumers. First, Plumber $L$ and Plumber $H$ simultaneously choose a name associated with the highest expected profits given their respective abilities and best responses of competitors. If one firm selects an $n_b$ name and the other selects an $n_g$ name, they will each be contacted by the appropriate type of consumer should he arrive (assuming that (8) holds, an $m$-type consumer will select the firm with an $n_b$ name and the $M$-type consumer will contact the firm with an $n_g$ name). If both firms select the same name, they will be equally likely to be contacted by an arriving consumer, but can only accept one job which is randomly chosen with equal probability.[8] Following firms' name choices, consumers contact firms and outcomes are realized

### 2.2.1 One Name

In the first scenario, assume that a firm can use only one name and that it chooses the one that maximizes its expected profits given its exogenous ability and the best response of its competitor. In addition, assume that (8) holds so that an $M$-type consumer is always willing to search in the event that the plumbers use distinct names. Suppose that $\frac{\lambda_L+\lambda_H}{2}\,[u(M) - P] < FF$, which implies that an $M$-type consumer who only sees one type of name in the directory will not contact either firm. Firms choose names simultaneously and the payoffs are described by the following normal-from game:

| | | Plumber L | |
|---|---|---|---|
| | | $n_b$ | $n_g$ |
| Plumber H | $n_b$ | $\frac{\alpha_m}{2}FF\ ,\ \frac{\alpha_m}{2}FF$ | $\alpha_m FF\ ,\ \alpha_M(FF+\lambda_L P)$ |
| | $n_g$ | $\alpha_M(FF+\lambda_H P)\ ,\ \alpha_m FF$ | $\frac{\alpha_m}{2}FF\ ,\ \frac{\alpha_m}{2}FF$ |

Given the payoffs described above, a unique equilibrium exists in which the high-ability Plumber $H$ chooses the more-attractive name, $n_g$, and the low-ability Plumber $L$ chooses the

[8] That is, assume each type of consumer flips a coin to choose which firm to contact when both have the same name; moreover, if both types of consumers elected to contact the same plumber, only one call would "go through," and the call going through would be randomly chosen by the phone company; if a call does not go through, the consumer contacts the other firm.

less-attractive name, $n_b$, if the set of model primitives

$$\{\alpha_m, \alpha_M, FF, P, \lambda_L, \lambda_H, h(q_b), E[q_g|q_b], h(q_g), c, u_M(1), u_m(1), u_i(0)\}$$

is such that

$$2\left[\frac{FF+\lambda_H P}{FF}\right] > \frac{\alpha_m}{\alpha_M} > 2\left[\frac{FF+\lambda_L P}{FF}\right].$$

One such equilibrium is the set $\{\alpha_m = 3/4, \alpha_M = 1/4, FF = 1, P = 6, \lambda_L = 0, \lambda_H = 1, h(q_b) = 0, E[q_g|q_b = 0] = 1, h(q_g) = 1, c = 0.4, u_M(1) = 7.5, u_m(1) = 1, u_i(0) = 0\}$.

Intuitively, pooling on less-attractive names will obtain when the proportion of consumers with small projects is relatively large in a market (i.e., $\alpha_m$ is much larger than $\alpha_M$). In this case, a high-ability firm is willing to sacrifice the small chance of attracting a customer with a large project in order to secure a smaller, but more likely, project by choosing a name towards the front of the directory, even if the name will be such that it will never exceed the $M$-type consumer's threshold for attractiveness, which would preclude the high-ability firm from ever receiving a larger, more-lucrative job.

A low-ability firm, on the other hand, is indifferent regarding a customer's project size, as the firm will likely fail to accomplish any of the tasks in the project and will only receive the fixed fee irrespective of the size of the job. A low-ability firm's decision, then, is driven solely by the relative arrival rates of customer-types in the market.

Separation of firms by names will obtain when smaller projects arrive frequently enough to entice low-ability plumbers to market themselves exclusively to that type of clientele, while the relative profitability of a more extensive project is sufficiently large enough to motivate high-ability plumbers to forego the minor projects.

### 2.2.2 Multiple Names

In the scenario directly above, a firm could use only one name. As documented in Section 4, however, some firms use more than one name, and incorporating this choice into the above example will prove useful for understanding the behavior driving the empirical regularities. To extend the above example, assume a firm can use both an $n_b$ and an $n_g$ name if it expects to be more profitable by doing so.[9] The only additional assumption is that if a firm chooses to use both names, the type of job it receives will be determined randomly in the event that the firm would have received two jobs. That is, if a firm uses both names, the probability that it receives an $m$-type job will be $\alpha_m - \frac{\alpha_m \cdot \alpha_M}{2}$, and the probability that it receives $M$-type job will be $\alpha_M - \frac{\alpha_m \cdot \alpha_M}{2}$, though these probabilities will also depend on the choice of its competitor in the manner described in the normal-form tables presented in Appendix A. In other words, if a firm uses both names, its overall probability of receiving any job will increase to $\alpha_m + \alpha_M - \alpha_m \cdot \alpha_M$, but if a firm receives two jobs, it will be randomly assigned one of them (e.g., due to a capacity constraint).

Suppose again that $\frac{\lambda_L+\lambda_H}{2}[u_M(1) - P] < FF$. This implies that an $M$-type consumer who

[9] As before, the firm's endogenous entry decision is not considered. The assumption is that the firm has already incurred the sunk costs of entry because it expects to be profitable by using at least one of the names.

only sees one type of name in the directory is unwilling to accept the risk of contacting either firm for fear of getting the low-ability plumber. Due to the assumed capacity constraint under which a plumber can accept at most one job, an $M$-type consumer might still be willing to contact a plumber in the directory in light of the possibility that Plumber $L$ has chosen to use both an $n_b$ and an $n_g$ name. This would occur if the probability that Plumber $L$ is already committed to an $m$-type job is large enough to offset the chance that an $M$-type consumer will contact Plumber $L$ when he contacts a firm with an $n_g$ name.

In addition, assume that $(1 - \frac{\alpha_m}{2})[\lambda_H(u_M(1) - P) - FF] < c$ and (8) holds. Thus, if an $M$-type consumer sees that both plumbers have chosen to use an $n_b$ name, he is unwilling to incur an additional search cost to obtain an $n_g$ name due to the possibility that Plumber $H$ will already be committed to an $m$-type job for the period. The normal-form tables presented in Appendix A describe these payoffs.

Given these payoffs, there exists a unique equilibrium in which the high-ability Plumber $H$ uses only the attractive $n_g$ name, while the low-ability Plumber $L$ uses both names. This occurs when the set of model primitives

$$\{\alpha_m, \alpha_M, FF, P, \lambda_L, \lambda_H, h(q_b), E[q_g|\text{only one } n_b], E[q_g|\text{more than one } n_b], h(q_g), c, u_M(1), u_m(1), u_i(0)\}$$

is such that

$$2\left[\frac{FF + \lambda_H P}{2FF - \alpha_M(FF + \lambda_H P)}\right] > \frac{\alpha_m}{\alpha_M} > 2\left[\frac{FF + \lambda_L P}{FF}\right].$$

One such equilibrium is the set

$$\{\alpha_m = 3/4, \alpha_M = 1/4, FF = 1, P = 6, \lambda_L = 0, \lambda_H = 1, h(q_b) = 0, E[q_g|\text{only one } n_b] = 1/2,$$
$$E[q_g|\text{more than one } n_b] = 0, h(q_g) = 1/2, c = 0.4, u_M(1) = 7.5, u_m(1) = 1, u_i(0) = 0\}.$$

Compared to the setting in which firms could use only one name, the expected revenue for Plumber $H$ is lower in this equilibrium (1.20 vs. 1.75); expected revenue for Plumber $L$ is higher (0.78 vs. 0.75); and an $M$-type consumer's surplus is lower (0.1000 vs. 0.0625 in the event that he arrives, so 0.0250 vs. 0.0156 in expectation). Therefore, the total welfare loss that results from allowing firms to use multiple names is roughly 0.53 in this example ($\approx 20\%$).

The intuition for this partial-sorting equilibrium is that a high-ability firm must endure an opportunity cost if it chooses to expose itself to $m$-type consumers, as the firm potentially loses the opportunity to attract an $M$-type job if it receives an $m$-type job first, which would force the high-ability firm to give up the potential revenue it would have received from completing the more-lucrative project. The high-ability firm will find using both names optimal only when the forgone opportunity of a larger job is relatively small (i.e., when $P$ and/or $\alpha_M$ is not very large).

## 2.3 Testable Implications

The stylized model presented above yields two main results to test empirically:

**Implication 1** *Under certain market conditions, low-quality firms will choose lower-ordered and less-attractive names, while high-quality firms will choose higher-ordered and more-attractive names.*

**Implication 2** *Under certain market conditions, low-quality firms will operate with several names with varying levels of attractiveness, while high-quality firms will use only one (attractive) name.*

In Section 5, we consider the market for residential plumbing services in Illinois to test whether these implications hold empirically.

# 3 Data

We use data from several sources for our empirical analysis. We downloaded data for all plumbing firms operating in Illinois from the web-based version of ReferenceUSA in June 2008. ReferenceUSA contains information on businesses based on their listings in the Yellow and White pages, and its database is continually updated and cross-checked by direct phone calls and comparisons with other directories. ReferenceUSA is marketed as a comprehensive source for generating sales leads and for conducting market research. The firm-specific information contained in ReferenceUSA includes the firm's name, location, years in operation, advertising levels in the Yellow Pages, and estimates of its employee levels. This source has been utilized in previous applied work.[10] We chose ReferenceUSA as the basis for the data used in this paper because it constructs its universe of firms from local Yellow Pages, a source commonly used by consumers to search for plumbing firms.

We downloaded data for the number of complaints filed against each plumbing firm operating in Illinois from the Better Business Bureau's website in June 2008. The Better Business Bureau's website lists a historical record of complaints filed against a business during the preceding three years. A complaint filed with the Better Business Bureau is reviewed by a staff member and forwarded to the company within two business days if deemed legitimate. If the company does not respond within 14 days, the Better Business Bureau makes a second attempt to resolve the issue. If the Better Business Bureau does not judge the matter to have been satisfactorily resolved after two attempts to contact the company, the complaint becomes a part of its record with the Better Business Bureau. As opposed to using other sources of quality information for plumbing firms, such as Angie's List or Yelp.com, we use data from the Better Business Bureau for our empirical analysis because the Better Business Bureau provides a more-comprehensive coverage of the firms operating in Illinois and verifies the legitimacy of each complaint in its database.[11]

We used several approaches to determine which plumbing firms in Illinois use more than one name. First, we matched the names listed in ReferenceUSA to a common owner using phone numbers, fax numbers, websites, and addresses to generate an initial list of aliases among the universe of plumbing firms. In addition, we linked names to one another using the known aliases

[10] For instance, Waldfogel (2008) used RefernceUSA, while Seim (2006) and Ellickson (2007) both used the offline version of ReferenceUSA, American Business Disc, in their empirical work.

[11] We show that our results are robust to using quality information from other popular consumer search platforms, including Angie's List and Yelp.com, in a supplemental appendix (available upon request).

listed in the Better Business Bureau records for each firm, when available. Finally, we surveyed all firms listed in ReferenceUSA by phone and determined that several use more than one name.[12]

We used two processes to verify the preliminary matches. First, firms must register their names with Illinois Secretary of State, and we confirmed all matches on the department's website, http://www.ilsos.gov/corporatellc/.[13] Second, we verified potential matches during our phone surveys. As a result of these measures, we linked the 2,670 names listed in ReferenceUSA to 2,293 independent firms.

In the event that a firm had more than one name, we constructed its firm-level variables from ReferenceUSA and the Better Business Bureau by summing over the variables for employees, advertising expenditures, and complaints listed for all of its names. In addition, we assumed a firm's years in operation was the maximum age of all the listed names for the firm and that a firm served the metro-Chicago area if at least one of the names belonging to the firm did.

We compiled pricing data for plumbing firms in Illinois by conducting an exhaustive phone survey of the 2,670 listings in ReferenceUSA. Between July 2008 and December 2008, we queried each listing within the plumbing category in ReferenceUSA regarding its fixed service charge, its hourly rate, and its earliest start date. We called each listed phone number a maximum of three times. In this manner, we received price quotes from 543 of 2,293 firms (23.7%). A limitation of our survey is that we could not determine the effective price of actual projects. For instance, a firm with a lower stated hourly rate could charge an effectively higher price by taking longer to complete a project.[14]

We collected advertising data from Google in June 2009. To obtain this data, we ran an automated script that conducted searches on Google related to plumbing services in Illinois. For example, we searched using the term "Chicago Plumbers" and extracted the paid advertising listings that appeared at the top and right-hand side of Google's results along with the position of each advertisement within the search results.[15] In total, we conducted 5,477 searches that generated 12,153 advertising listings. We then matched the advertisements to the plumbing firms listed in ReferenceUSA and linked 5,623 relevant advertisements to 85 firms.[16]

# 4 Empirical Setting and Regularities

To empirically test the predictions of the model presented in Section 2, we use the market for residential plumbing services in Illinois. We now discuss our empirical setting in greater detail, as well as present the relevant empirical regularities from our data. We begin with a description of the platform consumers often use to search for plumbing firms, the Yellow Pages, and conclude

[12] This occurred most frequently when a call to Firm X was answered by an individual stating he was from Firm Y.

[13] A firm must register its name with the county clerk of the county(ies) in which it operates. In Cook County, for example, this requires an application fee of $50 and publishing a public notice in the local media. The Secretary of State then issues a Certificate of Good Standing for those businesses meeting that state's requirements, and enforces the requirement that a newly registered name must be "distinguishable" from those names already registered in the state.

[14] In almost all cases, firms were unwilling to provide detailed estimates of standard projects such as fixing a broken pipe without assessing the project in person.

[15] The complete list of search terms we used is available upon request.

[16] A number of paid listings were irrelevant for plumbing services in Illinois, such as advertisements for "plumbing fixtures," or for search aggregator sites such as Angie's List.

this section with a description of the market for residential plumbing services.

**Yellow Pages** The "Yellow Pages" are printed directories that list the phone numbers and addresses of businesses within a geographic area. Most commonly, Yellow Pages list businesses under different category headings in alpha-numerical order. Yellow Pages are typically published annually and distributed by local phone companies to their subscribers at no charge. Publishers also sell advertising space within the directory, with prices varying by region, business category, and size (Busse & Rysman 2005). While declining in popularity over the past decade, users still made 13.4 billion print Yellow Page references in 2007, and 87% of U.S. households made at least one reference (Yellow Pages Association 2008).

Many consumers search listings in the Yellow Pages in a top-down manner (Lohse 1997). As a result, some businesses exploit the search behavior of consumers by choosing names that place them near the top of their categories. Intuitively, one might suspect this tendency will be more prevalent in categories that attract the most usage in the Yellow Pages, which are presented in Table 1.

As shown in Figure 1, however, businesses in the categories viewed most often by consumers in the city of Chicago and, more generally, in all of Illinois, actually have a smaller proportion of businesses with names that begin with an "A" or a number than businesses across all categories. While seemingly counterintuitive, other factors dominate the importance of the placement of a business in the Yellow Pages for these categories. For example, patients do not typically select a urologist by calling the first listing they find in the phone book.

In certain categories, however, consumers rely more extensively on firms' listings in the Yellow Pages when searching for a provider. For instance, in categories offering home service, the physical location of the business does not affect a consumer's choice, as she no longer bears a transportation cost for obtaining the service. Consequently, spatial differentiation does not influence a consumer's choice of a firm, so other firm characteristics – including its name – become relatively more important for attracting customers. Consistent with this intuition, the top home-service categories in the Yellow Pages, as shown in Table 2, have a larger proportion of firms with names that begin with an "A" or a number, as shown in Figure 2.

Firms' names also vary by their tenures. As shown in Figure 3, 35% of new entrants in home-service categories use names beginning with an "A" or a number in the city of Chicago, which compares to an average of 10% across all categories. Intuitively, this result can be explained by the different manners by which nascent and established firms attract customers. For instance, a firm's reputation affects its revenue through repeat business and referrals. A new entrant, however, will not have an extant track record from which to attract customers, and thus must rely on other methods. One such strategy would be to choose a name that would put its business near the beginning of the listings in its Yellow Pages heading.

This preliminary analysis suggests that the type of name a firm uses often depends on its business category in the Yellow Pages. We now focus specifically on local markets for plumbing services in Illinois to better understand the economic primitives underlying firms' name choices.

**Plumbing Firms** The supply of plumbing services in Illinois is determined, first and foremost, by the number of licensed plumbers in the state. In Illinois, the Department of Public Health regulates plumbers and plumbing-related activities, and its program licenses approximately 7,300 plumbers and 3,000 apprentice plumbers. Plumbers must pass a state licensing exam after completing a 48- to 72-month apprentice program under a licensed plumber, and maintain their skills with continuing education. Throughout Illinois, local municipalities can institute their own plumbing regulations, and occasionally require separate licensing. In addition, many plumbers belong to local unions that provide benefits to their members, such as pensions and health insurance, in exchange for dues, and also set union wage rates.

We present the summary statistics for the plumbing firms appearing in our data in Table 3. The majority of plumbing firms in Illinois are small businesses, with over 70% employing fewer than four people. The median age of firms is 10 years.[17] The amount firms spend on advertising in the Yellow Pages is skewed around its mean, with the median firm spending $750 in 2008 and the average firm spending $5,362.[18] Finally, 1,420 of the 2,293 firms (61.9%) serve the metro-Chicago area.

We use complaints filed with the Better Business Bureau as our measure of firm quality. In this setting, complaints represent a noisy but informative measure of a firm's quality, though arguably not continuous, as the time and effort required to file a formal complaint likely leads many disgruntled consumers to not file one unless they are particularly dissatisfied with a firm's service. The distribution of complaints filed against firms with the Better Business Bureau is highly skewed around its mean: the median number of complaints filed against a firm is 0, while a firm at the 99th percentile received 7.

In Illinois, approximately 12.9% of plumbing firms use at least one name that begins with an "A" or a number. Examples of such names actually used in Illinois are A-AAAA Sewer & Drains, AAAA Scott's Plumbing, A Aabbey Plumbing, and A Abest Rooter. The tendency to use a name that begins with an "A" or a number differs inside and outside the metro-Chicago area: 15.7% of firms serving metro Chicago use at least one name that begins with an "A" or a number, while only 8.3% of firms outside of metro Chicago do. In addition, new entrants are more likely to use a name that begins with an "A" or a number compared to more-established firms: 15.7% of firms in operation for less than three years use at least one name that begins with an "A" or a number, compared to 12.5% of firms in operation for at least three years. Once again, firms exhibit different behavior within metro Chicago: 18.7% of firms in operation for less than three years within Chicago use a name that begins with an "A" or a number, compared to 9.3% of firms of this vintage outside the metro area.

Firms that use at least one name that begins with an "A" or a number differ across many observable characteristics compared to firms that do not, as shown in Table 4. Firms that use a name that begins with an "A" or a number are younger, spend more on advertising, and are more likely to serve metro Chicago, on average, than those that do not. Importantly, firms that use names that begin with an "A" or a number do not have more employees than other firms,

[17] A firm's age is top-coded at 25 years in the data. Approximately 23.3% of the listed firms are at the maximum.

[18] Advertising expenditures are top-coded at $50,000, which is the approximate cost of a full-page advertisement in major Chicago Yellow Pages. This affects 46 firms ($\approx$ 2%).

on average. This suggests that firms that use names that begin with an "A" or a number do not consistently receive more business than other firms due to the capacity constraints of individual plumbers. For this reason, the fact that firms that use names that begin with an "A" or a number receive more complaints, even after controlling for employee levels, provides evidence that they provide lower-quality service.

Many plumbing firms use more than one name. For instance, note in Figure 4 that this firm, linked clearly by its plumbing license in the two advertisements, uses at least four distinct names. Using the measures discussed in Section 3, we determined that the majority of firms (over 90%) use only one name in Illinois, while 228 firms use more than one. Firms that use more than one name are demonstrably different than firms that do not, as shown in Table 5. Firms that use more than one name have more employees, are older, spend more on advertising in the Yellow Pages, and are more likely to serve metro Chicago, on average, than those that do not. In terms of quality, firms that use more than one name receive more complaints, on average, than those that do not. In addition, approximately 38.6% of firms that use more than one name have at least one that begins with an "A" or a number. Finally, in Table 6 we report the summary statistics for firms that use more than one name and use at least one that begins with an "A" or a number. This group of firms receives even more complaints, on average.

We report the summary statistics from our price survey in Table 7. We find that firms' pricing policies vary by their name choices. As shown in Table 8, firms that use at least one name that begins with an "A" or a number are more likely to charge a fixed service fee, have higher fixed fees and hourly rates, and charge more overall for a two-hour project that incorporates both a fixed fee and an hourly rate.[19] We discuss our interpretation of these findings in the following section.

# 5 Results

To analyze the relationship between the quality of service a firm provides and its name choice, in this section we present a series of regressions that measure the correlation between the content of a firm's name and the number of complaints filed against it with the Better Business Bureau. Following our quality analysis, we consider the relationship between a firm's name and the price it charges for its services.

**Quality** In Table 9, we present the results from a series of negative binomial regressions in which the dependent variable is the number of complaints filed against a plumbing firm with the Better Business Bureau.[20] In Specification (1), we show that the number of complaints filed against a firm is positively correlated with the number of workers it employs and the amount it spends on advertising in the Yellow Pages. Older firms receive fewer complaints, though not to a statistically significant degree. Finally, firms serving the metro-Chicago area receive more

[19] Some firms apply a fixed fee to the first hour of service, while others do not. We explicitly account for this when we construct our two-hour project price.

[20] We use a negative binomial regression to account for the over-dispersed count nature of the data. All qualitative results are robust to using an OLS specification or using complaints per employee as the dependent variable.

complaints than firms outside the metro area.

In Specification (2), we show that firms that use at least one name that begins with an "A" or a number receive more complaints. To interpret the marginal effect of using this type of name, we note that the incident rate ratio for firms that use at least one name that begins with an "A" or a number is approximately 3.4, meaning that these firms receive 237.9% more complaints than other firms, all else equal. The qualitative interpretation of the remaining controls in Specification (2) is the same as in Specification (1).

In Specification (3), we include a control for firms that use more than one name. Using multiple names is associated with receiving 357.1% more complaints, all else equal. Controlling for firms that use more than one name reduces the marginal effect of having at least one name that begins with an "A" or a number, bringing the incident rate ratio to 2.0. The qualitative interpretation of the remaining controls in Specification (3) is the same as in Specifications (1) and (2).

Finally, in Specification (4) we include a control for firms that use more than one name and have at least one that begins with an "A" or a number. The interaction term that is equal to one if a firm has more than one name and at least one of its names begins with an "A" or a number is positive but not statistically significant at conventional levels. Including this control does not affect the qualitative interpretation of the remaining explanatory variables.

These regressions demonstrate a statistically significant correlation between the content of a firm's name and the quality of service it provides, as predicted by the models in Section 2. Firms that use a name that begins with an "A" or a number provide lower-quality service, all else equal, which is consistent with Implication 1. In addition, firms that use more than one name and use at least one that begins with an "A" or a number receive even more complaints, which is consistent with Implication 2.

**Quality by Market Size** In Tables 10 and 11, we consider whether the relationship between a firm's name and its service quality differs inside and outside the metro-Chicago area. In Table 10, we restrict our sample to firms that do not serve the metro-Chicago area. In Specification (2), we show that firms that use at least one name that begins with an "A" or a number outside metro Chicago receive 282.4% more complaints, all else equal. When controlling for firms that use more than one name in Specification (3), however, the effect of having a name that begins with an "A" or a number is no longer statistically significant. In this sense, the content of a firm's name is not as indicative of the quality of service a firm provides outside the metro area, as the variance in complaints is explained primarily by firms that use more than one name in markets outside metro Chicago. Intuitively, this result can be explained by the fact that firms benefit comparatively less from a favorable position in the Yellow Pages in less-crowded markets. That is, a firm that uses a name that begins with a "B" is still contacted by consumers with relatively high search costs in these markets. A correlation between a firm's quality and decision to use more than one name still exists because this measure is conflated with the firm's reputational concerns, a dynamic phenomenon beyond the scope of this paper but considered in McDevitt (2009).

In Table 11, we restrict our sample to firms that serve the metro-Chicago area. In Specification (2), we show that firms that use at least one name that begins with an "A" or a number within metro Chicago receive 270.9% more complaints, all else equal. When controlling for firms that use more than one name in Specification (3), the effect of having a name that begins with an "A" or a number is still positive and statistically significant, which contrasts with the effects outside of metro Chicago. In this sense, the signal a firm sends by using a name that begins with an "A" or a number matters comparatively more in metro Chicago even after controlling for those firms that use more than one name.

**Price** We now consider the relationship between a firm's name and its price-setting behavior. The relationship is likely endogenous in the sense that a firm will choose a lower-ordered name to exploit consumers' search behaviors by charging higher prices, and its decision will depend on other characteristics, such as its ability. We present the results of our OLS price regressions in Table 12, where the dependent variable is the price a firm quoted for a representative two-hour project in our survey. In Specification (1), we find that firms that have more employees charge lower prices, while older firms and firms serving the metro-Chicago area charge higher prices. For our main parameter of interest, we find that firms that use a name that begins with an "A" or a number charge higher prices, all else equal. In this specification, firms that use at least one name that begins with an "A" or a number command a $21.05 premium, which is 8.4% above the mean in metro Chicago when other explanatory variables are fixed at their mean levels. This result is consistent with the predictions of ordered-search models in which price declines with the order a firm is searched because consumers require an incentive in the form of lower prices to make searching worthwhile.

We control for firms that use more than one name in Specifications (2) and (3), and the qualitative interpretation of these results does not change. In Specifications (4) – (6), we include the number of complaints filed against the firm with the Better Business Bureau as an explanatory variable and find that firms with more complaints charge lower prices, all else equal. We interpret this as evidence consistent with quality-adjusted prices. Finally, in Specification (7) we include an interaction term between complaints and a dummy variable equal to one if the firm uses at least one name that begins with an "A" or a number. The interaction term is negative and statistically significant. We interpret this result as suggesting that low-quality firms are less able to exploit their position in the Yellow Pages.[21]

# 6 Extension to Position Auctions with Consumer Search

Over the past decade, Internet search engines have become a substitute for off-line print Yellow Pages. As such, we now consider the relevance of our analysis to this new medium.

Internet search engines such as Google do not follow the convention of Yellow Pages of placing listings in alpha-numerical order under business category headings. Instead, a consumer who

[21] We note that we cannot determine whether these firms are more likely to provide a lower price quote and then charge a higher one *ex post*, which is a common reason cited by consumers for filing complaints.

searches for "chicago plumber" on Google will see "organic" results on the left-hand side of the results page with their order determined by a proprietary algorithm that ranks the relevance of each link, as well as sponsored links at the top and right-hand side of the results page. Advertisers bid to receive placement among these links, commonly in a generalized second price auction in which the $k^{th}$ highest bidder wins the $k^{th}$ highest link and pays the highest $k+1^{st}$ bid.

Athey & Ellison (2009) provide a review of the theoretical literature on position auctions and develop a model in which advertisers differ in quality, which they define as the ability of the advertiser to meet each consumer's need; consumers incur search costs from clicking on links; and consumers act rationally when choosing how many links to click and in what order. Athey & Ellison state that, "A more basic theme of our paper is that sponsored link auctions create surplus by providing consumers with information about the quality of sponsored links which allows consumers to search more efficiently." A main implication of their model is that firms that advertise on Google will be higher quality than firms that do not.

Their conception of quality is that the firm meets the needs of the consumer conducting the search. We define the needs of consumers searching for plumbers in Illinois to be that the plumber provides adequate service, i.e., that the service will not lead to a complaint filed with the Better Business Bureau.

To empirically test a main prediction of theoretical position-auction literature, we systematically extracted plumbing-related search results from Google, as discussed in Section 3. We present the summary statistics for the plumbing firms that advertise on Google in Table 13. On average, this group of firms has more employees, spends more on advertising in the Yellow Pages, is more likely to serve the metro-Chicago area, is more likely to use at least one name that begins with an "A" or a number, and is more likely to use more than one name. In terms of quality, firms that advertise on Google receive more than thirteen times as many complaints, on average, and receive more than three times as many complaints per employee.

We present the results from a negative binomial regression in which the dependent variable is the number of complaints filed against the firm in Table 14. As shown in Specification (1), firms that advertise on Google receive 205.2% more complaints, all else equal. The qualitative interpretation of the remaining explanatory variables is equivalent to the interpretation discussed in Section 5. In Specifications (2) – (4), other controls related to firms' names are included and their qualitative results remain similar.

Our finding that plumbing firms that advertise on Google provide lower-quality service suggests that the primary implication of a sorting equilibria – than firms that appear among the sponsored links are more likely to meet the needs of consumers that firms that do not advertise on Google – is rejected empirically. Our preliminary intuition is that the sorting equilibria fails to hold in this case due to the comparative importance firms place on attracting customers via advertising. For instance, low-quality firms cannot generate loyal repeat customers and must rely on high-search cost and infrequent customers who disproportionately search for plumbers on Internet search engines. We cannot rule out, however, other interpretations, such as the first-order need of a consumer searching on Google is a plumber offering emergency service or other dimensions of service quality not captured in our analysis. For this reason, we consider these

results as warranting further scrutiny and leave this research question for future studies.

# 7 Conclusion

In this paper, we have shown that the type of name a firm uses can signal credible information about the quality of service it provides. In the market for residential plumbing services in Illinois, plumbing firms that use a name that begins with an "A" or a number provide lower-quality plumbing services. The model we develop rationalizes this result. Consumers with high search costs relative to the scopes of their projects settle for low-quality plumbers, while consumers with low relative search costs expend greater effort to find high-quality plumbers. Low-quality plumbers prefer to self-select names that attract high relative search cost customers because they cannot generate loyal repeat customers. High-quality plumbers, on the other hand, use names that do not attract high relative search cost customers because they benefit comparatively more from more-extensive projects and from building a loyal customer base.

Our results have implications for the price-setting behavior of firms in this market. We have shown that firms that strategically use names that place them at the beginning of the plumbing category in the Yellow Pages command higher prices. This result is consistent with existing theoretical models of consumer search in which the firms sampled first charge higher prices than the firms sampled after consumers have searched extensively. Intuitively, consumers require an incentive to search, and in this case consumers search because doing so allows them to locate firms that charge lower prices and provide higher-quality service.

We have also contributed empirically to the theoretical literature on position auctions on Internet search engines. While a common result in this literature is that listings will be sorted by the quality of the firms that advertise on the search engine, we have found that the converse holds in the setting of plumbing. Plumbing firms in Illinois that advertise on Google provide lower-quality service. This result suggests that the extant theoretical results require further study to determine the settings in which the model's assumptions hold.

While we have limited our current empirical analysis to plumbing, our results extend more broadly. For instance, Cooper et al. (2001) showed that firms that added the ".com" suffix to their names during the Internet boom realized above-market stock price returns, even if the company had no Internet-related business. Post-boom, Cooper et al. (2003) found that firms that removed the ".com" suffix again realized above-market returns, even if their business model did not change materially. Relatedly, corporations often change their names to reflect how they wish to be positioned in the marketplace, such as Apple Computer, Inc. to Apple, Inc. and Radio Shack to The Shack. In this paper, we have examined a setting in which this superficial behavior actually sends a meaningful signal to consumers.

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# A Normal Form Payoffs

Payoffs for Plumber H (row) given Plumber L (column)

| | $n_b$ | $n_g$ | $Both$ |
|---|---|---|---|
| $n_b$ | $\frac{\alpha_m}{2}FF$ | $\alpha_m FF$ | $\frac{\alpha_m}{2}FF$ |
| $n_g$ | $\alpha_M(FF+\lambda_H P)$ | $\frac{\alpha_m}{2}FF$ | $\frac{2\alpha_M+\alpha_m\alpha_M}{4}(FF+\lambda_H P)$ |
| $Both$ | $\frac{\alpha_m}{2}FF$ | $\frac{4\alpha_m-\alpha_m\alpha_M}{4}FF+\frac{2\alpha_M-\alpha_m\alpha_M}{4}(FF+\lambda_H P)$ | $\frac{\alpha_m}{2}FF$ |

Payoffs for Plumber L (column) given Plumber H (row)

| | $n_b$ | $n_g$ | *Both* |
|---|---|---|---|
| $n_b$ | $\frac{\alpha_m}{2} FF$ | $\alpha_M(FF + \lambda_L P)$ | $\frac{\alpha_m}{2} FF$ |
| $n_g$ | $\alpha_m FF$ | $\frac{\alpha_m}{2} FF$ | $\frac{4\alpha_m - \alpha_m \alpha_M}{4} FF + \frac{2\alpha_M - \alpha_m \alpha_M}{4}(FF + \lambda_L P)$ |
| *Both* | $\frac{\alpha_m}{2} FF$ | $\frac{2\alpha_M + \alpha_m \alpha_M}{4}(FF + \lambda_L P)$ | $\frac{\alpha_m}{2} FF$ |

# B Tables and Figures

| Rank | Heading | Users (MM) |
|---|---|---|
| 1 | Restaurants | 1,269.5 |
| 2 | Physician & Surgeons | 1,088.9 |
| 3 | Automobile Parts-New & Used | 517.8 |
| 4 | Automobile Repairing & Service | 392.5 |
| 5 | Pizza | 295.7 |
| 6 | Attorneys/Lawyers | 290.1 |
| 7 | Automobile Dealers-New & Used | 273.0 |
| 8 | Dentists | 246.4 |
| 9 | Plumbing Contractors | 234.8 |
| 10 | Hospitals | 208.6 |
| 11 | Beauty Salons | 206.4 |
| 12 | Department Stores | 205.6 |
| 13 | Insurance | 204.1 |
| 14 | Veterinarians | 153.0 |
| 15 | Tire Dealers | 136.8 |

Table 1: Categories with the highest Yellow Pages usage. Source: Yellow Pages Association, 2008.

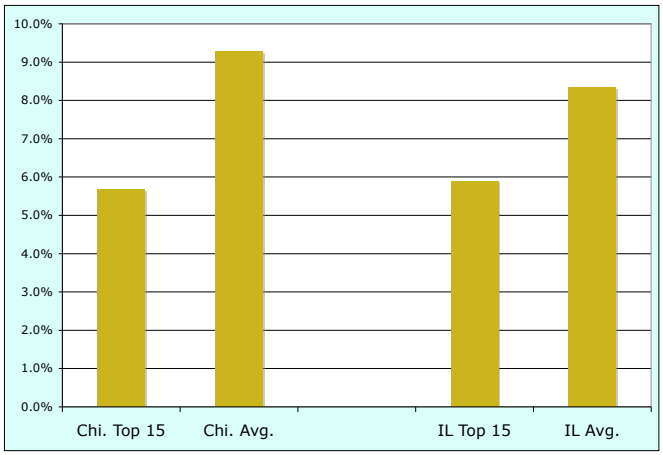


Figure 1: Proportion of businesses in the top-fifteen usage categories that use names that begin with an "A" or a number. Source: ReferenceUSA.

| Rank | Heading | Users (MM) |
|---|---|---|
| 9 | Plumbing Contractors | 234.8 |
| 23 | Carpet & Rug Cleaners | 90.6 |
| 25 | Electric Contractors | 78.9 |
| 29 | Landscape Contractors | 74.1 |
| 31 | Roofing Contractors | 69.0 |
| 42 | Pest Control Services | 53.3 |
| 48 | Heating Contractors | 46.1 |
| 50 | Taxicabs | 43.7 |
| 51 | Lawn Maintenance | 43.6 |
| 52 | Tree Service | 43.1 |
| 59 | Air Conditioning Contractors | 38.3 |
| 69 | Towing-Automotive | 32.3 |
| 77 | Concrete Contractors | 29.2 |
| 82 | Movers | 28.3 |
| 87 | Locks & Locksmiths | 26.9 |

Table 2: Categories with the highest Yellow Pages usage among home-service categories. Source: Yellow Pages Association, 2008.

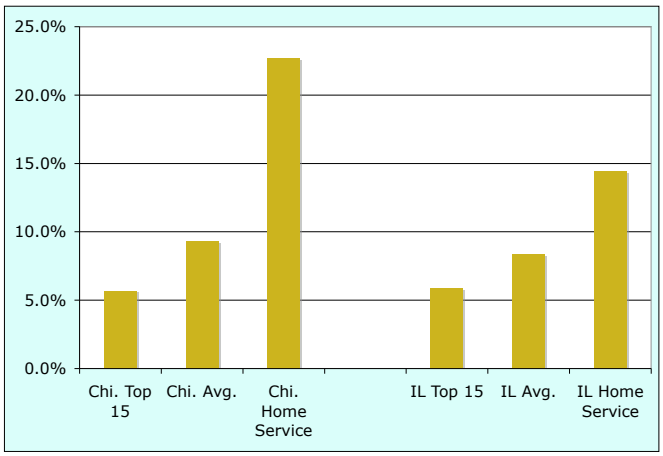


Figure 2: Proportion of businesses in the top-fifteen usage categories and top home-service categories that use names that begin with an "A" or a number. Source: ReferenceUSA.

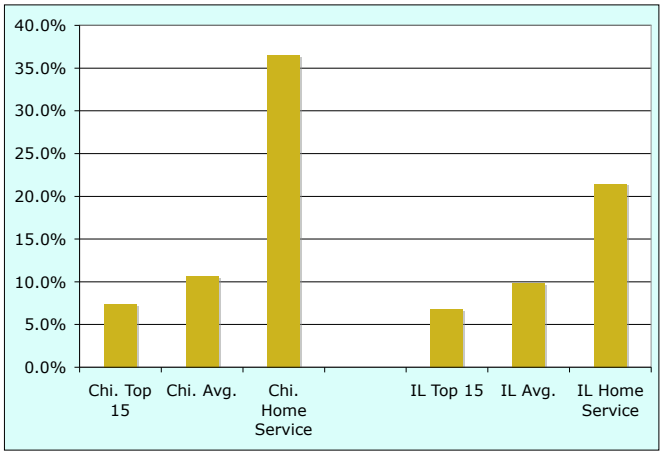


Figure 3: Proportion of new entrants that use names that begin with an "A" or a number. Source: ReferenceUSA.

| Variable | Mean | Std. Dev. | Min. | Max. |
|---|---|---|---|---|
| Complaints | 0.389 | 2.601 | 0 | 57 |
| Complaints per Employee | 0.138 | 1.373 | 0 | 57 |
| Employees | 5.632 | 15.455 | 1 | 300 |
| Firm Age | 12.505 | 8.938 | 1 | 25 |
| Ad Spending | 5362.669 | 10937.454 | 0 | 50000 |
| Name Begins with "A" | 0.129 | 0.335 | 0 | 1 |
| Number of Names | 1.16 | 0.659 | 1 | 16 |
| Metro Chicago | 0.619 | 0.486 | 0 | 1 |
| N | | 2293 | | |

Table 3: Summary statistics for plumbing firms operating in Illinois. Source: ReferenceUSA and the Better Business Bureau.

| Mean of Variable | Name Begins with "A" No | Yes | t-stat |
|---|---|---|---|
| Complaints | 0.248 | 1.339 | 6.79 |
| Complaints per Employee | 0.101 | 0.387 | 3.35 |
| Employees | 5.530 | 6.325 | 0.83 |
| Firm Age | 12.767 | 10.729 | 3.67 |
| Ad Spending | 5,149.7 | 6,805.1 | 2.43 |
| Metro Chicago | 0.599 | 0.756 | 5.21 |
| Number of Names | 1.091 | 1.631 | 13.67 |
| N | 1,998 | 295 | |

Table 4: Summary statistics for plumbing firms operating in Illinois. Source: ReferenceUSA and the Better Business Bureau.


Figure 4: A plumbing firm that operates under multiple names in Illinois. Source: Northshore Real Yellow Pages.

| Mean of Variable | Multiple Names | | t-stat |
|---|---|---|---|
| | No | Yes | |
| Complaints | 0.191 | 2.180 | 11.25 |
| Complaints per Employee | 0.090 | 0.569 | 5.02 |
| Employees | 5.239 | 9.197 | 3.68 |
| Firm Age | 12.425 | 13.2329 | 1.30 |
| Ad Spending | 4,703.3 | 11,334.6 | 8.83 |
| Metro Chicago | 0.600 | 0.798 | 5.91 |
| Name Begins with "A" | 0.100 | 0.386 | 51.35 |
| N | 2,065 | 228 | |

Table 5: Summary statistics for plumbing firms operating in Illinois. Source: ReferenceUSA and the Better Business Bureau.

| Mean of Variable | Name Type | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| Name Begins with "A" | 0 | 1 | 0 | 1 |
| Has Multiple Names | 0 | 0 | 1 | 1 |
| Complaints | 0.179 | 0.295 | 1.164 | 3.795 |
| Complaints per Employee | 0.082 | 0.160 | 0.347 | 0.921 |
| Employees | 5.271 | 4.952 | 8.971 | 9.557 |
| Firm Age | 12.712 | 9.845 | 13.500 | 12.807 |
| Ad Spending | 4,806.8 | 3,774.4 | 9,700.7 | 13,934.1 |
| Metro Chicago | 0.589 | 0.696 | 0.736 | 0.898 |
| N | 1,858 | 207 | 140 | 88 |

Table 6: Summary statistics for plumbing firms operating in Illinois. Source: ReferenceUSA and the Better Business Bureau.

| Variable | Mean | Std. Dev. | Min. | Max. |
|---|---|---|---|---|
| Fixed Fee | 54.353 | 66.177 | 0 | 320 |
| Hourly Rate | 103.446 | 46.156 | 19.95 | 320 |
| Has Fixed Fee | 0.61 | 0.488 | 0 | 1 |
| Two-Hour Price | 215.846 | 94.641 | 39.9 | 640 |
| Complaints | 0.79 | 3.211 | 0 | 43 |
| Complaints per Employee | 0.158 | 0.548 | 0 | 7 |
| Employees | 9.297 | 20.569 | 1 | 300 |
| Firm Age | 14.823 | 9.153 | 1 | 25 |
| Ad Spending | 7936.372 | 12922.134 | 0 | 50000 |
| Metro Chicago | 0.606 | 0.489 | 0 | 1 |
| Name Begins with "A" | 0.151 | 0.358 | 0 | 1 |
| Number of Names | 1.32 | 0.891 | 1 | 11 |
| N | | 543 | | |

Table 7: Summary statistics for plumbing firms operating in Illinois that responded to our price survey. Source: Firm responses, ReferenceUSA, and the Better Business Bureau.

| | Name Begins with "A" | | |
|---|---|---|---|
| Mean of Variable | No | Yes | t-stat |
| Fixed Fee | 48.789 | 85.634 | 4.74 |
| Hourly Rate | 100.173 | 121.847 | 3.97 |
| Has Fixed Fee | 0.584 | 0.756 | 2.97 |
| Two-Hour Price | 209.488 | 251.591 | 3.76 |
| N | 461 | 82 | |

Table 8: Summary statistics for plumbing firms operating in Illinois that responded to our price survey. Source: Firm responses.

| | (1) Complaints | (2) Complaints | (3) Complaints | (4) Complaints |
|---|---|---|---|---|
| Name Begins with "A" | | 1.218*** | 0.707*** | 0.669** |
| | | (0.217) | (0.220) | (0.260) |
| Multiple Names | | | 1.520*** | 1.476*** |
| | | | (0.230) | (0.278) |
| Begins with "A" * Multiple Names | | | | 0.133 |
| | | | | (0.482) |
| Employees | 0.0200** | 0.0236*** | 0.0206*** | 0.0206*** |
| | (0.00906) | (0.00867) | (0.00771) | (0.00771) |
| Ad Spending | 0.0557*** | 0.0514*** | 0.0421*** | 0.0420*** |
| | (0.00729) | (0.00707) | (0.00647) | (0.00649) |
| Firm Age | -0.0118 | -0.0139 | -0.0102 | -0.0103 |
| | (0.00997) | (0.00997) | (0.00961) | (0.00962) |
| Metro Chicago | 1.158*** | 0.976*** | 0.917*** | 0.917*** |
| | (0.191) | (0.190) | (0.185) | (0.185) |
| Constant | -2.570*** | -2.687*** | -2.839*** | -2.833*** |
| | (0.213) | (0.213) | (0.209) | (0.210) |
| Observations | 2293 | 2293 | 2293 | 2293 |
| Pseudo $R^2$ | 0.069 | 0.082 | 0.102 | 0.102 |

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9: Negative binomial regression in which the dependent variable is the number of complaints filed against the firm with the Better Business Bureau.

| | (1) Complaints | (2) Complaints | (3) Complaints | (4) Complaints |
|---|---|---|---|---|
| Name Begins with "A" | | 1.341*** | 0.656 | 0.113 |
| | | (0.451) | (0.475) | (0.626) |
| Multiple Names | | | 2.049*** | 1.641*** |
| | | | (0.447) | (0.493) |
| Begins with A * Multiple Names | | | | 1.656 |
| | | | | (1.084) |
| Employees | 0.0448** | 0.0407** | 0.0404** | 0.0403** |
| | (0.0201) | (0.0198) | (0.0187) | (0.0183) |
| Ad Spending | 0.0741*** | 0.0779*** | 0.0687*** | 0.0682*** |
| | (0.0147) | (0.0146) | (0.0137) | (0.0133) |
| Firm Age | -0.00605 | 0.00899 | 0.0178 | 0.0189 |
| | (0.0176) | (0.0183) | (0.0181) | (0.0179) |
| Constant | -2.908*** | -3.321*** | -3.624*** | -3.592*** |
| | (0.298) | (0.340) | (0.355) | (0.351) |
| Observations | 873 | 873 | 873 | 873 |
| Pseudo $R^2$ | 0.084 | 0.100 | 0.139 | 0.143 |

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 10: Negative binomial regression in which the dependent variable is the number of complaints filed against the firm with the Better Business Bureau and the sample is restricted to firms not serving the metro-Chicago area.

| | (1) Complaints | (2) Complaints | (3) Complaints | (4) Complaints |
|---|---|---|---|---|
| Name Begins with "A" | | 1.311*** | 0.819*** | 0.811*** |
| | | (0.255) | (0.255) | (0.305) |
| Multiple Names | | | 1.419*** | 1.410*** |
| | | | (0.266) | (0.327) |
| Begins with A * Multiple Names | | | | 0.0252 |
| | | | | (0.551) |
| Employees | 0.0157* | 0.0229** | 0.0206** | 0.0206** |
| | (0.00916) | (0.00956) | (0.00850) | (0.00851) |
| Ad Spending | 0.0518*** | 0.0446*** | 0.0363*** | 0.0362*** |
| | (0.00822) | (0.00800) | (0.00732) | (0.00737) |
| Firm Age | -0.0144 | -0.0242** | -0.0212* | -0.0212* |
| | (0.0120) | (0.0121) | (0.0117) | (0.0117) |
| Constant | -1.327*** | -1.562*** | -1.762*** | -1.760*** |
| | (0.164) | (0.164) | (0.160) | (0.163) |
| Observations | 1420 | 1420 | 1420 | 1420 |
| Pseudo $R^2$ | 0.045 | 0.061 | 0.078 | 0.078 |

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 11: Negative binomial regression in which the dependent variable is the number of complaints filed against the firm with the Better Business Bureau and the sample is restricted to firms serving the metro-Chicago area.

| | (1) Two-Hour Price | (2) Two-Hour Price | (3) Two-Hour Price | (4) Two-Hour Price | (5) Two-Hour Price | (6) Two-Hour Price | (7) Two-Hour Price |
|---|---|---|---|---|---|---|---|
| Name Begins with "A" | 21.04** | 19.66* | 16.50 | 24.41** | 22.40** | 16.17 | 30.73*** |
| | (10.17) | (10.66) | (13.76) | (10.38) | (10.77) | (13.73) | (10.73) |
| Multiple Names | | 4.365 | 2.219 | | 7.091 | 2.943 | |
| | | (9.981) | (11.60) | | (10.10) | (11.58) | |
| Begins with "A" * Multiple Names | | | 7.776 | | | 15.95 | |
| | | | (21.35) | | | (21.78) | |
| Complaints | | | | -1.986 | -2.130* | -2.328* | 3.187 |
| | | | | (1.251) | (1.268) | (1.297) | (2.645) |
| Begins with "A" * Complaints | | | | | | | -6.292** |
| | | | | | | | (2.838) |
| Employees | -0.595*** | -0.598*** | -0.595*** | -0.538*** | -0.538*** | -0.527*** | -0.553*** |
| | (0.177) | (0.178) | (0.178) | (0.181) | (0.181) | (0.182) | (0.180) |
| Firm Age | 0.789* | 0.789* | 0.780* | 0.767* | 0.765* | 0.745* | 0.821** |
| | (0.402) | (0.402) | (0.403) | (0.402) | (0.402) | (0.403) | (0.401) |
| Ad Spending | 0.0538 | 0.0217 | 0.0165 | 0.226 | 0.186 | 0.190 | 0.147 |
| | (0.282) | (0.292) | (0.292) | (0.302) | (0.307) | (0.307) | (0.303) |
| Metro Chicago | 97.10*** | 96.82*** | 96.80*** | 97.35*** | 96.92*** | 96.89*** | 96.58*** |
| | (7.459) | (7.492) | (7.498) | (7.450) | (7.480) | (7.483) | (7.431) |
| Constant | 147.2*** | 147.1*** | 147.5*** | 146.6*** | 146.3*** | 147.1*** | 144.7*** |
| | (8.606) | (8.620) | (8.708) | (8.604) | (8.618) | (8.693) | (8.616) |
| Observations | 543 | 543 | 543 | 543 | 543 | 543 | 543 |
| $R^2$ | 0.266 | 0.266 | 0.266 | 0.269 | 0.270 | 0.271 | 0.276 |

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 12: Ordinary least-squares regression in which the dependent variable is the project price of firms responding to our price survey.

| | Advertise on Google | | |
|---|---|---|---|
| **Mean of Variable** | **No** | **Yes** | **t-stat** |
| Complaints | 0.265 | 3.588 | 11.91 |
| Complaints per Employee | 0.128 | 0.394 | 1.76 |
| Employees | 5.410 | 11.400 | 3.51 |
| Firm Age | 12.483 | 13.070 | 0.59 |
| Ad Spending | 4,947.7 | 16,141.8 | 9.44 |
| Metro Chicago | 0.608 | 0.918 | 5.81 |
| Name Begins with "A" | 0.123 | 0.282 | 4.33 |
| Number of Names | 1.135 | 1.800 | 9.30 |
| N | 2,208 | 85 | |

Table 13: Summary statistics for firms that do and do not advertise on Google. Source: Google search results, ReferenceUSA, and the Better Business Bureau.

| | (1) Complaints | (2) Complaints | (3) Complaints | (4) Complaints |
|---|---|---|---|---|
| On Google | 1.116*** | 0.942** | 0.977** | 0.851** |
| | (0.388) | (0.373) | (0.436) | (0.358) |
| Name Begins with "A" | | 1.166*** | 1.176*** | 0.676*** |
| | | (0.216) | (0.225) | (0.218) |
| Name Begins with "A" * On Google | | | -0.127 | |
| | | | (0.793) | |
| Multiple Names | | | | 1.492*** |
| | | | | (0.227) |
| Firm Age | -0.0136 | -0.0148 | -0.0148 | -0.0120 |
| | (0.00988) | (0.00988) | (0.00990) | (0.00952) |
| Ad Spending | 0.0497*** | 0.0478*** | 0.0480*** | 0.0379*** |
| | (0.00724) | (0.00699) | (0.00704) | (0.00651) |
| Employees | 0.0168** | 0.0203** | 0.0203** | 0.0174** |
| | (0.00837) | (0.00824) | (0.00824) | (0.00731) |
| Metro Chicago | 1.032*** | 0.883*** | 0.883*** | 0.833*** |
| | (0.190) | (0.189) | (0.189) | (0.185) |
| Constant | -2.482*** | -2.623*** | -2.626*** | -2.759*** |
| | (0.213) | (0.213) | (0.214) | (0.210) |
| Observations | 2293 | 2293 | 2293 | 2293 |
| Pseudo $R^2$ | 0.073 | 0.085 | 0.085 | 0.104 |

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 14: Negative binomial regression in which the dependent variable is the number of complaints filed against the firm with the Better Business Bureau