Abstract
This paper analyzes the effects of diversification and brand breadth on firm performance for professional service firms (PSFs). The research aim is twofold. First, we test whether moving into products may put at risk the core resources that sustain PSFs’ competitive advantage. Second, we study which branding strategies best match their diversification attempts. Broad (narrow) brands characterize a branding strategy with scarce (plentiful) associations to specific product characteristics. We analyzed trademark portfolios of 47 U.S. based management consulting firms in the 2000-2009 time period. Panel regression results suggest that (1) PSFs always benefit from diversification when they remain pure service providers; (2) performance is positively related to a strategy of specialized narrow brands.

Keywords: Professional Service Firms, Diversification, Brand Breadth, Performance

INTRODUCTION

Is diversification a growth strategy that increases performance for Professional Service Firms (PSFs)? As far as service firms are concerned, PSFs are at the extreme end of the intangibility range (Amonini et al., 2010), because their main input and output is knowledge (von Nordenflycht, 2010). This knowledge is embedded in specialized services such as consultancy, usually developed and delivered by highly skilled employees. Thus, PSFs display typical service firm characteristics like high labor intensity, low capital investment and customized offerings (Miles, 1993), which correspond to low fixed and high marginal costs with scarce economies of scale and scaling-up incentives. Although we might expect an extreme fragmentation of offerings and markets dominated mostly by small firms, instead we see the emergence of large companies in PSF sectors, such as in accountancy (Suddaby & Greenwood, 2001), management consulting (Sarvary, 1999) and advertising (von Nordenflycht, 2011), as well as increases in market concentration. This evidence is puzzling and prompts the research question: what mechanisms are allowing some PSFs to grow successfully, despite the apparent lack of opportunities from economies of scale?
We tackle this question by combining theoretical insights from the resource-based view of the firm (Teece, 1982; Stiglitz, 2000; Helfat and Eisenhardt, 2004) and information economics (Nayyar, 1990). Our aim is to explain the growth path of diversified PSFs consistent with recent specialized business media debates on how some PSFs are able to exploit their intangibles through diversification (The Economist, 2013). According to the resource-based view, the primary sources of a firm’s competitive advantage are intangible, unique and difficult to imitate resources (Denrell, Fang & Winter, 2003; Foss, Lyngsie & Zahra, 2013). These resources are also often deployable in a wide range of end-applications (Gruber, MacMillan & Thompson, 2008; Eggers, 2012). For PSFs, an important step in diversification is moving from pure service to product diversification (Brivot, 2011). As this move represents an important tilting point for PSFs with managerial relevance, we argue that this contingency is key when studying performance through diversification. In this context, the release of a physical product should be seen as the release of a software-related product that is coded and reproducible, implying a transition from a labor intensive offering to a more capital-intensive one. Christensen et al. (2013) suggest that PSF sectors, in particular management consulting, are on the verge of a major “product” disruption due to the new possibilities offered by Information and Communication Technologies (ICT); De Man et al. (2016) describe the emergence of new business models where consulting
firms are moving away from the traditional pure-service provision model. However, the performance implications of this diversification process are still unexplored.

The second aspect we discuss is how PSFs should brand their offerings during the diversification processes. The severe information asymmetries in PSF markets present opportunities for firms to strategically position and market their offerings with a strong reputational image (Nayyar, 1990; Kotler et al., 2002). Consumers, unsure about the quality of an offer due to the lack of tangible attributes, will use the brand with its attached meaning as a decision anchor. When firms diversify, they choose a single broad brand or multiple narrow brands. On the one hand, the intangibility of services and their “credence” characteristics (Nayyar, 1990) can push PSFs to focus on a single brand, i.e., the company name that captures the firm’s overall reputation (De Chernatony & Riley, 1999). On the other hand, PSFs can also successfully develop multiple sub-brands to market diverse services (Rahman & Areni, 2014). If reputation and trust are key variables, should PSFs employ the same broad brands to market different products and services? Or bet on various narrow brands that are product/service-specific? We argue that the distinction between PSFs offering pure services vs. tangible products is key for solving this dilemma. Our two main research questions are therefore:
Q1: Is diversification positively related to PSF performance, also for PSFs offering products?

Q2: Which branding strategies favor performance for diversified pure-service PSFs as opposed to PSFs offering products?

Empirically, we select as our test sample a set of professional service firms, namely 47 U.S. based management consulting firms, and analyze their performance in the 2000-2009 time period. We capture these PSFs’ diversification and brand dimensions from their trademark portfolios. Trademarks are the legal counterparts of brands that firms can use to identify unique products or services and advertise in markets. Semadeni (2006) shows, for the specific case of management consulting, that trademarks contain information on firms’ marketing strategies.

Our first main finding is that PSFs always benefit from diversification if they merely add new services. The truly unrelated diversification that exposes the pitfalls of diversification is the addition of product offerings. We argue that this diversification to products undermines PSFs’ strategic positioning as providers of expert knowledge. This finding contributes to the diversification literature by showing the performance implications of diversification for service firms with a high level of intangibility in both input and
market output. Compared to recent works on diversification, this paper is closely aligned to the relatedness debate (see Neffke & Henning, 2013).

As regards studies focusing on PSFs (Hitt et al., 2006 on law firms and Greenwood et al., 2005 on accountancy firms), we complement their tests on the impact of diversification by considering diversification into products as well as services. In terms of managerial importance, this article shows that for PSFs, the transition from service to products, given the different level of codification involved, could be a significant threshold that divides negative (or null) from positive performance outcomes. We suggest that the impact of diversification depends on a contingency (services vs. products) related to the codification and visibility of tangible attributes.

The second key finding is that a strategy of narrow brands fits pure-service PSFs better than a broad brand strategy. This result provides a novel take in the understanding of service marketing for diversified PSFs. While some authors (Amonini et al., 2010; Rahman and Areni, 2014) acknowledge that brands are key in PSF contexts where customers run a high risk of making an incorrect decision (Hill & Neeley, 1988), evidence on the effect of branding is still limited (Berry, 2000). Our contribution relies on insights from the economics of information theory already applied in marketing studies (Zhang et al., 2015), but not yet to PSFs. Our finding that pure-service PSFs’ performance is enhanced by
narrow brands somewhat contradicts the expectation from prior studies that reputation-driven markets favor one single broad brand (Amonini et al., 2010). Instead, we argue that pure-services PSFs have strategic incentives to provide targeted information signals to customers in new segments by using narrow brands.

Concerning the empirical side, using trademarks as a proxy of product/service and brand strategies enables us to present results from a panel data set, also accounting for some endogeneity issues. This advances the nascent research on trademarks as a valuable proxy in social science research (Mendonça, Pereira & Godinho, 2004; Schautschick & Greenhalgh, 2016). Moreover, using trademark registrations means we can track companies’ actual actions. This responds to the call by Amonini et al. (2010) for more research on the competitive positioning of service firms relying on actual actions.

THEORY AND HYPOTHESES

Emergence and consolidation of PSFs

Professional service firms are a quintessential example of organizations whose performance is driven by resource-based strategies. The resource-based view of the firm (Grant, 1996; Barney, 1991) dictates that firms’ intangible resources are often the major determinants of competitive advantage and performance potential. For PSFs, intangible resources in the
form of knowledge are not only their major production input, but also a main component of their, often intangible, output.

The emergence of PSFs is part of the structural transformation of industrialized economies to knowledge economies where firms’ comparative advantage has come to lie around their ability to skillfully manage intangibles rather than tangible capital (Starbuck, 1992). Service firms that rely significantly on knowledge and human capital are at the heart of this phenomenon (Miles, 1993): their output is intangible and can neither be stored nor easily transferred; service production is not capital intensive, whereas service output is often co-produced with clients’ interaction and thereby customized rather than standardized. Such properties explain why these firms typically rely less on traditional economies of scale from production (Miles, 1993; von Nordenflycht, 2010). While novel communication technologies have spurred major advances in the degree to which services can be standardized, codified and also transferred (Miozzo & Soete, 2001), high-end services, such as those offered by consulting firms, still strive to maintain personalization and customization while enjoying the efficiency benefits of codification and standardization (Hansen et al., 1999). All this reasoning suggests that PSFs have scarce incentives to scale-up operations (Christensen et al., 2013). Moreover, there are additional constraints to performance when the production output is also intangible and it is difficult to evaluate ex-
Diversification and PSF performance

Von Nordenflycht (2011) suggests that the growth of PSFs goes hand in hand with increasing diversification. He observes how a process of size matching between clients and suppliers characterizes the evolution of many knowledge intensive industries, with large and diversified companies serving large clients and small companies serving small clients. The very large companies combine the ability to coordinate large projects and provide whole packages of diversified services that satisfy the complex needs of large clients. In this respect, diversification is important for PSFs’ performance mainly because of demand forces. Other studies in different contexts have also offered demand-based explanations of diversification benefits, including one-stop-shop considerations (Greenwood et al., 2005, Brush et al., 2012) and in general economies of scope in consumer utility (Ye et al., 2012, Kuruzovich et al., 2013).

1 http://www.inc.com/inc5000/list/2016/
Compared to manufacturing companies, performance is linked to the ability of PSFs to create value, more than to capture it, because the benefits of diversification will be in sales volumes (more customers or higher prices) with scarce efficiency gains linked to economies of scope in production (Greenwood et al., 2005).

From a resource-based perspective, intangibles are sunk investments with redeployable characteristics that naturally lead to diversification (Teece, 1982 and 1986; Helfat & Eisenhardt, 2004; Gruber et al., 2008). Yet, for PSFs, intangible resources like human capital skills are often tacit because they are practice-based and the outcome of a routinization process (Dougherty, 2004). Thus, PSFs that aim to redeploy their intangible resources in other contexts must attempt codification, because knowledge should be replicated in order to be transferred (Kogut & Zander, 1992). The intensity of codification is therefore a strategic decision with several degrees of freedom; PSFs that scale up and apply knowledge resources to different markets will adjust codification strategies according to their optimal replication-based economies (Hansen et al., 1999). However, a crucial stage in PSFs’ codification efforts is when they decide to move from services to tangible products (Brivot, 2011). Products with tangible attributes are by nature based on more codified and visible characteristics. For example, the Management Consulting Group has developed Ascertain® a revenue management and process evaluation toolset: the software
analyses, monitors and links data from different sources and networks within a firm, across operational and business support systems and inventories. This product is the outcome of a codification process that allowed the company to move from a business model based on consultancy services to one based more on product licensing revenues.

If we focus on the input side, adding products to services represents a related diversification, because firms replicate the same key knowledge for targeting (often) the same customers (Von Nordenflycht, 2011; Neffke & Henning, 2013). However, the realization of tangible products forces firms to adopt a more formal codification that could generate trade-offs. The availability of tangible offerings renders information in the marketplace less asymmetric, which in turn diminishes PSFs’ ability to defend their source of sustainable comparative advantage. Tangible products that allow customers to produce their own solution can eventually cannibalize the professionals-embodied competencies (Roberts & McEvily, 2005). This is a key point in our theory. For PSFs, diversification towards products could undermine the strategic resources that primarily define the value proposition of PSFs in the marketplace. Their reputation is precisely based on tacit professionals-embodied competencies that diversification could render more visible and codified (Neffke and Henning, 2013), reducing their non-imitability and non-substitutability (Barney, 1991) and their value creation potential accordingly.
We therefore propose the following hypothesis:

\textit{H1: PSFs with a greater diversification only achieve a higher performance if they remain pure service providers.}

\textbf{Branding and Performance}

Services are the quintessential example of experience goods, whose quality can only be evaluated after consumption, and some services can even be credence goods, if their ex-post evaluation is complex or even impossible (Nayyar, 1990; Dolfsma, 2011). In sum, information asymmetries are particularly high (Starbuck, 1992; Skagg & Snow, 2004). In this respect, PSFs face challenges when promoting, protecting and leveraging their intangible resources. Consumers who cannot rely on previous experience for making an informed decision typically depend instead on a firm’s reputation (Fombrun & Shanley, 1990). Brands are a classic tool on which a firm’s reputation rests (Brown & Dacin, 1997), therefore the information a brand conveys can be key to reducing uncertainty over the quality of a service and its provider (Bharadwaj et al., 1993).

Branding, as a specific form of communication, fulfils different roles. It lowers transaction costs in the market by reducing uncertainty about some of the provider’s properties during an information search (Sappington & Wernerfelt, 1985). It also works as
an appropriation tool since it helps to distinguish and identify the product/service in the market. Thereby it forms barriers to entry (Lancaster, 1990). Branding increases customer loyalty, thereby strengthening a company’s reputational assets. In terms of systematic empirical evidence, strong brand equity is related in the literature to higher consumer awareness, higher company performance and higher financial returns (Keller & Lehmann, 2006).

Branding research on PSFs is still in its infancy and there is no consistent evidence of how brands impact PSF performance (Rahman and Areni, 2014). Feldman Barr and McNeilly (2003) show that not all PSFs are able to use branding strategically to create a competitive edge. From a strategic point of view, we expect reputation building to be a key driver of PSFs’ performance thanks to the inherent properties of their business: “Most service organizations will depend upon the associations stakeholders make with their corporate names” (Davies et al., 2010: 530). This is crucial because if diversification is a common phenomenon for PSFs, we could ask how branding adapts and translates into actual strategies.

We can define PSFs’ branding strategies according to their brand breadth. On the one hand, PSFs may focus on one (or a few) consolidated brands that can be extended when diversification takes place, hence bet on broad brands. This strategy is usually realized
through names and logos that identify an emotional awareness linked to firm name and image (Keller, 1990; Krasnikov et al., 2009). On the other hand, PSFs can create brands that contain specific information on product/service attributes, generating a portfolio of specialized narrow brands. In practice, there will be a continuum of branding strategies to complement diversification.

Broad brands may be a tool to charge premium prices or boost demand: companies that risk their name may be rewarded by customers who act on the belief that those companies would do their best to deliver the value that they promise. In fact, brand extension strategies tend to be positively evaluated by market analysts (Block et al., 2014).

However, broad brands might expose firms to more risks: firstly, in cases of negative publicity due to failures in diversification attempts. Termination, culls and recalls of products/services marketed with brands used for other products/services backfire on brand image (Cleeren, van Heerde & Dekimpe, 2013). Secondly, by using the same brand, firms may apply some niche-specific resources to antagonist niches, creating negative externalities. For example, it could be very difficult to sell under the same brand a service directed at environmentally concerned customers and polluting companies. The extension of a brand to different markets might be beneficial for service firms, but only if it is considered ‘legitimate’ by the market (Nayyar, 1990), i.e., there might be important market
constraints to brand extensions. For the specific case of management consulting firms, Greenwood et al. (2005) even talk about “reputation stickiness”: given the complex and abstract nature of services offered, corporate clients do not easily extend a firm’s reputation from one service to another. Semadeni (2006) argues that PSFs embed a tension between branding radically new offerings to differentiate themselves from competitors, and sticking to their core mission to increase their legitimacy and alignment to the sector’s professional norms. When information asymmetries are strong, legitimacy is an important asset for firms. Hence, firms will prefer to have narrow brands that are very specific to the targeted product/service segment.

Clearly, the previous arguments apply to the specific conditions encountered by typical PSFs marketing their knowledge-intensive expert services. As soon as PSFs include products in their offerings, they are giving away tangible characteristics from which customers can extract clues on quality. Thereby consumers are also able to compare those clues with the firm’s reputation conveyed through brands. This reduces the asymmetric information in the market, relaxing the importance of brands as signals.

In sum, the final impact depends on how brands could be leveraged to support higher premium prices or an increasing demand in markets plagued by asymmetric information between firms and consumers. While a similar argumentation in terms of value
creation applies to product firms, we argue that the information asymmetries are much stronger in the markets where PSFs are active, given the ‘credence’ nature of PSFs (Nayyar, 1990). Thus, we propose these two contrasting hypotheses:

**H2a:** PSFs adopting a narrow brand strategy only achieve a higher performance if they remain pure service providers.

**H2b:** PSFs adopting a broad brand strategy only achieve a higher performance if they remain pure service providers.

**EMPIRICAL ANALYSIS**

**Sample**

For our sample, we select public companies from Bureau Van Dijk’s Osiris database within Standard Industrial Classification (SIC) code 8741, i.e., management and public relations service firms. We choose U.S. companies to ensure comparability in terms of trademark numbers and cultural approaches (Giarratana & Torrisi, 2010). We focus on the organic growth of these organizations, i.e., excluding mergers and acquisitions, thus avoiding the confounding effects of financial mergers. Trademarks can change owner when sold or acquired by companies. The United States Patent and Trademark Office (USPTO) database
details changes in ownership if the acquirer maintains a brand without a stand-alone subsidiary. If after acquisition, a subsidiary remains independent, it will maintain the ownership of the brand. We only consider the trademarks registered and owned by the companies in our sample without grouping for holding ownership. We further limit our analysis to public companies in order to have valid financial data; finally, we select companies that owned at least one live trademark during the sample period. It turns out that 47 firms fulfilled this condition. In other words, we fine-tune our sample in order to consider only PSFs with a high visibility, press coverage and whose brands had reached a legitimacy level that needs formal trademark protection from potential imitators. These selection criteria are also in line with the conceptual focus of our paper. We do not attempt to explain how PSFs build reputational assets, rather to understand how they use them to counteract the typical challenges of information asymmetry in their markets.

We use four accounting variables from the Osiris database: a) the total number of employees, b) turnover, c) total assets and d) cost of goods sold. We take data for the years 2000–2009, thereby constructing a balanced panel dataset. Wherever the Osiris variables for turnover and number of employees are missing, we drop the entire observation for that specific company and year and keep only the complete ones, resulting in a total of 172 observations.
For each company, we collect the trademarks registered at the USPTO. Trademarks are combinations of “words, phrases, symbols, or designs that identify and distinguish the source of the goods or services” (USPTO Documentation, http://tess.uspto.gov). Firms can register as a trademark a new firm name, a name of a product, a jingle, a slogan, a new image, or a logo. In this way, they secure legal protection for their investment in marketing and reputation (WIPO, 2013). Even though trademarks do not protect against the imitation of the product per se, they do help to create a barrier to imitation because they prevent a similar product with a similar name or brand being sold in the same market. Trademark owners pay different fees for each class of goods or services for which a trademark is registered, and they have to prove periodically that they are using the trademark in the relevant market; even if the owner is willing to pay the fees, a trademark is cancelled if it is not commercially used for five consecutive years after registration. Academic interest in trademarks has only recently emerged. Previous studies show that trademarks represent a good proxy for the products and markets in which a firm operates, and that they are correlated with performance measurements and stock market value (Fosfuri & Giarratana, 2009; Krasnikov et al., 2009). While trademarks are clearly related to advertising investments, they do not capture marketing strategies equally well across different sectors (Flikkema et al., 2014). Information available on a trademark is the extent to which firms
decide to register names, logos, words, or phrases; the product categories protected and the registration/filing and cancellation/abandon dates.

We collect data from USPTO’s TESS (Trademark Electronic Search System) database. Trademarks are assigned to 45 international classes (IC) and 60 U.S. product classes. For each trademark, the IC tends to be unique (one class per trademark) and identifies the primary product category where the product or service is marketed. The U.S. classification is an older system that represents the product categories to which the brand could be extended and is still kept by the USPTO as a secondary system next to the international one (Graham et al., 2013). Each trademark is usually linked to several U.S. classes starting with the goods and service description provided by the applicant. The more complex the good and service description, the more U.S. classes that are assigned to a trademark. IC and U.S. classes thus provide different information: the unique IC code identifies the type of product/service underlying the trademark, whereas the multiple U.S. codes indicate the breadth of the trademarks, i.e., the product/service classes potentially covered by the same trademark.² It is also important to mention that the U.S. classification is not independently produced by the USPTO office. It is a classification constructed from the analysis of the standardized keywords that trademark applicants at the USPTO have to
use to describe the goods and services covered by the trademark.\textsuperscript{3} Thereby, U.S. classes capture information directly provided by companies on the breadth of their trademark.

**Dependent variables**

To test our hypotheses, we aim to fit a model with performance as the key dependent variable and a vector of independent variables related to diversification and brand breadth. We measure performance with the ratio of total sales and employees, as in Greenwood et al. (2005):

\[
\text{PERFORMANCE}_{i,t+1} = \frac{\text{SALES}_{i,t+1}}{\text{EMPLOYEES}_{i,t+1}}
\]  

(1)

Given that PSFs rely strongly on their human capital as their main intangible asset, considering sales per employee is a good indicator of their potential performance (Lorsch and Tierney, 2002). Our measurement is also in line with the diversification literature, where the typical dependent variable concerns measurements of sales, to avoid confounding effects due to efficiency gains at corporate level (Zahavi and Lavie, 2013). We also check the correlation of our measurement with two classic indicators of profitability, Returns on Sales (ROS) and Capital Turnover (CT). ROS and CT are the two components of the Return on Investment (ROI=ROS * CT), in which ROS is more of a measure of value capture and efficiency, while CT is more of a measure of value creation (CT= Sales /(
Fixed assets + working capital)). We find that our dependent variable is significantly
correlated (p value =0.006) to CT, but not to ROS (p value =0.287); this means that,
consistently with our theory on PSFs, our dependent variable captures more value creation
processes than value capture and efficiency.

**Independent variables of theoretical interest**

*Diversification.* The USPTO usually assigns each trademark to a unique IC product/service
class that determines the goods or services on which the mark is used. There are 34 product
categories and 11 service categories. For each firm we know how many live trademarks in
the different IC classes the firm owned in a certain year $t$. We then calculate a Herfindhal
index for each firm at time $t$. Such a concentration index takes a maximum value of 1 when
all trademarks are registered in the same IC and a minimum value of $1/N$, with $N$ equal to
the number of ICs available, when each class is covered by one trademark. Nineteen IC
classes appear in our sample, and given the problem of small sample bias, we follow the
standardization suggested by Hall (2005), adopting the following formula:

$$
\text{DIVERSIFICATION}_{i,t} = - \frac{(\text{Herfindhal}_{\text{IC},i,t}-1/N_i)/(1-1/N_i)}
$$

(2)
Note that for a straightforward interpretation, we insert a negative sign at the beginning so that a higher DIVERSIFICATION variable means a firm’s diversification is higher.

*Brand Breadth.* Even if assigned to a unique IC product/service class, each trademark is classified by the USPTO into one or more of 60 different U.S. product and service classes. U.S. classification is based on the detailed description of the products and services that trademark applicants are asked to file at each trademark application. The more U.S. classes of a trademark, the more the underlying brand can potentially be extended to different product and service domains. We then calculate a Herfindhal index of concentration for the U.S. classes covered by the portfolio of live trademarks for each firm in each year. We standardize it according to Hall (2005) to avoid small sample bias, given that the number of U.S. classes in our sample is $M=39$. Thus our measurement reads:

$$\text{FIRM BRAND BREADTH}_{i,t} = - \frac{\text{Herfindhal}_{US_{i,t}} - 1}{M_t} / (1 - 1/M_t).$$

(3)

Note that we insert a negative sign at the beginning so that the broader the brand the higher the potential extensions of a firm’s brand portfolio. Sandner and Block (2011) use a similar measurement as a proxy for the value of trademarks: the higher the breadth, the higher the costs, which implies that the company is investing more in protecting that trademark. This
is confirmed by Melnyk et al. (2014), who show that broader brands are less likely to be abandoned.

**Controls**

A common concern when estimating firm-level models is that samples might include firms with very different strategic positions. To allow for this heterogeneity, we include several firm-level controls and rely on estimations including firm-fixed effects.

The first control is the firm’s lagged performance, which accounts for auto-correlation in firm-specific processes:

\[
\text{PERFORMANCE}_{i,t} = \frac{\text{SALES}_{i,t}}{\text{EMPLOYEES}_{i,t}}
\]

Firms in our sample also have different strategies when it comes to trademark filing. We count the number of live trademarks owned by each firm in each year and standardize them by firm size, proxied by the number of employees. The stock of trademarks changes annually because some trademarks ‘die’ and new ones are registered. This variable allows controlling for brand proliferation according to the size of the firm. We take the logarithm of this ratio and define it in such a way that the \( \text{BRAND INTENSITY}_{i,t} \) is zero if the company does not own any live trademarks in that year:

\[
\text{BRAND INTENSITY}_{i,t} = \ln \left( \frac{\text{Number of Live Trademarks}_{i,t}}{\text{Employees}_{i,t}} + 1 \right)
\]  

(4)
We further control for the size of the company by controlling for its total assets.

\[ \text{LN ASSETS}_{i,t} = \ln(\text{ASSETS}_{i,t} + 1) \]

We also control for the total costs to avoid the following potential bias: if firms with higher growth rates have to pay higher costs in terms of wages for better skilled employees, the implied growth strategy is not sustainable in the long term. We also include the squared costs to control for non-linear effects.

Given the many missing values in the data on costs (382 of the 470 data points are missing), we turn missing values into zeros and add a dummy for missing costs.

\[ \text{LN COSTS}_{i,t} = \ln(\text{COSTS}_{i,t} + 1) \]

**Regression methods**

We perform panel regression estimations. A major issue to bear in mind is that the two main variables of theoretical interest (diversification and brand breadth) are highly correlated. We then resort to regression models with instrumental variables (IVs). IV estimators exist also for panel data models and can be estimated in Stata by relying on the `xtivreg` and `xtivreg2` routines (Baum et al., 2007; Schaffer, 2010). The main idea behind instrumentation is to find exogenous variables that act as proxies for the endogenous regressors and are at the same time not correlated with other variables (Campa & Kedia,
2002). In our case, we choose to instrument Firm Brand Breadth with three additional variables: these three instruments are expected to correlate with brand breadth but not with diversification.

The first instrument is Prestige. This variable is constructed from information compiled by market research company Vault. Rankings of the most prestigious U.S. consulting companies are available for the years 2006-2010 (http://www.vault.com/company-rankings/consulting/best-consulting-firms-prestige/). Vault bases its rankings on evaluations by consultants, not customers, which ensures they are independent of typical brand value measurements. Given that the list includes 50 firms, our variable is defined as 50-rank+1. The variable is set at zero if the company does not appear at all on the list that year. Nine companies in our sample appear at least once in the ranking. The instrument captures the part of firm performance directly influenced by brand awareness, with no connection to product strategies.

The second instrument is Patents. This variable is constructed by collecting information from the USPTO on patents filed by the companies in the years considered. Fourteen companies in our sample applied for at least one patent. The idea behind this instrument is that filing patents signals a greater ability by firms to manage the formal
protection of their intangible assets (i.e., also trademarks), with all the associated legal requirements.

The third instrument is TRADEMARK AGE\textsubscript{i,t}: this variable is calculated as the average age of live trademarks in each firm’s portfolio in each year. Older trademarks might have a greater chance of being used for several products/services. If a company’s portfolio includes older trademarks, this might correlate with its reliance on the same names, thus affecting brand breadth, but not diversification. As mentioned above, to account for cross-firm heterogeneity, we include firm-level controls and firm-fixed effects.\textsuperscript{4}

To take into account the different effects of diversification within service sectors as compared to physical products, we run two additional regressions after dividing the data into two subsamples. The first regression accounts for the firms that have not released at each time \( t \) any physical product (‘Pure service cases’). We do so by selecting cases where the entire portfolio of live trademarks owned by firm \( i \) in year \( t \) only covers service IC classes, i.e., in the 35 to 45 range. The second additional regression covers firms that at time \( t \) had already released a physical product in the market. Operationally, their trademarks cover at least one product class, i.e., one class in the 1 to 34 range. We should note that the Nice Agreement, which produced the international Nice Classification, states: “A service is any activity or benefit that one party can offer to another that is intangible and
does not result in the transfer of ownership of any physical object” (EUIPO, 2014, p.8). This definition matches our definition of services as intangible products.

Finally, IV panel regression estimates can be tested for the validity of instrumentation using two main post-estimation statistics (Baum et al., 2007). The first test addresses concerns of weak identification, i.e., for situations where the excluded instruments are only weakly correlated with the endogenous regressors). If the Cragg Donald Wald test produces F-statistics higher than 10, the null hypothesis of weak identification can be rejected. The second post-estimation test checks the validity of instrumentation by testing for over-identifying restrictions. If the Sargan-Hansen statistic is significant, the null hypothesis that the instruments are valid (i.e., uncorrelated with the error terms and correctly excluded instruments) can be rejected.

**Results**

Table 1 shows the basic overall descriptive statistics for our variables and Table 2 reports the pairwise correlation coefficients, together with their significance. It is worth noting that apart from the diversification discussed above, no other variable of theoretical interest significantly correlates with FIRM BRAND BREADTH\textsubscript{t,t} above 20%.

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Insert Tables 1 and 2 about Here
Table 3 shows the results of the IV estimates, which we perform for all cases (A), pure service cases (B) and cases with products (C). Model 1 is the baseline model where performance only depends on past performance. Model 2 includes several control variables and Model 3 is the full model, with all the variables of theoretical interest.

At first glance, the significant differences between the three models (A, B and C) confirm our theory that PSFs’ transition from service to products should be treated separately, since it accounts for different dynamics and impacts on main variables.

DIVERSIFICATION is significantly positively related to performance for pure service firms (coefficient=203.918, p value=0.025), which provides empirical support for Hypothesis 1. We also check whether this positive relationship with productivity is also thanks to labor-saving effects, by running separate regressions for sales and employees. We find that the changes in our variables are only significantly related to changes in employment at pure-service firms. This is in line with the notion that the PSF business model is biased towards a balance between marginal revenues vs. marginal costs without capital fixed investments and traditional economies of scale. For the two competing hypotheses, we find support for Hypothesis 2a: the narrower the brand strategy the higher the performance in pure service firms (coefficient= -5001.265, p value=0.015). PSFs that
exploit economies of scope from their intangibles, managing a specialized portfolio of brands within services, achieve a higher performance.

In terms of our controls, BRAND INTENSITY tends to exert a negative effect, meaning that the stock of brands is limited by the firm’s ability to spur growth in size; in fact, the brand proliferation should demonstrate a lower growth rate than the PSF’s increase in size for the intensity variable to have a positive impact on performance. This suggests fine-tuning brand strategies with the firm’s potential to extend its market share. Note also that costs are not significant for the mixed case. We think that this is a confirmation on the importance of value creation effects, compared to value capture arguments based on efficiency.

----------------------------------
Insert Table 3 about Here
----------------------------------

The post-estimation tests reassure us that the models have been correctly identified, except for weak identification in the cases with products (when the Cragg-Donald Wald F-test is 5.422, hence too small to reject the hypothesis of weak identification). In all the other models, the F-statistics for the Cragg-Donald test are high enough to reject the null hypothesis of weak identification. The Sargan test results are consistent across all models,
indicating that the null hypothesis of valid instruments cannot be rejected. Models have an explanatory power, measured by $R^2$ of about 20% for the product case, 50% for the service, and 30% overall. This power is in line with previous studies on diversification and performance like Campa and Kedia (2002), reporting an $R^2$ of about 15% with IV estimation (p. 1751), or Hashai (2015), reporting an $R^2$ of about 20% (p. 1393).

As a robustness check, we tackle the issue of potential selection bias. Despite only focusing on firms owning trademarks, our choice could be related to variables that we also include in our model. Since it is very arduous to find an instrument that affects trademark registration but not performance, we opt for an indirect test. We define a selection dummy $S_{it}$ which is 1 if a firm own trademarks in that year, and otherwise 0. We also recode all our trademark-based variables into new variables where missing values (corresponding to $S_{it} =0$) are set at zero. We then re-estimate all our regression models using the recoded independent variables and add the selection dummy as an additional control. If the selection dummy proves insignificant and the other variables have qualitatively similar effects on the models, then a bias from selection can be safely disregarded. For all our model specifications, this turns out to be the case (see Table 4 for the entire sample). This evidence suggests there is no significant selection bias in our estimates.
CONCLUSIONS

This article analyses diversification and branding strategies as performance determinants for professional service firms (PSFs). Drawing on a sample of management consulting firms, we find that diversification combined with product-specific narrow brands enhances firm performance. However, these results only apply if PSFs do not extend diversification into tangible products like software packages. These results are a novel complement to the extant literature (Hitt et al., 2006; Greenwood et al., 2015).

This study has the following implications for academics and practitioners. First, diversification is an important avenue for increasing performance, but it should be coherently managed and fine-tuned with branding strategies (Hui, 2004). Managers should focus on their firm’s intangible knowledge stock that could be extended into different service niches by customizing their offer accordingly. Given that the core competences of PSFs lie in their human resources, this task should probably be accomplished with a modularity approach that combines teams with different skills (Greenwood et al., 2005).
Thus, the two necessary conditions to achieve this objective are a reliable map of all the skills in a focal PSF (Criscuolo et al., 2007), and the ability to form different combinations of expertise according to the demand requirements. Novel research could dig deeper in this area, proposing empirical evidence to match diversification and performance data with some measure of the modularization and team rotation.

Second, we show that moving from services to products requires competencies that are difficult to nurture within the boundaries of a company. These range from managing radically different client relations to the complexity of controlling different distribution channels for off-the-shelf products (Brivot, 2011). More generally, besides exploiting the modularity of skilled personnel, other variables should account for the relationship between performance and diversification when PSFs include products. Diversification through mergers and acquisitions could be an important aspect when PSFs enter the realm of physical products, as suggested by Von Nordenflycht (2011); future studies could test if, when and how acquisitions are the real means of increasing performance when PSFs enter the product domain.

Third, in terms of brand strategies, we confirm that PSF markets have particularly strong information asymmetries. Brands are classical anchors for channeling and protecting reputations. In the case of pure-service PSFs, given their extreme level of intangibility, the
risks of diluting firm legitimacy by extending the same brand to different niches could be too high (Davies et al., 2010). For example, a failure in a new product niche tapped with a consolidated brand could compromise the reputation of the same brand in the traditional market. Moreover, extending the same brand to new clients with different social values or behaviors could be a detrimental move if brand reputation is particularly meaningful for the original group of customers (Brush et al., 2012).

In this respect, our main recommendation to managers is to develop narrow brands along with diversification rather than extend consolidated brands when tapping into a new service niche. Consequently, high coordination between the marketing division and “production” side of a company is advisable in order to understand the role of brands in a particular niche. Needless to say, a more fine-grained analysis could shed light on the real differences across brands trademarked by PSFs. Even though firms register multiple brands, the actual differences (names, colors, logos) may not be significant.

Fourth, further studies could address how customer perception is linked to actual trademarked brands, given that customer-based measurements of performance are particularly relevant for services (Bowen and Ford, 2002). Direct consumer surveys or laboratory research could indeed achieve a twofold aim. On the one hand, it is key to measure how brand extension to different sectors lowers customers’ perception of
uniqueness. On the other hand, these approaches could decompose the evaluation of a global portfolio of PSF brands into the values of single brands, testing also whether or not the value of the brand portfolio is equal to the sum of the single parts. An important direction of this line of reasoning will shed light on how customer perceptions change when PSFs brands are extended to product-based business models. As rightly stressed by Greenwood et al. (2005, p.670): “the benefits of diversification for professional service firms are socially constructed”.

This article is not without limitations. Our empirical results draw only on a specific set of PSFs represented by management consulting firms with a coarse headquarter-based measure of performance. Further empirical research could test the validity of our conclusions in other PSF settings, for example the more technology-intensive ones like engineering consultancies with performance measures for every niche in the firm portfolio. Another important test could be to see if our results apply to other industries that share with PSFs a high level of tacitness and asymmetric information. Finally, we do not have any proxy for the sunk-investments that firms make on a registered trademark, nor its actual market value. This is a common limitation of firm-level studies on the economic effect of brands (Sandner and Block, 2011). Clearly, if our results remain valid, brands with higher costs and value should be subject to more restraints in terms of potential extensions.
REFERENCES


Dolfsma, W. 2011. Appropriability, services and reputation. Technology Analysis and Strategic Management, 23(8), 919-9


ENDNOTES

1 This includes: Management services (8741), Management consulting services (8742), Public relations services (8743), Facilities support management services (8744) and Business consulting services, not classified elsewhere (8748).

2 To use again the example of Ascertain®, this trademark is assigned to IC class 9 (Electrical and Scientific Apparatus) but spans US classes 21 (Electrical Apparatus, Machines and Supplies), 23 (Cutlery, Machinery, Tools and Parts Thereof), 26 (Measuring and Scientific Appliances), 36 (Musical Instruments and Supplies) and 38 (Prints and Publications).


4 Given the short temporal dimension of our panel data set and the related absence of a significant trend, we expect fixed effects estimates not to suffer from collinearity between the errors and the lagged dependent variable.
Table 1
Descriptive statistics: mean, standard deviations, min and max

<table>
<thead>
<tr>
<th>All cases (A)</th>
<th>MEAN</th>
<th>StDev</th>
<th>MIN</th>
<th>MAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. PERFORMANCE_t+1</td>
<td>197.236</td>
<td>131.605</td>
<td>1.333</td>
<td>885.875</td>
</tr>
<tr>
<td>2. PERFORMANCE_t</td>
<td>193.991</td>
<td>129.999</td>
<td>1.333</td>
<td>885.875</td>
</tr>
<tr>
<td>3. DIVERSIFICATION_t</td>
<td>0.621</td>
<td>0.296</td>
<td>0.134</td>
<td>1.000</td>
</tr>
<tr>
<td>4. FIRM BRAND BREADTH_t</td>
<td>0.241</td>
<td>0.171</td>
<td>0.056</td>
<td>1.000</td>
</tr>
<tr>
<td>5. BRAND INTENSITY_t</td>
<td>0.039</td>
<td>0.098</td>
<td>0.000</td>
<td>0.693</td>
</tr>
<tr>
<td>6. LN ASSETS_t</td>
<td>11.596</td>
<td>2.188</td>
<td>1.386</td>
<td>17.159</td>
</tr>
<tr>
<td>7. LN COSTS_t</td>
<td>7.141</td>
<td>5.978</td>
<td>0.000</td>
<td>14.585</td>
</tr>
<tr>
<td>8. PRESTIGE RANK_t</td>
<td>1.368</td>
<td>5.748</td>
<td>0.000</td>
<td>39.000</td>
</tr>
<tr>
<td>9. PATENTS_t</td>
<td>1.251</td>
<td>5.691</td>
<td>0.000</td>
<td>39.000</td>
</tr>
<tr>
<td>10. TRADEMARK AGE_t</td>
<td>5.049</td>
<td>4.013</td>
<td>0.027</td>
<td>19.989</td>
</tr>
</tbody>
</table>
### Table 2
Correlation matrix\(^a\)

<table>
<thead>
<tr>
<th>All cases (A)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. PERFORMANCE(_{t+1})</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. PERFORMANCE(_t)</td>
<td>0.757***</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. DIVERSIFICATION(_{it})</td>
<td>-0.236*</td>
<td>-0.216*</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. FIRM BRAND BREADTH(_{it})</td>
<td>-0.106</td>
<td>-0.055</td>
<td>0.493***</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. BRAND INTENSITY(_{it})</td>
<td>0.246***</td>
<td>0.209*</td>
<td>0.051</td>
<td>-0.073</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. LN ASSETS(_{it})</td>
<td>-0.024</td>
<td>-0.075</td>
<td>-0.191</td>
<td>-0.170</td>
<td>0.500***</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. LN COSTS(_{it})</td>
<td>0.054</td>
<td>0.064</td>
<td>-0.143</td>
<td>-0.114</td>
<td>-0.209*</td>
<td>0.457***</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. PRESTIGE RANK(_{it})</td>
<td>0.200*</td>
<td>0.247**</td>
<td>-0.230</td>
<td>-0.169***</td>
<td>-0.094</td>
<td>0.254***</td>
<td>0.226***</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>9. PATENTS(_{it})</td>
<td>0.166</td>
<td>0.190</td>
<td>-0.071</td>
<td>0.029</td>
<td>0.411***</td>
<td>-0.211**</td>
<td>-0.016</td>
<td>0.043</td>
<td></td>
</tr>
<tr>
<td>10. TRADEMARK AGE(_{it})</td>
<td>0.276***</td>
<td>0.318***</td>
<td>-0.092</td>
<td>0.431</td>
<td>0.029**</td>
<td>0.080</td>
<td>0.031</td>
<td>0.137</td>
<td>0.046</td>
</tr>
</tbody>
</table>

\(^a\) We report the pairwise correlation coefficients and their Bonferroni-adjusted significance: * p-value<.05 ** p-value<.01 *** p-value<.001
Table 3
IV 2SLS instrumental variables regression results\(^a\)

<table>
<thead>
<tr>
<th>All cases (A)</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3 (IV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DV: (\text{PERFORMANCE}_{it} + 1)</td>
<td>(0.323^{***})</td>
<td>(0.248^{***})</td>
<td>(0.238^{**})</td>
</tr>
<tr>
<td>(\text{PERFORMANCE}_{it})</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(\text{DIVERSIFICATION}_{it})</td>
<td>9.414</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(\text{FIRM BRAND BREADTH}_{it})</td>
<td>158,210</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(\text{BRAND INTENSITY}_{it})</td>
<td>-368,824*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(\text{LN ASSETS}_{it})</td>
<td>13.484</td>
<td>13.652</td>
<td></td>
</tr>
<tr>
<td>(\text{LN COSTS}_{it})</td>
<td>-130.984***</td>
<td>-128.776***</td>
<td></td>
</tr>
<tr>
<td>(\text{LN COSTS}_{it}^2)</td>
<td>6.481***</td>
<td>6.521***</td>
<td></td>
</tr>
<tr>
<td>(\text{DUMMY MISSING COSTS})</td>
<td>-591.880***</td>
<td>-569.108***</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pure service cases (B)</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3 (IV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DV: (\text{PERFORMANCE}_{it} + 1)</td>
<td>0.223</td>
<td>0.228*</td>
<td>0.121</td>
</tr>
<tr>
<td>(\text{PERFORMANCE}_{it})</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(\text{DIVERSIFICATION}_{it})</td>
<td>203.918*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(\text{FIRM BRAND BREADTH}_{it})</td>
<td>-5001.265*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(\text{BRAND INTENSITY}_{it})</td>
<td>-1.6e+03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(\text{LN ASSETS}_{it})</td>
<td>-10.627</td>
<td>-48.683</td>
<td></td>
</tr>
<tr>
<td>(\text{LN COSTS}_{it})</td>
<td>-182.851***</td>
<td>-119.929***</td>
<td></td>
</tr>
<tr>
<td>(\text{LN COSTS}_{it}^2)</td>
<td>8.546***</td>
<td>3.328</td>
<td></td>
</tr>
<tr>
<td>(\text{DUMMY MISSING COSTS})</td>
<td>-872.497***</td>
<td>-891.949***</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>(N)</th>
<th>(R^2)</th>
<th>Cragg-Donald Wald F</th>
<th>Sargan-Hansen test (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pure service cases (B)</td>
<td>82</td>
<td>0.042</td>
<td>7.664</td>
<td>0.2897</td>
</tr>
</tbody>
</table>
## Cases with products (C)

<table>
<thead>
<tr>
<th>DV: PERFORMANCE&lt;sub&gt;i,t+1&lt;/sub&gt;</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3 (IV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERFORMANCE&lt;sub&gt;i,t&lt;/sub&gt;</td>
<td>0.264**</td>
<td>0.086</td>
<td>0.084</td>
</tr>
<tr>
<td>DIVERSIFICATION&lt;sub&gt;i,t&lt;/sub&gt;</td>
<td></td>
<td>-17.948</td>
<td></td>
</tr>
<tr>
<td>FIRM BRAND BREADTH&lt;sub&gt;i,t&lt;/sub&gt;</td>
<td></td>
<td>203.798</td>
<td></td>
</tr>
<tr>
<td>BRAND INTENSITY&lt;sub&gt;i,t&lt;/sub&gt;</td>
<td></td>
<td>-136.817</td>
<td></td>
</tr>
<tr>
<td>LN ASSETS&lt;sub&gt;i,t&lt;/sub&gt;</td>
<td>34.661*</td>
<td>33.491*</td>
<td></td>
</tr>
<tr>
<td>LN COSTS&lt;sub&gt;i,t&lt;/sub&gt;</td>
<td>6.737</td>
<td>7.488</td>
<td></td>
</tr>
<tr>
<td>LN COSTS&lt;sub&gt;i,t&lt;/sub&gt;&lt;sup&gt;2&lt;/sup&gt;</td>
<td>0.606</td>
<td>0.615</td>
<td></td>
</tr>
<tr>
<td>DUMMY MISSING COSTS</td>
<td>176.584</td>
<td>184.481</td>
<td></td>
</tr>
</tbody>
</table>

| N                               | 138     | 138     | 137          |
| R<sup>2</sup>                   | 0.072   | 0.188   | 0.199        |
| Cragg-Donald Wald F             |         |         | 5.422        |
| Sargan-Hansen test (p-value)    |         |         | 0.809        |

* The estimation uses Prestige Rank, Patents and Age as instruments for Brand Breadth. We report the estimated coefficients and their significance: * p-value<.05 ** p-value<.01 *** p-value<.001
Table 4
IV 2SLS instrumental variables regression results accounting for selection\(^b\)

<table>
<thead>
<tr>
<th>All cases</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3 (IV)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DV: PERFORMANCE(_{it+1})</strong></td>
<td>0.321***</td>
<td>0.252***</td>
<td>0.211**</td>
</tr>
<tr>
<td><strong>PERFORMANCE(_{it})</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>RECODED DIVERSIFICATION(_{it})</strong></td>
<td></td>
<td></td>
<td>14.821</td>
</tr>
<tr>
<td><strong>RECODED FIRM BRAND BREADTH(_{it})</strong></td>
<td></td>
<td></td>
<td>-117.904</td>
</tr>
<tr>
<td><strong>RECODED BRAND INTENSITY(_{it})</strong></td>
<td></td>
<td></td>
<td>-265.729</td>
</tr>
<tr>
<td><strong>LN ASSETS(_{it})</strong></td>
<td></td>
<td>14.752</td>
<td>13.830</td>
</tr>
<tr>
<td><strong>LN COSTS(_{it})</strong></td>
<td>-131.219***</td>
<td>-128.220***</td>
<td></td>
</tr>
<tr>
<td><strong>LN COSTS(_{it})^2</strong></td>
<td>6.471***</td>
<td>6.387***</td>
<td></td>
</tr>
<tr>
<td><strong>DUMMY MISSING COSTS</strong></td>
<td>-594.463***</td>
<td>-565.150***</td>
<td></td>
</tr>
<tr>
<td><strong>S(_{it})</strong></td>
<td>2.781</td>
<td>-12.319</td>
<td>-24.550</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>N</th>
<th>264</th>
<th>263</th>
<th>263</th>
</tr>
</thead>
<tbody>
<tr>
<td>(R^2)</td>
<td>0.100</td>
<td>0.144</td>
<td>0.186</td>
</tr>
<tr>
<td>Cragg-Donald Wald F</td>
<td>25.039</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sargan-Hansen test (p-value)</td>
<td>0.9598</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^b\) The estimation uses Prestige Rank, Patents and Recoded Age as instruments for Recoded Brand Breadth. We report the estimated coefficients and their significance: * p-value<.05 ** p-value<.01 *** p-value<.001