Prestige and Collaboration Patterns

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Abstract

How do concerns about prestige affect patterns of collaboration among competing firms? Firms often need to collaborate with some competitors for a variety of reasons including: sharing risks; combining complementary resources; limiting competition and developing standards. Which competitors a firm chooses as collaboration partners also influences how potential clients and other stakeholders view that firm. In effect, the prestige of collaborating firms “rubs off” on one another since potential clients (and other interested parties) may use the identity of a firm’s partners as an indication of a firm’s prestige. Most research on prestige has assumed, and several industry studies have found, that firms try to bolster their own prestige by eschewing collaborations with less prestigious rivals and pursuing collaborations with firms of similar or greater prestige. While this is a logical behavioral heuristic for a firm that wants to boost its absolute prestige, absolute prestige may not be as critical to success as relative prestige. This paper looks at how differences among contexts in the rewards firms receive from prestige may lead to different collaboration patterns and different distributions of prestige. In doing so, the paper tries to open a broader discussion about how prestige affects collaboration patterns among competing firms and how closely prestige will reflect firms’ underlying abilities.

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**What is prestige and why do firms care about it?**

Sociologists have long believed that prestige plays an important role in determining an actor’s standing in society and the allocation of rewards in society. Beniot-Smullyan (1944) argued that there were three primary hierarchies (economic, political, and prestige) that defined individuals’ social positions which in turn influenced the allocation of societal rewards. These three hierarchies are neither exhaustive nor completely exclusive: actors have other ways to improve their social standing and may be able to
leverage a prominent position in one hierarchy to gain standing in another (such as using economic power to gain political power). Despite their lack of exhaustiveness or exclusiveness, the economic, political and prestige hierarchies continue to be studied as important influences on social standing and social rewards.

One of the challenges in understanding the role of prestige, in particular, has been to maintain a general but operational definition of the construct. Beniot-Smullyan defined prestige quite loosely as “…a sentiment which some individuals feel towards others…” This definition is perhaps too general for competitive studies as it provides little guidance for measuring prestige or predicting the effect of prestige on market outcomes.

Podolny (1993) provides a narrower but more competitively relevant definition of prestige as “…the perceived quality of that producer's products in relation to the perceived quality of that producer's competitors' products.” This definition of prestige as perceived quality allows us to see how prestige could influence profits by lowering the costs of selling a firm’s services (Podolny 1993) or raising the market prices that those services can command (Benjamin and Podolny 1999). It also makes it clear why firms would value prestige and why concerns about prestige would influence a firm’s choice of collaboration partners.

Podolny’s definition of prestige as perceived quality, however, often leads to confusion over the difference between prestige and reputation. The cleanest way to provide a separate conceptual and working definition for the two concepts is to differentiate the two based on how they are developed. A firm’s reputation is generally described as an inference about a firm based on observations of the firm’s own past actions. A reputation is something a firm develops by what it does. A firm’s prestige, however, is described as
an inference about a firm based on observations of whom the firm has as collaborators. Prestige is something a firm gains by virtue of its associations. The difference between the two is akin to establishing guilt-by-evidence-of-past-actions determining guilt-by-association.

The difference between prestige and reputation is perhaps even clearer when we see the two as substitutes. Prestige is most important when a reputation is hard to determine. In settings where it is difficult to make accurate judgments about a firm’s past actions, people may choose to rely on the judgments of other firms as evidenced by associations among firms. For example, in settings such as investment banking and hospital care there is a wealth of information about past actions. However, it is difficult to evaluate the quality of an organization based on available measures of past work. Inferences about the success of past actions are confounded by differences in the difficulty of the tasks. Better hospitals generally do better work but they also tend to take on more difficult patients. The difficulty of tasks, however, is often hard to measure. As a result, we may rely on the observed association of a bank or hospital with other prestigious actors as a signal of quality.

**Prestige games firms play**

Prestige is unique among the three bases for social status in how it is developed. Prestige is transferred from one actor to another through association. Third parties observe the associations among actors and use these associations to develop a sense of the prestige of each actor. In this way, connections among firms become not only momentary instrumental combinations of resources, commitments to joint standards and pipes of information, but also prisms through which actors are viewed in industries such as
venture capital, wineries and investment banking (Podolny 1993; Benjamin and Podolny 1999; Podolny 1999; Park and Podolny 2000).

The prevailing though often implicit assumption in most research on prestige has been that prestige is maintained by firms’ desire to increase their own prestige. If they are solely concerned with their own prestige, firms will eschew collaborations with low prestige rivals and pursue collaborations with firms of similar or greater prestige. The expected outcome of this kind of decision making is a stratified world with strong associations among firms with similar status levels and minimal associations otherwise. The assumption that firms are concerned primarily with their own absolute prestige deserves closer scrutiny. If prestige works like quality then a firm’s own performance may depend less on its own absolute quality than it does on the firm’s quality relative to rivals. Concern about relative prestige forces firms to think about not only how their choice of partners affects their own prestige but also how it affects the prestige of the other firms in the industry. Does it make sense for the most prestigious firm in an industry to lend its prestige to its closest rivals? What strategies might less prestigious firms engage in to offset the advantages of the most prestigious firms in an industry and under what conditions should firms pursue these strategies? If firms are concerned about how their collaborations affect not only themselves but their rivals, how will their choices distort the distribution of prestige within industries relative to other measures of firm quality?

**Competing with Capabilities and Prestige**

We developed a simple model to explore the collaboration patterns and distributions of prestige that would occur if firms care less about maximizing prestige than maximizing
the rewards they receive from prestige. The model has two main components. The first component determines a firm’s prestige from the true quality of its services and the prestige of its collaborators. The second component uses the distribution of firms’ prestige to determine market rewards. We then evaluate the likelihood of various collaboration strategies (patterns of collaboration choices by firms) based on how well they reward the firms.

The first component of the model assumes that a firm’s prestige is a reflection of both the true quality of its services and the prestige of its collaborators. For example, a firm a with capabilities $U_a$ that collaborates with two other firms b and c will have prestige:

$$s_a = \frac{1}{n}(s_b - s_a) + \frac{1}{n}(s_c - s_a) + u_a$$

where $s_b$ is the prestige of firm b, $s_c$ is the prestige of firm c and n determines how much weight third-parties give to associations in their perceptions of a firm’s own prestige. In matrix notation we can determine the vector $S$ of the prestige of all competing firms as:

$$S = GS + U$$

where $U$ is the vector of firms true quality of services and $G$ is the matrix of collaboration among firms. Solving the system for the status vector in terms of only the matrix of connections and vector of true quality:

$$S = (I-G)^{-1} U.$$
share. We use the discrete choice (logistic) model to determine market share for firms based on their prestige so that a firm i’s market share \((MS_i)\) is:

\[
MS_i = \frac{e^{\rho S_i}}{\sum_i e^{\rho S_i}}
\]

where \(\rho\) is a factor that determines how intensely market share is influenced by prestige. When \(\rho\) is equal to zero prestige has no effect and all firms get an equal share of the market. As \(\rho\) approaches infinity, prestige becomes the sole determinant of sales so that a firm with even the tiniest advantage in prestige will gain the entire market.

**Prestige and collaboration patterns**

Even among a small group of firms the number of possible patterns of industry collaborations is extremely large. For five firms there are \(2^{10}\) possible collaboration patterns and for six firms there are \(2^{15}\) possible collaboration patterns when we consider all possible permutations ranging from no collaborations to all firms collaborating. In this section we explore the likelihood of three primary patterns for six competing firms. To keep the consideration set simple we assume that firms have strong instrumental reasons such as risk sharing or combining complementary to interact with two other firms. We call these patterns stratified, polarized and insurgent (figure 1).

The stratified pattern is the classic one associated with prestige concerns. Here the top three firms collaborate in terms of true quality interact with one another and the bottom three firms in terms of true quality interact with one another. None of the top three firms interact with any of the bottom three firms.
The polarized pattern occurs when the firm with the highest true quality tries to put distance between itself and its nearest rival. It does so by linking with the third and fourth firms based on true quality to force its rival to collaborate with the bottom two firms in terms of true quality.

The insurgent pattern occurs when the second, third, and fourth firms in true quality decide to gang up against the strongest firm. Here they collaborate with one another leaving the top firm only the bottom two firms as collaboration partners.

We evaluate the payoffs to each of the firms assuming a uniform distribution of true quality within the industry (U equals 0.8, 0.7, 0.6, 0.5, 0.4, 0.3, 0.2 for the six firms respectively) and that each collaboration rubs off $1/7^{th}$ of the gap in the collaborators' prestige ($n=7$).

The different collaboration patterns have very different implications for the relationship between prestige and true quality (figure 2). In a stratified market, prestige understates ability gaps within groups and overstates ability gaps across groups. In a polarized market, prestige overstates the relative ability of the leader and understates the relative ability of the leader’s closest rival as intended. In an insurgent collaboration pattern, prestige understates the relative differences in ability among all firms.

When we vary the intensity of prestige’s effects on market share ($\rho$) we find that firms choose different collaboration patterns (figure 3). When prestige differences have a relatively small effect on market share the two firms with the highest true quality benefit most from a classic stratified market. Since the firm with the third highest true quality benefits only slightly more from a polarized market, we might expect the top two firms to
convince the third firm to join them in a stratified market either with a side payment or a threat to work with the fourth firm instead.

As the importance of prestige rises (from $\rho = 5$ to $\rho = 15$) the top firms will increasingly dominate the market. As a result, when the importance of prestige rises from $\rho = 5$ to $\rho = 10$, the top firm becomes more concerned with its standing relative to its main rival than its standing relative to all other rivals. This leads it to favor a polarized collaboration pattern. Given that the third firm also favors the polarized pattern to weaken the second firm, the two are likely to be able to convince the third firm to join them by promising side payments or threatening to work with the fourth firm instead. Finally, as the importance of prestige rises even further the second, third, and fourth firm come to favor an insurgency. With prestige playing a large role in client's decisions, the leading firm would so dominate the second firm that it is better off joining with weaker rivals to limit the prestige and win some share back from the firm with the highest true quality.

**Discussion and conclusions**

The analyses presented in this paper are exploratory rather than exhaustive. Currently we are working with Markov chains and cooperative game theory to evaluate the most likely collaboration patterns from all possible patterns under a wide range of assumptions about the distribution of true quality among firms, the costs and intrinsic value of forming collaborations, how prestige transfers among firms and how prestige affects market rewards. Markov chains and collaborative game theory are promising means of determining the likely outcomes from a large number of possible collaboration patterns, but are not without limitations of their own. The Markov chain approach requires the manipulation of very large matrices even for very small numbers of firms. The
computational demands quickly exceed the capabilities of available server clusters. The ground work in cooperative game theory to date generally assumes symmetric firms. However, if firms were symmetric in their true quality and other attributes it is unclear why we would have any prestige differences at all.

While these results are only exploratory, they do show that firms will not always benefit most from avoiding linkages with less prestigious firms in favor of links with more prestigious firms. When market rewards are reasonably skewed toward the more prestigious actors, it appears that the most prestigious firms benefit from expelling some of their own, leading to polarized collaboration patterns. When market rewards are highly skewed toward the most prestigious actors, it appears that firms may benefit most from banding together and rejecting links to the most capable of firms.

The results also indicate that prestige may present a distorted picture of the distribution of true quality. This supports Podolny’s (1993) assertion that prestige is a meaningful construct and need not simply be identical to the economic concept of a true signal of quality that emerges from a signaling game. Depending on the competitive situation that firms find themselves in and their resulting choices of collaboration partners, prestige can overstate or understate the relative quality of firms. Under the right conditions, it appears that firms will choose collaboration patterns that decouple even the rank ordering of prestige from true quality: some firms will have prestige that is indistinguishable from (and under the right conditions almost certainly higher than) that of rivals with higher levels of true quality.
References


Figure 1: Collaboration Patterns Examined

$G = \begin{pmatrix}
0 & 1 & 1 & 0 & 0 & 0 \\
1 & 0 & 1 & 0 & 0 & 0 \\
1 & 1 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 1 & 1 \\
0 & 0 & 0 & 1 & 0 & 1 \\
0 & 0 & 0 & 1 & 1 & 0
\end{pmatrix}$

Stratified – Top 3 firms collaborate and bottom 3 firms collaborate

$G = \begin{pmatrix}
0 & 0 & 1 & 1 & 0 & 0 \\
0 & 0 & 0 & 0 & 1 & 1 \\
1 & 0 & 0 & 1 & 0 & 0 \\
1 & 0 & 1 & 0 & 0 & 0 \\
0 & 1 & 0 & 0 & 0 & 1 \\
0 & 1 & 0 & 0 & 1 & 0
\end{pmatrix}$

Polarized – 1st, 3rd & 4th firms collaborate and 2nd, 5th & 6th firms collaborate

$G = \begin{pmatrix}
0 & 0 & 0 & 0 & 1 & 1 \\
0 & 1 & 1 & 0 & 0 & 0 \\
0 & 1 & 0 & 1 & 0 & 0 \\
0 & 1 & 1 & 0 & 0 & 0 \\
1 & 0 & 0 & 0 & 0 & 1 \\
1 & 0 & 0 & 0 & 1 & 0
\end{pmatrix}$

Insurgency – 2nd, 3rd, and 4th firms unite forcing 1st firm to collaborate with 5th and 6th
Figure 2: Patterns of Prestige

- Stratification – Prestige understates ability gaps within groups and overstates ability gaps across groups
  \[ s = \{0.766667, 0.7, 0.633333, 0.466667, 0.4, 0.333333\} \]

- Polarization – Prestige overstates the relative ability of the leader and understates the relative ability of the two closest rivals
  \[ s = \{0.744444, 0.622222, 0.620635, 0.534921, 0.431745, 0.34603\} \]

- Insurgency – Prestige understates ability gaps overall
  \[ s = \{0.71, 0.67, 0.6, 0.53, 0.43, 0.36\} \]

Figure 3: Payoffs from Collaboration Patterns

- \( \rho = 5 \)
  - Stratified: \( \{0.366664, 0.262705, 0.100236, 0.0010071, 0.0066173, 0.0420011\} \)
  - Polarized: \( \{0.359998, 0.195388, 0.193813, 0.126377, 0.0753648, 0.0481086\} \)
  - Insurgent: \( \{0.310366, 0.254057, 0.179031, 0.126161, 0.0765206, 0.0539232\} \)

- \( \rho = 10 \)
  - Stratified: \( \{0.536053, 0.278219, 0.141302, 0.0266888, 0.0137023, 0.00703502\} \)
  - Polarized: \( \{0.564969, 0.166425, 0.163005, 0.0695143, 0.0247735, 0.0105133\} \)
  - Insurgent: \( \{0.442575, 0.296669, 0.147321, 0.0791774, 0.0269221, 0.0139646\} \)

- \( \rho = 40 \)
  - Stratified: \( \{0.360623, 0.0646756, 0.00449599, 5.7317\times10^{-6}, 3.9768\times10^{-7}, 7.6019\times10^{-6}\} \)
  - Polarized: \( \{0.296797, 0.0741775, 0.0096203, 0.00225042, 2.6317\times10^{-7}, 1.1916\times10^{-7}\} \)
  - Insurgent: \( \{0.823089, 0.166179, 0.0101053, 0.00614509, 0.0000112551, 5.84422\times10^{-7}\} \)

\( \square = \) a firm's best payoff