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

Ryan C. McDevitt[†]

January 2011

Abstract

This paper considers a simple model in which a firm's name signals meaningful information about its quality, and confirms the prediction 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. Other equilibrium implications confirmed in this setting include: (i) firms use names that begin with an "A" or a number more often in larger markets, (ii) firms that use multiple names receive more complaints, and (iii) firms with names that begin with an "A" or a number have higher prices. The model also applies to position auctions: firms that advertise on Google receive more complaints, all else equal.

1 Introduction

Firms choose names deliberately. Often, their choices aim to influence the perceptions of consumers. A firm might claim to provide high-quality service by including the word "quality" or "best" in its name, or to offer low prices by calling itself a "discount" provider. When consumers cannot verify the claims implied by a firm's name, however, they might dismiss them as cheap talk. This paper examines when a firm's name can signal meaningful information about itself.

Consider, for example, a market for residential plumbing services. A typical customer hires a plumber infrequently and does so using little information other than the business' name. In response, many plumbing firms choose names strategically to attract business. In the city of Chicago, for instance, approximately 21% of plumbing firms use names that begin with an "A" or a number, such as A-AAAA Sewer & Drains and AAAA Scott's Plumbing. A plumbing firm presumably chooses this type of name to appear near the beginning of the plumbing category in the Yellow Pages, which potentially attracts customers who search the directory by starting with the first listing. Because firms freely choose their names, however, the benefits of using a name that begins with an "A" or a number must come with a tradeoff. If they did not, all firms would prefer to use such a name.

The tradeoff is the type of customer a name attracts. An infrequent customer with a small project, such as a homeowner with a broken pipe, will not devote much time to searching for a plumber; almost any will do an adequate job, and calling the first listing in the phone book minimizes the time spent finding one. In contrast, a customer with an elaborate or recurring project, such as a landlord with many broken pipes, will dedicate more time to finding a good plumber, perhaps dismissing ones with names like A-AAAA Sewer & Drains. A firm using a name that starts with an "A" or a number thus faces the opportunity cost of not attracting customers with low relative search costs, attracting customers with high relative search costs instead.

If a low-quality firm profits more from customers with high relative search costs than a high-quality firm does, firms will prefer to choose different names depending on their quality. For example, a low-quality plumber will not benefit much from attracting a customer with many future projects because he will not satisfy the customer initially and will not be recommissioned. A high-quality plumber, on the other hand, will prefer not to attract infrequent customers with small projects if doing so costs him the opportunity to work for a customer who potentially has many future jobs. As a result of these tradeoffs, a firm's name can credibly signal its quality.

It does for plumbing firms in Illinois: those with names that begin with an "A" or a number receive more than five times as many complaints with the Better Business Bureau, on average. In this sense, a firm's name provides meaningful 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 identities 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.

The type of name a firm uses also has implications for its prices. Because the Yellow Pages lists names alpha-numerically, the standard prediction of ordered search models such as Arbatskaya (2007) applies: prices will decline with the order in which a firm is searched since consumers require an incentive to justify searching. Again, the model's predictions hold empirically. Firms with names that begin with an "A" or a number require a fixed service charge more often and have higher prices overall. Specifically, firms serving metro Chicago that use a name beginning with an "A" or a number command an 8.4% price premium, all else equal.

Search costs drive these results. If consumers could costlessly search for plumbers, quality-adjusted price dispersion could not persist in equilibrium. As such, an increase in search costs should amplify the model's predicted effects, and two patterns in the data suggest that it does. First, the proportion of firms that use names beginning with an "A" or a number increases with market size. Second, the magnitude of quality differences is larger for firms in Illinois that serve the much larger metro-Chicago market. Because search costs increase with market size – that is, it takes longer to pick a name out of one hundred listings than out of ten – both of these findings suggest that consumers' search costs influence firms' name choices.

The model's results extend beyond the Yellow Pages. Any setting will exhibit equilibrium sorting when customers face different incentives to search for firms, and firms, in turn, prefer to attract different types of customers depending on their characteristics. For instance, Internet search engines such as Google do not list firms alpha-numerically, but instead sort listings using proprietary algorithms for the left-hand side of their search results and position auctions for the top and right-hand side. Because firms must bid to appear among the paid listings, a series of recent papers contends that position auctions enhance welfare by excluding lower-quality firms from search results since high-quality firms will submit higher bids in anticipation of satisfying

more customers. To cite one such claim, Athey & Ellison (forthcoming) 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."

Contrary to the prediction that only the highest-quality firms will win position auctions, plumbing firms that advertise on Google receive more than thirteen times as many complaints, on average. The model in this paper explains why: because Google disproportionately attracts customers with high relative search costs, a low-quality plumbing firm has a greater incentive to appear among the top paid listings on Google, just as it has a greater incentive to choose a name that would place it among the top listings in offline Yellow Pages. As a result, the efficiency gains speculated to arise from position auctions have not occurred in this particular case.

This paper contributes to several strands of literature. First, it studies the economic implications of names. Previous work has considered many topics in this area, such as name trading (Tadelis 1999), labor market outcomes (Einav & Yariv 2006, Fryer Jr & Levitt 2004, Bertrand & Mullainathan 2004), voting behavior (Meredith & Salant 2007), and stock price returns (Cooper et al. 2001). No prior work (to my knowledge) has considered a model in which a firm's name represents a primitive strategic choice variable and tested its equilibrium implications empirically.

Second, this paper contributes to the literature on firm reputation.[1] A firm's response to an event that tarnishes its reputation motivates this line of literature, which includes Tadelis (1999, 2003), Cremer (1986), Kreps (1990), and Mailath & Samuelson (2001). For instance, AIG and GMAC Bank recently changed their names to AIU and Ally Bank, respectively, due to the negative sentiment associated with their parent companies following the financial crisis. A firm facing a situation like AIG or GMAC Bank would adopt such a strategy because its poor performance diminishes the value of its name (reputation) as consumers update their beliefs regarding the firm's quality. Once the value falls far enough, a firm will discontinue or change its name to start with a clean record and exploit the ignorance of consumers regarding who is behind the new name. This paper considers a related question: Can the content of a firm's name signal credible information to consumers about its reputation?

This paper also contributes to the sparse empirical literature regarding names and reputations. Two recent papers within this vein are Cabral & Hortacsu (2010), who find that sellers on eBay

---

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

(where a user name is associated with a seller's reputation) are more likely to exit after receiving negative feedback, and McDevitt (forthcoming), who shows that plumbing firms change their names more frequently after receiving complaints. In a similar spirit, this paper establishes an empirical relationship between the content of firms' names and their reputations.

Third, this paper contributes to the literature on signaling. An extensive body of work has considered circumstances under which firms can credibly signal information about themselves, such as Milgrom & Roberts (1986), Bagwell & Riordan (1991), and Wolinsky (1983). More closely related to the objectives of this paper, Shin (2005) develops a model in which advertisements with vague information about a firm's prices can nevertheless provide meaningful information to consumers. When a firm incurs costs to sell a product, either directly or in the form of opportunity costs, attracting the wrong mix of consumers by sending an inappropriate signal about its prices reduces profits. As a result, firms have no incentive to mislead consumers with their signals, and an equilibrium obtains under certain conditions in which firms separate by choosing different advertising strategies given their types. A similar intuition governs the name choices of plumbing firms in this paper.

Finally, this paper contributes to the literature on consumer search. Specifically, Armstrong et al. (2009) examine the effects of prominence in search markets where 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. In contrast, lower-quality plumbing firms dominate the most prominent positions in the Yellow Pages.

In addition, a growing theoretical literature has studied position auctions for advertisements on Internet search engines. For instance, Chen & He (2006) and Athey & Ellison (forthcoming) develop models in which position auctions enhance consumer welfare because high-quality firms submit higher bids for favorable listings on Internet search engines, enabling consumers to search more efficiently. In contrast to these theoretical results, plumbing firms that advertise on Google receive more complaints, on average. In this setting, the sorting behavior predicted by the position auction literature is not consistent with observed market outcomes.

This paper proceeds with Section 2 which develops a stylized model of firm name choice and consumer search, analyzes a separating equilibrium, and outlines five testable implications. Section 3 discusses the empirical setting used to test the model's predictions and highlights several prominent empirical regularities. Section 4 presents the results from reduced-form estimates of

4

the model. Section 5 provides an extension to Internet position auctions. Section 6 concludes. Finally, Appendix A describes the data and Appendix B contains all tables and figures.

2   Model

Consider a market for a service supplied by two types of firms, L and H. Each firm-type successfully provides the service with probability λ_j, with $0 < \lambda_L < \lambda_H < 1$. Two types of consumers demand the service, S and R. Each consumer-type has a project size, T_i, with $1 \leq T_S < T_R$. Consumers receive utility T_i from a successfully completed project, and 0 otherwise.

Firms choose one of two types of names, A and Z. Consumers select firms based on their names. Consumers can contact an A-type name at no cost (i.e., no search), but must pay a search cost of $C > 0$ to contact a Z-type name.

Because consumers cannot distinguish among firms within a given name-type, prices depend only on the name of the firm, with A-types charging $P_A > 0$ per unit of service and Z-types charging $P_Z > 0$. Payment is composed of a fixed service charge, P_n, and a contingent portion that is paid upon the successful completion of the project.[2] Payment is therefore $P_n + T_i * P_n$ if the project is completed successfully, and P_n otherwise.

Sorting Equilibrium   Given this structure, the following four conditions represent a sorting equilibrium in which L-type firms choose A-type names and H-type firms choose Z-type names, while consumers make rational search decisions such that S-type consumers select firms using A-type names and R-type consumers search for firms using Z-type names:

Condition 1 $\lambda_H T_R - P_Z - \lambda_H P_Z T_R - C \geq \lambda_L T_R - P_A - \lambda_L P_A T_R$

Condition 2 $\lambda_L T_S - P_A - \lambda_L P_A T_S \geq max(\lambda_H T_S - P_Z - \lambda_H P_Z T_S - C, 0)$

Condition 3 $P_Z + \lambda_H P_Z T_R \geq P_A + \lambda_H P_A T_S$

Condition 4 $P_A + \lambda_L P_A T_S \geq P_Z + \lambda_L P_Z T_R$

Condition 1 implies that R-type consumers search for an H-type firm using a Z-type name because this firm's lower price and greater likelihood of success outweigh the cost of searching for R-type consumers given their projects. Condition 2 implies that S-type consumers, because

---

[2]This is a common pricing structure for residential plumbing services, as discussed in Section 3.

of their smaller projects, do not benefit enough from the lower price and greater probability of success associated with selecting an H-type firm using a Z-type name to justify incurring search costs. Condition 3 implies that H-type firms accept the lower price commensurate with a Z-type name because they benefit comparatively more from a larger project due to the greater likelihood that they will complete it successfully. Condition 4 implies that L-type firms prefer the larger fixed service charge associated with A-type names due to the smaller chance that they will complete a project successfully and receive the contingent portion of the contract.

Finally, compatible parameters satisfying these four conditions yield the following result:

Result 1 *In a sorting equilibrium that satisfies Conditions 1 – 4, $P_A \geq P_Z$.*

The proof follows directly from Condition 4. Suppose $P_A < P_Z$. Then $P_A < \frac{1+\lambda_L T_R}{1+\lambda_L T_S} P_Z$ because $T_R > T_S$, which contradicts Condition 4.

Discussion While stylized, the model captures the main features of the market for plumbing services. Many customers require a plumber infrequently and for minor projects, such as a broken pipe. This kind of customer has little reason to search extensively for a plumber, as most licensed plumbers can complete a small project successfully and the variation in prices across plumbers for a project of this size will not warrant requesting multiple bids. This type of customer seems likely to limit his search to the first few listings in the Yellow Pages.

Other customers require a plumber more often or for more elaborate projects, such as a landlord responsible for the plumbing in several apartments. This type of customer has more incentive to search for a high-quality plumber with lower marginal prices, and will likely extend his search beyond the first few listings in the Yellow Pages.

Each type of plumber, due to the differences in their abilities, prefers to attract a different type of customer. Because a low-quality plumber cannot satisfy customers with elaborate projects and will not receive any recurring business, he prefers to attract customers who do not search and who pay higher prices. A high-quality plumber, on the other hand, does not want to attract many low-frequency customers with small projects because he would then lose the opportunity to receive the contingent portion from a larger project if already engaged with a small one. High-quality plumbers prefer to "de-market" to the high relative search cost customers who would be most likely to call one of the first few listings in the Yellow Pages, and do so by choosing a name that appears farther down in the plumbing category.

Pooling Equilibrium Other market conditions result in a pooling equilibrium in which names do not convey meaningful information. When consumers have low search costs, for example, all search extensively and sorting behavior by firms cannot hold in equilibrium. In this case, no consumer would contact a name associated with a low-quality firm, and therefore low-quality firms would not prefer to signal their type by using a distinguishable name. Likewise, if $\frac{\lambda_H}{\lambda_L}$ or $\frac{T_R}{T_S}$ are too large or small, pooling of firm-types across names will obtain.

Search Costs and Market Size When search costs increase with market size, comparative statics along this dimension yield further equilibrium predictions. Illustrating these results requires two additional assumptions. First, assume from Condition 2 that S-type consumers receive no surplus so that

Assumption 1 $\lambda_L T_S - P_A - \lambda_L P_A T_S = 0$,

which along with Condition 1 bounds P_Z:

$$P_Z < \frac{\lambda_H T_R - \lambda_L T_R - C}{1 + \lambda_H T_R} + \frac{1 + \lambda_L T_R}{1 + \lambda_H T_R} \frac{\lambda_L T_S}{1 + \lambda_L T_S}. \tag{1}$$

Second, let P_Z^* be the equilibrium price charged by plumbers using Z-type names and assume that

Assumption 2 P_Z^* *is arbitrarily close to the upper bound in* (1).

In a sorting equilibrium that satisfies Conditions $1-4$, Assumptions 1 and 2 imply that for a given set of project sizes and firm qualities,

$$\frac{\partial P_Z^*}{\partial C} < 0. \tag{2}$$

Now, consider the quality indifference point, λ^*, for a firm deciding between an A- and Z-type name,

$$\lambda^* = \frac{P_Z - P_A}{T_S P_A - T_R P_Z}. \tag{3}$$

That is, given prices and project sizes, a firm with quality $\lambda > \lambda^*$ prefers a Z-type name, while a firm with quality $\lambda < \lambda^*$ prefers an A-type name. Let $P^* = \frac{P_A}{P_Z}$. Then

$$\frac{\partial \lambda^*}{\partial P^*} > 0, \tag{4}$$

7

which implies:

Result 2 *The quality threshold for choosing a Z-type name increases with price dispersion.*

In other words, as the ratio of prices increases, the equilibrium level of quality at which a firm is indifferent between choosing an A- and Z-type name also increases. Together, (2) and (4) imply that as search costs increase, a larger measure of firms will prefer to use A-type names because the quality cutoff above which a firm would prefer to use Z-type names is higher.

To appreciate the empirical content of Result 2, consider a marginal entrant in a market with low search costs compared to a market with high search costs. Assuming the entrant takes market characteristics (i.e., prices and project sizes) as fixed and receives a random draw for λ, Result 2 predicts that the entrant will be more likely to choose an A-type name in the high-search-cost market because the quality threshold at which he would prefer to use a Z-type name is higher. That is, because λ^* increases with search costs, the measure of plumbers who would prefer to use an A-type name also increases. And to the extent that search costs increase with market size, a larger proportion of firms will choose A-type names in larger markets.

Finally, a complementary analysis shows that the difference in quality between firms using A- and Z-type names must increase with search costs in order to maintain a sorting equilibrium, holding other market characteristics fixed. Note from Conditions 1 and 2 that

$$\frac{\partial \lambda_H}{\partial C} > 0 \tag{5}$$

and

$$\frac{\partial \lambda_L}{\partial C} < 0. \tag{6}$$

Along with the set of previously imposed restrictions, (5) and (6) dictate that $\frac{\lambda_H}{\lambda_L}$ increases with C, which yields the following result:

Result 3 *Quality dispersion increases with search costs.*

Result 3 simply reflects the intuition that if search costs increase while other market characteristics remain fixed, the relative quality of an H-type firm must also increase in order to maintain R-type consumers' incentive to search.

Extension to Multiple Names The qualitative results of the model extend naturally to a setting in which firms can use more than one name.[3] Consider a very low-quality firm that derives the majority of its revenue from fixed service fees (i.e., the firm does not often perform well and is fired before completing the project, receiving no referrals or repeat customers). This firm is indifferent about the type of customer it attracts so long as it attracts many of them and collects their fixed service charges. High-quality firms, on the other hand, still incur an opportunity cost by attracting infrequent customers with small projects, as they must forgo the chance to attract a customer who would provide more business over time if already committed to a small project. As long as the number of low-quality plumbers pooling with high-quality plumbers on certain names is not so large that it eliminates the benefits from searching for all consumers, a partial-sorting result still holds: low-quality plumbers use several names to attract as many customers as possible, while high-quality plumbers prefer to use only one, higher-ordered name to attract customers with larger projects.

Testable Implications To review, the model generates five main predictions:

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

Implication 2 *Under certain market conditions, low-quality firms will operate with several names, while high-quality firms will use only one, higher-ordered name.*

Implication 3 *In a sorting equilibrium, the proportion of firms using names beginning with an "A" or a number increases with search costs.*

Implication 4 *In a sorting equilibrium, the difference in quality between firms using lower-ordered names and those using higher-ordered names increases with search costs.*

Implication 5 *In a sorting equilibrium, firms using lower-ordered names will charge higher prices than firms using higher-ordered names.*

---

[3]In short, the extension requires assumptions about capacity constraints for firms and type-dependent arrival rates for customers.

3 Empirical Setting and Regularities

This section discusses both the Yellow Pages and the market for residential plumbing services in Illinois, and presents several relevant empirical regularities.[4]

Yellow Pages The "Yellow Pages" refers to 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, with local phone companies distributing copies to their subscribers annually at no charge. Publishers 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 Yellow Pages' listings in a top-down manner (Lohse 1997). In response, some businesses choose names that place them near the beginning of their categories. And though one might suspect that firms would adopt this strategy more often in the categories that attract the most usage in the Yellow Pages, which are shown in Table 1, they do not. Whereas approximately 8.3% of businesses listed in Illinois' Yellow Pages use a name that begins with an "A" or a number, only 5.9% of businesses among the fifteen most-viewed categories do, as shown in Figure 1. While seemingly counterintuitive, the placement of a business' listing in the Yellow Pages likely influences customers less in these categories. For example, most patients would not select a urologist by calling the first listing they find in the phone book.

To appreciate when a business' name might have more influence on a consumer, Table 2 presents the categories with the largest proportion of firms using names that begin with an "A" or a number in the city of Chicago. A common feature stands out among this group: the majority of these categories are for businesses used infrequently by a customer with an urgent need inside his home.

In these categories, a firm's location does not affect a consumer's choice of a business because she does not bear a transportation cost for obtaining the service. Consequently, a firm's other characteristics – including its name – are relatively more important for attracting customers as the firm has fewer ways to differentiate itself. Consistent with this intuition, the top home-service

---

[4]Appendix A contains a description of the data sources used throughout this paper.

categories in the Yellow Pages, as shown in Table 3, have a larger proportion of firms with names that begin with an "A" or a number, as shown in Figure 2. In Illinois, 14.4% of businesses in these categories use names that begin with an "A" or a number, significantly above the statewide average of 8.3%. Moreover, the home-service categories among the top-fifteen where businesses have the most repeated interaction with customers – lawn maintenance and landscaping services – have relatively fewer businesses that use names beginning with an "A" or a number: only 8.3%, just in line with the state average. For these firms, success will depend more on satisfying customers repeatedly than on attracting attention with a particular name.

Firms' names also vary by their tenure in the market. As shown in Figure 3, 35% of new entrants in home-service categories in the city of Chicago use names beginning with an "A" or a number, which compares to an average of 10% across all categories. The different manners by which new and established firms can attract customers explain this result. Because a new entrant cannot attract customers with its nonexistent track record, it must rely on other methods to draw clientele. Choosing a name that appears near the beginning of the Yellow Pages is one such strategy, as potential customers will tend to view its listing more often.

This preliminary analysis suggests that a firm's business category influences its name choice. Focusing specifically on local markets for plumbing services in Illinois allows for a more detailed analysis of the economic primitives underlying this result.

Plumbing Firms   The supply of plumbing services in Illinois depends, first and foremost, on 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. To meet the state's standards, 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.

Plumbers often conduct business within firms, and Table 4 presents the summary statistics for residential plumbing firms operating within Illinois. The typical firm has four employees and spends approximately $5,000 annually on advertising. In general, these are not large, sophisticated enterprises.

Plumbing firms vary greatly in terms of their service quality, and the number of complaints

filed against a firm with the Better Business Bureau serves as one measure of this. Firms' complaints have a highly skewed distribution: the median number of complaints filed against a firm is 0, while a firm at the 99th percentile received 7. In other words, almost all firms provide adequate service; only a few generate the majority of complaints. In this setting, however, complaints represent a noisy proxy for this dimension, as the time and effort required to file a formal complaint likely deters all but the most disgruntled customers from filing one.

Plumbing firms make deliberate name choices, using names beginning with an "A" or a number more often than firms in most categories. 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 include 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 plumbing firms serving metro Chicago use at least one name that begins with an "A" or a number, while only 8.3% of firms outside metro Chicago do. As shown in Figure 4, markets outside Illinois also exhibit this pattern. Across the United States, the average proportion of plumbing firms using a name that begins with an "A" or a number increases steadily with market size, as predicted by Implication 3. In contrast, a category where market size bears no apparent relation to a firm's name choice – beauty salons – has no such pattern, as shown in Figure 5.

In keeping with other home-service categories, new entrants to the plumbing category are more likely to use a name that begins with an "A" or a number: 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 make different choices 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.

Plumbing firms that use a name beginning with an "A" or a number differ from firms that do not in many respects, as shown in Table 5. They are, on average, younger, spend more on advertising, and are more likely to serve metro Chicago. Moreover, as predicted by Implication 1, firms that use names beginning with an "A" or a number receive more than five times as many complaints, on average. As a robustness check, Table 6 provides the average reviews for firms

from other sources of quality information: Yelp.com, Angie's List, and Consumer's Checkbook. In all cases, plumbing firms that use names beginning with an "A" or a number receive lower ratings. As a falsification test, note also in Table 6 that no correlation between a firm's name and quality rating exists for restaurants.

Importantly, firms that use names beginning with an "A" or a number do not have more employees than other firms, on average, which suggests that they do not consistently receive more business than other firms due to the capacity constraints of individual plumbers. For this reason, the fact that firms using names that begin with an "A" or a number receive more complaints, even after controlling for employee levels, suggests that they provide lower-quality service. Additional supporting evidence comes again from Table 6. If firms using names that begin with an "A" or a number received significantly more business, they would also receive significantly more reviews from customers. They do not.

Unlike firms in most settings, plumbing firms can use more than one name. For instance, note in Figure 6 that this firm, linked clearly by its plumbing license in the two advertisements, uses at least four distinct names. A plumbing firm might use more than one name for many reasons, such as to disassociate from past failures or to have more listings in the Yellow Pages with which to attract customers, to name a few. While the majority of firms in Illinois (over 90%) use only one name, 228 firms use more than one and they differ considerably from single-named firms, as shown in Table 7. On average, firms that use more than one name have more employees, are older, spend more on advertising in the Yellow Pages, are more likely to serve metro Chicago, and receive more complaints. 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, compared with 10.0% for firms that use only one name. Moreover, firms that use more than one name and use at least one that begins with an "A" or a number receive even more complaints, as shown in Table 8. Because having multiple listings in the Yellow Pages serves as a form of advertising, the fact that firms using more than one name also (i) spend more on advertising, (ii) are more likely to use a name that begins with an "A" or a number, and (iii) receive more complaints aligns well with the model's motivation in Section 2.

Finally, Table 9 presents the summary statistics from a price survey of plumbing firms described in Appendix A. Notably, firms' pricing policies vary by their name choices. 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, as shown in Table 10.[5] All of these results are consistent with Implication 5.

4 Results

This section tests the five implications derived from the model. It begins by considering the relationship between a firm's name and its quality, and concludes by considering the relationship between a firm's name and its prices.

Quality To test the primary hypothesis of this paper, that firms using names that begin with an "A" or a number provide lower-quality service, consider the following regression:

$$y_j = \beta_A A_j + \beta_M M_j + \alpha X_j + \varepsilon_j, \tag{7}$$

where the dependent variable, y_j, is the number of complaints filed against a firm with the Better Business Bureau; A_j is an indicator variable equal to one if the firms uses a name that begins with an "A" or a number; M_j is an indicator variable equal to one if the firm uses more than one name; X_j is a vector of other firm-specific variables such as its advertising expenditures, employee levels, years in operation, and service area; and ε_j is the error term.

Table 11 presents the results from a series of such regressions.[6] As a baseline, Specification (1) shows 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 the difference is not statistically significant at conventional levels. Finally, firms serving the metro-Chicago area receive more complaints than firms outside the metro area.

Specification (2) confirms Implication 1: 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, note that the incident rate ratio for firms that use at least one name beginning with an "A" or a number is approximately 3.379, meaning that these firms receive 237.9% more complaints

---

[5]Some firms apply a fixed fee to the first hour of service, while others do not. This feature is explicitly accounted for when the two-hour project price is constructed.

[6]Due to the over-dispersed count nature of the complaints data, a negative binomial regression is used for estimation. All qualitative results are robust to using an OLS specification or using complaints per employee as the dependent variable.

than other firms, all else equal. The qualitative interpretation of the remaining controls in Specification (2) is the same as in Specification (1).

Specification (3) includes a control for firms that use more than one name. As predicted by Implication 2, firms that use multiple names receive 357.1% more complaints, all else equal.[7] Controlling for firms that use more than one name reduces the marginal effect of having at least one that begins with an "A" or a number, bringing the incident rate ratio to 2.0, though the effect remains statistically significant ($p < 0.01$). The qualitative interpretation of the remaining controls in Specification (3) is the same as in Specifications (1) and (2).

Finally, Specification (4) includes 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 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.

As predicted by the model in Section 2, a statistically significant correlation exists between the content of a firm's name and its service quality. 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 multiple names receive even more complaints, which is consistent with Implication 2.

Quality by Market Size Consistent with the model's predictions, simple statistics show that the relationship between a firm's name and its service quality varies with market size. In line with Implication 3, 15.7% of firms serving the more populous metro-Chicago area use a name that begins with an "A" or a number, while only 8.2% of firms outside metro Chicago do. In line with Implication 4, the ratio of complaints received by the average firm that does and does not use a name beginning with an "A" or a number in metro Chicago is 4.9, which compares with a ratio of 2.8 for firms outside metro Chicago.

To further explore these findings, Table 12 presents the results from a series of regressions restricted to firms that do not serve the metro-Chicago area. As shown in Specification (2), firms outside metro Chicago that use at least one name beginning with an "A" or a number receive 282.4% more complaints, all else equal. Controlling for firms that use more than one name in

---

[7]Note that using multiple names is also related to a firm's dynamic reputation concerns, as discussed in McDevitt (forthcoming). While these considerations cannot be considered in the cross-section data used here, the mere fact that a firm uses more than one name does convey information to consumers, regardless of the mechanism that leads to this outcome.

Specification (3), however, reduces the marginal effect of having a name that begins with an "A" or a number – bringing the IRR to 1.9 – and renders the coefficient statistically insignificant. In this sense, the content of a firm's name does not provide a meaningful signal of a firm's quality outside the metro area, as using more than one name primarily explains the variation in firms' complaints for these markets.

Table 13 presents the same series of regressions restricted to firms that do serve the metro-Chicago area. Specification (2) shows that firms within metro Chicago that use at least one name beginning with an "A" or a number receive 270.9% more complaints, all else equal. When controlling for firms that use more than one name in Specification (3), having a name that begins with an "A" or a number is associated with an IRR of 2.3 and remains statistically significant, which contrasts with the effects outside metro Chicago. As predicted by Implication 4, the signal a firm sends by using a name that begins with an "A" or a number matters comparatively more in metro Chicago, even when controlling for those firms that use more than one name.

Price   Implication 5 predicts that firms using names that begin with an "A" or a number will have higher prices. To test this prediction, consider a series of OLS regressions taking the form

$$y_j = \beta_A A_j + \beta_M M_j + \alpha X_j + \varepsilon_j, \tag{8}$$

where the price a firm quoted for a representative two-hour project, y_j, is the dependent variable. Table 14 presents the results of these regressions, with Specification (1) providing evidence consistent with Implication 5: firms that use a name beginning with an "A" or a number charge higher prices, all else equal. In this specification, firms that use at least one name beginning with an "A" or a number command a \$21.05 premium, which is 8.4% above the mean in metro Chicago holding other explanatory variables at their sample means.

Specifications (2) and (3) include controls for firms that use more than one name and the qualitative interpretation of the results does not change. Furthermore, Specifications (4) – (6) include the number of complaints filed against the firm with the Better Business Bureau as an explanatory variable. The results from these regressions suggest that firms with more complaints charge lower prices, all else equal, which is consistent with quality-adjusted prices.[8]

---

[8]Note, however, that it is not possible to determine whether these firms are actually just more likely to provide a lower price quote but then charge a higher price *ex post*, which is a common reason cited by consumers for filing complaints.

5 Extension to Position Auctions with Consumer Search

Over the past decade, Internet search engines have become a substitute for traditional offline Yellow Pages. Typically, search engines such as Google do not follow the Yellow Pages' convention of listing names in alpha-numerical order under distinct business category headings. Instead, a consumer who searches for "chicago plumber" on Google will receive two sets of results on the page: (i) "organic" listings on the left-hand side and (ii) "sponsored" links at the top and right-hand side. Google determines the position of organic results by using a proprietary algorithm that ranks the relevance of each link and the position of sponsored links by ordering firms based on their bids in a generalized second-price auction for keywords.[9] On this type of platform, using a name that begins with an "A" or a number does not guarantee a firm a top position, potentially muting the signal a firm's name sends about its quality.

In light of this, a growing line of research contends that position auctions make search more efficient. For instance, Athey & Ellison (forthcoming) develop a model in which advertisers differ in quality, consumers incur search costs from clicking on links, and consumers act rationally when choosing how many links to click and in what order. Their model implies that only higher-quality firms will advertise on Google, with quality defined as the ability of the firm to meet the needs of the consumer conducting the search. For a setting such as plumbing services, a consumer's need, more or less, is to find a plumber that provides adequate service, i.e., that the service will not lead to a complaint filed with the Better Business Bureau.

To test this prediction of the theoretical position auction literature and its relation to offline search platforms, the data from ReferenceUSA and the Better Business Bureau were merged with plumbing-related search results from Google, as discussed in Appendix A. Table 15 presents the summary statistics for the plumbing firms that advertise on Google. On average, firms that advertise on Google have more employees, spend more on advertising in the Yellow Pages, are more likely to serve the metro-Chicago area, are more likely to use at least one name that begins with an "A" or a number, and are 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.

To control for confounding factors, Table 16 presents the results from a series of negative binomial regressions in which the dependent variable is the number of complaints filed against

---

[9]In this auction, the kth highest bidder wins the kth highest link and pays the $k + 1^{st}$ highest bid.

the firm. 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 4. Specifications (2) – (4) include other controls related to firms' names and the results remain similar to those in Specification (1). In short, being among the winners of Google's position auctions for plumbing-related key words is correlated with receiving more complaints with the Better Business Bureau.

Because plumbing firms that advertise on Google provide lower-quality service, the primary implication of the high-quality sorting equilibria for position auctions – that firms appearing among the sponsored links are more likely to meet the needs of consumers – does not hold for residential plumbing services. The model in Section 2 explains why: low-quality firms cannot attract loyal repeat customers and instead must rely on infrequent customers with high search costs who disproportionately search for plumbers on Internet search engines. High-quality firms, on the other hand, prefer to avoid this type of customer in favor of clients who will yield longer, more-lucrative relationships.[10] The characteristics of firms advertising on Google align with this contention: they spend more on advertising in the Yellow Pages, use names beginning with an "A" or a number more often, and have more listings overall. The correlation among these factors is consistent with a firm strategy aimed at attracting customers with high search costs.

This result suggests that the predicted efficiency gains from using online search platforms instead of traditional offline media do not necessarily prevail in every market. Because firms often face the same incentives across the two platforms, the same relationship between position and quality holds as well.

6   Conclusion

The type of name a firm uses can signal credible information about its quality. In the market for residential plumbing services in Illinois, firms that use a name that begins with an "A" or a number provide lower-quality service. The model in this paper illustrates why. 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 ones.

---

[10]It is not possible to rule out other interpretations, however, such as that 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 this analysis. For this reason, these results warrant further scrutiny and the research question of which settings induce high-quality sorting equilibria on Google is left for future studies.

Low-quality plumbers prefer to self-select names that attract high relative search cost customers because their poor service will not lead to repeat business. High-quality plumbers, on the other hand, use names that do not attract high relative search cost customers because they benefit comparatively more from large projects and from building a loyal customer base than from one-time emergency jobs.

This paper also considers the relationship between a firm's name and its prices. Firms that strategically use names to appear at the beginning of the Yellow Pages command higher prices. Again, the model in this paper explains why. Consumers require an incentive to search, and in this case consumers search to locate firms that charge lower prices and provide higher-quality service.

Finally, this paper provides evidence that position auctions do not make search more efficient in all markets. While the previous literature suggests that firms' listings will be sorted from high to low quality, the converse holds for residential plumbing services: firms in Illinois that advertise on Google provide lower-quality service. The same model of behavior that rationalizes the results from the Yellow Pages applies to Google, as the incentives for firms to signal their qualities to potential customers still predominate. As such, understanding the circumstances under which position auctions will make search more efficient for consumers in a particular market requires further study.

References

Arbatskaya, M. (2007), 'Ordered Search', *RAND Journal of Economics* **38**(1), 119.

Armstrong, M., Vickers, J. & Zhou, J. (2009), 'Prominence and Consumer Search', *RAND Journal of Economics* **40**(2), 209–233.

Athey, S. & Ellison, G. (forthcoming), 'Position Auctions with Consumer Search', *Quarterly Journal of Economics* .

Bagwell, K. & Riordan, M. (1991), 'High and Declining Prices Signal Product Quality', *The American Economic Review* **81**(1), 224–239.

Bar-Isaac, H. & Tadelis, S. (2008), Seller Reputation, *in* 'Foundations and Trends in Microeconomics', Vol. 4.

Bertrand, M. & Mullainathan, S. (2004), 'Are Emily and Greg More Employable than Lakisha and Jamal? A Field Experiment on Labor Market Discrimination', *American Economic Review* **94**(4), 991–1013.

Busse, M. & Rysman, M. (2005), 'Competition and Price Discrimination in Yellow Pages Advertising', *RAND Journal of Economics* **36**(2), 378–390.

Cabral, L. & Hortacsu, A. (2010), 'Dynamics of Seller Reputation: Theory and Evidence from eBay', *Journal of Industrial Economics* **58**(1), 54–78.

Chen, Y. & He, C. (2006), 'Paid Placement: Advertising and Search on the Internet'. Mimeo, NET Institute.

Cooper, M. J., Dimitrov, O. & Rau, P. R. (2001), 'A Rose.com by Any Other Name', *The Journal of Finance* **56**(6), 2371–2388.

Cremer, J. (1986), 'Cooperation in Ongoing Organizations', *Quarterly Journal of Economics* **101**, 33–50.

Einav, L. & Yariv, L. (2006), 'What's in a Surname? The Effects of Surname Initials on Academic Success', *Journal of Economic Perspectives* **20**(1), 175–188.

Ellickson, P. B. (2007), 'Does Sutton Apply to Supermarkets?', *RAND Journal of Economics* **38**(1), 43–59.

Fryer Jr, R. & Levitt, S. (2004), 'The Causes and Consequences of Distinctively Black Names', *Quarterly Journal of Economics* **119**(3), 767–805.

Kreps, D. (1990), Empirical models of entry and market structure, *in* 'Perspectives on Positive Political Economy', Cambridge University Press.

Lohse, G. (1997), 'Consumer Eye Movement Patterns on Yellow Pages Advertising', *Journal of Advertising* **26**(1), 61–73.

Mailath, G. & Samuelson, L. (2001), 'Who Wants a Good Reputation?', *Review of Economic Studies* **68**, 415–441.

McDevitt, R. (forthcoming), 'Names and Reputations: An Empirical Analysis', *American Economic Journal: Microeconomics* .

Meredith, M. & Salant, Y. (2007), 'The Causes and Consequences of Ballot Order-Effects'. Mimeo, Northwestern University.

Milgrom, P. & Roberts, J. (1986), 'Price and Advertising Signals of Product Quality', *The Journal of Political Economy* **94**(4), 796–821.

Seim, K. (2006), 'An Empirical Model of Firm Entry with Endogenous Product-Type Choices', *RAND Journal of Economics* **37**(3), 619–640.

Shin, J. (2005), 'The Role of Selling Costs in Signaling Price Image', *Journal of Marketing Research* **42**(3), 302–312.

Tadelis, S. (1999), 'What's in a Name? Reputation as a Tradeable Asset', *American Economic Review* **89**(3), 548–563.

Tadelis, S. (2003), 'Firm Reputation with Hidden Information', *Economic Theory* **21**(2-3), 635–651.

Waldfogel, J. (2008), 'The Median Voter and the Median Consumer: Local Private Goods and Population Composition', *Journal of Urban Economics* **63**, 567–582.

Wolinsky, A. (1983), 'Prices as Signals of Product Quality', *The Review of Economic Studies* **50**(4), 647–658.

A Data

Data for all plumbing firms operating in Illinois come from a June 2008 download of the web-based version of ReferenceUSA. ReferenceUSA contains information based on businesses' listings in Yellow and White Pages, and continually updates and cross-checks its database with direct phone calls and comparisons with other directories. ReferenceUSA markets itself as a comprehensive resource for generating sales leads and conducting market research, and has been used in previous academic research.[11] The firm-specific information contained in ReferenceUSA includes the firm's name, address, years in operation, advertising expenditures in the Yellow Pages, and estimated number of employees.

Data for the number of complaints for each plumbing firm operating in Illinois come from a June 2008 download of the Better Business Bureau's website, which lists a historical record of complaints filed against a business during the preceding three years. A staff member reviews each complaint filed with the Better Business Bureau and forwards it to the accused 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. Data from the Better Business Bureau have advantages over other sources of quality information for plumbing firms because the Better Business Bureau provides a more-comprehensive coverage of the firms operating in Illinois and verifies the legitimacy of each complaint. All results in this paper, however, are robust to using quality information from other popular platforms, including Angie's List and Yelp.com, as discussed in Section 3.

Several approaches were used to determine which plumbing firms in Illinois use more than one name. First, names listed in ReferenceUSA were matched 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, names were linked to one another using the known aliases listed in the firm's Better Business Bureau record, when available. Finally, all firms listed in ReferenceUSA were surveyed by phone and several were discovered to have more than one name.[12]

Two processes were used to verify the preliminary matches. First, firms must register their names with the Illinois Secretary of State, and all matches were confirmed on the department's website.[13] Second, potential matches were verified during the phone surveys. Using these measures, the 2,670 names listed in ReferenceUSA were linked to 2,293 independent firms.

In the event that a firm uses more than one name, its firm-level variables from ReferenceUSA and the Better Business Bureau are constructed by summing over the variables for employees,

---

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

[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 the state's requirements, and enforces the requirement that a newly registered name must be "distinguishable" from those names already registered in the state.

advertising expenditures, and complaints listed for all of its names.[14] In addition, a firm's years in operation is assumed to be the maximum age of all the names listed for the firm and that a firm serves the metro-Chicago area if at least one of the names belonging to the firm does. Finally, a firm is considered to use a name that begins with an "A" or a number if at least one of its names begins with an "A", a number, or a symbol (e.g., "#").

Pricing data for plumbing firms in Illinois come from an exhaustive phone survey of the 2,670 listings in ReferenceUSA. Between July 2008 and December 2008, each listing within the plumbing category in ReferenceUSA was queried regarding its fixed service charge, hourly rate, and earliest start date. An attempt to contact each listed name was made until successful, up to a maximum of three times. In this manner, price quotes were obtained from 543 of 2,293 firms (23.7%). A limitation of this survey is that the effective price of actual projects cannot be determined. For instance, a firm with a lower stated hourly rate could charge an ultimately higher price by taking longer to complete a project.[15]

Advertising data from Google were collected in June 2009. To obtain these data, an automated script conducted searches on Google related to plumbing services in Illinois. For example, the script entered the term "Chicago Plumbers" on Google 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.[16] In total, the script conducted 5,477 searches that resulted in 12,153 advertising listings. The advertisements on Google were then matched to the plumbing firms listed in ReferenceUSA, with 5,623 relevant advertisements linked to 85 firms.[17]

---

[14]While it would be interesting to examine within-firm variation across names for these variables, the manner in which the Better Business Bureau reports complaints makes doing so infeasible. When the Better Business Bureau recognizes that a firm has more than one name, it reports a single complaint figure for all of its names. Therefore, it is not possible to separately assign complaints to each name used by that firm for those cases.

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

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

[17]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.

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 most Yellow Pages usage. Source: Yellow Pages Association, 2008.

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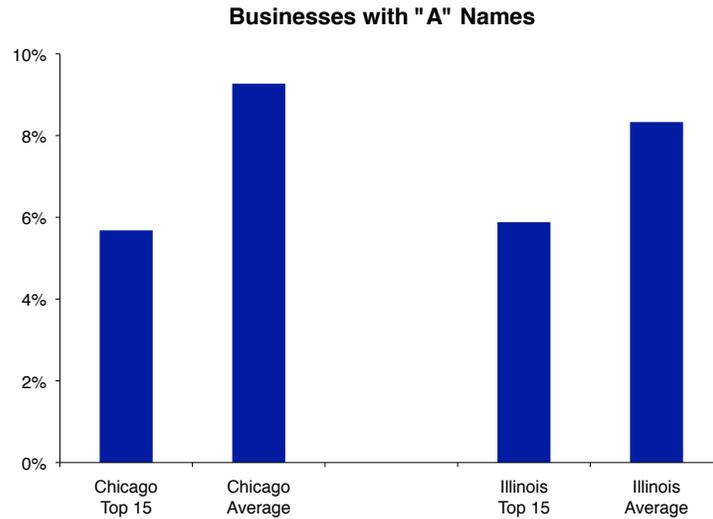
Figure 1: Proportion of businesses in the top-fifteen usage categories that use names beginning with an "A" or a number. Source: ReferenceUSA.

Rank	Heading	Proportion of Firms
1	Locks & Locksmiths	46%
2	Household Appliance Repair	27%
3	Towing-Automotive	25%
4	Limousine Service	24%
5	Pest Control Services	22%
6	Floor Refinishing & Resurfacing	22%
7	Hardware Stores	21%
8	Plumbing Contractors	21%
9	Insurance	20%
10	Windows	20%

Table 2: Categories with the largest proportion of businesses using names that begin with an "A" or a number in the city of Chicago. The sample includes categories with 100 or more listings and excludes business listings that only list addresses (e.g., apartment buildings). Source: American Business Disc, 2005.

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 3: Categories with the most Yellow Pages usage among home-service categories. A category is defined to be "home service" if a customer typically would not travel to receive the service. Source: Yellow Pages Association, 2008.

Businesses with "A" Names
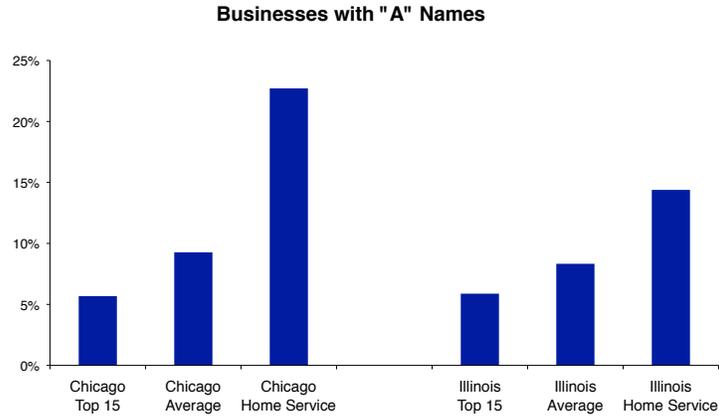
Figure 2: Proportion of businesses in the top-fifteen usage categories and top home-service categories that use names beginning with an "A" or a number. A category is defined to be "home service" if a customer typically would not travel to receive the service. Source: ReferenceUSA.

New Entrants with "A" Names
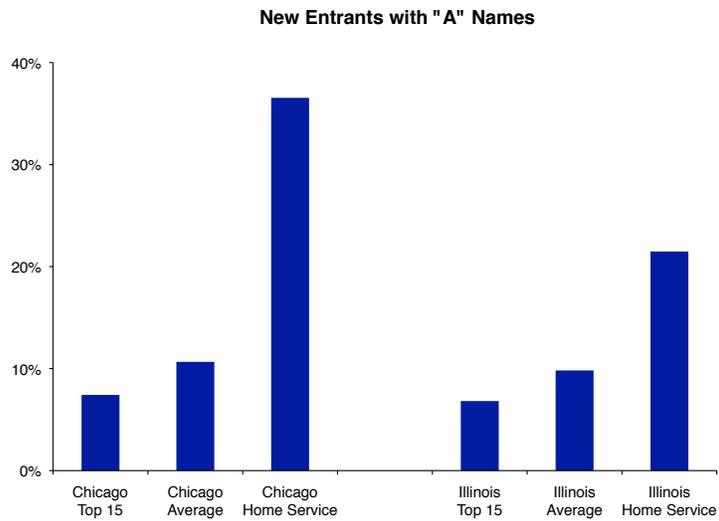
Figure 3: Proportion of new entrants that use names beginning with an "A" or a number. A category is defined to be "home service" if a customer typically would not travel to receive the service. Source: ReferenceUSA.

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 4: Summary statistics for plumbing firms operating in Illinois. If a firm uses more than one name, its firm-level variables are constructed by summing over the variables for employees, advertising expenditures, and complaints listed for all of its names. A firm's age is assumed to be the maximum age of all the names listed for the firm. A firm is assumed to serve the metro-Chicago area if at least one of the names belonging to the firm does. A firm is considered to use a name that begins with an "A" or a number if at least one of its names begins with an "A", a number, or a symbol (e.g., "#"). Source: ReferenceUSA and the Better Business Bureau.

Plumbers with "A" Names
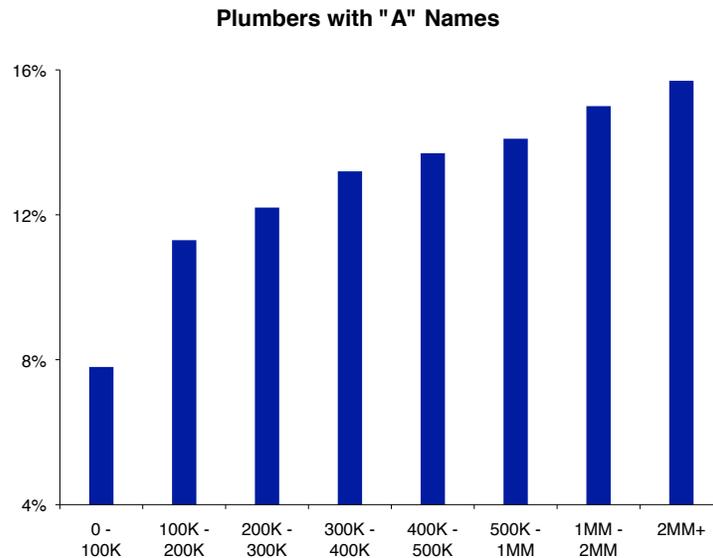
Figure 4: Proportion of plumbing firms using names that begin with an "A" or a number by market size across the United States. A market is defined to be a county. Within a given market-size bin, "proportion" is the average proportion of firms using names that begin with an "A" or a number across markets. Source: American Business Disc, 2005.

Beauty Salons with "A" Names
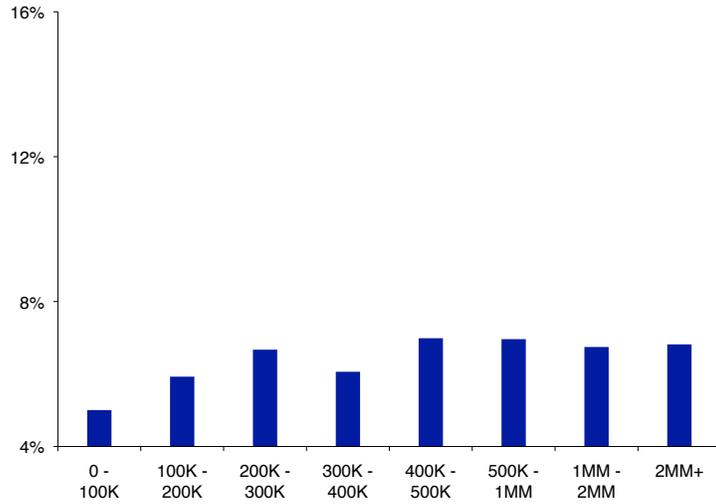
Figure 5: Proportion of beauty salons using names that begin with an "A" or a number by market size across the United States. A market is defined to be a county. Within a given market-size bin, "proportion" is the average proportion of firms using names that begin with an "A" or a number across markets. Source: American Business Disc, 2005.

| | Name Begins with "A" | | |
Mean of Variable	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 5: Conditional summary statistics for plumbing firms operating in Illinois based on whether the firm does or does not use a name that begins with an "A" or a number. If a firm uses more than one name, its firm-level variables are constructed by summing over the variables for employees, advertising expenditures, and complaints listed for all of its names. A firm's age is assumed to be the maximum age of all the names listed for the firm. A firm is assumed to serve the metro-Chicago area if at least one of the names belonging to the firm does. A firm is considered to use a name that begins with an "A" or a number if at least one of its names begins with an "A", a number, or a symbol (e.g., "#"). Source: ReferenceUSA and the Better Business Bureau.

Review Source	Mean Firm Rating Name Begins with "A"			Mean # of Reviews Name Begins with "A"			Mean Price Index Name Begins with "A"			# of Firms Reviewed Name Begins with "A"		
	No	Yes	t-stat	No	Yes	t-stat	No	Yes	t-stat	No	Yes	% "A"
Yelp.com Illinois Plumbers	4.085	2.833	2.57	4.244	1.333	1.09				41	6	12.8
Yelp.com U.S. Plumbers	3.701	2.784	4.05	2.870	1.784	1.74				309	51	14.2
Yelp.com Illinois Home-Service	3.826	3.368	1.92	4.653	2.816	0.96				170	38	18.3
Angie's List Illinois Plumbers	4.497	4.145	2.32	20.957	24.618	0.35				376	55	12.8
Checkbook.com Illinois Plumbers	74.940	67.958	1.93	39.170	41.625	0.28	99.570	104.824	1.26	182	24	11.7
Yelp.com Illinois Restaurants	3.578	3.621	0.80	29.236	29.246	0.00				4,795	223	4.4

Table 6: Conditional summary statistics for firms appearing on yelp.com, Angie's List, and Consumer's Checkbook (checkbook.com) based on whether the firm does or does not use a name that begins with an "A" or a number. A firm is considered to use a name that begins with an "A" or a number if at least one of its names begins with an "A", a number, or a symbol (e.g., "#"). A business can receive 1 – 5 stars on yelp.com, with 5 representing better service. Reviews are the number of users who rated the business. The 21 cities covered by yelp.com across the U.S. are Atlanta, Austin, Boston, Chicago, Dallas, Denver, Detroit, Honolulu, Houston, Los Angeles, Miami, Minneapolis, New York, Philadelphia, Portland, Sacramento, San Diego, San Francisco, San Jose, Seattle, and Washington D.C. The 15 home-service categories are Plumbing Contractors, Carpet and Rug Cleaners, Electric Contractors, Landscape Contractors, Roofing Contractors, Pest Control Services, Heating Contractors, Taxicabs, Lawn Maintenance, Tree Service, Air Conditioning Contractors, Towing-Automotive, Concrete Contractors, Movers, and Locks & Locksmiths. A business can receive a grade of A – F on Angie's List, with A representing better service and coded as 5, while F is coded as 0. A business can receive a rating of 1 – 100 on checkbook.com, with 100 representing better service. The price index is a set of normalized prices for routine plumbing projects constructed by checkbook.com for the firm.

Figure 6: A plumbing firm that uses more than one name in Illinois, as determined by a unique license number in each advertisement linked to four names. Source: Northshore Real Yellow Pages.

| | Multiple Names | | |
Mean of Variable	No	Yes	t-stat
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 7: Conditional summary statistics for plumbing firms operating in Illinois based on whether the firm does or does not use more than one name. If a firm uses more than one name, its firm-level variables are constructed by summing over the variables for employees, advertising expenditures, and complaints listed for all of its names. A firm's age is assumed to be the maximum age of all the names listed for the firm. A firm is assumed to serve the metro-Chicago area if at least one of the names belonging to the firm does. A firm is considered to use a name that begins with an "A" or a number if at least one of its names begins with an "A", a number, or a symbol (e.g., "#"). Source: ReferenceUSA and the Better Business Bureau.

| | Name Type | | | |
Mean of Variable	1	2	3	4
Name Begins with "A"	No	Yes	No	Yes
Has Multiple Names	No	No	Yes	Yes
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 8: Conditional summary statistics for plumbing firms operating in Illinois based on whether the firm does or does not use a name that begins with an "A" or a number, and does or does not use more than one name. If a firm uses more than one name, its firm-level variables are constructed by summing over the variables for employees, advertising expenditures, and complaints listed for all of its names. A firm's age is assumed to be the maximum age of all the names listed for the firm. A firm is assumed to serve the metro-Chicago area if at least one of the names belonging to the firm does. A firm is considered to use a name that begins with an "A" or a number if at least one of its names begins with an "A", a number, or a symbol (e.g., "#"). 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 9: Summary statistics for plumbing firms operating in Illinois that responded to the price survey. A firm's fixed fee is the amount it charges for consultation which may or may not be applied to the final price of the project if the firm is ultimately commissioned. A firm's hourly rate is its charge per hour of service. A firm's two hour price includes its fixed service charge if it is not applied to the final price. If a firm uses more than one name, its firm-level variables are constructed by summing over the variables for employees, advertising expenditures, and complaints listed for all of its names. A firm's age is assumed to be the maximum age of all the names listed for the firm. A firm is assumed to serve the metro-Chicago area if at least one of the names belonging to the firm does. A firm is considered to use a name that begins with an "A" or a number if at least one of its names begins with an "A", a number, or a symbol (e.g., "#"). Source: Firm responses, ReferenceUSA, and the Better Business Bureau.

Mean of Variable	Name Begins with "A"		t-stat
	No	Yes	
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 10: Conditional summary statistics for plumbing firms operating in Illinois that responded to the price survey based on whether the firm does or does not use a name that begins with an "A" or a number. A firm's fixed fee is the amount it charges for consultation which may or may not be applied to the final price of the project if the firm is ultimately commissioned. A firm's hourly rate is its charge per hour of service. A firm's two hour price includes its fixed service charge if it is not applied to the final price. Source: Firm responses.

	(1) Complaints	(2) Complaints	(3) Complaints	(4) Complaints
Name Begins with "A"		1.218*** (0.217)	0.707*** (0.220)	0.669** (0.260)
Multiple Names			1.520*** (0.230)	1.476*** (0.278)
Begins with "A" * Multiple Names				0.133 (0.482)
Employees	0.0200** (0.00906)	0.0236*** (0.00867)	0.0206*** (0.00771)	0.0206*** (0.00771)
Ad Spending	0.0557*** (0.00729)	0.0514*** (0.00707)	0.0421*** (0.00647)	0.0420*** (0.00649)
Firm Age	-0.0118 (0.00997)	-0.0139 (0.00997)	-0.0102 (0.00961)	-0.0103 (0.00962)
Metro Chicago	1.158*** (0.191)	0.976*** (0.190)	0.917*** (0.185)	0.917*** (0.185)
Constant	-2.570*** (0.213)	-2.687*** (0.213)	-2.839*** (0.209)	-2.833*** (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 11: Negative binomial regression in which the dependent variable is the number of complaints filed against the firm with the Better Business Bureau. If a firm uses more than one name, its firm-level variables are constructed by summing over the variables for employees, advertising expenditures, and complaints listed for all of its names. A firm's age is assumed to be the maximum age of all the names listed for the firm. A firm is assumed to serve the metro-Chicago area if at least one of the names belonging to the firm does. A firm is considered to use a name that begins with an "A" or a number if at least one of its names begins with an "A", a number, or a symbol (e.g., "#").

	(1)	(2)	(3)	(4)
	Complaints	Complaints	Complaints	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 12: 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*. If a firm uses more than one name, its firm-level variables are constructed by summing over the variables for employees, advertising expenditures, and complaints listed for all of its names. A firm's age is assumed to be the maximum age of all the names listed for the firm. A firm is assumed to serve the metro-Chicago area if at least one of the names belonging to the firm does. A firm is considered to use a name that begins with an "A" or a number if at least one of its names begins with an "A", a number, or a symbol (e.g., "#").

	(1)	(2)	(3)	(4)
	Complaints	Complaints	Complaints	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 13: 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*. If a firm uses more than one name, its firm-level variables are constructed by summing over the variables for employees, advertising expenditures, and complaints listed for all of its names. A firm's age is assumed to be the maximum age of all the names listed for the firm. A firm is assumed to serve the metro-Chicago area if at least one of the names belonging to the firm does. A firm is considered to use a name that begins with an "A" or a number if at least one of its names begins with an "A", a number, or a symbol (e.g., "#").

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

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

Table 14: Ordinary least-squares regression in which the dependent variable is the project price of firms responding to the price survey. A firm's fixed fee is the amount it charges for consultation which may or may not be applied to the final price of the project if the firm is ultimately commissioned. A firm's hourly rate is its charge per hour of service. A firm's two hour price includes its fixed service charge if it is not applied to the final price. If a firm uses more than one name, its firm-level variables are constructed by summing over the variables for employees, advertising expenditures, and complaints listed for all of its names. A firm's age is assumed to be the maximum age of all the names listed for the firm. A firm is assumed to serve the metro-Chicago area if at least one of the names belonging to the firm does. A firm is considered to use a name that begins with an "A" or a number if at least one of its names begins with an "A", a number, or a symbol (e.g., "#").

| | 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 15: Conditional summary statistics for plumbing firms operating in Illinois based on whether the firm does or does not advertise on Google. A firm is considered to advertise on Google if it appeared in at least one sponsored link among the Google search result data described in Appendix A. If a firm uses more than one name, its firm-level variables are constructed by summing over the variables for employees, advertising expenditures, and complaints listed for all of its names. A firm's age is assumed to be the maximum age of all the names listed for the firm. A firm is assumed to serve the metro-Chicago area if at least one of the names belonging to the firm does. A firm is considered to use a name that begins with an "A" or a number if at least one of its names begins with an "A", a number, or a symbol (e.g., "#"). Source: Google search results, ReferenceUSA, and the Better Business Bureau.

	(1) Complaints	(2) Complaints	(3) Complaints	(4) Complaints
On Google	1.116*** (0.388)	0.942** (0.373)	0.977** (0.436)	0.851** (0.358)
Name Begins with "A"		1.166*** (0.216)	1.176*** (0.225)	0.676*** (0.218)
Name Begins with "A" * On Google			-0.127 (0.793)	
Multiple Names				1.492*** (0.227)
Firm Age	-0.0136 (0.00988)	-0.0148 (0.00988)	-0.0148 (0.00990)	-0.0120 (0.00952)
Ad Spending	0.0497*** (0.00724)	0.0478*** (0.00699)	0.0480*** (0.00704)	0.0379*** (0.00651)
Employees	0.0168** (0.00837)	0.0203** (0.00824)	0.0203** (0.00824)	0.0174** (0.00731)
Metro Chicago	1.032*** (0.190)	0.883*** (0.189)	0.883*** (0.189)	0.833*** (0.185)
Constant	-2.482*** (0.213)	-2.623*** (0.213)	-2.626*** (0.214)	-2.759*** (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 16: Negative binomial regression in which the dependent variable is the number of complaints filed against the firm with the Better Business Bureau. A firm is considered to advertise on Google if it appeared in at least one sponsored link among the Google search result data described in Appendix A. If a firm uses more than one name, its firm-level variables are constructed by summing over the variables for employees, advertising expenditures, and complaints listed for all of its names. A firm's age is assumed to be the maximum age of all the names listed for the firm. A firm is assumed to serve the metro-Chicago area if at least one of the names belonging to the firm does. A firm is considered to use a name that begins with an "A" or a number if at least one of its names begins with an "A", a number, or a symbol (e.g., "#").