Names and Reputations: An Empirical Analysis*

Ryan C. McDevitt†

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Abstract

This paper tests several predictions of the theoretical literature on firm reputation. A main result in the literature, that poor past performance will prompt a firm to conceal its reputation, is confirmed empirically in the market for residential plumbing services. A firm with a record of complaints one standard deviation above the mean was 133.2% more likely to change its name than the average firm. In addition, firms with longer track records were less likely to change their names or exit, while firms that made more firm-specific investments, such as advertising, were more likely to change their names than exit. Finally, firms in small markets were found to value their reputations comparatively more than firms in large markets.

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†Department of Economics, Northwestern University, r-mcdevitt@northwestern.edu

1 Introduction

In many settings, a firm's name, or reputation, serves as one of its most critical assets. Owing to this importance, an extensive literature has considered models of firm reputation in which poor performance by a firm causes the value of its name to decrease as consumers update their beliefs regarding the firm's quality.[1] Once the value falls far enough, a firm will change or drop its name to start with a clean record in order to exploit the ignorance of consumers as to who exactly is behind the new name.

This paper considers several empirical questions related to firms' names and their reputations. First, how does the reputation of a firm attached to its name increase or decrease in value, as is often observed in reality? Second, how do firm-specific investments, such as advertising, influence a firm's decision to change its name? Third, how does a firm's response to fluctuations in the value of its reputation depend on the size of its market?

The market for residential plumbing services in Illinois provides an ideal empirical setting to address these questions. For one, a plumbing firm's name reflects its reputation, as its listing in a directory such as the Yellow Pages is the manner by which many consumers locate and contact plumbers. Second, the services provided by plumbers are experience goods, so uncertainty surrounding a transaction's outcome motivates consumers to base their choices, in part, on a firm's reputation. Third, consumers primarily have uniform preferences over outcomes in the sense that, when a clogged drain is cleared, all consumers agree that the transaction was successful.[2] Finally, the results of past transactions are documented, at least partially, in sources such as the Better Business Bureau and Angie's List, and these reviews serve as a close proxy for a firm's reputation.

To utilize this favorable empirical setting, I have constructed a unique data set that contains each plumbing firm operating in Illinois between 2008 and 2009, the number of complaints filed against it with the Better Business Bureau, and any of the aliases or previous names associated with it. I use the data to test a main result of the literature: that failures will cause a firm's name to decrease in value, which will be reflected here by the revealed preferences of firms that change their names following reported complaints.

This prediction is confirmed empirically, as a firm that amassed a number of complaints one standard deviation above the mean in 2008 was 133.2% more likely to change its name in 2009. Moreover, firms that had more-established reputations, as evidenced by having been in operation for a longer period of time, were less likely to change their names: a firm that had been in operation one standard deviation longer than the average firm was 11.4% less likely to change its name. In addition, firms' responses to fluctuations in their reputations differed across market sizes: firms outside of metro Chicago were 48.5% less likely to change their names than firms within the metropolitan area, all else equal. Relatedly, a firm outside metro Chicago was more likely to change its name if it had received a large number of complaints, but less likely after having established a longer track record. Finally, firms that made more sunk, firm-specific investments, such as advertising, were more likely to change their names than exit: a firm that had advertising expenditures one standard deviation above the mean was 17.8% more likely to change its name rather than exit the market given that it did not maintain its *status quo*.

This paper contributes to the scant empirical literature on firm reputation. As noted in Bar-Isaac & Tadelis (2008), a comparatively small body of work has taken the theoretical models of the reputation

[1] Bar-Isaac & Tadelis (2008) provide a thorough review of the economic literature related to firm reputation.

[2] This contrasts with other settings in which a reported "success" or "failure" might not be representative of how other consumers would have viewed the result, which makes reported outcomes a less accurate reflection of a firm's reputation in the market (e.g., a meal might be reported by one patron to be a failure because it was "too spicy," whereas another might report the very same meal to be a success because it had "just the right amount of flavor").

literature to actual data. The few that do focus mainly on online marketplaces, which may not be representative of seller and buyer behavior in offline settings. For example, Cabral & Hortacsu (2010) find that sellers on eBay are more likely to stop selling on the site after receiving negative feedback, though they do not explicitly observe name changes. The most common reason given for using online markets as opposed to offline ones is that few settings allow for a clean empirical analysis in a "bricks and mortar" environment. Exceptions include Hubbard (2002) and Jin & Leslie (2009), though they do not consider the same topic as this paper, the relationship between a firm's name and its reputation, for which no empirical work exists to my knowledge.

This paper proceeds in Section 2 with a brief exposition of a model of firm reputation and name choice that incorporates the empirical feature that some firms use more than one name. In Section 3, the empirical setting and data used to address the research questions of this paper are discussed. In Section 4, a preliminary analysis of the data is presented, followed by the results from a series of estimations that test the model's predictions in Section 5. Finally, Section 6 concludes with a discussion of the main results of this paper and their connection to the sparse, but growing, empirical literature on firm reputation.

2 Model

To fix intuition, this section presents a model that captures the key relationship between a firm's reputation and its name choices.[3] The model extends the literature on reputation dynamics, such as Tadelis (1999, 2002) and Mailath & Samuelson (2001), by allowing firms to use more than one name. The model incorporates adverse selection among sellers, which leads buyers to base their payments on the reputations of sellers, as reflected by their names.

Consider a market for a service in which a transaction can have one of two possible outcomes, success, s, or failure, f. Consumers are risk-neutral, demand at most one transaction per period, and have utilities over outcomes, $U(\cdot)$, such that $U(s) = 1$ and $U(f) = 0$.

Two types of firms provide the service in the market, G-types and B-types. G-types succeed with probability P_G, while B-types succeed with probability P_B, and $0 < P_B < P_G < 1$. Furthermore, consumers know the distribution of firm-types in the market.

Consumers associate firms with unique names. If a firm uses more than one name, consumers cannot link the names together to identify the common agent behind them.[4] Consumers select firms from two platforms, S_{sort} and F_{sort}. The S_{sort} platform lists only the record of successful transactions associated with a name, while the F_{sort} platform lists only the failures.[5] That is, a firm that has a history of 4 successes and 2 failures associated with one name will have a record of 4 successes on the S_{sort} platform and consumers who use this platform will not be aware of the firm's 2 failures; on the F_{sort} platform, this firm's name will have a record of 2 failures and users will not be aware of its 4 successes. This firm might prefer to conceal its identity on the F_{sort} platform if it can still benefit from its good record on the

[3] A more formal treatment is available from the author upon request.

[4] This is similar to the assumption in Tadelis (1999) that changes in firm ownership are not observable by consumers. The qualitative results discussed below still hold if this extreme assumption is relaxed to allow all but a non-zero measure of customers to observe the name change.

[5] The motivation for this assumption is that an F_{sort} platform resembles the structure of the Better Business Bureau, which lists only complaints (i.e., failures) and not any positive reviews. An S_{sort} platform would represent a complementary site that only lists positive reviews (e.g., a hypothetical Angie's List or eBay that only lists positive reviews). An S_{sort} platform might also resemble a "word of mouth" effect in which the number of referrals a firm receives is increasing in the number of satisfied customers it has served in past periods. In this sense, a firm with many previously satisfied customers will benefit from a large number of referrals, irrespective of the number of dissatisfied customers it has also accrued.

S_{sort} platform. If so, it would change its name on just the F_{sort} platform to start over with a record of 0 failures, while the firm would maintain its old name on the S_{sort} platform to benefit from its 4 successes.

Firms can use at most one name on each platform.[6] If a firm uses the same name on both platforms, it incurs a cost of $C_N > 0$, while if it uses two different names, the cost is $2C_N$. The intuition for making the cost of using two names greater than the cost of using one name is that firms incur name-specific costs, such as the expense of having two separate phone lines, paying two separate registration fees to the Secretary of State, and attracting customers to both names via advertising. It will become clear why a firm could not have, say, one phone line but two names: a firm that wants to "hide" from its past transactions must take steps to disguise itself; it would be trivial for a platform like the Better Business Bureau to link a firm to its past names if it uses the same phone number for all of them.

Firms participate in an overlapping-generations economy in which G-types and B-types arrive each period with masses $G > 0$ and $B > 0$, respectively, and each generation of firms lives for at least three periods. In each period, consumers are on the long side of the market, pay their full expected surplus from the transaction, and cannot base payment on the transaction's outcome. That is, consumers offer prices based on the history of the firm listed on the platform they consult, and these prices must be paid up front before the transaction takes place.

Consumers use only one of the two platforms to select a firm. Consumers' platform choices are such that the probability a firm is selected from the F_{sort} platform is $\alpha \in (0, 1)$, and the probability it is selected from the S_{sort} platform is $(1 - \alpha)$.[7] That is, each operating firm is selected each period (i.e., full employment obtains), but a firm does not know *ex ante* which platform it will be selected from and has no discretion regarding whether or not it accepts the job.

The expected profits for a firm that uses N names with a history of (abusing notation) $S = \sum s$ on the S_{sort} platform and $F = \sum f$ on the F_{sort} platform in Period t are

$$E[\pi^t(S, F, N)] = \alpha P_F^t(F) + (1 - \alpha) P_S^t(S) - NC_N, \tag{1}$$

where $P_F^t(F)$ is the wage offered by consumers using the F_{sort} platform for a firm with a history of F failures, and $P_S^t(S)$ is the wage offered by consumers using the S_{sort} platform for a firm with a history of S successes. Consumers base wage offers on their expectations of the seller's type, which are formed through Bayesian updating in regards to the seller's history on the platform. This implies $P_S^t(S) = P_G Pr^t\{G|S\} + P_B Pr^t\{B|S\}$ and $P_F^t(F) = P_G Pr^t\{G|F\} + P_B Pr^t\{B|F\}$.

Because buyers correctly update their beliefs regarding a seller's type based on its history of transactions, it follows from (1) that

$$\frac{\Delta E[\pi^t(S, F, N)]}{\Delta F} < 0, \tag{2}$$

and

$$\frac{\Delta E[\pi^t(S, F, N)]}{\Delta S} > 0. \tag{3}$$

Equations (2) and (3) result in the following testable implication:

Implication 1. *Firms with more reported failures will be more likely to change their names, all else equal, while firms with more reported successes will be less likely.*

Because a name associated with many reported failures is more likely to belong to a B-type (since

[6] This assumption can be easily relaxed at the expense of making the following derivations more cumbersome.

[7] How consumers choose which platform to consult is not modeled explicitly here. Instead, consumers are assumed to randomly select a platform with the aforementioned probabilities. Since consumers are risk-neutral and pay their full expected surplus up front, this is an inconsequential assumption in regards to consumer welfare. If this assumption is relaxed to allow all but a non-zero measure of consumers to use both platforms, the model's main qualitative results hold.

$P_B < P_G$), rational consumers offer a lower wage to a firm that uses this name. As a result, a firm that uses a name with a failure associated with it will be more likely to conceal its reputation to increase its expected profits, which follows from (2). Relatedly, because a name associated with many reported successes is more likely to belong to a G-type, rational consumers offer a higher wage to a firm that uses this name. For this reason, a firm that uses a name with successful transactions associated with it will be less likely to change its name, as implied by (3).

The empirical setting considered in this paper allows for an analysis of two additional empirical questions related to the relationship between market size and firm reputation. Enriching the model to allow market structure to influence firm behavior directly is beyond the scope of this paper, however, and the following are posed as hypotheses to be tested empirically.

Hypothesis 1. *Firms in larger markets will be more likely to change their names, all else equal.*

If firms in rural markets rely comparatively more on referrals and repeat customers than firms in urban markets – because, say, the community is closer knit and their is a smaller pool of potential customers – firms in large metropolitan areas such as Chicago will be more likely to change their names irrespective of their reputations, as they benefit comparatively less from being recognizable by their past customers.[8] In addition, if customers in rural markets are more likely to observe firms' name changes, the gains from changing a name will be relatively lower for firms in smaller markets than in larger ones. As such, firms in smaller markets will be less likely to change their names in general.

Hypothesis 2. *Following complaints, firms in smaller markets will be more likely to change their names, all else equal, while following successes, they will be less likely.*

Extending Hypothesis 1, once a firm is known to be a B-type in a small market, it will be even more likely to change its name to conceal its reputation. Even if name changes are comparatively less effective in small markets than large ones because consumers will be more likely to link a firm's names together, a firm will still prefer to attempt to conceal its identity in a small market because doing so would be better than the certain alternative of being offered a low wage in the event that the entire market recognizes that the firm provides poor-quality service. In addition, if a firm in a small market relies on its reputation relatively more than a firm in a large market, it will be even less likely to change its name after establishing a good track record when compared to firms in large markets. In other words, the reputation mechanism might have more "bite" in small markets.

3 Empirical Setting and Data

As discussed in Section 1, the market for residential plumbing services in Illinois is well-suited for empirically testing the main equilibrium predictions of the theoretical reputation literature. Illinois, like most states, requires plumbers to be licensed. In Illinois, the Department of Public Health regulates plumbers and plumbing-related activities, and licenses approximately 7,300 plumbers and 3,000 apprentice plumbers. To become licensed, 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. 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.

[8] One reason a firm might change its name for reasons unrelated to its reputation is the desire to receive a better position in the Yellow Pages.

To use this empirical setting, data have been brought together from several sources. The data for the panel of all plumbing firms operating in Illinois between 2008 and 2009 were downloaded from the web-based version of ReferenceUSA in June of each year. ReferenceUSA contains information on businesses based on their listings in the Yellow and White Pages, and is continually updated and cross-checked by direct phone calls and comparisons with other directories. 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 used in previous applied work, though not in a panel.[9] ReferenceUSA was chosen as the source the data used in this paper because it constructs its universe of firms from a source commonly used by consumers in this market, the local Yellow Pages.

Data for the number of complaints filed against each firm in ReferenceUSA were downloaded 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 to be legitimate. If the company does not respond within 14 days, a second request is made 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, data from the Better Business Bureau are used because the Better Business Bureau provides a more-comprehensive coverage of the firms operating in Illinois and verifies each of the complaints in its database.[10]

Many plumbing firms use more than one name, with firms adding and discontinuing names gradually over time. For instance, note in Figure 1 that this firm, linked clearly by its plumbing license in the two advertisements, uses at least four names. This institutional detail makes it possible to track the changes firms make to their names from period to period.

Several approaches were used to determine which firms changed their names or used multiple names between 2008 and 2009. First, names were matched to a common owner using the phone numbers, fax numbers, websites, and addresses listed in ReferenceUSA to generate an initial list of aliases and name changes among the universe of plumbing firms. In addition, names were linked to one another using the known aliases listed in the Better Business Bureau records for each firm, when available. Finally, all firms listed in ReferenceUSA were surveyed by phone, and several were determined to have more than one name or to have changed their names.[11]

Two processes were used to verify the preliminary matches. First, firms must register their names with Illinois Secretary of State, and all matches were confirmed on the department's website.[12] Second, potential matches were also verified through phone surveys. As a result of these measures, the original 2,670 names contained within the ReferenceUSA database were linked to 2,293 independent firms.

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

[9]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.

[10]McDevitt (2009) contains a comparison of the information contained on the Better Business Bureau's website with that on other sites, such as Angie's List and Yelp.com, and finds them to be qualitatively similar.

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

[12]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. The department's website is http://www.ilsos.gov/corporatellc/.

expenditures, and complaints listed for all of its names. In addition, a firm's years in operation is assumed to be the maximum age of all the names listed for the firm, and a firm is assumed to serve the metro-Chicago area if at least one of the names belonging to the firm serves the area.

While the data described above are well-suited for the objectives of this paper, they nevertheless suffer from several potential shortcomings. For one, a firm that began operations after June 2008 and exited before June 2009 would not be included in the data. Secondly, any plumbing firm that does not have a listing in a Yellow Pages directory would be missing from the data. Third, a complete history of a firm's transactions is not available and instead must be inferred using a summary measure – here, the number of complaints filed with the Better Business Bureau – which fails to capture other relevant information regarding a firm's reputation that might be utilized by consumers, such as referrals from past customers. Finally, changes of ownership are not observable, which precludes a direct examination of name trading among agents that could have important effects on seller behavior (Tadelis 1999).

4 Preliminary Analysis

The data discussed in Section 3 exhibit several notable empirical regularities. As the summary statistics presented in Table 1 indicate, the majority of plumbing firms in Illinois are small businesses, with over 70% employing fewer than four people. The average plumbing firm in Illinois is approximately twelve years old, though a firm's age is top-coded at 25 years in the data, which biases downwards the average age of firms in the sample.[13] The average plumbing firm spent $5,363 advertising in the Yellow Pages in 2008.[14] In addition, 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 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. Note also that the majority of firms (over 90%) used only one name in 2008, while 228 firms used more than one. The relative dearth of firms using multiple names conforms with the intuition that it is difficult for firms to continually and systematically conceal their identities. Finally, 1,420 of the 2,293 firms (61.9%) serve the metro-Chicago area.

Between June 2008 and June 2009, firms had one year – and, importantly, at least one cycle of Yellow Pages printing – to change their names. For the purposes of this paper, a firm will be assumed to have three choices: make no change, make a change by adding and/or dropping a name, or exit the market entirely. As shown in Table 2, 80% of firms made no change between 2008 and 2009, 12% exited the market entirely, and 8% changed their names.

The distribution of name changes made by firms between 2008 and 2009 is documented in Table 3 to further distinguish the different types of name changes, . The most common choice was for a firm to drop a name, which would naturally result from a firm deciding to eliminate a past name that was no longer attracting a sufficient number of customers to cover its fixed costs of maintenance (e.g., the monthly cost of an additional phone line). This decision likely spans several periods, however, and a longer panel would better capture the behavior of these firms.[15] As currently constructed, the available data can

[13] Approximately 23.3% of the listed firms are at the maximum.

[14] The amount spent on advertising in the Yellow Pages each year is top-coded at $50,000, which is the approximate cost of a full-page advertisement in a major Chicago directory, which affects 46 firms ($\approx 2\%$).

[15] For example, a firm that receives several complaints might add an additional name as a response. Gradually, over time, its original name will attract fewer and fewer customers as the new name becomes more established. Finally, at some point, the costs of maintaining the old name outweigh the incremental profits that flow from it and the firm discontinues its use.

be interpreted as representing a short sample from a panel of a much longer "repeated economy." For instance, the conditional summary statistics for firms that changed their names between 2008 and 2009 show that firms that solely dropped a name during this period were older, on average, than firms that solely added a name (by 28.1%, on average; table not reported). It seems plausible, then, that firms that exclusively added a name this period will then gradually discontinue names over future periods. As such, the three sub-groups of firms that changed their names are aggregated into one category, and "name changes" are defined to be changes to the stock of a firm's names.

The groups of firms that made each type of decision varied considerably across their observable characteristics, as shown in Table 4. Notably, the average firm that changed its name had more than seven times as many complaints filed against it in 2008 than the average firm that exited and the average firm that made no change. Moreover, the average firm that changed its name made more sunk investments, such as advertising and hiring and training employees, that might make it reluctant to exit the market altogether, especially when the alternative of reseting its reputation by changing its name is available. In this setting, advertising expenditures in previous periods have a firm-specific, but not necessarily a name-specific, "call option" value associated with them due to Yellow Pages' advertising policies discussed in the next section, and thus might influence a firm's decision to change its name rather than exit. Note that this was not the first time that firms that changed their names in 2009 had done so, on average, as the mean number of names used by these firms in 2008 was nearly 2.5, which is significantly greater than the average number of names used by the other two groups ($p < .001$).

While it might seem counterintuitive at first glance that firms that exited the market entirely received the same number of complaints, on average, as the firms that made no change, firms also exit markets for reasons unrelated to their reputations.[16] This implies that ignoring the distinction between firms that change their names and those that exit the market entirely could potentially bias estimates of the relationship between a firm's reputation and its name choices, though previous work has not explicitly accounted for this distinction (to my knowledge).

5 Results

To further study the patterns in the data, this section presents a series of regression models that take a firm's decision regarding its name as the dependent variable. In the first, a firm's decision to change its name and exit the market entirely are grouped together (because these firms have decided to do something other than maintain their *status quos*). In this specification, a firm makes a binary choice regarding its name and a probit model is a natural way to analyze this decision. Here, the dependent variable is equal to one if a firm changes its name or exits between 2008 and 2009, and zero otherwise. The results from this estimation are presented in Table 5.

Consistent with the model presented above, firms that received more complaints were more likely to change their names or exit: a firm with a record of complaints one standard deviation above the mean was 74.7% more likely to change its name or exit in 2009. In addition, firms with longer track records were less likely to change their names or exit: a firm that had been in operation for one standard deviation longer than the average firm was 6.5% less likely to change its name or exit. Finally, firms outside metro Chicago were 32.3% less likely to change their names or exit than firms within metro Chicago, all else

[16] For example, a plumber might move to a different state for personal reasons unrelated to his business, or, due to the recessionary environment that disproportionately affected home builders and home owners, these younger and smaller firms might have been forced out of business irrespective of the number of complaints they received because they were less likely to receive loans than their older and larger competitors, and were thus less likely to survive the downturn in business.

equal.

As shown in the summary statistics in Table 4, the average firm that changed its name between 2008 and 2009 differed on many observable dimensions compared to the average firm that exited the market entirely. As such, pooling these two groups of firms together, as is commonly done in scant empirical literature on seller reputation, potentially obscures the true effects of changes in firms' reputations. As the data used in this application allow for a distinction to be made between firms that exited the market entirely and firms that merely changed their names, a series of multinomial regressions that treat the two groups as distinct are considered.

The results from a series of multinomial probit models are presented in Table 6. In these models, a firm makes a categorical decision to (i) maintain its *status quo*, (ii) exit the market, or (iii) add and/or drop a name.[17] As shown in Column 1 of Equation 1, firms that changed their names and remained in business received more complaints, had shorter track records, spent more on advertising, and were more likely to serve the metro-Chicago area than firms that maintained their *status quos*. Moreover, as shown in Column 1 of Equation 2, firms that exited received more complaints, were younger, spent less on advertising (though not to a statistically significant degree), and were more likely to operate in metro Chicago than firms that maintained their *status quos*. All of these results accord with economic intuition.

Focusing on the key variable of interest, a firm with a record of complaints one standard deviation above the mean was 133.2% more likely to change its name, which is consistent with Implication 1 in Section 2. In addition, firms that changed their names had been in operation for a shorter period of time than the base group. This is consistent with the intuition that a firm that has established a good reputation over many years will be less likely to change its names or exit the market, all else equal. A one standard deviation increase from the mean number of years a firm had been in operation was associated with a 11.4% decrease in the likelihood that a firm changed its name, which is consistent with the second half of Implication 1. Moreover, firms that had advertised more extensively were more likely to change their names than exit: a one standard deviation increase from the mean level of advertising expenditures was associated with a 17.8% increase in the likelihood that a firm changed its name rather than exited. Finally, firms outside metro Chicago were 48.5% less likely to change their names than firms within metro Chicago, which is consistent with Hypothesis 1.

Note also the significant non-linearity in the key variables of interest, complaints and tenure. Including quadratic terms for the explanatory variables improves the fit of the model, increasing the log-likelihood from -1375.6 to -1346.8, though the qualitative interpretation of the results remains similar. The economic rationale for including quadratic terms is that the first few complaints filed against a firm have a substantial effect on its reputation, though the incremental effect diminishes gradually for each additional complaint.

To understand how the number of failures and successes associated with a firm interact with the other explanatory variables, the next regression, reported in Column 2 of Table 6, considers the same multinomial probit specification as above, but includes additional interaction terms of interest. The results of this estimation provide evidence in support of Hypothesis 2: firms outside of metro Chicago that received more complaints were more likely to change their names, while firms outside of metro Chicago that had more successes, as proxied by the number of years a firm has been in operation, were less likely to change their names. This result corresponds with the intuition that rural businesses rely relatively more on referrals and repeat customers, and thus firms in smaller markets potentially benefit more from remaining "recognizable" by their past customers. Once a firm in a small market establishes a reputation for poor performance, however, it must conceal its past history because the entire market

[17] In estimation, the base outcome is maintaining the *status quo*.

recognizes that the firm should command a low wage, if it is transacted with at all.

The results are consistent with this contention, as complaints had a significantly stronger effect in rural markets: a one standard deviation increase from the mean number of complaints received by a firm outside of metro Chicago was associated with a 144.3% increase in the likelihood that a firm changed its name or exited, compared with only 62.9% for firms within metro Chicago. Moreover, an established track record was more important outside of metro Chicago: a one standard deviation increase from the mean number of years a firm had been in operation was associated with a 16.4% reduction in the likelihood that the firm changed its name or exited if it operated outside metro Chicago, whereas within metro Chicago the reduction was 5.5%. Put simply, the reputation mechanism had considerably more "bite" in rural markets.

The other statistically significant coefficient of interest in Column 2 is the interaction between Ad Spending and Firm Age. This result can be explained by the advertisement placement policies of the Yellow Pages whereby a firm that has advertised for a longer period of time will have its advertisements placed nearer the beginning of its category. This reduces the effective costs of adding a name (i.e., C_N is lower in the model presented in Section 2) which would naturally make it more likely that a firm will add a name, all else equal. In addition, because an advertisement's position in the Yellow Pages depends on the amount a firm has spent on advertising in the past, its stock of past advertising expenditures represents a valuable "advertising option" for the firm. Firms with more valuable advertising options will thus be less likely to exit the market, all else equal, as this intuitively increases their continuation values.

This effect, however, might differ for firms inside and outside of metro Chicago. Because metro Chicago is a crowded market with over 1,400 firms serving the area, firms find it difficult to attract attention with their listings in the Yellow Pages. As such, some firms exploit the conventional method of listing names alpha-numerically in the Yellow Pages by using names that begin with an "A" or a number to appear near the front of the plumbing category.[18] To the extent that advertising heavily in the Yellow Pages reflects the degree to which a firm depends on the Yellow Pages to attract customers, firms that advertise heavily might also be more likely to add names for reasons unrelated to complaints. Because this behavior should be more prevalent in a crowded market like metro Chicago where it is difficult to attract customers in the Yellow Pages, the effect will differ inside and outside the metro area.

As shown in Column 3 of Table 6, firms that advertised relatively more in the Yellow Pages and operated exclusively outside metro Chicago did not respond in the same way to changes in their reputations as firms within metro Chicago. In metro Chicago, older firms that had invested more in advertising were less likely to exit: a one standard deviation increase from both the mean number of years a firm had been in operation and its level of advertising expenditures was associated with a 57.5% reduction in the likelihood that the firm exited if it served metro Chicago, compared with a 40.5% reduction for firms outside metro Chicago. Moreover, firms in metro Chicago that had advertising expenditures and tenures one standard deviation above their means were 4.4 times more likely to change their names than exit, whereas firms outside metro Chicago at these levels were only 2.4 times more likely. These results suggest that the option value of receiving a favorable ad placement in the Yellow Pages was more valuable for firms in metro Chicago, and this had different implications for firms' decisions to change their names or exit inside and outside the metro area.

[18] This topic is considered at length in McDevitt (2009).

6 Conclusion

This paper has empirically tested a main equilibrium prediction of the theoretical literature on firm reputation: that poor past performance will cause a firm's name to lose value, and a firm will change its name in order to start with a clean record, or reputation, once the value falls far enough. The results of this paper are consistent with this theoretical prediction, as plumbing firms that had received more complaints were more likely to change their names or exit the market, while firms that had longer track records were less likely.

The consumer welfare implications of not distinguishing between actual exits and mere name changes in this setting are potentially stark, as the former would serve to purge the market of bad sellers through the reputation mechanism, while the latter would act only to pool experienced bad types with inexperienced good types, resulting in a negative spillover from bad types to good in the form of lower wages for all sellers with nascent transaction histories.

An immediately apparent method for preventing this behavior is to make it more onerous for firms to change or add names (i.e., make C_N very large in the model above). In practice, the relative ease with which firms can conceal their reputations has serious consequences for consumers. For instance, a recent investigation by the United States Government Accountability Office found that at least 9% of motor coach carriers that were ordered "out of service" by the Federal Motor Carrier Safety Administration for violating safety standards simply "reincarnated" themselves with new names, which undermines the effectiveness of regulations and consumers' searches for safe and reliable service providers.[19]

Finally, this paper represents the first empirical test of the theoretical literature on name changes in a "bricks and mortar" setting, which holds relevance for the much broader phenomenon of major corporations rebranding themselves following notorious failures or bad publicity (e.g., ValuJet to AirTran, AIG to AIU, GMAC Bank to Ally Bank, and Philip Morris to Altria, to cite just a few).

[19] cf. GAO Report to Congressional Requesters, "Motor Carrier Safety: Reincarnating Commercial Vehicle Companies Pose Safety Threat to Motoring Public; Federal Safety Agency Has Initiated Efforts to Prevent Future Occurrences," July, 2009.

References

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

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

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

Hubbard, T. (2002), 'How Do Consumers Motivate Experts? Reputational Incentives in an Auto Repair Market ', *Journal of Law and Economics* **45**, 437–468.

Jin, G. & Leslie, P. (2009), 'Reputational Incentives for Restaurant Hygiene', *American Economic Journal: Microeconomics* **1**(1), 237–267.

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

McDevitt, R. (2009), 'A Business by Any Other Name: Firm Name Choice as a Signal of Firm Quality'. Northwestern University.

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

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

Tadelis, S. (2002), 'The Market for Reputations as an Incentive Mechanism', *Journal of Political Economy* **110**(4), 854–882.

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

A Tables and Figures

Figure 1: A plumbing firm that operates under multiple names in Illinois.

Variable	Mean	Std. Dev.	Min.	Max.
Employees	5.632	15.455	1	300
Years in Operation	12.505	8.938	1	25
Ad Spending	5362.7	10937.5	0	50000
Complaints	0.389	2.601	0	57
Number of Names	1.16	0.659	1	16
Metro Chicago	0.619	0.486	0	1
N		2293		

Table 1: Summary statistics for plumbing firms operating in Illinois in 2008.

Decision	Freq.	Pct.	Cum.
No Change	1838	80.16	80.16
Exit Market	270	11.77	91.93
Name Change	185	8.07	100.00
Total	2293	100.00	

Table 2: Decisions made by plumbing firms operating in Illinois in 2008 regarding their names in 2009.

Decision	Freq.	Pct.	Cum.
Add Only	17	9.19	9.19
Drop Only	137	74.05	83.24
Add and Drop	31	16.76	100.00
Total	185	100.00	

Table 3: The type of name change made by plumbing firms operating in Illinois in 2008 that changed their names in 2009.

Mean	No Change	Exit Market	Name Change	Total
Employees	5.6066	3.8148	8.5405	5.6324
Years in Operation	13.0936	8.1778	12.9730	12.5050
Ad Spending	4971.5	4701.7	10213.5	5362.7
Complaints	0.2573	0.2630	1.8757	0.3886
Number of Names	1.0381	1.0852	2.4811	1.1601
Metro Chicago	0.5914	0.6963	0.7838	0.6193
N	1838	270	185	2293

Table 4: Summary statistics for each type of decision made by plumbing firms operating in Illinois in 2008 regarding their names in 2009.

Variable	Coefficient	(Std. Err.)	Marg. Eff.	(Std. Err.)
Complaints	0.162***	(0.028)	0.043***	(0.007)
Firm Age	-0.094***	(0.018)	-0.025***	(0.005)
Employees	0.004	(0.004)	0.001	(0.001)
Ad Spending	0.007	(0.009)	0.002	(0.003)
Metro Chicago	0.244***	(0.067)	0.064***	(0.017)
Complaints^2	-0.003***	(0.001)	-0.001***	(0.000)
Firm Age^2	0.003***	(0.001)	0.001***	(0.000)
Employees^2	0.000	(0.000)	-0.000	(0.000)
Ad Spending^2	0.000	(0.000)	-0.000	(0.000)
Intercept	-0.323***	(0.087)		
N		2293		
Log-likelihood		-1078.476		
$\chi^2_{(9)}$		127.877		

Significance levels : * : 10% ** : 5% *** : 1%

Table 5: A probit regression where the dependent variable is equal to 1 if a firm changed its name or exited completely between 2008 and 2009, and 0 otherwise.

	Equation 1 : Name Change			Equation 2 : Exit		
	(1)	(2)	(3)	(1)	(2)	(3)
Complaints	0.288***	0.502***	0.812***	0.086*	-0.012	0.439
	(0.042)	(0.109)	(0.186)	(0.051)	(0.203)	(0.298)
Firm Age	-0.065**	-0.083**	-0.085**	-0.155***	-0.145***	-0.154***
	(0.032)	(0.034)	(0.035)	(0.029)	(0.031)	(0.031)
Employees	0.010	0.004	0.004	0.000	-0.002	-0.002
	(0.007)	(0.012)	(0.012)	(0.008)	(0.011)	(0.011)
Ad Spending	0.025*	0.005	0.017	-0.004	-0.001	-0.050
	(0.015)	(0.017)	(0.024)	(0.016)	(0.017)	(0.035)
Metro Chicago	0.489***	0.253	0.354	0.212**	0.307*	0.138
	(0.124)	(0.216)	(0.242)	(0.106)	(0.171)	(0.190)
Complaints^2	-0.006***	-0.005***	-0.005***	-0.002	-0.002	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Firm Age^2	0.002*	0.002	0.002	0.004***	0.004***	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Employees^2	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Ad Spending^2	-0.000	-0.000	-0.000	0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Complaints * Metro Chicago		-0.232**	-0.549***		0.093	-0.361
		(0.112)	(0.191)		(0.208)	(0.305)
Firm Age * Metro Chicago		0.024*	0.024		-0.010	0.007
		(0.014)	(0.016)		(0.012)	(0.014)
Complaints * Ad Spending		-0.001	-0.016**		0.000	-0.116
		(0.001)	(0.007)		(0.002)	(0.116)
Firm Age * Ad Spending		0.002***	0.001		-0.000	0.004**
		(0.001)	(0.001)		(0.001)	(0.002)
Complaints * Employees		0.000	0.000		-0.000	-0.000
		(0.001)	(0.001)		(0.003)	(0.003)
Firm Age * Employees		0.000	0.000		0.000	0.000
		(0.001)	(0.001)		(0.001)	(0.001)
Ad Spending * Metro Chicago			-0.020			0.062*
			(0.022)			(0.036)
Complaints * Ad Spending * Chicago			0.015**			0.117
			(0.007)			(0.116)
Firm Age * Ad Spending * Chicago			0.000			-0.005***
			(0.001)			(0.002)
Constant	-2.068***	-1.790***	-1.862***	-0.786***	-0.854***	-0.743***
	(0.185)	(0.227)	(0.245)	(0.151)	(0.185)	(0.194)
Observations	2293	2293	2293	2293	2293	2293
LL	-1346.8064	-1334.9854	-1326.1957	-1346.8064	-1334.9854	-1326.1957

Standard errors in parentheses

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

Table 6: A multinomial probit regression where the choices for a firm are not changing its name and not exiting (base outcome), exiting, and changing its name between 2008 and 2009.