Do Business Models Matter?

Richard Lai, Peter Weill, and Thomas Malone

April 26, 2006

Acknowledgment. This research was funded by the National Science Foundation under grant number IIS-0085725. We would especially like to thank Tom Apel for his insights and exemplary software support for this project. In a future paper, we hope to report on his even more impressive work on automatic classification of business models. We are grateful for the insightful comments of Erik Brynjolffson, George Herman, S.P. Kothari, Wanda Orlikowski, Stephanie Woerner, and JoAnne Yates on earlier versions of this paper. We would also like to thank Rani Bhuva, Preeti Chadha, Armando Herrera, J B. Hohm, Jayne Huang, Sonia E. Koshy, Kelsey Presson, Kristen Quinn, Elisa Rah, Alice Takajan, Isaac Taylor, and Jason Yeung for their work on coding business models, and Aaron Johnson and Jon Scott for their work on selecting financial performance measures.

Abstract

A central question in strategic management is: what explains the difference in performance among firms? The traditional debate is whether firm or industry effects are the dominant explanation. Yet, among practitioners, a very different explanation, in the form of "business model," is commonly offered for why some firms do better than others. We provide a fundamental, reliable, and practical typological definition of business model, and use this to classify the segments of all U.S. firms in COMPUSTAT/CRSP. We find that business model effects explain performance heterogeneity more than even industry effects do.

Running head

Do Business Models Matter?

Keywords

business models, performance, strategic management, components of variance, analysis of variance

Do Business Models Matter?

1. INTRODUCTION

A central question in strategic management is: what explains the difference in performance among firms? Different theories have been proposed, many of which are aligned with one of two views. The first is the "industry view." It suggests that industry factors, such as market size and barriers to entry, form the most important explanation for performance heterogeneity. Industrial organization in economics and industry analysis in the strategy field are examples of this view (*e.g.,* (Porter, 1980)). The second is the "firm view." It argues that firms' endowments and capabilities, and the difficulty of replicating these, are why firms exhibit different performance. The resource-based perspective is one example of this view (*e.g.,* (Wernerfelt, 1984)). A large empirical literature is based on testing which of these two views better explain differences in firm performance. We review this literature in section 2.

Yet, among business practitioners and in the trade literature, a very different explanation, in the form of "business model," is commonly offered for why some firms do better than others (*e.g.,* (Kaplan *et al.*, 2004), (Slywotzky *et al.*, 1997), (Timmers, 1998), (Tapscott *et al.*, 2000)). Many people – corporate executives and especially venture capitalists – attribute the success of firms like Amway, eBay, Dell, and Wal*Mart, for example, not only to their industry or to their firm-specific capabilities, but also to their innovative business models. And among executives, "innovation in products, services, and *business models*" is the single factor contributing the most to the accelerating pace of change in the global business environment, outranking other factors related to information and the Internet, talent, trade barriers, greater access to cheaper labor and capital ((McKinsey, 2006)).

In this paper, we provide one definition of "business model" that captures the similarities among the definitions provided by others, and relies on two fundamental intellectual traditions. The main question is how much business model, even in the simple way defined, matters to performance.

Our definition of business model is a typological one. In section 3, we describe this definition in the form of sixteen business models, such as Manufacturer and Wholesaler/Retailer. This typology is built

upon the intellectual traditions associated with asset rights and asset types.

In section 4, we describe how we use this typology to classify all the firms in COMPUSTAT between 1998 and 2002 based on the text of the SEC 10K filings. We report statistics to show that our classification has strong inter-rater reliability (some evidence of convergent validity) and is distinct from industry classification (discriminant validity). We also describe how we use ANOVA and variance decomposition methods—standard in the empirical literature—to analyze the extent to which business models matter in firm performance

In section 5, we report our baseline results. The evidence is that business model effects are larger than year effects in explaining performance heterogeneity, as measured by return on assets (ROA) or return on sales (ROS). Importantly, business model effects also appear to be at least as strong, if not stronger, than industry effects in explaining performance.

In section 6, we report evidence that our interpretation is unlikely to be a result of reverse causality, or to systematic differences in the level of diversification in the firms in our sample. We also test the robustness of our finding to different interaction effects and treatment of outliers. And we address issues of potential sample selection bias and measurement errors. We find that our baseline conclusion is robust.

This study does not claim that our definition of business model is unique, although we argue that it satisfies important criteria. Like the empirical literature on firm-versus-industry effects, we also have not answered questions like *how* business models impact performance, nor do we address the normative question of how individual firms can exploit or modify their business models to improve their performance. We hope that the work described here provides a foundation for future work on these questions.

2. MOTIVATION AND ANTECEDENTS

The "industry view" of performance heterogeneity among firms is usually associated with industrial organization (IO). (Porter, 1980) develops the early IO structure-conduct-performance framework into a

foundation for competitive advantage. In this view, firm performance is primarily determined by industry-level factors like market share, entry barriers into the industry, and relative cost positions. (Schmalensee, 1988) and (Rumelt *et al.*, 1991) provide surveys of this view.

The "firm view" offers a different explanation of performance heterogeneity. It has many variants. An important one is the resource-based view (*e.g.,* (Amit *et al.*, 1993), (Barney *et al.*, 1986), (Cool *et al.*, 1989), (Penrose, 1959), (Rumelt, 1984), (Teece, 1980), (Wernerfelt, 1984)). Firms can produce sustained superior performance if they have valuable, scarce, inimitable, non-substitutable factor access or capabilities. Other variants include dynamic theories consistent with the firm view, such as those on organizational population and evolutionary economics by (Hannan *et al.*, 1992) and (Nelson *et al.*, 1982), and the dynamic capabilities perspective by (Teece *et al.*, 1997).

The empirical literature focuses on disentangling the industry and firm explanations of performance heterogeneity. (Schmalensee, 1985), using 1975 data on lines of businesses, reports that industry explains 20% of return on assets (ROA) heterogeneity, while firm – using market share as a proxy – has negligible explanatory power. However, his study leaves 80% of performance variance unexplained. Partly driven by the large unexplained variance, (Rumelt, 1991) uses four years of FTC (Federal Trade Commission) data and a composite measure of firm effects. Unlike Schmalensee, he reports that firm (business unit) effects account for 34 to 46% of explained ROA heterogeneity while industry effects account for only 8 to 18%, of which about half of this is transient, as measured by the interaction of industry effects with year effects. Rumelt also includes a corporate-parent effect and finds that it is negligible. This is interpreted as consistent with the firm view: corporate strategy that structures industry and positions a firm within that industry, does not matter (*e.g.,* (Carroll, 1993) (Ghemawat *et al.*, 1993), (Hoskisson, 1993)).

Rumelt's paper leads to a stream of others that focus on the robustness of his findings. – *e.g.,* (Bowman *et al.*, 2001), (Brush *et al.*, 1997), (Chang *et al.*, 2000), (McGahan *et al.*, 1997), and (Roquebert *et al.*, 1996). Recent papers agree that firm effects dominate industry effects (*e.g.,* (Agrawal *et al.*, 1991), (Amit *et al.*, 2001), (Lubatkin *et al.*, 2001), (Mauri *et al.*, 1998), (McNamara *et al.*, 2003), (Powell, 1996),

(Ruefli *et al.*, 2000), (Vilmos *et al.*, 2006), (Walker *et al.*, 2002), but see some differing opinions in (Hawawini *et al.*, 2003), (Hawawini *et al.*, 2005), (McNamara *et al.*, 2005)). There is also an important branch of the empirical literature that argues that it is persistence that is important, and on this measure, industry effects dominate (*e.g.,* (Denrell, 2004), (McGahan *et al.*, 1999), (McGahan *et al.*, 1999)).

We depart from this firm versus industry debate by testing if the concept of business model might also substantively explain performance heterogeneity. The concept of business model is motivated by its common usage by business people, although, as we will show, it is also consistent with a number of theoretical antecedents.

When IBM CEO Louis Gerstner gave his 2001 annual analyst address about the company's new strategic initiatives, he concluded that the strategy "makes more sense given the current business environment and IBM's *business model*."(2001). This reference to business model is not unique to IBM. It is pervasive:

1. As an alleged source of success–"Dell's *business model* stands head and shoulders above its competitors'." ((Gurley, 2001))—and the root of failures—"[IBM's] PC division 'had a *business model* problem.'" ((Spooner, 2002))
2. Among both information technology firms and industrial ones—(Bair, 2003) reports that "along with creating a new airplane [the new Boeing 7E7], we're creating a new *business model* for our industry. From the way we involve suppliers."
3. In big business annual reports—the "GE *Business Model*" in (Welch, 2003)—and among analysts, venture capitalists, and consultants.

Despite wide-spread use in the industry, the idea of a "business model" is rarely studied in academic research, except for some pioneering research focused on e-businesses (Amit et al., 2001). This lack of progress could be due to many difficulties in executing a rigorous study of business models. First, there appear to be diverse views on what a business model is. Table 1 summarizes some of these. Some authors define business model as something firms have, others as something that firms have in relation to other firms in a network. Some authors classify business models by type of transaction (*e.g.,* franchising,

leasing, one-time sales, and sales-plus-annual-maintenance) and others by type of product or service sold (*e.g.,* should an online search engine sell search services embedded in other websites, or sell advertising space?). Even if a convergent definition is obtainable, a second difficulty is to show that it has discriminant validity—is it sufficiently different from related concepts such as industry classification? Third, there is another challenge of obtaining data. Datasets on firms are commonly classified by industry and its various derivations, such as "line of business" or segment. It is extraordinarily difficult to collect data on any meaningful definition of "business model." Large-scale surveys of firms are possible, but are subject to self-reporting errors.

In the next section, we propose a simple definition of business model that captures the essence of many definitions proposed, and is also consistent with antecedent literature. In later sections on empirics, we describe how our definition has discriminant validity, and how we obtain data on business models.

3. DEFINING BUSINESS MODELS

At the broadest level, a business model may be defined as how businesses appropriate the maximum value of the products or services they have created. This, of course, is not the only definition possible. For example, (Amit *et al.*, 2001) define business models mainly on the dimension of how value is created. We settle on value appropriation because this is the essence among the practitioner definitions in Table 1. It also has strong theoretical antecedents, described below.

The bulk of this section describes our proposed definition of business model. It is a typological definition, based on two dimensions. One dimension is the type of *assets* involved—*i.e.,* what products or services have been created for appropriation. We distinguish among four important asset types: physical, financial, intangible, and human. The second dimension is type of *rights* being sold—*i.e.,* how value is appropriated. We consider four types of asset rights: Creator, Distributor, Landlord, and Broker. These two dimensions lead to sixteen business models. Examples are in Table 2. In our judgment, this typological definition fits important criteria, such as parsimony, being mutually exclusive and collectively exhaustive, and has a good fit with intuition. We provide only a summary here; details of these are in

(Weill *et al.*, 2004).

3.1. What assets are involved?

Our first dimension is simply what assets are involved in value appropriation. We consider four types of assets: physical, financial, intangible, and human. These are commonly referred to in the literature, often as components of a resource-based view or some core competence. For example, (Teece *et al.*, 1997) list as their "positions" financial assets and intangible assets, into which they group what they call technological, complementary and reputational assets. There is also a large literature that describes the differences among these asset types, and how the economy is shifting its weight on one to another—*e.g.,* (Quah, 2002); (Rajan *et al.*, 1998); (Varian, 2000).

Physical assets include durable items (such as houses, computers, and machine tools) as well as nondurable ones (such as food, clothing, and paper).

Financial assets include cash and securities like stocks, bonds, and insurance policies that give their owners rights to potential future cash flows.

Intangible assets include legally protected intellectual property (such as patents, copyrights, and trade secrets), as well as other intangible assets like knowledge, goodwill, and brand image.

Human assets include people's time and effort. People are not "assets" in an accounting sense and cannot be bought and sold, but their time (and knowledge) can be "rented out" for a fee.

3.2. What rights are being sold?

The first, and most obvious, kind of right a business can sell is the right of *ownership* of an asset. Customers who buy the right of ownership of an asset have the continuing right to use the asset in (almost) any way they want, including selling, destroying, or disposing of it. In the property rights literature, this is idea that the seller of an asset transfers residual rights to the buyer—*e.g.,* (Grossman *et al.*, 1986) and (Mahoney, 1992). Furthermore, we distinguish between sales that involve significantly transformed assets from those that do not. This allows us to distinguish between firms that make what they sell (like manufacturers) and those that sell things other firms have made (like retailers). We could

have ignored this distinction and have only one model (called, for example, "Seller") including all firms selling ownership rights. But if we had done so, the vast majority of all firms in the economy would have been in this category, and we would have lost an important conceptual distinction between two very different kinds of asset rights models: creators and distributors.

A *Creator* buys raw materials or components from suppliers and then transforms or assembles them to create a product sold to buyers. This is the predominant business model in manufacturing. A key distinction between Creators and Distributors is that Creators design the products they sell. We classify a firm as a Creator, even if it out-sources all the physical manufacturing of its product, as long as it does substantial design of the product.

A *Distributor* buys a product and resells essentially the same product to someone else. The Distributor usually provides additional value by, for example, transporting or repackaging the product, or by providing customer service. This business model is ubiquitous in wholesale and retail trade.

We now turn to the second obvious kind of right a business can sell: the right to *use* an asset, such as a car or a hotel room. Customers buy the right to use the asset in certain ways for a certain period of time, but the owner of the asset retains ownership and can restrict the ways a customers use the asset. And, at the end of the time period, rights revert to the owner. As an example from theory, (Coase, 1972) conjectures that a durable good monopoly can appropriate more value if it leases it rather than sells it. The intuition is straightforward: having sold its good, a monopolist is tempted to undercut himself in the future second-hand market, whereas a monopolist that leases its good is still in control of its market and does not suffer the same temptation. This motivates our third type of model: Landlord.

A *Landlord* sells the right to use, but not own, an asset for a specified period of time. Using the word "landlord" in a more general sense than its ordinary English meaning, we define this basic business model to include not only physical landlords who provide temporary use of physical assets (like houses, airline seats and hotel rooms), but also lenders who provide temporary use of financial assets (like money), and contractors and consultants who provide services produced by temporary use of human assets. This asset rights model highlights a deep similarity among superficially different kinds of business: All these

businesses sell the right to make temporary use of their assets.

Finally, there is one other less obvious—but important—kind of right a business can sell. This is the right to be *matched* with potential buyers or sellers of something. A home seller, for instance, may sign an agent contract with a real estate broker. Thereafter, the broker works to find buyers, who in turn must not bypass the broker to seal a transaction directly with the home seller. In short, the broker sells the right to be matched with potential buyers or sellers of real estate. There is a very large literature on intermediation, including different types of intermediators such as brokers, dealers, and market-makers (see (Rust *et al.*, 2003) for a recent exposition). Taken together, we call this fourth type Broker.

A *Broker* facilitates sales by matching potential buyers and sellers. Unlike a Distributor, a Broker does not take ownership of the product being sold. Instead, the Broker receives a fee (or commission) from the buyer, the seller, or both.

We make two final notes. First, in deriving the above, we have considered other ways in which asset rights could be involved in value appropriation, and are satisfied that our framework is the most appropriate. For example, a distinction often used by practitioners when talking about business models is that of how firms charge. (Grossman *et al.*, 1986) provide the example of why it does not matter whether an insurance firm calls its agents "commissioned employees" or "independent agents." What is important is whether the insurance firm or the agent owns residual rights to critical assets, such as the list of clients. Our second note is that, for expositional simplicity, we describe the above in terms of physical products, but our descriptions apply to non-physical assets, too.

3.3. The Sixteen Business Model

As Table 2 shows, each of the asset rights models can be used (at least in principle) with each of the asset types. While all of the models are logically possible, some are quite rare, and two (Human Creator and Human Distributor) are illegal in most places today.

Many of the models can be mapped into commonly understood ones. For example, *Physical Creator* is mapped into manufacturers. A few are less obvious:

- *Intangible Creator* (Inventor) sells intangible assets such as patents. An example is Lucent's Bell Labs (see patentsales.lucentssg.com). Firms that license the use of their intangible assets while retaining ownership are not classified as Inventors; they are *Intangible Landlords* (see below).
- *Human Creator* and *Human Distributor* create and sell human assets. Since selling humans—whether they were created naturally or artificially or obtained by capture—is illegal and morally repugnant in most places today, these models are included here for logical completeness and secondarily, as a historical footnote that they have been used in the past.
- *Financial Landlord* includes banks and insurers. The former provides cash that their customers can use for a limited time in return for a fee (*i.e.,* "interest"). The latter provides their customers financial reserves that the customers can use only if they experience losses, for a fee (*i.e.,* "premium").
- *Intangible Landlord* licenses or otherwise gets paid for limited use of intangible assets. There are three major subtypes: (1) an *attractor* attracts people's attention using, for example, television programs or web content and then "sells" that attention (an intangible asset) to advertisers; the attractor may devote significant effort to creating or distributing the assets that attract attention, but the source of revenue is from the advertisers who pay to deliver a message to the audience that is attracted—*e.g.*: New York Times, (b) a *publisher* provides limited use of information assets such as software, newspapers, or databases in return for a purchase price or other fee (often called a subscription or license fee)—*e.g.*: Microsoft; many publishers also receive revenues from advertising that is bundled with the information assets, but we classify such revenues as part of the previous attractor business model, (c) a *brand manager* gets paid for the use of a trademark or other elements of a brand; this includes franchise fees for restaurant or hotel chains—*e.g.*: Wendy's.
- *Physical and Human Landlords*. In most cases, *Human Landlords* (Contractors) also require physical assets (such as tools and workspace), and *Physical Landlords* also provide human services (such as cleaning hotel rooms and staffing amusement parks) associated with their physical assets. In cases where substantial amounts of both human and physical assets are used to provide a service, we

classify a firm's business model (as *Human Landlord* or *Physical Landlord*) on the basis of which kind of asset is "essential" to the nature of the service being provided. For example, a passenger airline would generally be considered a *Physical Landlord*—even though it provides significant human services along with its airplanes—because the essence of the service provided is to transport passengers from one place to another by airplane. Conversely, a package delivery service (like Federal Express) would be classified as a *Human Landlord* because the essence of the service provided is to have packages picked up and delivered (usually by people) regardless of the physical transportation mode used (bicycle, truck, train, etc.).

As the subtypes of *Financial Landlord* and *Intangible Landlord* listed above illustrate, it is certainly possible to subdivide these 16 business models even further. For now, however, we have found that this level of granularity provides a useful level of analysis.

3.4. Performance Implications

Our null hypothesis in this paper is that business models can explain performance heterogeneity, perhaps as much as the traditional factors such as year, industry, and firm effects. This hypothesis is motivated by a number of antecedent theories. We review these by asset rights.

Start with the *Creator* and *Distributor* models, where the emphasis is on selling asset rights. We note that the property rights literature suggests that with incomplete contracting, the firm that has the most competitive advantage in using an asset will pay the highest price to own it. This is also related to the point made in transaction cost economics. (Williamson, 1971) posits that transactions that are costly—asset-specific, uncertain, or are exchange-frequent—are more likely to be internalized within organizations, through a process of "fundamental transformation" that can reduce "opportunism." More recently, (Williamson, 2002) expands this transformation to not only within but also between organizations, through contracting. For example, intangible products tend to be more asset-specific (see (Teece, 1980) for technological assets, (Teece *et al.*, 1997) for reputational assets), so we might observe that such asset types are more likely to bought and sold outright rather than be borrowed and lent.

Some other products, however, might be better borrowed and lent rather than bought and sold. Returning to the (Coase, 1972) Conjecture mentioned earlier, a durable good monopoly should prefer to lease its products rather than sell it. A whole literature has sprung up to prove the conjecture (see (Bulow, 1982) and (Stokey, 1979) for early work, and (Waldman, 2003) for a survey). Conversely, with competition, it is optimal to sell rather than lease. Most famously, IBM increased its sales/rental ratio as competition intensified, from 0.46 in 1966 to 1.38 in 1983 (see (Bulow, 1986)), and Xerox increases its ratio from 0.28 in 1968 to 0.85 in 1983 ((Carlton *et al.*, 1989)). Again, there is some motivation that the *Landlord* model has performance implications.

Finally, the literature on networks is explicit about the performance implications of broking. Unlike *Creators*, *Distributors*, or *Landlords*, *Brokers* seem to be useful for all types of assets. Theory seems to suggest that it is different types—brokers, dealers, market-makers—that may emerge for different asset types. For example, (Rust *et al.*, 2003) suggest that market-makers might be "more appropriate for trading standardized commodities and assets for which the volume is sufficiently large to produce 'thick' and 'active' markets." (pg. 354). Broking has performance implications more in its suitability for only certain types of *firms*. This is the point made by economic sociologists (*e.g.,* (Burt, 1992), (Granovetter, 1973)), who posit that only certain firms—those in central positions—are well-placed to create and appropriate value.

The above discussion is not meant to be comprehensive. Instead, we want to make the simpler claim: the proposition that business models can explain performance heterogeneity is consistent with a number of extant theories.

4. DATA AND METHOD

To test our claim, we selected a sample of segment-year observations, classified their business models, and then analyzed their ability to explain variance in financial performance.

4.1. Sample of Segment-Year Observations

We chose the set of segment-year observations belonging to all 10,419 publicly traded United States

firms in the COMPUSTAT-CRSP segment-level tapes, from 1998 through 2002. We included any restatements available up until September 30, 2003. From this, which we will call the *ALL* dataset, we created a baseline sub-sample that has information on segment-level return on assets (ROA) or return on sales (ROS), our dependent variables. We call this latter the *BASELINE* dataset. Table 3 shows summary statistics of the segment-year observations for both datasets. We ran estimations on *BASELINE*, but used *ALL* to econometrically correct for potential sample selection bias. From Table 3, we see that *BASELINE* consists of segments that are slightly smaller in sales (mean of $665.1 million instead of $770.4 million) and assets, but otherwise seem quite representative of *ALL*. We also note that mandatory financial reporting at the segment level started December 15, 1997, with SFAS 14 (FASB Statement No. 131, "Disclosures about Segments of an Enterprise and Related Information"). However, this accounting guideline has a significant exception: it "does not require an enterprise to report information that is not prepared for internal use if reporting it would be impracticable." This is why we still have gaps for ROA and ROS data. Nevertheless, the presence of this guideline reduces some discretionary disclosure bias. In the robustness section, we further attack the issue of potential sample selection bias.

4.2. Classification of Segments' Business Models

Our classification approach used the segments' revenue as a guide. More specifically, we used: (a) the dollar amounts of the segments' revenue as reported by COMPUSTAT or the publicly filed SEC Form 10-K and (b) the textual descriptions of the segments as reported in the 10-Ks. We read the latter and classified the former according to which business model it represented. The details of how we classified the business models are described by Weill et al (2004) and summarized here.

The classification was done using two methods: manual and automated. Manual classification was applied to segments of the top 1,000 firms by revenues in 2000 (we call these the SeeIT1000 firms). We trained a team of eight MIT students to do this. Each segment's business model was classified by at least one of these students and all the classifications were also reviewed—and, if necessary, corrected—by a senior MIT research staff member. We use an interactive online database to record all the classifications

along with comments about how classifications are determined.

Automated classification was applied to the rest of the dataset. This was done with a rule-based program that first learned from the manually classified SeeIT1000 which words and SIC codes went with which business models. Using this knowledge, the program examined SIC codes and words in the text descriptions manually extracted from sources (mainly the 10-Ks) and automatically classified segments based on this information (see Apel, 2006, for details of the automatic classification).

We faced three major issues in classification. First, we were worried about the reliability of the classification. To assess consistency of the manual method, we test inter-rater reliability among our eight raters for a random sample of 45 firms. For each firm, two raters independently classified each firm's segments. Of these ratings, 97% of the total revenue was classified identically, and (Cohen, 1960)'s Kappa statistic was 0.96, significant at lower than 0.01 level. To test the validity of these automatic classifications, three random samples of 500 firms each were also rated manually. In these three samples, the rule-based program classified an average of 97% of the revenue in the same way the human rater classified it, and the Cohen's Kappa statistics were 0.95, 0.94, and 0.95, respectively ($p < .01$ for each one). Thus, the automatic classification program has approximately the same level of agreement with human raters as the human raters have with each other. We could not hope for better performance from any automated system.

The second issue was whether our definition of business model has discriminant validity against an natural alternate classification, by industry. Following (Hoskisson *et al.*, 1993), we ran a factor analysis on the firms' primary business model and primary industry (using 4-digit SIC codes) shows that the eigenvalue of the only common factor is just 0.35. The uniqueness is a very high 0.82. We interpret this as strong evidence that our definition of business model is substantially different from standard industry classifications.

The final issue with classification arose when the text indicated that a segment included multiple business models. We had to somehow allocate the segment revenue across the different business models. To do this, we first used any detailed information in the 10-K to make a specific split of the revenue. In

the absence of any such details, we used our judgment to allocate revenue across models. However, we did not attempt to make arbitrarily fine-grained subjective allocations. Instead, we either split the revenue evenly across all of the different models that were included in the segment or, if the text implied that one model was much more important than the others, we assigned all the revenue to that model. In the robustness section, we address potential measurement problems that might arise with even this approach.

To illustrate these classifications, Table 4 shows the classification for segments associated with General Electric (GE). Note, for example, that the line item "Equipment Management (GE Capital Services)" is repeated and assigned to two different business models (Lender and Contractor). The text of the Form 10-K implies that GE Capital Services both lent money and performed services for the Equipment Management line of business, but it gives no details as to how much of each is done. Therefore we split the revenue for the line item equally among the models.

Table 5 shows the distribution of different business models in the *ALL* dataset over the 1998 and 2002 period (the *BASELINE* dataset is similar). In panel (a), we report the "popularity" of business models by the sales associated with them. Reading down the right-most column, *Creators* accounted for about 50% of annual revenues. *Landlord* models were next, followed by *Distributors* and *Brokers*. The lowest row shows that an overwhelming portion (about 73%) involved *Physical* assets. *Financial* and *Human* assets were next, and *Intangible* assets were less than 3%. Business models are shown in the cells. The most popular models were *Physical-Creator* (Manufacturer), *Physical-Distributor* (Wholesaler/Retailer), *Financial-Landlord, Intangible-Landlord*, and *Human-Landlord* (Contractor). Between 1998 and 2002 (the two rows in each cell), there was very little change among asset types or asset rights.

In panel (b), we report the "popularity" of business models by the percentage of firms that employ them. The static view is qualitatively the same as that above. For example, *Creators* and *Physical* models were the most popular. There is one difference: *Human* and *Intangible* asset models were considerably more popular in numbers than in sales, while the reverse was true for *Financial* models. This suggests that *Financial* models tended to generate more revenues per firm and *Human* and *Intangible* asset models, less. It is difficult to tell if this is because *Financial* models needed to be large to

be viable or they were "better" in generating more revenues, or both. But this is an indication that business models might explain performance. The lack of substantial change over time is also very similar. Combined with panel (a), these observations suggest that the influence of *Creators* in terms of revenues and numbers was not diminished in the "new economy." The same comment holds for *Physical* models. However, we bear in mind that these were over a short five-year period.

The preponderance and persistence of *Physical* asset models might appear contradictory to theories on the weightless economy (e.g., (Quah, 2002); (Rajan *et al.*, 1998); (Varian, 2000)). We suggest that this is because of the way we define business models. For example, a manufacturer's supporting services would be lumped into *Physical Creator* (Manufacturer). In contrast, "weightlessness" is usually based on the types of jobs people hold (*e.g.,* knowledge workers), so the two ways of classification would differ. However, we believe that our definition better captures the complementarities in today's actual organizational boundaries. One explanation for this could be that the weightless part of the economy is substantial, but that it is so intricately linked to the "weighty" part that it cannot easily be moved into completely separate firms. Another interpretation might simply be that these changes take time and that many "weightless" jobs that are still inside manufacturing (or other "weighty") firms will eventually be outsourced (e.g., to "Contractors").

The way in which asset rights and asset types are correlated presents some intriguing patterns. For example, looking at asset rights, we see that *Creators* and *Distributors* were concentrated on *Physical* assets. One story consistent with this is that *Creators* on other asset types did not require or could not acquire scale. Looking at asset types, *Intangible* assets are observed only with the *Landlord* model. This is consistent with the Coase Conjecture, in that *Intangible* assets are durable—or at least can be made durable with repeated revisions and releases—so that they were best leased out rather than sold. We do not go deeper into these possibilities here, but these patterns open avenues for future research. Our point is to suggest that these observations are consistent with our null hypothesis that business models explain performance, in that observed business models tend to cluster into only several cells in Table 5. Nevertheless, Table 5 alone does not directly address the question of performance, since there is no

mention of the key dependent variables of performance measures. We now turn to the empirical strategy to rigorously determine how much business models explain performance heterogeneity.

4.3. Empirical Strategy

We rely on a strong tradition of methodology in the empirical literature. To summarize, the literature uses one of two main methods: components of variance (COV, sometimes also called variance components analysis, or random ANOVA) and nested ANOVA. We give only a brief summary of these here, given the descriptions in the many papers cited earlier. COV assumes random effects, in that processes generating the effects are not correlated with the levels of the effects. Nested ANOVA does not use this assumption, but it suffers the disadvantage that the order with which the effects enter the model matters. For robustness, we analyze using both methods.

The baseline specification has the following form:

$$PERFORMANCE_{c\,s,i,b,t} = \alpha + \beta_c + \gamma_s + \zeta_i + \kappa_b + \lambda_t + \varepsilon_{c\,s,i,b,t}\,,$$

where $PERFORMANCE_{c,s,i,b,t}$ is a measure of corporation c's segment s performance when it has primary industry i and business model b over year t, α is a constant for the overall mean effect averaging over the indices, β_c the corporate parent effect, γ_s the segment effect, ζ_i the industry effect, κ_b the business model effect, λ_t the year effect, and $\varepsilon_{f,b,i,t}$ is white noise. We defer discussion of robustness issues to later. For now, this baseline model is specified with the following measures.

PERFORMANCE is ROA, which is operating income before depreciation divided by total assets. Corporate parent effects are measured with an indicator variable for each firm. Note that this is more conservative for our purposes than the measure used in some studies. For example, (McGahan *et al.*, 2002) allocate a corporate parent effect only when a firm has more than one segment. Because we want to find stringent conditions for not rejecting the null hypothesis, we include all firms, whether than they have one segment or more. Segment effects are measured with indicator variables for each firm's segments. In this baseline model, industry effects uses just the primary industry, as is standard in the literature (e.g., (McGahan *et al.*, 2002)). There is an issue of what granularity of industry classification to

use. Recall that our business model classification is at an intentionally coarse level, given the preliminary nature of the investigation. Specifically, segments were classified into only one of 12 business models (see Table 5, panel (b)). Therefore, a comparative granularity of industry classification seems to be at the one-digit NAICS level, which has 9 industries in the *BASELINE* dataset (10 in the *ALL* dataset). By comparison, there are 95 industries at the three-digit level (100 in *ALL*) and 815 (1,212 in *ALL*) at the six-digit level. For perspective, (McGahan *et al.*, 2002) use 390 industries at the four-digit SIC classification. We describe robustness to these later. Finally, year effect is simply an indicator variable for each year in our dataset.

5. BASELINE RESULTS

Table 6 shows the results of the COV analysis. In columns (1) and (2), and for comparison, we first report the decomposition of ROA from two prominent papers in the literature. Both show that segment effects are dominant.

In models (3) and (4), we report the similar result—that is, without business model effects—using our *BASELINE* dataset. Model (3) uses the six-digit NAICS codes while model (4), one-digit. Unsurprisingly, at the six-digit level, the industry effect in model (3) begins to take on some of the firm effects (corporate and segment). At the extreme, 11.6% of the observations were monopolist segments in which the segment is the only one observed in the "industry." And interestingly, model (4) does not seem to deviate too much from models (1) and (2) despite its coarse industry classification. These two observations bolsters our theory-based argument earlier, that it seems more reasonable to compare business model effects to industry effects at the one-digit level. We also note that apart from the above observations, models (3) and (4) seem to replicate models (1) and (2) in the literature quite well.

In models (5), (6), and (7), we add business model effects to the variance decomposition of ROA. Model (5) uses the six-digit NAICS classification, model (6) three-digit, and model (7) one-digit. In all cases, business model effects are bigger than year effects. As in model (3), we view model (5) with some skepticism, because part of the industry effect could be attributable to firm effects. Model (6) is still less

reasonable, since industry classification has almost eight times the granularity of business model classification (95 industries versus 12 business models). Model (7), using one-digit industry classification, is theoretically the most comparable. Here, we see that business model effects are greater than industry effects—6.3% versus 5.6%.

In model (8), we repeat the estimation using return on sales (ROS), as measured by operating income before depreciation divided by total revenues. Again, business model effects are larger than industry effects.

Remarkably, adding business model effects also reduces the error components. For example, model (3) has error at 31.4%, which is reduced to 28.6% in model (5). Likewise, model (4) has 33.9%, reduced to 29.6% in model (7).

Our interpretation is that the null hypothesis that business models explain performance heterogeneity cannot be rejected. More specifically, business model effects are larger than year effects, and in the most reasonable comparison, are even larger than industry effects. This finding is rather startling, since our definition of business model is very coarse (just 12 models), and yet, business model effects are about one-quarter of industry effects as defined with 815 industries (six-digit NAICS in model (5)) and larger than industry effects as defined comparably (one-digit NAICS in model (7)). We next turn to evaluating the robustness of this surprising result.

6. ROBUSTNESS TESTS, ALTERNATIVE INTERPRETATIONS

The summary of this section is that our key finding that business model effects are strong is robust to a wide array of checks.

6.1. Nested ANOVA Analysis

As mentioned, one of the controversies in the empirical literature is whether explanations of performance heterogeneity are robust to COV versus nested ANOVA methods. In Figure 1, we show the results of the nested ANOVA method when the performance measure is ROA (those for ROS are qualitatively similar). We use the *BASELINE* dataset below, but further restrict it to just segments of the

SeeIT1000 companies, which were least likely subject to measurement errors because they were subject to most intense classification efforts and inter-rater reliability checks. This restriction is for computational tractability. Ten other random samples produce qualitatively the same results.

The main message is that business model effects are larger than industry or year effects, as we have found with COV. The bottom-most box shows the unrestricted model, with an adjusted *R*-squared of 80%. The next level, removing one of the effects in turn, shows that segment and corporate parent effects are dominant, as before. The explanatory power is similar to those from COV. For example, the unexplained error component is about 20%, compared to about 30% in models (5) through (7) in Table 6. The boxes of interest—with business model or industry effects only—are shown in bold. We see that business model effects alone have an adjusted *R*-squared of 5%, but industry effects have 2%.

6.2. The Brush and Bromiley Critique

(Brush *et al.*, 1997) argue that COV is biased by the number of industries and firms in the specification. They recommend evaluating relative size of the effects by taking the square roots of the variance components. These are what we report in Table 6, as well as all other tables in this paper. In Table 7, panel (a), we report the raw variance components. As Brush and Bromiley predict, the results without taking square roots are qualitatively the same, but tend to understate the size of the industry (and in our case, business model) effects.

6.3. Reverse Causality

One alternative interpretation of our baseline results is associated with endogeneity of the right-hand-side effects. Specifically, one could argue that business models might have been chosen as a *consequence* of performance. For example, retail chains might start out as *Physical Distributors*, but once they achieve the clout that comes with operating performance, they might morph into *Physical Brokers*. In this latter business model, powerful book stores accept books only on consignment, and strong supermarket chains charge slotting fees to vendors for putting their goods on store shelves, without taking ownership of the goods. Like previous studies in the empirical genre, we do not claim causality in our variance

decomposition. Nevertheless, we think it useful to see how robust our finding is if we use a simple way to deal with endogeneity, which is to use forward right-hand side variables. The result is in Table 7, panel (b). Broadly, the result is still consistent with our baseline finding: business model effects are larger than year effects and industry effects, except for ROA, where it is slightly smaller than industry. We also include up to two-period forward dependent variables and the results are qualitatively the same.

6.4. Diversification

(Bowman *et al.*, 2001) and (McGahan *et al.*, 2002) argue that the percentage of focused firms in the sample reduces the likelihood of identifying corporate effects, which would in turn over-state the true explanatory power of other effects, including business model effects. As a corollary, we are concerned that diversified firms, presumably unburdened by this concern, would then show business model effects to be insignificant. Table 7, panel (b), shows the results for firms in the highest and lowest diversification. We measure business model diversification by firms in several ways: the Herfindahl index (defined as $\Sigma(p_i^2)$ where p_i is the fraction of the firm's revenues from business model i; see (Herfindahl, 1950)), entropy ($\Sigma[p_i \cdot \log(p_i)]$, see (Jacquemin *et al.*, 1979)), and two concentration indices, C1 and C2 (sum of the fractions of revenues from the largest and two largest business models; see (Kwoka, 2002)). The first has the merit of bounded properties, the second can be decomposed into additive components each of which defines diversification at different aggregation levels, and the concentration indices have historical availability from the Bureau of the Census for comparison.

The business model effect is robust to this inclusion, as shown in panel (c) for the Herfindahl measure. The most focused decile (model (1)) shows a smaller corporate effect compared to the most diversified decile (model (2)) as the literature suggests, but we observe that even in model (1), business model (7.0%) effects still dominate over year (2.4%) and industry (5.0%) effects. If these non-corporate effects are over-stated proportionately, then our baseline conclusion still holds. A stronger piece of evidence is in model (2), where over-stating is not a concern. We see that business model effects are even more dominant (12.1%), compared with year (9.3%) and industry (1.9%) effects. This is consistent with

a story that corporate effects are more correlated with segment and industry effects, and not with business model effects, so that business model has strong discriminant validity.

In models (3) through (6), we repeat the estimate with finer industry classifications. Even though we argue that business models as we defined them are best compared with industry at the one-digit NAICS level, one potential criticism is that business model effects are weaker than industry effects at finer industry effects. Models (4) and (6).show that even if our baseline conclusion is not true for the average firm, it is true for diversified firms, where business model effects are still larger than industry effects at the 3- or 6-digit NAICS level (11.7% versus 5.7%, and 12.0% versus 11.2%).

Finally, we note that the above results are qualitatively the same when we use the other diversification measures mentioned, and are therefore not reported here. The same holds for estimations using quartiles instead of deciles, and for performance measures other than ROA (ROS, forward ROA, forward ROS).

6.5. Time Stability

(Bowman *et al.*, 2001) suggest that COV analysis can be biased with the omission of stability effects. It might also be argued that time-varying effects—which (Rumelt, 1991) calls transient effects—are less important as explanations of performance To this end, we use a refined specification:

$$PERFORMANCE_{c\,s,i,b,t} = \alpha + \beta_c + \gamma_s + \zeta_i + \kappa_b + \lambda_t + \theta_{b,t} + \pi_{i,t} + \varepsilon_{f,b,i,t}\,,$$

where $\theta_{b,t}$ and $\pi_{i,t}$ are interactions of business model and industry with year effects. In Table 7, panel (d), we report the results of this specification. A striking result is that the business model effect appears quite time-stable, compared with the industry effect. For example, in explaining ROA heterogeneity, the stable business model effect explains 3.2% of the variance while the time-varying effect is 0.2%. On the other hand, the stable industry effect explains 1.5% while the time-varying effect explains 1.8%. We interpret this as being consistent with the earlier result that a business model effect exists, and even more strongly, that most of the business model effect is time-stable.

6.6. Outliers

To deal with outliers, we winsorize the *BASELINE* data at 1% and 99%, as is standard in the finance

literature (*e.g.,* (Gompers *et al.*, 2005)). We also undertake estimation without winsorizing, and the results are qualitatively unchanged—see Table 7, panel (e).

(Hawawini *et al.*, 2003) argue that *within*-industry outliers might be driving the previous reports on the importance of firm effects. (McNamara *et al.*, 2005) discuss this issue further. Following the latter, we remove outliers based on a threshold number of standard deviations from the mean firm within industry and within business model, and the results are qualitatively unchanged. For example, for a threshold of 3 standard deviations—as in (McNamara *et al.*, 2005)—and for the ROA performance measure, the business model effect is still as before, also shown in panel (e).

6.7. Heckman Correction for Sample Selection Bias

Recall that *BASELINE* excludes observations that do not report ROA or ROS data. One concern we have is whether our *BASELINE* dataset is systematically biased toward a more significant business model effect than the *ALL* dataset. We cannot think of very realistic ways in which bias might occur, although there could be remote possibilities. Suppose, for example, only higher performing firms keep internal books on segments so that under SFAS 14, only they report financial information. And it also happens that, unrelated to performance, certain business models tend to require book-keeping more than others. Then the tendency to book-keeping and financial reporting might be the reason we observe that business models explain performance.

In panel (f), we report results of a standard Heckman correction procedure for potential sample selection bias (*e.g.,* (Wooldridge, 2002)). The selection model is a probit using robust standard errors:

$$SELECTED_{c\,s,i,b,t} = f(\, INDUSTRY_i\,,\, YEAR_t,\, SEGMENT\text{-}SALES_{c\,s,i,b,t},$$
$$SEGMENT\text{-}ASSETS_{c\,s,i,b,t},\, FIRM\text{-}HERFINDAHL_{c\,s,i,t})$$

This is used to calculated the inverse Mills ratio. The corrected results in panel (f) show that our baseline conclusion that business model effects dominate year and even industry effects stands.

6.8. Measurement Error

One empirical challenge we have to deal with is that some variables might be measured with error.

For example, we have run estimations using just the primary industry of each segment, following the literature. In panel (g), we concatenate the one-digit secondary industry to the one-digit primary industry classification. This results in 86 industry categories, more than seven times the 12 business models. The panel shows that business model effects are still larger than year effects, and are about half the industry effects. Given the different granularity of business model and industry, we interpret this not a significant rejection of the null hypothesis.

A more serious kind of measurement error is for business model. For example, two segments might have simultaneously decided to be *Financial Brokers*, but one generates sales in that model earlier than the other, perhaps because of spill-over from other parts of its business. We would have classified the latter segment as starting *Financial Broker* later, and incorrectly attribute better performance to the model as a whole because we understate this segment's true poor performance. One way to address this issue is use only observations for the SeeIT1000 firms, which were classified manually and doubly checked with the automated classifier. The result, also shown in panel (g), is that our conclusion holds.

Another way to deal with potential measurement error of business models is to discretize the business model variables (*e.g.*, (Morck *et al.*, 1990)). In other words, we say a firm has a business model only if revenues from that model exceed a threshold. Notice that we now decompose variance at the firm, rather than segment, level. This technique can also provide an intuitive way to incorporate secondary industries and business models into our measures. For example, if previously we have a firm-year observation with 10% of revenues from *Physical Creator* and 90% from *Financial Landlord*, we would have assigned that firm-year to only the primary *Financial Landlord* model, since it has more revenues. Now, if we set a revenue threshold of 10%, then we assign to the firm-year a business model combination of *Physical Creator – Financial Landlord* (the order does not matter in our data set up). Similarly, we do likewise for industry combinations. The last column in Panel (g) shows that even with this technique, our baseline conclusion stands. The result is also qualitatively the same if we use other revenue thresholds, such as 5% or 20%.

7. CONCLUSION

A central question in strategic management is: what explains the difference in performance among firms? This debate is usually between the "firm view" and "industry view." Yet, among business practitioners and in the trade literature, a very different explanation, in the form of "business model," is commonly offered for why some firms do better than others. In this paper, we first formulate a fundamental, reliable and practical typological definition of business models, classify U.S. firms at the segment level by business model, and ask if business models might explain performance heterogeneity. We find that business model effects are larger than year effects. They also dominate industry effects, when we measure industry at the comparative (*i.e.,* one-digit NAICS) level. Our conclusion is robust to very many econometric issues as well as alternative interpretations. All these support business practitioners' intuitive enthusiasm for the concept. We hope this study will generate further rigorous study into what could be an important element of strategy and organizational performance.

8. REFERENCES

2001. IBM: IT services are key, *CNN Money*:

Afuah A, Tucci C. 2003. *Internet Business Models and Strategies* (2nd ed.). Irwin/McGraw-Hill: New York, NY

Agrawal A, Makhija AK, Mandelker GN. 1991. Executive Compensation and Corporate Performance in Electric and Gas Utilities. *Financial Management* **20**(4): 113-124

Alt R, Zimmermann H. 2001. Introduction to Special Section – Business Models, *Electronic Markets*, Vol. 11: 3-9

Amit R, Schoemaker PJH. 1993. Strategic Assets and Organizational Rent. *Strategic Management Journal* **14**(1): 33-46

Amit R, Zott C. 2001. Value Creation in E-Business. *Strategic Management Journal* **22**(6): 493-520

Applegate LM. 2001. E-business Models: Making sense of the Internet business landscape. In LM Applegate, WG Dickson, GL DeSanctis (Eds.), *Information Technology and the Future Enterprise: New Models for Managers*. Prentice-Hall: Upper Saddle River, N.J.

Bair M. 2003. Mike Bair, Senior Vice President of the 7E7 program, *Boeing Frontiers*, Vol. 1:

Barney, Jb. 1986. Strategic Factor Markets - Expectations, Luck, and Business Strategy, *Management Science*: 1230-1241

Bouwman H. 2003. Designing metrics for business models describing mobile services delivered by networked organisations, *16th Bled Electronic Commerce Conference eTransformation*: Bled, Slovenia

Bowman EH, Helfat CE. 2001. Does Corporate Strategy Matter? *Strategic Management Journal* **22**: 1-23

Brush TH, Bromiley P. 1997. What Does a Small Corporate Effect Mean? A Variance Components Simulation of Corporate and Business Effects. *Strategic Management Journal* **18**(10): 825-835

Bulow JI. 1982. Durable-Goods Monopolists. *Journal of Political Economy* **90**(314-332)

Bulow JI. 1986. An Economic Theory of Planned Obsolescence. *Quarterly Journal of Economics* **101**:

729-749
Burt RS. 1992. *Structural Holes: The Social Structure of Competition*. Harvard University Press: Cambridge, MA
Carlton DW, Gertner R. 1989. Market Power and Mergers in Durable-Good Industries. *Journal of Law and Economics* **32**: 203-226
Carroll GR. 1993. A Sociological View on Why Firms Differ. *Strategic Management Journal* **14**(4): 237-249
Chang SJ, Singh H. 2000. Corporate and industry effects on business unit competitive position. *Strategic Management Journal* **21**(7): 739-752
Chesbrough H, Rosenbloom RS. 2002. The Role of the Business Model in Capturing Value from Innovation: Evidence from Xerox Corporation's Technology Spin-Off Companies. *Industrial & Corporate Change* **11**(3): 529-555
Coase RH. 1972. Durability and Monopoly. *Journal of Law & Economics* **15**: 143-149
Cohen J. 1960. A Coefficient of Agreement for Nominal Scales. *Educational and Psychological Measurement* **20**: 37-46
Cool K, Dierickx I, Jemison D. 1989. Business Strategy, Market Structure and Risk-Return Relationships: A Structural Approach. *Strategic Management Journal* **10**(6): 507-522
Denrell. 2004. Random walks and sustained competitive advantage, *Management Science*: 922-934
Ghemawat P, Costa JERI. 1993. The Organizational Tension between Static and Dynamic Efficiency. *Strategic Management Journal* **14**(Special Issue: Organizations, Decision Making and Strategy): 59-73
Gompers P, Lerner J, Scharfstein D. 2005. Entrepreneurial Spawning: Public Corporations and the Genesis of New Ventures, 1986-1999. *Journal of Finance*
Gordijn J, Akkermans J. 2001. Designing and Evaluating E-Business Models. *IEEE Intelligent Systems* **16**(4): 11-17
Granovetter M. 1973. The Strength of Weak Ties. *American Journal of Sociology* **78**: 1360-1380
Grossman SJ, Hart OD. 1986. The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration. *The Journal of Political Economy* **94**(4): 691-719
Gurley JW. 2001. Why Dell's War Isn't Dumb, *Fortune*: 134-136
Hamel G. 2000. *Leading the revolution*. Harvard Business School Press: Boston, MA
Hannan MT, Carroll GR. 1992. *Dynamics of Organizational Population: Density, Legitimation, and Competition*. Oxford University Press: New York
Hawawini, Subramanian G, Verdin V. 2003. Is performance driven by industry- or firm-specific factors? A new look at the evidence. *Strategic Management Journal*: 1-16
Hawawini, Subramanian G, Verdin V. 2005. Is performance driven by industry- or firm-specific factors? A reply to McNamara, Aime, and Vaaler. *Strategic Management Journal*: 1083-1086
Herfindahl O. 1950. Concentration in the U.S. Steel Industry, *Economics Department*. Columbia University: New York
Hoskisson RE. 1993. Multidivisional Structure and Performance: The Contingency of Diversification Strategy. *Academy of Management Journal* **30**(4): 625-644
Hoskisson RE, Hitt MA, Johnson RA, Moesel DD. 1993. Construct Validity of an Objective (Entropy) Categorical Measure of Diversification Strategy. *Strategic Management Journal* **14**(3): 215-235
Jacquemin AP, Berry CH. 1979. Entropy measure of diversification and corporate growth. *Journal of Industrial Economics* **27**: 359-369
Kaplan RS, Norton DP. 2004. *Strategy Maps: Converting Intangible Assets in to Tangible Outcomes*. Harvard Business School Press: Boston, MA
Kar Evd, Maitland CF, Montalvo UWd, Bouwman H. 2003. Design guidelines for mobile information and entertainment services: based on the Radio538 ringtunes i-mode service case study, *Proceedings of the 5th international conference on Electronic commerce*: 413-421. ACM Press: Pittsburgh, PA
Kwoka JE, Jr. 2002. Governance Alternatives and Pricing in the U.S. Electric Power Industry. *Journal of Law Economics & Organization* **18**(1): 278-294

Linder J, Cantrell S. 2000. Changing Business Models: Surveying the Landscape. Accenture Institute for Strategic Change
Lubatkin M, Schulze WS, Mainkar A, Cotterill RW. 2001. Ecological investigation of firm effects in horizontal mergers. *Strategic Management Journal*: 335-357
Magretta J. 2002. Why Business Models Matter, *Harvard Business Review*, Vol. 80: 86-92
Mahadevan B. 2000. Business Models for Internet-based e-Commerce: An anatomy, *California Management Review*, Vol. 42: 55-69
Mahoney JT. 1992. The Choice of Organizational Form: Vertical Financial Ownership Versus Other Methods of Vertical Integration. *Strategic Management Journal* **13**(8): 559-584
Malone TW, Weill P, Lai R, D'Urso VT, Herman G, Apel TG, Woerner S. 2006. Do Some Business Models Perform Better than Others? A Study of the 1000 Largest US Firms, *MIT Sloan School Working Paper 4615-06*. MIT SeeIt Project: Cambridge, MA
Mauri AJ, Michaels MP. 1998. Firm and Industry Effects within Strategic Management: An Empirical Examination. *Strategic Management Journal* **19**(3): 211-219
McGahan AM, Porter ME. 1997. How Much Does Industry Matter, Really? *Strategic Management Journal* **18**(Summer 1997 Special Issue: Organizational and Competitive Interactions): 15-30
McGahan AM, Porter ME. 1999. The persistence of shocks to profitability. *Review of Economics and Statistics* **81**(1): 143-153
McGahan AM, Porter ME. 2002. What do we know about variance in accounting profitability? *Management Science* **48**(7): 834-851
McKinsey. 2006. An Executive Take on the Top Business Trends: A McKinsey Global Survey, *McKinsey Quarterly*, Vol. April:
McNamara G, Aime F, Vaaler P. 2005. Is performance driven by industry-or firm-specific factors? A response to Hawawini, Subramanian, and Verdin. *Strategic Management Journal*: 1075-1081
McNamara G, Vaaler P, Devers C. 2003. Same as it ever was: The search for evidence of increasing hypercompetition. *Strategic Management Journal* **24**(3): 261-278
Morck R, Shleifer A, Vishny RW. 1990. Do Managerial Objectives Drive Bad Acquisitions? *Journal of Finance* **45**(1): 31-48
Nelson RR, Winter SG. 1982. *An Evolutionary Theory of Economic Change*. Harvard University Press: Cambridge, MA
Penrose E. 1959. *The Theory of the Growth of the Firm*. Basil Blackwell: London
Porter ME. 1980. *Competitive Strategy: Techniques for Analyzing Industries and Competitors*. Free Press: New York
Powell TC. 1996. How Much Does Industry Matter? An Alternative Empirical Test. *Strategic Management Journal* **17**(4): 323-334
Quah D. 2002. Almost efficient innovation by pricing ideas, *CEP Working Paper 1219*: 59. CEP: London
Rajan RG, Zingales L. 1998. Financial Dependence and Growth. *American Economic Review* **88**(3): 559-586
Rappa M. 2003. Managing the digital enterprise - Business models on the Web:
Roquebert JA, Phillips RL, Westfall PA. 1996. Markets vs. Management: What 'Drives' Profitability? *Strategic Management Journal* **17**(8): 653-664
Ruefli TW, Wiggins RR. 2000. Technical Note: Longitudinal Performance Stratification. An Iterative Kolmogorov-Smirnov Approach. *Management Science* **46**(5): 685-692
Rumelt RP. 1984. Towards a Strategic Theory of the Firm. In RB Lamb (Ed.), *Competitive Strategic Management*. Prentice-Hall: Englewood Cliffs, N.J.
Rumelt RP. 1991. How Much Does Industry Matter? *Strategic Management Journal* **12**(3): 167-185
Rumelt RP, Schendel D, Teece DJ. 1991. Strategic Management and Economics. *Strategic Management Journal* **12**(Special Issue: Fundamental Research Issues in Strategy and Economics): 5-29
Rust J, Hall G. 2003. Middlemen versus Market Makers: A Theory of Competitive Exchange. *Journal of Political Economy* **111**(2): 353-403

Schmalensee R. 1985. Do Markets Differ Much? *American Economic Review* **75**(3): 341-351
Schmalensee R. 1988. Industrial Economics: An Overview. *Economic Journal* **98**(392): 643-681
Slywotzky AJ, Morrison DJ, Andelman B. 1997. *The Profit Zone*. Times Books: New York, NY
Spooner JG. 2002. Palmisano sheds light on IBM's path, *ZDNet UK*:
Stokey NL. 1979. Rational Expectations and Durable-Goods Pricing. *Bell Journal of Economics* **12**: 112-128
Tapscott D, Ticoll D, Ticoll D, Lowy A. 2000. *Digital Capital: Harnessing the Power of Business Webs*. Harvard Business School Press: Boston, MA
Teece D. 1980. Economics of Scope and the Scope of the Enterprise. *Journal of Economic Behavior & Organization*(1): 223-247
Teece DJ, Pisano G, Shuen A. 1997. Dynamic Capabilities and Strategic Management. *Strategic Management Journal* **18**(7): 509-533
Timmers P. 1998. Business Models for Electronic Markets. *Journal on Electronic Markets* **8**(2): 3-8
Varian HR. 2000. Buying, Sharing and Renting Information Goods. *Journal of Industrial Economics* **48**(4): 473-488
Vilmos FM, Heather E, Thomas G, Jeffrey AL. 2006. A new perspective on a fundamental debate: a multilevel approach to industry, corporate, and business unit effects. *Strategic Management Journal* **27**(6): 571
Waldman M. 2003. Durable Goods Theory for Real World Markets. *Journal of Economic Perspectives* **17**: 131-154
Walker E, Maturana G. 2002. Estilos, Timing e imitacion en los fondos mutuos accionarios chilenos. (With English summary.). *Revista de Analisis Economico* **17**(1): 71-101
Weill P, Malone TW, D'Urso VT, Herman G, Woerner S. 2004. Do Some Business Models Perform Better than Others? A Study of the 1000 Largest US Firms. MIT SeeIt Project: Cambridge, MA
Weill P, Vitale MR. 2001. *Place to Space: Migrating to eBusiness Models*. Harvard Business School Press: Boston, MA
Welch J. 2003. The GE Business Model, *GE Annual Report*: 3
Wernerfelt B. 1984. A Resource-Based View of the Firm. *Strategic Management Journal* **5**(2): 171-180
Williamson OE. 1971. The Vertical Integration of Production: Market Failure Considerations. *American Economic Review* **61**(2): 112-123
Williamson OE. 2002. The Lens of Contract: Private Ordering. *American Economic Review* **92**(2): 438-443
Wooldridge JM. 2002. *Econometric Analysis of Cross Section and Panel Data*. MIT Press: Cambridge, MA

Table 1 – Some Common Definitions of Business Model

	Level of analysis		Dimensions of typology		
	Network	Firm	How to appro-priate value	What value is created	Some core concepts
(Afuah *et al.*, 2003)		√			Implementation, capabilities, sustainability
(Alt *et al.*, 2001)		√	√		Structure, processes, revenues, legal, technology
(Applegate, 2001)	√		√	√	Value webs, platforms, market roles
(Bouwman, 2003)		√	√		Value, finance, technology, organization
(Chesbrough *et al.*, 2002)		√	√	√	Market, proposition, value chain, position
(Gordijn *et al.*, 2001)	√		√	√	Actor, value objects, market segment
(Hamel, 2000)	√	√	√	√	Interface, strategy, resources, network, linkages
(Kar *et al.*, 2003)		√	√		Service formula, technology, revenue model
(Linder *et al.*, 2000)		√	√	√	Activity and price/value position; 8 models
(Magretta, 2002)		√	√		Producing and selling activities; models as stories
(Mahadevan, 2000)	√		√		Value, revenue, and logistical streams
(Rappa, 2003)		√	√	√	Value, revenue, product, architecture
(Tapscott *et al.*, 2000)	√		√		Economic control/hierarchy, value integration
(Timmers, 1998)	√		√		Degrees of integration vs. innovation
(Weill *et al.*, 2001)	√		√	√	Firms, flows of products and info, revenues

Table 2. The Sixteen Business Models

Each cell is illustrated with a common name for the model, as well as an example firm, in brackets. The two "Not applicable" models are illegal in the US and most places today because they involve selling human beings. They are included here for logical completeness. Adapted from (Malone *et al.*, 2006).

		What type of asset is involved?			
		Financial	**Physical**	**Intangible**	**Human**
What rights are being sold?	**Creator**	Entrepreneur (Kleiner Perkins)	Manufacturer (GM)	Inventor (Lucent Bell Labs)	Not applicable
	Distributor	Financial Trader (Merrill Lynch)	Wholesaler/ Retailer (Wal*Mart)	IP Trader (NTL Inc.)	Not applicable
	Landlord	Financial Landlord (Citigroup)	Physical Landlord (Hertz)	IP Landlord (Microsoft)	Contractor (Accenture)
	Broker	Financial Broker (Charles Schwab)	Physical Broker (eBay)	IP Broker (Valassis)	HR Broker (EDS)

Table 3. Summary Statistics

This data is obtained from the COMPUSTAT-CRSP merged tapes at the segment-level, supplemented from a variety of sources, such as SEC 10-K's. Each observation is a segment-year. The period is 1998 through 2002. The baseline sample consists of observations for which ROA or ROS information exists. All observations, including those without ROA and ROS information, are shown on the right half and are used later for correcting sample selection bias. The mean number of segments per firm is 1.15 for *BASELINE* and 2.04 for *ALL*.

	Baseline sample (*BASELINE*)			All observations, incl. those without ROA, ROS information (*ALL*)		
	Obs	Median	Std. Dev.	Obs	Median	Std. Dev.
Year	15,413	2,000.0	1.2	87,096	2000.0	1.4
Unique firms	4,435			11,280		
Segment						
Sales ($M)	15,413	68.6	2,845.0	87,096	48.7	3,913.9
Op. inc. bef. depr. ($M)	15,413	5.5	585.5	15,488	5.3	584.2
Total book assets ($M)	15,413	98.9	8,034.6	58,310	55.8	11,545.6
Return on assets, ROA	14,945	7.5%	384%	14,945	7.5%	384%
Return on sales, ROS	15,050	8.0%	12,485%	15,050	8.0%	12,485%
Corporate						
Herfindahl index	15,363	1.00	0.16	84,227	1.00	1.62
C-2 concentration index	15,363	1.00	0.26	84,227	1.00	0.44
Entropy	15,363	0.00	0.17	84,227	0.00	0.35

Table 4. Classification of General Electric's Segments, based on Revenues for FY2000. Reproduced from (Malone *et al.*, 2006).

Firm Segment	Revenue in $000	% of Revenue	Business Model Archetype	Split
Aircraft Engines	10,779	8.16	*Manufacturer*	
All Other (GE Capital Services)	4,582	3.47	*Distributor*	
Appliances	5,887	4.46	*Manufacturer*	
Consumer Services (GE Capital Services)	23,893	18.09	*Financial Landlord (Lender)*	
Equipment Management (GE Capital Services)	7,374	5.58	*Financial Landlord (Lender)*	50%
Equipment Management (GE Capital Services)	7,374	5.58	*Contractor*	50%
Industrial Products & Systems	11,848	8.97	*Manufacturer*	
Mid-Market Financing (GE Capital Services)	5,483	4.15	*Financial Landlord (Lender)*	
NBC	6,797	5.15	*IP landlord*	
Plastics	7,776	5.89	*Manufacturer*	
Power Systems	14,861	11.25	*Manufacturer*	
Specialized Financing (GE Capital Services)	5,648	4.28	*Financial Landlord (Lender)*	
Specialty Insurance (GE Capital Services)	11,878	8.99	*Financial Landlord (Insurer)*	
Technical Products & Services	7,915	5.99	*Manufacturer*	
Total Revenue	$132,094			

Table 5 - Distribution of Business Models

The observations are from firms in the *ALL* dataset; years are 1998 through 2002. The top set of numbers in each cell is for 1998, the bottom for 2002. Numbers may not add up due to rounding. Reproduced from (Malone *et al.*, 2006).

Panel (a) - Percent of total sample revenue in business model

Figures in brackets are revenues in billions of nominal dollars.

		What type of asset is involved?				Total by Asset Right
		Financial	**Physical**	**Intangible**	**Human**	
What rights are being sold?	**Creator** (ownership of asset with significant transformation)	0.0% ($3) 0.0% ($0)	48.9% ($5965) 48.9% ($6703)	0.0% ($0) 0.0% ($0)	-	48.9% ($5967) 48.9% ($6703)
	Distributor (ownership of asset with limited transformation)	0.1% ($18) 0.3% ($38)	15.3% ($1863) 15.2% ($2078)	0.0% ($0) 0.0% ($0)	-	15.4% ($1881) 15.5% ($2117)
	Landlord (use of asset)	13.7% ($1676) 12.8% ($1754)	9.3% ($1140) 9.1% ($1245)	2.5% ($307) 2.9% ($400)	9.5% ($1157) 9.9% ($1360)	35.1% ($4280) 34.7% ($4760)
	Broker (matching of buyer and seller)	0.4% ($52) 0.7% ($91)	0.1% ($12) 0.2% ($22)	0.0% ($0) 0.0% ($0)	0.0% ($4) 0.0% ($2)	0.6% ($68) 0.8% ($115)
	Total by Asset Type	14.3% ($1749) 13.8% ($1884)	73.6% ($8980) 73.4% ($10049)	2.5% ($307) 2.9% ($400)	9.5% ($1161) 9.9% ($1362)	100.0% ($12200) 100.0% ($13700)

Panel (b) - Percent of firms with any revenue in business model

Figures in brackets are number of firms. Row and column totals do not add to the grand total at the bottom right, since a firm can have multiple business models.

		What type of asset is involved?				Total by Asset Right
		Financial	**Physical**	**Intangible**	**Human**	
What rights are being sold?	**Creator** (ownership of asset with significant transformation)	0.1% (9) 0.0% (6)	47.2% (7629) 47.6% (6386)	0.0% (0) 0.0% (0)	-	47.3% (7638) 47.7% (6392)
	Distributor (ownership of asset with limited transformation)	0.5% (79) 0.7% (89)	8.5% (1375) 8.1% (1081)	0.0% (0) 0.0% (0)	-	9.0% (1454) 8.7% (1170)
	Landlord (use of asset)	7.6% (1230) 7.2% (963)	9.1% (1463) 8.9% (1189)	8.4% (1361) 8.7% (1164)	17.9% (2884) 17.9% (2404)	43.0% (6938) 42.7% (5720)
	Broker (matching of buyer and seller)	0.6% (100) 0.8% (102)	0.1% (14) 0.1% (15)	0.0% (2) 0.1% (4)	0.1% (9) 0.1% (9)	0.8% (123) 0.9% (126)
	Total by Asset Type	8.8% (1418) 8.7% (1160)	64.9% (10481) 64.7% (8671)	8.4% (1361) 8.7% (1164)	17.9% (2893) 18.0% (2413)	100.0% (16153) 100.0% (13408)

Table 6 - Components of Variance (COV) Analyses – Baseline Specification

The data is from COMPUSTAT-CRSP, for the period 1998-2002. Segments are classified manually, with counter-checks, while the rest of the observations are classified automatically. The specification for all but models (1) and (2) is:

$$PERFORMANCE_{c\,s,i,b,t} = \alpha + \beta_c + \gamma_s + \zeta_i + \kappa_b + \lambda_t + \varepsilon_{c\,s,i,b,t},$$

where $PERFORMANCE_{c,s,i,b,t}$ is a measure of corporation *c*'s segment *s* performance when it has primary industry *i* and business model *b* over year *t*, α is a constant for the overall mean effect averaging over the indices, β_c the corporate parent effect, γ_s the segment effect, ζ_i the primary industry effect, κ_b the business model effect, λ_t the year effect, and $\varepsilon_{f,b,i,t}$ is white noise. "BM" is short for "business model." The components are square roots of the original outcomes, as recommended by (Brush *et al.*, 1997).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	(Roquebert *et al.*, 1996), Table 4	(McGahan *et al.*, 2002), Table 3, adj R-sq version	ROA	ROA	ROA	ROA	ROA	ROS
Year	2.3% (a)	0.8%	1.4%	1.6%	1.2%	1.2%	1.4%	1.7%
Industry	10.2% (b)	8.9% (b)	22.0% (c)	7.3% (e)	20.3% (c)	13.9% (d)	5.6% (e)	4.7% (e)
Corporate	17.9%	8.8%	13.2%	18.9%	20.0%	21.7%	24.3%	14.3%
Segment	37.1%	32.5%	32.1%	38.3%	25.0%	28.7%	31.4%	32.1%
Bus. Model	**-**	**-**	**-**	**-**	**4.9%**	**5.0%**	**6.3%**	**5.0%**
Error	32.0%	51.0%	31.4%	33.9%	28.6%	29.6%	31.1%	42.2%

(a) In (Roquebert *et al.*, 1996), this is a industry×year effect.
(b) 4-digit SIC classification
(c) 6-digit NAICS classification
(d) 3-digit NAICS classification
(e) 1-digit NAICS classification

Table 7 – Variance Components Analysis – Further Robustness Checks

The data is from COMPUSTAT-CRSP. The top 1000 firms by revenue ("SeeIT1000 firms") in the 1998-2002 sample are classified manually, with counter-checks, while the rest of the observations are classified automatically. The estimation is done using components of variance (COV) analysis. Except for panel (a), the components are square roots of the original outcomes, as recommended by (Brush *et al.*, 1997). Unless explicitly shown, all dependent variables are the contemporaneous ROA.

Panel (a) – Raw Variance Decomposition

	ROA	ROS
Year	0.1%	0.1%
Industry	1.2%	0.7%
Corporate	22.6%	6.6%
Segment	37.6%	33.5%
Business Model	**1.5%**	**0.8%**
Error	37.0%	58.2%

Panel (b) – Forward Dependent Variables

	ROA_{t+1}	ROS_{t+1}
Year	0.9%	0.8%
Industry	4.2%	2.7%
Corporate	40.7%	39.0%
Segment	32.1%	32.7%
Business Model	**3.5%**	**3.3%**
Error	18.7%	21.5%

Panel (c) – Diversification Deciles

For each firm, the Herfindahl index is $\Sigma(p_i)^2$ where p_i is the fraction of the firm's revenues from business model *i*. Granularity of industry classification is indicated by the headers: "x-digit NAICS."

NAICS coding	1-digit	3-digits		6-digits		
Decile	1 (Focused)	10	1	10	1	10
	(1)	(2)	(3)	(4)	(5)	(6)
Year	2.4%	9.3%	2.2%	8.7%	2.2%	9.3%
Industry	5.0%	1.9%	9.9%	5.7%	11.9%	11.2%
Corporate	1.1%	7.0%	5.5%	8.0%	4.9%	0.7%
Segment	53.1%	13.5%	47.6%	13.1%	46.6%	10.7%
Business Model	**7.0%**	**12.1%**	**6.4%**	**11.7%**	**6.2%**	**12.0%**
Error	31.3%	56.2%	28.4%	52.9%	28.2%	56.2%

Panel (d) – Interactions and Stability

The specification is:

$$PERFORMANCE_{c\,s,i,b,t} = \alpha + \beta_c + \gamma_s + \zeta_i + \kappa_b + \lambda_t + \theta_{b,t} + \pi_{i,t} + \varepsilon_{f,b,i,t}\,,$$

where $\theta_{b,t}$ and $\pi_{i,t}$ are interactions of business model and industry with year effects.

	ROA	ROS
Year	1.3%	0.6%
Industry	1.5%	1.3%
Industry×Year	1.8%	1.1%
Corporate	7.9%	3.7%
Firm	13.6%	15.3%
Business Model	**3.2%**	**2.2%**
BM×Year	0.2%	1.6%
Error	70.4%	74.2%

Panel (e) – Outliers

In the left model, we do not winsorize outliers as we have done in our *BASELINE* dataset. In the right model, we remove segment-year observations that are more than 3 standard deviations from the within-industry and within-business-model means.

	Raw	McNamara
Year	0.9%	0.8%
Industry	1.8%	1.4%
Corporate	8.1%	3.8%
Firm	14.0%	15.7%
Business Model	**3.3%**	**2.2%**
Error	72.0%	76.1%

Panel (f) – Heckman Correction for Potential Sample Selection Bias

The selection model is:

$$SELECTED_{c\,s,i,b,t} = f(\,INDUSTRY_i\,,\,YEAR_t,\,SEGMENT\text{-}SALES_{c\,s,i,b,t},\,SEGMENT\text{-}ASSETS_{c\,s,i,b,t},\,FIRM\text{-}HERFINDAHL_{c\,s,i,t}).$$

	ROA
Year	0.6%
Industry	3.9%
Corporate	17.1%
Firm	21.9%
Business Model	**4.4%**
Error	52.1%

Panel (g) - Addressing Potential Measurement Error

In model (1), industry is a concatenation of the one-digit segment primary and secondary industries. In model (2), we include only SeeIT1000 firms, which are the largest firms by revenues in year 2000, for which we classify business models manually. In model (3), a firm has a business model only if revenues from that model exceed a threshold (10% in this estimation).

	Primary and secondary industries	SeeIT1000	Discretized (Firm-level)
	(1)	(2)	(3)
Year	1.3%	1.4%	5.6%
Industry	11.3%	5.6%	10.5%
Corporate	22.9%	24.3%	42.8%
Firm	29.3%	31.4%	
Business Model	**5.2%**	**6.3%**	**6.1%**
Error	30.0%	31.1%	35.0%

Figure 1 – Nested ANOVA

We use the *BASELINE* dataset below, but further restrict it to just segments of the SeeIT1000 companies. This is for computational tractability. Ten other random samples produce qualitatively the same results. The specification is:

$$ROA_{f,b,i,t} = \alpha_{....} + \beta_f + \gamma_b + \zeta_i + \lambda_t + \varepsilon_{f,b,i,t},$$

where $ROA_{f,b,.,i,t}$ is the return on total assets of firm *f*'s performance over year *t* when it has primary business model *b* and industry *i*, $\alpha_{...}$ is a constant for the overall mean effect with the three dots denoting averaging over the four indices, β_f the firm effect, γ_b the (primary) business mode effect, ζ_i the (primary) industry effect, λ_t the year effect, and $\varepsilon_{f,b,i,t}$ is white. "BM" is short for "business model."

The bottom-most model is the unrestricted model, and the top-most has only year effects. The *p*-values for all models is 0.0000. The boxes of interest—with business model or industry effects only—are shown in bold.