Social network perspective on franchising firm’s performance


Abstract
This paper examines franchising from the social networks perspective. The franchising network makes it possible for organizations to interconnect with others through social and economic relationships which result in a social network. Participants of a network typically profit from sharing financial, institutional, knowledge and informational resources. Expansion through franchising allows companies to evaluate potentially valuable partnering opportunities and expand its network. The benefits obtained from being a part of the network are expected to contribute to better firm performance. On the other hand, heavy reliance on franchising may result in a loss of product quality and diminishing brand value. The inverted U curvilinear relationship between the firm’s proportion of franchising and performance is tested within a contingency framework with size and competitive intensity within an industry as moderators. Based on the data from 56 franchising firms representing 10 industries, the findings support not inverted curvilinear relationship.

Key words: franchising, financial performance, social network theory, competitive intensity.

I. Introduction

Franchising is an important part of the global economy. Product and service franchisors represent over 40% of retail sales in the U.S. (PriceWaterhouseCoopers, 2003). It is a “business opportunity by which the owner (producer or distributor) of a service or trademarked product grants exclusive rights to an individual for the local distribution and/or sale of the service or product, and in return receives a payment or royalty and conformance to quality standards” (Justis and Judd, 1989). Franchising is defined by an agreement between a franchisor and a franchisee, and can be thought of as a contractual model of expansion. Business format franchising – which includes both a transfer of a brand/product and an operating system – experienced growth in many service industries and in some became prominent (Combs et al., 2004). For franchisors it is an opportunity for a faster expansion with lower risk and cost, while franchisees can obtain a tested business concept with the backing from an established firm. Franchising is used to found new businesses, restructure large organizations to be more flexible, and expand overseas. Also, it is a way to transfer knowledge beyond organizational boundaries (Sydow, 2002). Franchising was pioneered in the United States but also has experienced an explosive growth abroad (Fladmoe-Lindquist, 1996).

Prior studies have investigated factors that drive firms to franchise. According to Combs and Ketchen’s (2003) meta-analysis, agency and resource scarcity theories have been popular explanations for the creation of this business strategy. There have been calls to move the literature beyond resource scarcity and agency theories (Combs and Ketchen, 2003).

This paper uses social networks perspective to explore firm’s motivation to franchise and evaluate the impact of franchising on performance. Organizations interconnect with others through social and economic relationships which result in a social network. Network theory builds on a notion that economic action is embedded in a social network of external contacts which have implications for the organization’s survival and livelihood (Gulati et al., 2002). The embeddedness perspective uses firm’s social, economic, and professional networks (Granovetter, 1985) to explain economic actions such as alliance formation (Gulati, 1995). Social
network perspective allows an alternative view of franchising and franchising-performance relationship. Expanding the company through franchising establishes a social network. The participants of a network benefit from sharing financial, institutional, knowledge and informational resources. Such benefits are expected to have a positive association with the firm’s performance (Gulati et al., 2002). On the other hand, being a part of the network can limit firms from discovering opportunities and information outside the network. Therefore, such links may have negative influence on the firm’s performance (Gulati et al., 2002). Using social network theory, the paper proposes an inverted U-shaped relationship between proportion of franchising and performance. The moderating influences of size and competitive intensity on the curvilinear relationship between proportion of franchised units and performance are also examined.

This research makes three primary contributions. First, the article adapts a social network lens to examine the nature of franchising, an approach not used in previous franchising research. Second, an inverted U-shaped relationship between franchising and performance is proposed based on the insights from the networks literature. Third, a contingency framework is examined to establish the differential effects of firm size and competition on the franchising–performance relationship.

The rest of the paper is organized as follows. The second section presents literature review and hypothesis development. The third section describes the method and the fourth presents the results. The fifth section discusses the implications of these results for future research.

II. Literature review and hypotheses development

Social Network Perspective on Franchising

Franchising is an important part of the economy. In sectors such as lodging, restaurants tax preparation, printing and copying, and specialty food retailing, franchising plays a key role (Combs and Ketchen, 2003). A large portion of the franchising literature attempts to explain why companies choose to expand through franchising instead of company-owed units. The
reasons behind franchising have been highly debated and consensus has not been reached. Two popular explanations are resource scarcity and agency theories. From the agency theory perspective, franchising creates an efficient contract which aligns goals of franchisors and franchisees to minimize conflicts of self-interest (Rubin, 1978). Using resource scarcity perspective, firms use franchising to access financial capital, human capital and local market knowledge (Oxenfeldt and Kelly, 1969). According to Combs and Ketchen’s (2003) meta-analysis, agency and resource scarcity theories have been popular explanations for the creation of this business strategy. The meta-study found support for several of the hypothesis based on the agency theory but not for the ones grounded in resource scarcity. There have been calls to move the literature beyond resource scarcity and agency theories (Combs and Ketchen, 2003).

The social network perspective builds on a notion that economic action is embedded in a social network of external contacts which have implications for the organization’s survival and livelihood (Gulati et al., 2002). Organizations interconnect with others through social and economic relationships which result in a social network. A social network can be defined as a set of “nodes (e.g., persons, organizations) linked by a set of social relationships of a specified type” (Gulati, 1998: 295). Network researchers focus on the role of social context, such as prior ties between firms, to create a “social network in which most firms are embedded and that this network shapes the flow of valuable information about new tie opportunities and the reliability, capabilities, and trustworthiness of these partners” (Gulati et al., 2002: 282). External resources are crucial for competitiveness and value creation (McEvily and Zaheer, 1999), thus ability to identify and integrate transorganizational resources is key in firm’s value creation process (Achrol, 1997). As shown in prior research, “firms that can identify and exploit synergistic value creating opportunities with partners that own complementary resources and capabilities may be advantaged over those that are either unable, or unwilling, to do so” (Sakar et al., 2001: 702). In franchising, such synergies exist between the franchisor – holder of the brand and business format – and the franchisee – owner of the physical capital and entrepreneurial talent.
The social network perspective provides an alternative lens for grasping the franchising phenomenon. Franchising can be seen as an organizational network where organization’s egocentric network consists of the focal organization (called ego) and a set of organizations (called alters) with relationships between each. “The egocentric organizational network is a channel through which the focal organization obtains resources and information for the environment that is quality-controlled in both its content and credibility” (Gulati et al., 2002: 281). Sydow (1998) conceptualized franchising as an interfirm network. While highly formalized marketing and procurement make it “organization-like”, franchisees keep their entrepreneurial status by being responsible for managing the business and financial risk (Sydow, 1998). Franchisees are an important source of innovation and adaptation for highly standardized franchise systems and have much in common with other entrepreneurs (Stanworth and Curran, 1999).

**Performance and Proportion of Franchising**

Franchising is an established business phenomenon, however, only limited research has been done in linking performance to a decision to franchise. Various studies came to opposing conclusions. Shane (1996) showed that franchising has a positive effect on growth and survival. Similarly, Michael (2002) found franchising firms quickly gain market share. While these two studies focused on performance, financial performance was not part of their analysis. Combs and Ketchen (1999) did not find a linear relationship between franchising and performance. The objective of this paper is to add to the body of evidence on the impact of franchising on financial performance, and examine the possibility of non-linear relationships that may exist between franchising and financial performance.

Expanding the company through franchising establishes a social network. While networks can limit firm’s adaptability to the market, participants of a network benefit from sharing financial, institutional, knowledge and informational resources (Gulati et al., 2002). Franchisors benefit from access to capital required to maintain operations and growth. Institutional benefits result from the legitimacy of the entire organization as members are evaluated based on franchise organization to which they belong.
According to Khanna and Palepu (1999), association with a reputable network can help to increase performance and survival chances. This is consistent with Shane’s (1996) finding that franchising enhances survival. Franchise units allow more flexible, decentralized structures and perusal of strategies that emphasize flexibility and local adaptation (Yin and Zajac, 2004). Collective knowledge possessed by all firms within a network is referred to as knowledge and information resources (Gulati et al., 2002). The social network also allows access to information about capabilities and trustworthiness of current or potential partners (Gulati et al., 2002).

By being proximately positioned in a network, partnering firms are likely to have greater confidence in each other because of informational advantage and mutual interest to avoid damage to the reputation (Gulati, 1998: 307). Franchisors benefit from the information compiled by franchisees and their outside knowledge and connections. Expansion through franchising evaluates company’s ability to evaluate potentially valuable partnering opportunities and expand its network. The benefits from being a part of a franchising network are expected to contribute to higher levels of firm performance. The increase in the proportion of franchised units is expected to be positively related to performance.

The arguments up to this point support the idea that the slope of the curve plotting performance against proportion of franchising is positive. However, there are some indications that this relationship may be more complicated. According to Gulati et al (2002), being a part of the network can limit firms from discovering opportunities and information outside the network. For example, the franchisee may be required to buy ingredients from the franchisor as a premium, limiting its competitiveness. Therefore, such links may have negative influence on the firm’s performance. At certain proportion of franchised units, the company utilized the benefits associated with being a part of the network. The cost of maintaining an effective network may exceed its contribution to performance beyond a certain point because of diminishing returns to scale. After a certain proportion of the franchised units, firm’s performance may suffer. In other words, it is likely to see a change in slope of the performance curve for firms with higher proportion of franchising. The enterprises with greater balance between
franchised and company-owed units are expected to demonstrate superior performance.

Hypothesis 1: The relationship between proportion of franchising and performance is curvilinear such that the slope of the curve is positive at lower proportion of franchising and negative at higher levels of franchising.

Contingent Influences
Franchising network allows firms to access resources which create value for the members involved. An important issue to consider is how environmental uncertainty, in the form of the competitive environment, impacts the relationship between firm’s proportion of franchising and performance. Also, the impact of firm size on the relationship is examined. The study hypothesizes the contingent effect of competitive intensity and firm size on the performance – proportion of franchising relationship.

Proportion of franchising and competitive intensity: The firms which rely on franchising typically operate in mature, competitive service industries such as food, automotive, and recreation (Conley et al., 2005). In a mature industry, “emphasis is placed on cutting costs and improving service through incremental improvements in products and processes” (Auster, 1992: 779). Intense competition reduces coordination opportunities for firms within the industry (Oster, 1992). Typically such coordination opportunities between the firms are expected to decrease price wars and duplication of products. Competition within the industry is one of the challenges that influence firm’s strategy. Having a higher number of firms in an industry leads to more competition as each firm sees itself as a minor player and tends to act more individualistically. “Competitive intensity refers to the degree to which a firm faces competition in a market. The level of competitive intensity is related to the activities of competing firms, including price competition, promotion competition, and so forth” (Cui et al., 2005: 37). Intense competitive rivalry reduces average profitability (Oster, 1992). With increasing competitive rivalry within an industry, the ability to design and implement competitive strategies becomes crucial to organizational performance (Ramaswamy, 2001).
Companies turn to franchising to establish the network which can maintain its growth, respond to market needs, and allow efficient utilization of strategic resources. In a competitive environment, knowledge is one of the strategic capabilities which companies carefully manage (Cui et al., 2005). While firms pass on knowledge internally, franchising allows transfer of knowledge at a lower cost within the network with the ability to customize operations to the local environment. Franchising allows companies to establish a network of firms which coordinate even under intensely competitive conditions. The relationship between firm’s proportion of franchising and performance will be stronger under conditions of higher competitive intensity within the industry.

Hypothesis 2: Competitive intensity within the industry will moderate the relationship between proportion of franchising and performance, such that the higher the competitive intensity, the stronger the relationship between proportion of franchising and performance.

Proportion of franchising and size: The next issue to explore is whether proportion of franchising creates different value for small and large firms. Prior literature shows that small firms are at a disadvantage when forming an alliance with a large firm. Large portion of alliance value is harvested by a large firm, while a small firm, in the long-term, faces performance and survival issues (Alvarez and Barney, 2001). Similar argument can be made for franchised firms. Large firms benefit from established financial, marketing, distribution, and other organizational resources. Such companies are able to build franchising networks with greater ease due to established brand and access to significant resources. At the same time, a small company may benefit more from a growing franchising network.

Prior studies reported that small firms emphasize franchising more than large firms (Combs and Ketchen, 2003). This finding is consistent with the resource scarcity approach to franchising since small firms are in greater need for managerial, financial and entrepreneurial talent. A number of arguments support the idea of franchising benefiting small-
er firms to a greater extent. First, franchising allows companies to tap into external resources. Large companies may benefit from the expansion of franchising network due to standardization and efficiency gains, but small companies may not have an opportunity to expand and grow without franchising. Second, large companies already have cost advantage due to economies of scope and scale. Small firms can rapidly develop the scale by being proactive and building a franchising network. Further, through franchising, small firms get access to managerial talent, entrepreneurial thinking, and additional information sources. As a result, small firms will benefit from expanding franchising network to a greater extent than large firms.

Hypothesis 3: Size will negatively moderate the relationship between proportion of franchising and market performance, such that the smaller (larger) the size of the organization, the stronger (weaker) the relationship between proportion of franchising and performance.

III. Method

Sample and Data
The data was obtained from a combination of sources. Entrepreneur Magazine (2005) was consulted to identify industries which contain companies with franchises. The magazine publishes a yearly issue containing the top 500 franchises of the year (Conley et al., 2005). The list combines public and private companies. Due to limitations of available data for private companies, the listing was examined to identify industries with multiple public companies. The following industries were identified and contained more than one public company with franchising operations: automotive service & collision repair (SIC 7538), car & truck rental (SIC 7514), rent-to-own (SIC 7359), lawn and garden (SIC 0782), eating places (SIC 5812), hotels & motels (7011), radio electronic stores (7531), staffing (7361), hair salons (SIC 7231), and optical (SIC 3851). SIC codes for each industry were found on Hoover’s Online Industry Overview. A list of competitors within each industry was examined to identify publicly traded com-
panies. A compilation of publicly traded companies from these industries was assembled and contains information on franchised units, total units, net profit margin and number of competitors within each industry in the study. If company specific information was not available on Hoover’s Online for 2005, annual report (10K) filed by the company with SEC was consulted to obtain missing data. The total sample contained 56 companies.

Measures

Performance. The dependent variable, performance, was measured by company’s yearly profitability - net profit margin measure (Kesner, 1987; Oswald and Jahera, 1991).

Proportion of franchising. As in prior research, proportion of franchising was operationalized as a percentage of franchised outlets to total units. The measure was given a high validity rating by Combs and Ketchen (2003) in their meta-analysis of franchising literature.

Competitive intensity. The variable has been widely used in prior research with varied operationalizations. A number of papers used surveys to assess perceived competitive intensity/competitive dynamism (Cui et al., 2005; Sakar et al., 2001). Since industries with many players experience intense competition, measures of market structures were developed to gauge competitive intensity (Oster, 1992). Measures predominately used are the number of firms within the industry, the four-firm industry concentration ratio, and the Herfindahl index (Sakakibara, 2002). Due to data constraints, the number of firms in the four-digit industry classification is used as a proxy for the degree of industry competition. A similar approach was taken by Sakakibara (2002), who used the three-digit SIC industry category. Using a four-digit SIC category produces a narrower set of companies that compete in the same arena. Hoover’s Online categorization of firms within an industry was used in this paper.

Size. The logarithmic transformation of total number of outlets was used to operationalize the size variable. According to Combs and Ketchen’s (2003) meta-analysis of franchising literature, it is a high validity measure of size.
Control variable
Control for industry, in the form of a dummy variable at the four-digit SIC code level, was used to isolate industry effects. Sarkar et al. (2001) utilized similar approach to control for industry effect by using a dummy variable at the two-digit SIC level.

Model Specification and Estimation
The model was estimated in two steps. First, the proposed curvilinear relationship was specified by the following equation:

\[
\text{Performance} = \beta_{1-9} \text{Industry (Auto, Rental, Rent/Own, Lawn/Pest, Hotels, Electronics, Staffing, Hair, Optical)} + \beta_{10} \ \text{Proportion of Franchising} + \beta_{11} \ \text{Proportion of Franchising}^2 + \beta_{12} \ \text{Size}
\]

The proposed contingency impact of competitive intensity and firm size were tested in the following expanded equation:

\[
\text{Performance} = \beta_{1-9} \text{Industry (Auto, Rental, Rent/Own, Lawn/Pest, Hotels, Electronics, Staffing, Hair, Optical)} + \beta_{10} \ \text{Proportion of Franchising} + \beta_{11} \ \text{Proportion of Franchising}^2 + \beta_{12} \ \text{Size} + \beta_{13} \ \text{Competitive Intensity} + \beta_{14} (\text{Proportion of Franchising} \times \text{Size}) + \beta_{15} (\text{Proportion of Franchising} \times \text{Competitive Intensity}) + \beta_{16} (\text{Proportion of Franchising}^2 \times \text{Size}) + \beta_{17} (\text{Proportion of Franchising}^2 \times \text{Competitive Intensity})
\]

IV. Results
Table 1 shows the means, standard deviations, and correlations for the key variables. It shows that on average, a firm’s net profit margin is 4.92%, approximately 60% of its units are franchised and it is competing against 558 firms which are in the similar line of business. An examination of the correlation matrix reveals, not surprisingly, that the linear and quadratic terms of a variable are highly correlated. Based on the correlation matrix, performance is related to proportion of franchising (r = 0.25), proportion of franchising^2 (r = 0.30) and firm size (r= 0.42).
Table 1. Means, Standard Deviations, and Correlations of Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>s.d</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance (Net Profit Margin)</td>
<td>4.92</td>
<td>5.5</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion of Franchising</td>
<td>0.59</td>
<td>0.32</td>
<td>0.25</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion of Franchising^2</td>
<td>0.45</td>
<td>0.36</td>
<td>0.30</td>
<td>0.98</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Competitive Intensity</td>
<td>558.43</td>
<td>276.31</td>
<td>-0.09</td>
<td>-0.15</td>
<td>-0.18</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Size</td>
<td>6.80</td>
<td>1.75</td>
<td>0.42</td>
<td>0.23</td>
<td>0.22</td>
<td>-0.17</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 2 contains the Ordinary Least Squares (OLS) estimation results.

Table 2. Main and interaction effects on performance

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Main effect model (H1)</th>
<th>Interaction model (H2 &amp; H3)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>B</td>
</tr>
<tr>
<td>Constant</td>
<td>0.30 (3.38)</td>
<td>18.62 (17.30)</td>
</tr>
<tr>
<td>Proportion of Franchising</td>
<td>-21.31* (10.23)</td>
<td>-154.63 (79.41)</td>
</tr>
<tr>
<td>Proportion of Franchising^2</td>
<td>20.73* (9.42)</td>
<td>139.98 (72.43)</td>
</tr>
<tr>
<td>Size</td>
<td>1.16* (0.43)</td>
<td>-2.37 (2.25)</td>
</tr>
<tr>
<td>Competitive Intensity</td>
<td></td>
<td>5.56E-03 (0.1)</td>
</tr>
<tr>
<td>Proportion of Franchising*Competitive Intensity</td>
<td></td>
<td>5.43E-02 (0.06)</td>
</tr>
<tr>
<td>Proportion of Franchising*Size</td>
<td>14.56 (8.97)</td>
<td></td>
</tr>
<tr>
<td>Proportion of Franchising^2*Competitive Intensity</td>
<td></td>
<td>-5.71E-02 (0.06)</td>
</tr>
<tr>
<td>Proportion of Franchising^2*Size</td>
<td></td>
<td>-12.01 (7.66)</td>
</tr>
<tr>
<td>Industry (not significant)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>2.40*</td>
<td>1.99*</td>
</tr>
<tr>
<td>Adjusted R^2</td>
<td>0.23</td>
<td>0.21</td>
</tr>
</tbody>
</table>

^ p < .05

H_1 posits a curvilinear relationship between proportion of franchising and performance. The model is significant and explains 23% of the variance in net profit margin, a proxy for firm performance. While it was expected that an improvement in performance will be observed with an
increase in proportion of franchising and a decrease in performance was anticipated at high levels of franchising, the opposite was found. The results from Table 2 indicate that there is a statistically significant, negative relationship between proportion of franchising and performance ($t = -2.08$, $p < 5\%$). Furthermore, there is a positive relationship between proportion of franchising squared and performance ($t = 2.20$, $p < 5\%$). The results support curvilinear relationship between proportion of franchising and performance. Also, firm size had a positive impact on performance ($t = 2.70$, $p < 5\%$) and indicates that larger firms were more profitable.

Next, contingent effect of firm size and competitive intensity on the relationship between proportion of franchising and performance was examined as proposed in $H_2$ and $H_3$. As shown in Table 2, the hypotheses were not supported and do not indicate moderating effect of competitive intensity or firm size on the curvilinear relationship between proportion of franchising and performance.

V. Discussion and conclusions

The study examined the relationship between proportion of franchising and firm’s performance. According to the social network theory, it was expected that the gradual increase in the proportion of franchised units will have a positive impact on the firm’s performance due to benefits obtained from sharing financial, institutional, knowledge and informational resources (Gulati et al., 2002). The improvement in performance was expected to occur up to a point and then a cost of maintaining an effective network of franchised units was expected to exceed the performance improvement associated with being in the network. Size and competitive intensity were expected to moderate that relationship. While, these hypotheses were not supported, a curvilinear relationship between proportion of franchising and performance was observed. A superior performance was demonstrated at the lower and higher levels of franchising with a drop in performance in the middle range. Such relationship indicates that franchising provides entrepreneurial form of business with high speed of development and brand name recognition. As franchising scale grows, the costs of coordination and the need for organizational restruc-
turing puts a stress on the firm that lowers profitability. Firms that are able to endure this stage make the necessary organizational adjustments, standardize processes and develop communication with franchisees, succeed at the end and achieve higher performance.

The results of the study can be interpreted based on Mintzberg’s (1979) typology configurations for business organizations. Using his typology, Castrogiovanni and Justis (1998) identified three common franchising configurations: entrepreneurial, confederation, and carbon-copy. These three types may characterize the three distinct stages that franchisors go through as they expand the scope of franchising operations.

Firms with low proportion of franchising fall into entrepreneurial configuration. They are new to franchising and operate in an uncertain environment which requires tight coordination to ensure efficient use of resources (Castrogiovanni and Justis, 1998; Mintzberg, 1979). Based on the results of this study, companies in this category demonstrated superior performance.

When franchise units increase in number and geographic dispersion, the entrepreneurial form is no longer suitable and a transition to a more complex form is required (Castrogiovanni and Justis, 1998). Consequently, franchise organizations switch to hybrid configurations. The confederation form is characterized by a loosely-coupled organizational network in which each franchisee has considerable autonomy; market opportunities are abundant, so each unit can experiment with new approaches without harming the operations of others (Castrogiovanni and Justis, 1998). It is possible, that due to higher coordination and communication cost associated with maintaining confederation form, franchisor profitability drops.

Firms with high proportion of franchising operate under carbon-copy configuration and demonstrate improved performance as compared to companies operating in confederation form. Such form is typical for firms where each unit operates as a “carbon-copy” of the other and there is a need for very tight financial and operational controls. Under this configuration, franchisees have very little autonomy; customers tend to purchase on a repeat basis and the product offerings from one franchise outlet to the next are standardized (Castrogiovanni and Justis, 1998).
VI. Limitations and future research
The central weakness of the paper is in the lack of significant results in the hypothesized direction. Social network theory, while perhaps giving guidance on selection of variables, has failed to explain the directionality of the variables, as operationalized. It seems from the results that either, social network theory is not appropriate to the study of franchising as conceptualized or that typical limitations of secondary research empirical work were encountered: such as, limited sample size and single year cross sectional data.

Given these limitations, future research needs to be expanded in two ways: first, attempt to find another theory that better explains the stages of franchising and their relationship to profitability. Secondly, the adaptation of Mintzberg typology by Castrogiovanni and Justice (1998) may be a fruitful theoretical approach.

Models explaining the link between franchising and profitability will help policy makers, franchising practitioners, and theoreticians better understand the mechanism by which franchising affect the organization, and how to use franchising to maximize the profitability of the firm. While this research did not find contingent effects, future research should continue to examine these variables and other non-linear impacts to reveal more complex patterns in the data.

References


