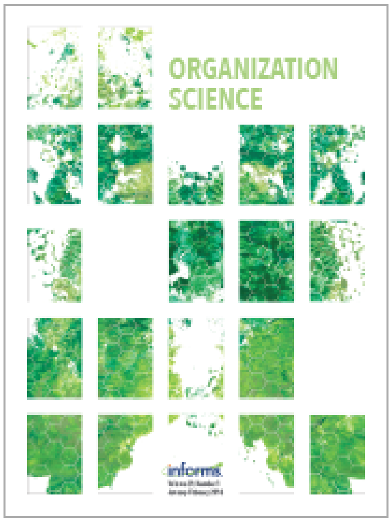

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Pursuing the New While Sustaining the Current: Incumbent Strategies and Firm Value During the Nascent Period of Industry Change

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Abstract. This study considers the nascent period of industry change when the prevalent business model is being threatened by a new model, but there is significant uncertainty with respect to whether and when the new model will dominate. We focus on the challenge of incumbents pursuing both models simultaneously during the nascent period, and the implications on their firms' valuations. Our theory is premised on the adjustment costs incurred by incumbents associated with the sharing of resources across business models and the conflict between managers vying for limited resources. While firms' assets and competitive environments are key drivers of their value, we argue that they also impact adjustment costs. Evidence from the U.S. electric utility industry, which is undergoing a change from a centralized to a decentralized model, offers strong support for our arguments. The greater the level of incumbents' assets that are specific to the existing model, and the greater the level of competition that they face, the lower are their firms' valuations when investing in the new model relative to when investing in the existing model. Hence, ironically, those incumbents potentially most threatened by the change seem to be least rewarded for their efforts to renew themselves. However, pursuing the new model via alliances can help mitigate adjustment costs. The study uncovers the challenges that incumbents face as they pursue the new model in tandem with the existing dominant model, and helps explain why some incumbents may successfully navigate the changing industry landscape while others may stumble.

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Keywords: industry change • strategic renewal • business model • alliances • energy industry

Introduction

Strategy scholars have long focused on the difficulties that incumbent firms face during episodes of industry change. The literature stream has traditionally viewed industry change through the lens of new technologies (e.g., Tushman and Anderson 1986, Henderson and Clark 1990, Tripsas 1997, Hill and Rothaermel 2003), and more recently, through the lens of new technologies being deployed within new business models (e.g., Christensen 2006, Ansari et al. 2015, Kapoor and Klueter 2015, Kim and Min 2015, Ahuja and Novelli 2016). The latter type of change is impacting incumbents in many established industries today as exhibited by the emergence of online streaming, mobile payments, personalized medicine, ride sharing, robo-advising, and cloud-based IT services. An important challenge for these incumbents is how to manage the nascent period of industry change when their existing business model that generates most of the value is being threatened by a new business model, but there is significant uncertainty with respect to whether and when the new model will dominate the industry.

The extant literature on industry change has underexplored this challenge because it has framed the theoretical discourse around explaining the difference in performance between incumbents and entrants once the industry change has materialized (e.g., Hill and Rothaermel 2003, Agarwal and Tripsas 2008). In so doing, the theoretical insights are premised on the assumption that the existing model is successfully displaced by the new model, and that the challenges of incumbency stem from the obsolescence of incumbents' competencies and the organizational inertia associated with the old model (e.g., Tripsas and Gavetti 2000, Gilbert 2005, Christensen 2006, Kapoor and Klueter 2015). However, in many cases, the new model may not successfully emerge or fully displace the old model (e.g., Markides 2006), and the challenges of incumbency may not just be embedded with respect to the pursuit of the new model but rather in the simultaneous management of the existing and the new models (Lavie et al. 2010, Ahuja and Novelli 2016). Further, such challenges may vary across incumbents, and this is masked by the prevalent theorizing of comparing *all* incumbents against entrants (Eggers and Park 2018).

In this study, we focus on the problem of incumbents allocating their resources through investments in the existing and the new business models during the nascent period of industry change, and we explore how those strategic decisions impact their firms' valuations. Drawing on the literature on diversification (Helfat and Eisenhardt 2004, Hashai 2015), and on industry change (Argyres et al. 2015, Ahuja and Novelli 2016), we consider that incumbent firms will be subjected to adjustment costs as they pursue both models. These adjustment costs entail direct costs associated with the development of assets to support the new model, and indirect costs associated with the disruption to the existing business model, conflict for resources between the two models, and the cannibalization of demand. We argue that these costs will increase with the level of an incumbent's assets that are specific to the existing model, and the intensity of competition in the markets in which incumbents operate. Hence, while firms' internal asset stocks and external competitive environment are key drivers of their value, we show that these factors can also play a significant role in terms of adjustment costs during periods of industry change. We further argue that alliances, especially with partners from outside the industry, can help incumbents offset such adjustment costs as they pursue the new model in tandem with the existing model.

We test our arguments using recent evidence from the U.S. electric utility industry from 2008 to 2015. This industry provides an important and relevant context for this study. It is currently in the midst of a nascent period of industry change as the dominant model of centralized electricity generation used by incumbent utilities is being challenged by an emerging, decentralized model (e.g., *The Economist* 2013, Cretys and Guccione 2015). Analysts have claimed that this is a major disruption to the industry with both entrants and incumbents investing in the new model (e.g., Hannes and Abbott 2013, Hummel et al. 2014). However, more than 99% of electricity consumed in 2016 is still associated with the centralized model, and it is uncertain whether and when the new model will dominate the industry (Abdelilah et al. 2016). Besides being in the nascent stage of change, two key features of the industry make it particularly valuable for the purpose of this study. First, incumbents vary in the asset stocks that are specific to the prevailing centralized model (i.e., generation assets) and these asset stocks are directly observable because of regulatory requirements. Second, because of the differences between states' regulatory regimes, incumbents across the country operate in different competitive environments ranging from monopoly to near perfect competition, allowing us to examine the important but underexplored effect of market competition on incumbents during periods of change. We assemble a unique panel data set of 48 of the top publicly listed electric utilities with information on more than 500 of their investment decisions within the centralized and the decentralized models between 2008 and 2015. We examine how electric utilities' investment announcements impact their market valuations through measuring cumulative abnormal returns (CARs) of their stocks (e.g., Woolridge and Snow 1990, Girotra et al. 2007).

Consistent with our arguments, we find that the greater the level of a utility's generation assets and the greater the level of competition it faces, the lower is its value when it invests in the new model relative to when it invests in the existing model. A higher level of assets specific to the existing model and a more intense competitive environment are likely to subject these incumbent utilities to greater adjustment costs at the time when the existing model is dominant and the viability of the new model is uncertain. We uncovered some anecdotal evidence with respect to such adjustment costs in the case of a leading utility in the United States and utilities in Australia and Germany. These findings highlight that those utilities most threatened by the change (i.e., those with a high level of assets that cannot be deployed in the new model and those participating in more competitive markets) tend to generate lower value from their investments in the new model as compared with those in the existing model. This results in an "incumbent's dilemma." On the one hand, incumbents' sustainability may be premised on their strategic renewal through investments in the new model. On the other hand, those investments may deliver significantly less value than investments in the existing model at least in the short term. Finally, consistent with our argument that alliances with partners from outside the industry can help utilities mitigate adjustment costs, we find that investments in the new model are associated with higher valuations when they are implemented via alliances than when they are implemented in-house.

The study contributes to the literature on industry change in several ways. It is among the first to provide a systematic account of incumbent firms' allocating resources across existing and new business models during the nascent period of industry change, and the implications of these decisions on their firms' value. This allows us to expand on the incumbency challenges that are predicated on the obsolescence of competences and the presence of inertia impeding organizational change around the new model, to include challenges stemming from adjustment costs as incumbents proactively pursue the new model in tandem with the existing dominant model. We show that incumbents' asset stocks and their competitive environment can have a significant impact on their adjustment costs, and that alliances can play an important role in helping incumbents mitigate such costs. Second, the study moves beyond the typical consideration of incumbents versus entrants in the literature to uncovering sources of heterogeneity between incumbents in their management of industry change (Eggers and Park 2018). Such an expanded consideration helps to explain why some incumbents may be able to adapt to the changing industry landscape, whereas others may struggle despite having the same intentions. At the same time, our results speak to the scenario in which the new model may not fully replace the existing model. Accordingly, it might be better for some incumbents (i.e., those with a high level of assets specific to the prevailing model and those subject to more competitive environments) to hold back on allocating significant resources toward the new model until the uncertainty with respect to its viability is resolved. Finally, by using a valuation-based approach to examine the impact of incumbents' strategic decisions during the nascent stage of industry change, the study offers a novel approach that can help in advancing the literature beyond retrospective accounts. In so doing, scholars can isolate the effect of a given strategic decision especially during the nascent but critical period of industry change, and avoid any assumption about whether and when the change would actually be realized.

Hypotheses

Industry change often entails the emergence of new technologies being deployed within existing business models (e.g., Tushman and Anderson 1986, Henderson and Clark 1990, Tripsas 1997, Hill and Rothaermel 2003) or new technologies being deployed within new business models (e.g., Ansari et al. 2015, Kapoor and Klueter 2015, Kim and Min 2015, Ahuja and Novelli 2016). We consider industry-level changes encompassing new business models and with incumbents having to decide on their resource allocations between the new and the existing business models.[1]

A business model generally comprises three different components: the firm's customer value proposition, the firm's profit equation (i.e., how it generates revenues and appropriates profits), and how the firm's assets are aligned to deliver this value proposition (e.g., Zott et al. 2011). The new business model typically has a significantly different value proposition and profit equation to that of the existing business model, and also impacts the value of firms' existing asset configurations. On the one hand, a new business model may present new growth opportunities for incumbents through attracting new customers or improving the value proposition for existing customers. On the other hand, it may not necessarily displace the industry's prevailing business model because it may not be economically viable or it may coexist in a different market niche. Accordingly, firms need to manage a delicate balance between continuing to exploit their knowledge and assets within the existing business model and exploring opportunities within the new model (Markides and Charitou 2004, Lavie et al. 2010, Ahuja and Novelli 2016).

In developing our theoretical arguments, we focus on the early stage of industry change in which a new business model emerges that could potentially displace the existing model, but where the economic viability of this new model is unclear. We assume that all incumbents are subject to the same high level of uncertainty with respect to the economic viability and growth associated with the new model. We consider managers within incumbent firms making resource allocations across both models, and evaluate the impact of these investments on their firms' valuations.[2]

Firm value is a well-established forward-looking performance outcome for strategies whose payoffs are expected to accrue over time such as strategies related to R&D investments (e.g., Woolridge and Snow 1990), acquisitions (e.g., Montgomery and Singh 1987), and alliances (e.g., Kale et al. 2002). Theoretically, firm value also helps to isolate the effect of firms' investment decisions during the early stage of industry change when the emerging business model is still nascent, and there is a high degree of uncertainty with respect to its viability and industry dominance. Retrospective performance outcomes such as market share or sales that are typically considered in the industry change literature have an implicit selection bias toward the industry change having been realized (e.g., Agarwal and Tripsas 2008), and they also do not isolate the effect of a given strategic decision. This also helps to uncover the pressures that executives may face as they manage the balance between increasing value for their shareholders in the short term and staying relevant in the long term.

Incumbents pursuing a new model in tandem with the existing model is akin to related diversification. Accordingly, we draw on the literature on diversification to identify the theoretical underpinnings associated with such strategies. Helfat and Eisenhardt (2004) introduced the notion of adjustment costs to describe the organizational costs that firms may face as they move into new businesses. Subsequently, scholars studying both firms' diversification (Hashai 2015) and firms' management of industry change (Argyres et al. 2015, Ahuja and Novelli 2016) have drawn on this notion to assess the strategic and performance implications for firms. In the case of an incumbent pursuing the new model while still deriving most of the value from the existing model, it faces two types of adjustment costs. First, direct adjustment costs are associated with the expenses of moving human resources, developing new capabilities and routines, adapting existing assets to the new model, and mistakes resulting from learning to execute a new model (e.g., Helfat and Eisenhardt 2004, Hashai 2015). Second, indirect costs can include coordination costs associated with sharing of resources across business models, managerial attention costs associated with managers' limited capacity to address the trade-offs associated with competing business models, conflict costs associated with managers within each business model vying for limited resources, and cannibalization of demand of one business model by the other (e.g., Kim and Min 2015, Ahuja and Novelli 2016). The indirect costs are often more substantial in the case of firms pursuing a new model that threatens their existing model than in the case of firms diversifying into new related businesses over time.

Our theory development is premised on the differences among incumbents in terms of their adjustment costs. Firms' internal asset stocks and external competitive environment are two of the most basic drivers of their value (e.g., Dierickx and Cool 1989, Barney 1991, Porter 2008). We argue that these factors can also play a significant role in exacerbating incumbents' adjustment costs as they manage the existing model while exploring the new model. In contrast, alliances, especially with partners from outside the industry, can help incumbents mitigate these costs. We derive predictions with respect to how each of these factors may have implications for an incumbent firm's value when it invests in the new model relative to when it invests in the existing model. We note that our theory does not specify the direct effect of investments on firm value that could depend on not just firm-level but also business model–level factors (e.g., new versus existing customers, economic viability). Rather, our theory is predicated on identifying key sources of incumbent heterogeneity that may influence incumbents' adjustment costs, thereby moderating the relationship between investment decisions and firm value.

Asset Stocks

Industry change can have a differential impact on the assets of incumbents. On the one hand, some assets may still be deployed within the new business model. For example, the retail industry is undergoing a shift from the dominant brick-and-mortar model to the online model. The brand and the relationships that incumbent retailers have with consumers can still be leveraged within the online model (Kim and Min 2015). On the other hand, some assets such as retailers' physical stores are specific to the existing model and may not be readily deployed within the new business model. Such assets may be rendered obsolete if the new business model becomes dominant. We consider both the nature and the heterogeneity in incumbents' asset stocks to explain how their investments within the new and existing business models will affect their firms' values.

For incumbents with a high level of accumulated assets that are specific to the existing model, pursuit of the new model will subject them to greater adjustment costs, particularly indirect adjustment costs, than those with a lower level of such assets. First, managers having to balance their attention between new and existing business models will pay much greater attention to the existing business model if their asset base is more embedded within this model. As a result, starved of managerial attention, pursuit of the new model may be hindered. Second, there will be a greater power imbalance between the business units responsible for the respective business models, and growth within the new business model may be limited because of resource constraints. Finally, the impact of cannibalization of demand from the existing to the new model will be greater for firms with a higher level of assets specific to the existing model. Effectively, the pursuit of the new model may result in "stranded assets" such that the value appropriated from a high level of assets specific to the existing model will be significantly lower than originally expected (e.g., Joskow 2006, Caldecott and McDaniels 2014). Further, employees are typically incentivized by the value that they generate from firms' assets. Firms may face internal frictions as employees focused on the existing business model that's the main source of existing revenue will be adversely impacted by the cannibalization of demand from the new business model. In contrast, for incumbents with a high level of accumulated assets that are specific to the existing model, investments within the existing model will benefit them through asset mass efficiencies and interconnectedness of asset stocks (Dierickx and Cool 1989). Hence, we expect that the greater the level of an incumbent firm's assets that are specific to the existing model, the lower will be the firm's value when it invests in the new model relative to when it invests in the existing model. Accordingly, we predict:

Hypothesis 1 (H1). *The level of an incumbent firm's assets that are specific to the existing model negatively moderates the relationship between the type of business model investment and the firm's value such that incumbents with a higher level of assets will have lower valuations when they invest in the new model relative to when they invest in the existing model.*

Market Competition

Incumbents have to manage a delicate balance between both business models, which may be especially challenging in more competitive environments such as those characterized by low barriers to entry and intense rivalry (e.g., Porter 2008). Incumbents operating in such environments will likely face a greater threat from entrants into their markets pursuing the new model. At the same time, they have to compete with incumbents within the existing model who may become more aggressive in a market that is maturing and being threatened by the new model.

The difficulties of operating in competitive environments will exacerbate the adjustment costs that incumbents face as they pursue both models. With respect to direct costs, in highly competitive markets, developing new capabilities, adapting existing assets, and mistakes during execution of the new model are likely to be more costly. This is because the required threshold of assets and capabilities to compete effectively with the new model is likely to be higher in a more competitive market. At the same time, any mistakes during implementation are likely to create a greater downside as competitors will take advantage and the focal incumbent will find it more difficult to recover from the initial errors.

Indirect adjustment costs are also likely to be higher in environments that are more competitive. First, managers have to coordinate their activities competing against new entrants in the new model and against other incumbents in the existing model. As competition increases, firms will find it increasingly challenging to compete effectively in both models and may instead focus more on the existing model (Toh and Kim 2013). Similarly, managerial attention is likely to shift to the existing model to ensure that the firm is able to win on at least one front, deflecting attention from the new model. Third, greater external competition is likely to accentuate the impact of internal conflict between the new and existing models for scarce resources. Overall, these arguments suggest that when incumbents operate in more competitive environments, their pursuit of the new model will be subject to greater adjustment costs, both direct and indirect. Accordingly, we predict:

Hypothesis 2 (H2). *The level of market competition an incumbent faces negatively moderates the relationship between the type of business model investment and the firm's value such that incumbents facing a higher level of competition will have lower valuations when they invest in the new model relative to when they invest in the existing model.*

Alliances

Incumbents can pursue the new model on their own or through alliances.[3] Alliances are likely to be with entrants or established firms from outside the focal industry, who can help incumbents gain access to new assets, capabilities, and even customers who may be more amenable to the new model (Chan et al. 1997, Rothaermel 2001). Alliances can also help incumbents share the costs and risks associated with the pursuit of the new model (Das et al. 1998, Dyer and Singh 1998, Kale et al. 2002). Hence, alliances can help lower incumbents' direct adjustment costs with respect to human resources, development of new capabilities and assets, and mistakes during the execution of the new model. For example, General Motors (GM) has formed an alliance with the ride-hailing firm Lyft to explore the new business model of offering mobility services using autonomous vehicles. This alliance has given GM access to Lyft's assets and customers, and also Lyft shares the costs and risks with GM in terms of using GM's autonomous vehicles via a ride-hailing model.

Pursuing a new model via an alliance also helps to lower indirect adjustment costs through an ambidextrous design (e.g., Lavie et al. 2010). This is because the alliance creates greater organizational separation between the pursuit of the existing and the new models, and results in outsiders being involved in terms of resource allocation and decision-making (Kapoor and Klueter 2015). An alliance partner can ensure that greater attention is paid to the new model and there is a reduced likelihood of resources being diverted to the existing model. At the same time, coordination costs are mitigated because of fewer organizational interdependencies between the two models (Kim and Min 2015). Finally, because of a dedicated pool of resources and governance surrounding the alliance, conflicts with respect to allocating resources between the new and the existing model will be mitigated.

Incumbents can also pursue alliances within the existing model with other incumbents, entrants, or firms from outside the focal industry. However, the benefits of those alliances are likely to be confined to cost and risk sharing, as well as accessing new capabilities, and not with respect to indirect adjustment costs. Moreover, appropriability hazards pertaining to alliances are likely to be higher in the existing dominant model than in the new emerging model. Accordingly, the marginal impact of investing through alliances on firm's value will likely be lower for the existing model as compared with the new model. Therefore, we predict:

Hypothesis 3 (H3). *The incumbent's mode of investment (alliance versus in-house) will moderate the relationship between the type of business model investment and the firm's value such that investing via alliances (versus in-house) will result in higher valuations when incumbents invest in the new model relative to when they invest in the existing model.*

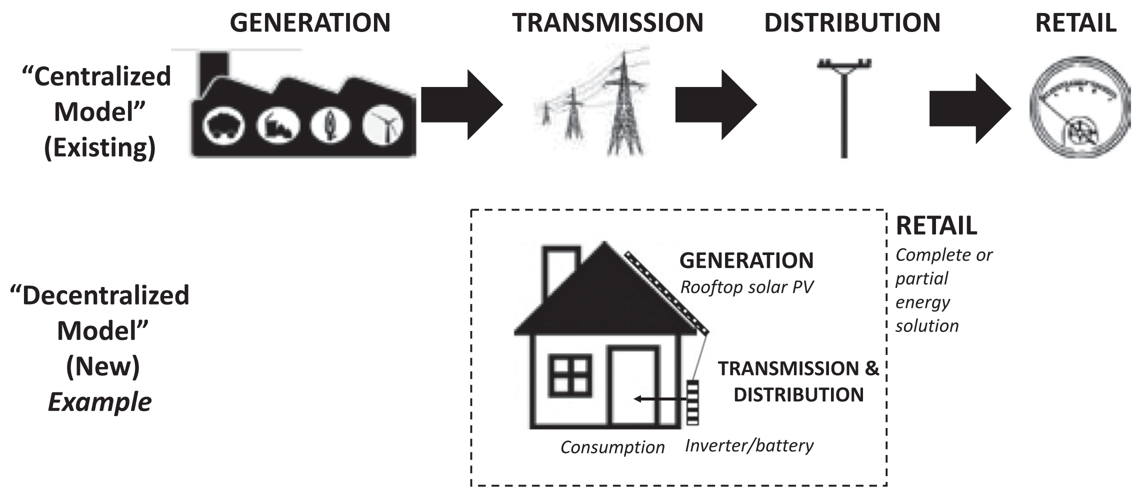
Methods

Research Context

> Distributed energy: Disrupting the utility business model.
> (Hannes and Abbott 2013, p. 1)

> The combination of distributed and intermittent generation, ever cheaper storage and increasingly intelligent consumption has created a perfect storm for utilities.
> (*The Economist* 2013)

Figure 1. Centralized (Existing) and Decentralized (New) Models of the Electric Utility Industry



> Several coincident, significant transformations are causing a revolution in the way electricity—the vital fuel of global commerce and human comfort—is produced, distributed, stored, and marketed. A top-down, centralized system is devolving into one that is much more distributed and interactive.
>
> (Schwieters and Flaherty 2015)

We examine our hypotheses in the context of the U.S. electric utility industry from 2008 to 2015. The industry presents an important and relevant setting to test our predictions. As highlighted by the quotes above, the industry is in the midst of significant change that started to take place in the mid-2000s, and is still in a nascent stage. The prevalent existing business model (the "centralized model") of electricity generation and delivery used by incumbent utilities relies on the generation of electricity using large power plants remotely located from the point of consumption (e.g., *The Economist* 2013, Cretys and Guccione 2015). Electricity is transported to the user via high-voltage transmission and lower-voltage distribution networks. A new "decentralized" model of electricity generation and consumption is now emerging that poses a threat to the dominance of the centralized business model.

In the decentralized business model, users consume electricity that is generated at or near the point of use often through a combination of rooftop solar photovoltaic (PV) systems, batteries, and digital management of the electricity grid. Figure 1 illustrates the difference between the existing centralized and the new decentralized model via a simplified schema. The decentralized model represents a new business model as it has a significantly different value proposition and method of value capture to that of the existing business model and also impacts the value of incumbents' existing asset configurations (e.g., Zott et al. 2011). The value proposition shifts from one in which electricity is provided as a service and its consumption is metered to one in which consumers buy or lease equipment to generate and manage the consumption of their own electricity. Value capture shifts from consumers paying for their electricity usage based on tiered tariff structures to consumers purchasing or leasing electricity generation, storage, and monitoring equipment, paying for energy advisory services and for the utilization of the smart grid. Finally, as shown in Figure 1, the new model is incompatible with incumbent utilities' existing centralized generation, transmission, and distribution assets. This significant industry change is drawing the attention of major industry incumbents.

We note that advances in solar PV technology, batteries, and digital management of the grid have been an important source of change within this industry over the past decade and these technologies have been applied by incumbent utilities within both the centralized and the decentralized models. For example, solar PV technology can be deployed within the centralized model as large power plants or within the decentralized model as small rooftop systems. We are able to identify incumbent utilities' decisions with respect to the existing and new business models during the initial period of industry change even if they are utilizing similar technologies. After presenting our main results, we report the results from a supplementary analysis in which we explore the effect of utilities investing in solar PV and battery technologies regardless of the business model in which they are deployed. The supplementary analyses suggest that the simultaneous management of an existing and an emerging business model is the main source of challenge that incumbent utilities face in this industry rather than the management of a new technology.

While all incumbent utilities are subject to the industry change, they differ significantly in their stock of generation assets that are not deployable within the decentralized model. These asset stocks are directly observable because of regulatory reporting requirements. Incumbents also differ in terms of the states in which they operate, and because of the differences among regulatory mandates across states in terms of competition ranging from monopoly to near perfect competition, incumbents are subject to varying levels of competition (Delmas et al. 2007).

Finally, the industry is in a nascent stage of change: based on Energy Information Administration (EIA) estimates, only 0.2% of U.S. electricity in 2016 was generated through the decentralized model (Abdelilah et al. 2016). Because of a variety of factors related to costs, subsidies, and ease of use, there is a high degree of uncertainty as to which model will ultimately dominate. We found such concerns also echoed by executives at incumbent firms in their annual letters to shareholders. However, even a relatively small penetration of the decentralized model can have a major impact on the profitability of incumbent utilities pursuing the centralized model (e.g., *The Economist* 2013).

Data and Sample

The sample of incumbent utilities was identified from Compustat using Standard Industrial Classification (SIC) codes 4911 and 4931. Initially, 78 incumbent utilities were identified. However, further investigation revealed that 19 of these utilities had been acquired prior to 2008 (the first year of observation for the study). Forms EIA-860 and EIA-861 from the EIA are the primary data source for each firms' electricity generation, sales, and asset positions. These data are collected via an annual survey of utilities, which they are legally obliged to complete for each of their subsidiaries, thus providing complete coverage of the U.S. electric utility industry. Subsidiaries are manually matched to the 59 parent firms using a variety of sources (e.g., annual reports, 10-Ks). [4] To account for merger and acquisition activity, the subsidiaries associated with the acquired utility are included as part of the acquiring utility the year after the merger's formal completion. This sample of utility firms represented 46% of U.S. electricity generation capacity and 59% of U.S. electricity sales, and served 61% of U.S. electricity customers (domestic and commercial) in 2014.[5]

The unit of analysis for this study is the firm-announcement—i.e., a specific external communication of a strategic investment made by an incumbent utility within the existing centralized or new decentralized model. Announcement data are collected from Compustat's Capital IQ "Key Developments" database. The database uses over 20,000 sources providing a high degree of confidence that all key announcements are captured. For the period 2008–2015, a total of 20,909 announcements are collected for our sample incumbent utilities. These announcements cover a multitude of topics including earnings guidance, new debt offerings, and changes in management personnel and legal disputes, in addition to firms' strategies. Often, announcements are repeated multiple times in the data set as the same announcement can be captured by different media sources. We used a two-step process to code announcements pertaining to investments in the centralized model and decentralized model, respectively. The first step involves a keyword-based approach to narrow the number of announcements to only those pertaining to incumbent utilities' investments within the centralized and the decentralized models. The second step involves a manual coding process by two trained raters to distinguish between investments within the centralized and those within the decentralized models.

In the first step, we used groups of keywords around electricity generation, subsequent stages of transmission, distribution and retail, and business model descriptors.[6] Keywords associated with electricity generation included solar, photovoltaic, battery, coal, nuclear, wind, smart, gas, and combined heat and power (CHP). Keywords associated with transmission, distribution, and retail included transmission, distribution, smart, advanced meter, digital, high-voltage power lines, low-voltage power lines, and substations. Keywords associated with business model descriptors included rooftop, distributed, power station, centralized, and decentralized. This keyword-based approached reduced the total number of relevant announcements from 20,909 to 1,985.

In the second step, the smaller set of announcements is manually coded by two raters who were trained by one of the authors with extensive experience in the utilities industry to identify which of these announcements corresponded to investments in the centralized model and decentralized model, respectively. A keyword-based approach would have been problematic here because many technologies (e.g., solar, batteries) could be deployed in either model as discussed above. The raters were trained to evaluate if the announcement refers to utilities' investments in centralized power generation (solar farms, carbon sequestration, coal-fired power stations, gas-powered stations), transmission, distribution (with or without batteries), and whether electricity is generated separately from where it is consumed (attributes of the centralized model). Similarly, the raters were trained to evaluate if the announcement refers to utilities' investments such that electricity is generated near the point of consumption through rooftop solar projects, batteries for homes, and smart minigrids—i.e., through the decentralized model. There was substantial agreement in the coding by the two raters (Kappa = 0.8). For the small number of announcements that are coded differently (mostly around solar PV), we reviewed and discussed the focal announcement, and coded them based on the logic with respect to the focal business model (i.e., location of generation and location of consumption). The manual coding process further reduced the set of announcements to 992 from 1,985. The 993 omitted announcements include 476 nonelectricity business–related announcements (e.g., gas pipelines) and 517 non-investment–related announcements (e.g., personnel changes).

To ensure that firm's valuation following an announcement is not confounded by other events or announcements, we follow the standard practice to exclude 225 announcements that occur within two days before or after firms' earnings announcements (McWilliams and Siegel 1997). We also exclude 180 announcements that provide updates on the initial announcement and 30 announcements that mention investments in both centralized and decentralized business models.[7] Finally, 45 announcements are excluded because they were made on nontrading days or because the data for some of the covariates is missing. The final sample for analysis consists of 512 announcements by 48 firms.

Measures

Dependent Variable: Cumulative Abnormal Stock Return. We use the event study approach to test our predictions (e.g., McWilliams and Siegel 1997). We examine the impact of firms' strategic investment decisions on their valuation through measuring cumulative abnormal returns (CAR) of firms' stocks at the time of their announcements.[8] CARs enable an immediate and direct assessment of firms' strategic decisions on their valuations (e.g., MacKinlay 1997). They have been extensively used by strategy scholars to evaluate the impact of decisions related to mergers and acquisitions (e.g., Lubatkin 1987, Montgomery and Singh 1987, Chatterjee et al. 1992), alliances (e.g., Das et al. 1998, Kale et al. 2002, Gulati et al. 2009), and R&D investments (e.g., Woolridge and Snow 1990, Doukas and Switzer 1992, Ba et al. 2013) on firms' value.

Using CARs to measure changes in firms' values following announcements of their strategic investments is subject to two key assumptions. The first one is the general assumption around market efficiency: a firm's stock price is an accurate reflection of the impact of an investment on a firm's value based on the available, pertinent information at the time of the announcement. The second, more specific assumption is that a change in a firm's stock price is primarily driven by the announcement at a given time, and not due to any other factors. We ensure that this assumption is met through excluding announcements that may be confounded by other simultaneous actions by the firm (e.g., earnings announcements, personnel changes), and by performing supplementary analyses using an event window prior to the focal announcement—namely, between three days and one day before the focal announcement [–3,–1]. For the main analysis, we measure CAR over a five-day [–2,2] window centered on the focal announcement. For robustness checks, we also use three-day [–1,1] and four-day [–1,2] windows. These windows are in line with those used in prior studies (e.g., McWilliams and Siegel 1997, Pfarrer et al. 2010, Rhee and Fiss 2014).

Independent Variables. The variable *New Model* takes a value of 1 if the announcement pertains to an investment within the decentralized model and 0 if it pertains to an investment within the centralized model. Ideally, we would have also liked to know about the scale of the investment, but such information was generally not mentioned in the announcements. Only about 29% of announcements mention a dollar amount. Within this sample, the difference between the investments in the existing, centralized (mean \$803M, standard deviation (SD) \$1,924M) and the new, decentralized (mean \$459M, SD \$506M) models is statistically insignificant. We note that the scale of investment is not likely to affect the directionality of the effect for firms with different levels of assets or facing different levels of competition, which is what we theorize.

We focus on incumbent utilities' generation capacity to test H1. Generation capacity represents approximately 60% of the U.S. electricity industry's physical asset base, transmission assets represents about 10%, and distribution assets the other 30% (United States Department of Energy 2003). While all of these assets are incompatible with the decentralized model, generation assets will have the greatest impact on utilities' values. The measure of utilities' generation assets is developed using data from Form EIA-860. The variable, *Existing Model Assets*, is calculated using the incumbent utilities' total generation capacities in megawatts (MW) in a given year. The variable is log transformed to account for skewness in the data. As a robustness check, we use an alternative measure based on incumbent utilities' number of electricity generators that are reported in Form EIA-860.

We measure the competitive environment in which the incumbent operates using the variable *Nocompetition* based on the proportion of its sales in non-Retail Choice states (e.g., Delmas et al. 2007). Some states are categorized as "Retail Choice" because of state-level regulation mandating that consumers should have a choice of electricity providers. In other states, electric utilities operate as monopolies where consumers have no choice but the state regulates the price. Utilities operating in states with Retail Choice face many competitors in their markets. Utilities operating in non-Retail Choice states not only face no competitive pressures with respect to the centralized model, but they also have been known to influence legislators to make it difficult for entrants pursuing the decentralized model (e.g., Leslie 2017). Utilities often operate across multiple states, some of which are Retail Choice states and some of which are not. We use the proportion of sales in non-Retail Choice states as the measure for *Nocompetition*. The more sales in non-Retail Choice states, the higher the value of the variable, implying that the electric utility is subject to lower competitive pressures. For example, if Utility X sells 40% of its electricity in non-Retail Choice states, *Nocompetition* = 0.4. Hence, the measure is a good proxy for the overall competitive pressures that incumbents face.

The variable *Alliance* takes the value of 0 if the investment is conducted by the incumbent utility alone or 1 if it is conducted jointly with an external partner. This categorization is based on the coding of the announcement text. For example, an announcement describing "Exelon and SunPower to Develop Nation's Largest Urban Solar Power Plant" would be coded as 1 as Exelon is partnering with SunPower. In our sample, 89% of alliances in the new decentralized model are with firms from outside the electric utility industry, in contrast 51% of alliances in the centralized model are with firms from outside the industry. Hence, incumbents are more likely to reach beyond their industry boundaries to find partners who can help them pursue the decentralized model.

Control Variables. We include a set of control variables that may influence firms' valuations following an announcement. We proxy a utility's level of transmission assets (*Transmission*) by using a simple binary indicator of whether a utility's subsidiaries have transmission operations as captured by Form EIA-861, and weighting this indicator by the share of the utility's sales across its subsidiaries. For example, if a utility has two subsidiaries with equal sales, one with transmission operations and the other without, *Transmission* will equal 0.5. We develop similar variables to measure utilities' assets in distribution (*Distribution*). Incumbent utilities can sell electricity through the wholesale channel to other utility providers and through the retail channel to residential and nonresidential users. We proxy a utility's dependence on the retail channel (*Retail*) by the percentage of its total sales through the retail channel. Utilities with a larger proportion of sales to retail customers may find it easier to adapt to the decentralized model as compared with firms that sell primarily via the wholesale channel.

We control for firm size (*Size*) based on the log of annual electricity sales in MW hours (MWh). We control for firm performance (*Performance*) using a rolling-three-year average return on assets (ROA) obtained from Compustat. We use a rolling-three-year average to smooth out year-on-year fluctuations in performance. Firms with older-generation asset bases may be subject to different adjustment costs. Using generation plant-level data reported in form EIA-860, we estimate a weighted average (by generation capacity in MW) age of firms' generation assets (*Plant Age*). We control for the percentage of a firm's electricity sales in states that operate through regional transmission organizations (RTOs) through the variable *RTO*. RTOs are real-time wholesale electricity markets as opposed to markets in which electricity is primarily sold through bilateral contracts.

We control for the differences in incentives for adoption of rooftop solar across states through the variable *Incentives*. Specifically, we focus on third-party solar PV power purchasing agreements (PPA) in which a utility can install and finance a solar PV system at a consumer's residence and sells the power generated back to the consumer. The legislation surrounding PPAs varies across states. We use DSIRE state maps of PPA legislation and code states where PPAs are in use as 1, those in which PPAs are disallowed as 0, and states in which the legislation is unclear as 0.5.[9] We then develop a weighted average (by retail sales) value of this PPA metric across each firms' states of operations. Relatedly, utilities operating in markets with higher levels of solar radiation may be seen as more preferable for rooftop solar, which is a key decentralized offering enabling firms to deliver more value from these investments. To control for this possibility, we develop a weighted average (by electricity sales) solar light intensity (*Light Intensity*) across utilities' states of operations using data from the National Renewable Energy Laboratory.

Firms with a greater market share may be able to benefit more from their investments. We control for this effect through the variable *Market Share*, which is a firm's market share of sales in MWh in its markets of operations. Similarly, we control for a firm's share of electricity generation capacity in MW (*Existing Model Capacity Share*) in its markets of operations. We also control for the degree of penetration of the decentralized model (*New Model Penetration*) in the markets of firms' operations. We measure the degree of penetration of the decentralized model using the percentage of net meters in each market. Net meters tend to be associated with decentralized electricity generation sources as customers can sell-off excess electricity generated locally to the grid and a net meter enables the measurement of electricity both in and out of the customers' locations. As with the other controls, we weight the penetration of net meters per market in which a firm operates by the proportion of sales in those markets. We control for the level of "certainty" associated with each announcement (*Certain*). The variable takes a value of 0 if there is any uncertainty that the investment may occur (i.e., text such as "is planned") and 1 otherwise.

We control for debt-equity level through the variable *Debt-Equity* (Joseph et al. 2014). We also control for stock ownership composition (*Ownership*) using the percentage of institutional investors using data collected from the FactSet database (Ferreira and Matos 2008). Finally, we also control for analysts' recommendations (e.g., buy, sell, hold) for firms' stock in the month prior to when the focal announcement is made (variable used is *Rating*). Stocks that are more highly rated may receive more favorable valuations for their investments. We use analyst consensus recommendations data from Thomson Reuters' Institutional Brokers' Estimate System (I/B/E/S) database.

Statistical Analysis

Hypotheses are tested using ordinary least squares (OLS) regression analyses with CAR as the dependent variable. All independent and control variables are measured for the year prior to the year in which the announcement is made. We employ year and firm fixed effects to account for industry-level time-varying and firm-level time-invariant unobservables. We cluster standard errors at the firm level to account for nonindependence of errors within the same firm (Petersen 2009). We also explore the robustness of our results using the coarsened exact matching estimation approach (Iacus et al. 2011).

The hypotheses are tested using interaction terms between the variable *New Model* and the variables *Existing Model Assets*, *Nocompetition*, and *Alliance*. Using interaction terms to test the predictions also enables us to estimate within-firm effects across the two models, addressing an important concern with respect to endogeneity of firms' investments across the two models. Further, at the time investment decisions are made by incumbent firms, their asset stocks and the degree of market competition that they face are effectively fixed, lowering the concerns around omitted variable bias for the relevant interaction coefficients (Nizalova and Murtazashvili 2016, Bun and Harrison 2018). Finally, while event studies using CARs have several advantages, a major disadvantage of this approach is that the dependent variable tends to be very noisy, resulting in low power of significance tests (MacKinlay 1997, Kothari and Warner 2008). The use of interaction terms as compared with running a split sample analysis also helps to address this issue of low statistical power.

Results

Main Analysis

Table 1 provides descriptive statistics for the variables used in the analysis. 14.6% of investments relate to the new, decentralized model. Firms investing in the decentralized model tend to have a lower proportion of their assets in generation and a lower proportion of their operations in distribution and transmission. Furthermore, firms making investments in the decentralized model exhibit a higher proportion of partnering and tend to operate in markets that provide greater incentives for rooftop solar. Interestingly, on average, firms with lower prior performance, a lower generation share, and operating in more competitive markets tend to be more active in the decentralized model. The mean CARs [–2,2], [–1,1], and [–1,2] are greater for investments in the centralized model as compared with those in the decentralized model. However, these differences are not statistically significant.

Table 2 provides the correlation matrix. There is a high correlation between transmission and distribution (0.69). This is to be expected because of the high interdependencies between these assets with firms often participating in both transmission and distribution. There is much lower correlation between other types of assets (e.g., between generation and transmission or between generation and retail). In addition, somewhat unsurprisingly, size (as measured by units of electricity sold) and generation capacity are highly correlated (0.63). Finally, there is a high negative correlation between *Incentives* and *Nocompetition* (–0.66), suggesting that states experiencing greater levels of competition tend to have a more favorable PPA legislation. We also tested for multicollinearity between variables. Variance inflation factors (VIFs) for each of the variables were below 4.3, with the overall VIF of 2.3, which is substantially below the guideline threshold of 10 (Hair et al. 1998).

In Table 3, we present the results from the regression analyses. The continuous variables *Existing Model Assets* and *Nocompetition*, which are the key variables for testing H1 and H2, are mean-centered to aid interpretation (e.g., Haans et al. 2015). Model 1 is the baseline model including only the control variables. Investment announcements by firms with a higher proportion of retail sales (*Retail*) are associated with a higher CAR. In Model 2, we observe a directionally negative coefficient for *New Model*; however, this coefficient is not statistically significant.

Models 3–5 are used to test H1–H3 by including interaction terms associated with each of the hypotheses; Model 5 is the fully specified model. The interaction term between *Existing Model Assets* and *New Model* is negative and statistically significant in Models 3–5, providing strong support for H1. Hence, the level of firms' assets that are specific to the centralized model negatively moderates the relationship between the type of business model investment and firms' values such that firms with a higher level of assets are associated with lower valuations for investments in the decentralized model relative to those in the centralized model. A one-standard-deviation increase in *Existing*

Table 1. Descriptive Statistics

	Overall sample		Existing/centralized		New/decentralized		
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	*t*-statistic
1. *New Model*	0.146	0.354					
2. CAR [–2,2] %	0.080	2.813	0.117	2.763	–0.132	3.101	0.71
3. CAR [–1,1] %	–0.046	2.189	–0.029	2.179	–0.141	2.255	0.41
4. CAR [–1,2] %	–0.002	2.517	0.046	2.438	–0.276	2.939	1.02
5. *Existing Model Assets*	9.248	1.472	9.294	1.373	8.982	1.944	1.70
6. *Nocompetition*	0.445	0.442	0.470	0.442	0.304	0.418	3.02
7. *Alliance*	0.242	0.429	0.199	0.400	0.493	0.503	–4.84[a]
8. *Transmission*	0.781	0.352	0.793	0.342	0.707	0.404	1.96
9. *Distribution*	0.855	0.281	0.862	0.272	0.816	0.330	1.28
10. *Retail*	0.749	0.180	0.749	0.175	0.744	0.207	0.24
11. *Size*	17.852	0.972	17.836	0.997	17.944	0.809	–0.89
12. *Performance*	0.028	0.012	0.029	0.012	0.026	0.013	1.78
13. *Plant Age*	31.023	6.724	31.054	6.425	30.843	8.302	0.25
14. *RTO*	0.417	0.427	0.425	0.430	0.371	0.409	1.02
15. *Incentives*	0.689	0.283	0.674	0.281	0.777	0.282	–2.92
16. *Light Intensity*	4.387	0.501	4.373	0.487	4.468	0.571	–1.52
17. *Market Share*	0.195	0.134	0.192	0.136	0.207	0.126	–0.84
18. *Existing Model Cap. Share*	0.332	0.301	0.341	0.306	0.279	0.266	1.64
19. *New Model Penetration %*	0.000	0.001	0.000	0.001	0.000	0.001	–1.56
20. *Certain*	0.039	0.194	0.046	0.209	0.000	0.000	4.58[a]
21. *Debt-Equity*	2.860	1.530	2.858	1.518	2.874	1.604	–0.08
22. *Ownership*	0.706	0.165	0.706	0.163	0.706	0.179	0.00
23. *Rating*	2.341	0.459	2.343	0.461	2.330	0.451	0.23
N	512		437		75		

[a]Nonparametric test as *Alliance* and *Certain* are dichotomous variables.

Model Assets from its mean value is associated with a 1.4% lower CAR for investments in the decentralized model relative to investments in the centralized model. Further, moving from the 5th percentile to the 95th percentile of *Existing Model Assets* values is associated with a 4.0% lower CAR for investments in the decentralized model relative to those in the centralized model. These values are economically significant, and the range is consistent with other studies examining the impact of firms' strategies on their valuations (e.g., Woolridge and Snow 1990, Bergh and Gibbons 2011, Rhee and Fiss 2014).

The interaction term between *Nocompetition* and *New Model* is positive and significant in Models 4 and 5, providing support for H2. As predicted, the level of market competition an incumbent faces negatively moderates the relationship between the type of business model investment and firms' valuations such that incumbents facing a higher level of competition have lower valuations when they invest in the new model relative to when they invest in the existing one. A one-standard-deviation decrease in *Nocompetition* from its mean value (i.e., an increase in competition) is associated with a 1.0% lower CAR for investments within the decentralized model relative to those in the centralized model. Further, a decrease in the value of *Nocompetition* from 1 to 0 (which represents its full range) is associated with a 2.5% lower CAR for investments in the decentralized model relative to those in the centralized model.

The interaction term between *Alliance* and *New Model* is positive and statistically significant in Model 5, providing support for H3. Hence, the incumbent's mode of investment (alliance versus in-house) moderates the relationship between the type of business model investment and the firm's value such that investing via alliances (versus in-house) results in higher valuations when incumbents invest in the new model relative to when they invest in the existing model.[10] Undertaking an investment through an alliance as opposed to in-house is associated with a 1.6% higher CAR for decentralized model investments as compared with those in the centralized model. Figures 2–4 illustrate the interaction effects associated with *New Model* and *Existing Model Assets*, *Nocompetition*, and *Alliance* by plotting CARs based on the estimates in Model 5, holding all other variables at their average values.

Robustness Checks

We conducted a number of additional analyses to assess the robustness of our results. The results are reported in Table 4. Models 6–8 use different event windows for calculating CAR. Model 6 uses a three-day window [–1,1] and Model 7 uses a four-day window [–1,2]. The estimates are qualitatively similar to our main results and continue to provide statistical support

Table 2. Correlation Matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1. *New Model*	1.00																						
2. CAR [−2,2] %	−0.03	1.00																					
3. CAR [−1,1] %	−0.02	0.73	1.00																				
4. CAR [−1,2] %	−0.05	0.88	0.84	1.00																			
5. *Existing Model Assets*	−0.07	0.01	0.02	−0.02	1.00																		
6. *Nocompetition*	−0.13	0.05	0.01	0.04	0.21	1.00																	
7. *Alliance*	0.24	−0.01	0.02	0.02	0.00	−0.03	1.00																
8. *Transmission*	−0.09	0.03	−0.00	0.03	−0.04	0.41	−0.08	1.00															
9. *Distribution*	−0.06	0.01	0.01	0.03	−0.12	0.38	−0.05	0.69	1.00														
10. *Retail*	−0.01	−0.02	0.01	−0.03	−0.08	0.08	−0.02	0.08	0.07	1.00													
11. *Size*	0.04	−0.04	0.01	−0.05	0.63	−0.17	−0.02	−0.05	−0.17	0.28	1.00												
12. *Performance*	−0.08	−0.01	0.02	0.01	−0.06	−0.18	0.03	0.00	0.11	0.02	0.04	1.00											
13. *Plant Age*	−0.01	−0.01	−0.03	−0.05	0.13	−0.37	0.02	−0.27	−0.18	−0.06	0.16	0.09	1.00										
14. *RTO*	−0.04	−0.05	−0.05	−0.05	0.01	0.13	0.07	0.07	0.23	−0.14	−0.07	−0.11	0.10	1.00									
15. *Incentives*	0.13	−0.05	−0.01	−0.03	−0.20	−0.66	0.08	−0.25	−0.12	0.01	0.07	−0.00	0.19	−0.03	1.00								
16. *Light Intensity*	0.07	0.02	0.02	0.02	0.09	0.07	−0.01	0.15	−0.16	0.27	0.04	−0.12	−0.16	−0.50	−0.04	1.00							
17. *Market Share*	0.04	0.02	0.03	0.05	0.06	−0.02	0.05	0.23	0.41	−0.03	0.03	0.10	0.08	−0.06	0.13	0.05	1.00						
18. *Existing Model Cap. Share*	−0.07	−0.04	−0.02	−0.01	0.07	0.21	−0.01	0.25	0.42	−0.05	−0.07	−0.03	−0.23	−0.07	0.02	−0.04	0.39	1.00					
19. *New Model Penetration %*	0.07	0.00	0.00	−0.00	−0.09	−0.07	0.08	0.09	0.07	0.14	−0.04	−0.09	0.07	−0.02	0.19	0.23	0.31	0.03	1.00				
20. *Certain*	−0.08	−0.04	0.00	−0.02	0.07	0.09	−0.09	0.04	0.07	−0.06	−0.03	−0.06	−0.05	0.07	−0.05	−0.04	0.01	−0.01	−0.01	1.00			
21. *Debt-Equity*	0.00	0.03	0.04	0.02	−0.04	−0.00	−0.09	0.04	0.13	−0.08	−0.16	−0.23	0.13	0.26	0.08	−0.18	−0.08	−0.12	0.05	0.11	1.00		
22. *Ownership*	0.00	−0.01	−0.04	−0.02	−0.12	−0.13	0.00	−0.18	−0.41	−0.23	−0.35	−0.31	−0.04	−0.16	0.04	0.39	−0.22	−0.03	−0.04	0.01	0.06	1.00	
23. *Rating*	−0.01	0.00	−0.00	0.01	0.16	0.14	−0.02	0.09	0.11	0.10	0.31	0.02	−0.17	−0.16	−0.02	−0.09	0.14	0.13	0.05	−0.04	−0.40	−0.32	1.00

Table 3. Coefficient Estimates from Fixed Effects OLS Regressions

Model	Model 1	Model 2	Model 3	Model 4	Model 5
Dependent variable	(CAR[–2,2])	(CAR[–2.2])	(CAR[–2,2])	(CAR[–2,2])	(CAR[–2,2])
Transmission	0.0256	0.0274	0.0461	0.0371	0.0407
	(0.0407)	(0.0418)	(0.0406)	(0.0418)	(0.0398)
Distribution	–0.0672	–0.0700†	–0.0819*	–0.0735†	–0.0696†
	(0.0402)	(0.0412)	(0.0399)	(0.0411)	(0.0374)
Retail	0.0242*	0.0227†	0.0190	0.0125	0.0110
	(0.0120)	(0.0119)	(0.0122)	(0.0123)	(0.0124)
Size	0.00595	0.00599	0.0116	0.0132	0.0149
	(0.0127)	(0.0128)	(0.0130)	(0.0131)	(0.0129)
Performance	–0.0156	–0.0207	0.0334	0.0834	0.0870
	(0.182)	(0.186)	(0.174)	(0.175)	(0.175)
Plant Age	–0.000449	–0.000460	–0.000385	–0.000463	–0.000413
	(0.000638)	(0.000648)	(0.000665)	(0.000682)	(0.000691)
RTO	0.00774	0.00740	0.00844	0.00946	0.00903
	(0.00656)	(0.00663)	(0.00656)	(0.00648)	(0.00675)
Incentives	0.00789	0.00784	0.00739	0.00708	0.00755
	(0.0124)	(0.0124)	(0.0124)	(0.0116)	(0.0119)
Light Intensity	0.0276	0.0281	0.0212	0.0216	0.0174
	(0.0324)	(0.0329)	(0.0340)	(0.0329)	(0.0341)
Market Share	0.00743	0.00635	0.00679	0.00748	0.00627
	(0.0130)	(0.0125)	(0.0128)	(0.0121)	(0.0113)
Existing Model Cap. Share	–0.00835	–0.00873	–0.00795	–0.00708	–0.00722
	(0.00627)	(0.00641)	(0.00652)	(0.00633)	(0.00618)
New Model Penetration	–0.0324	–0.0266	–0.0302	–0.0160	–0.0175
	(0.0336)	(0.0359)	(0.0381)	(0.0340)	(0.0375)
Certain	–0.00520	–0.00554	–0.00571	–0.00593	–0.00631
	(0.00690)	(0.00698)	(0.00685)	(0.00673)	(0.00667)
Debt-Equity	0.00127	0.00134	0.00142	0.00156	0.00189
	(0.00179)	(0.00181)	(0.00179)	(0.00173)	(0.00188)
Ownership	–0.00295	–0.00265	–0.00572	–0.00644	–0.00651
	(0.0301)	(0.0313)	(0.0323)	(0.0337)	(0.0304)
Rating	0.00237	0.00243	0.00381	0.00466	0.00356
	(0.00494)	(0.00499)	(0.00539)	(0.00541)	(0.00541)
Existing Model Assets	–0.00221	–0.00217	–0.000716	0.000643	0.000437
	(0.00269)	(0.00271)	(0.00301)	(0.00339)	(0.00340)
Nocompetition	0.0109	0.0105	0.0110	0.00867	0.00735
	(0.00737)	(0.00753)	(0.00760)	(0.00754)	(0.00745)
Alliance	–0.00127	–0.000640	0.0000564	–0.000220	–0.00365
	(0.00344)	(0.00373)	(0.00387)	(0.00405)	(0.00389)
New Model		–0.00340	–0.00384	–0.00139	–0.00823
		(0.00444)	(0.00441)	(0.00330)	(0.00584)
H1: *New Model* × *Existing Model Assets*			–0.00659**	–0.00899**	–0.00971**
			(0.00214)	(0.00234)	(0.00251)
H2: *New Model* × *Nocompetition*				0.0248**	0.0235*
				(0.00888)	(0.00878)
H3: *New Model* × *Alliance*					0.0155*
					(0.00740)
Number of observations	512	512	512	512	512
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
R^2	0.102	0.103	0.117	0.130	0.137

Note. Standard errors in parentheses.
$^{\dagger}p < 0.1$; $^{*}p < 0.05$; $^{**}p < 0.01$.

Figure 2. Estimated Effect of *Existing Model Assets* on CAR for Investments Within the Existing (Centralized) and New (Decentralized) Business Models

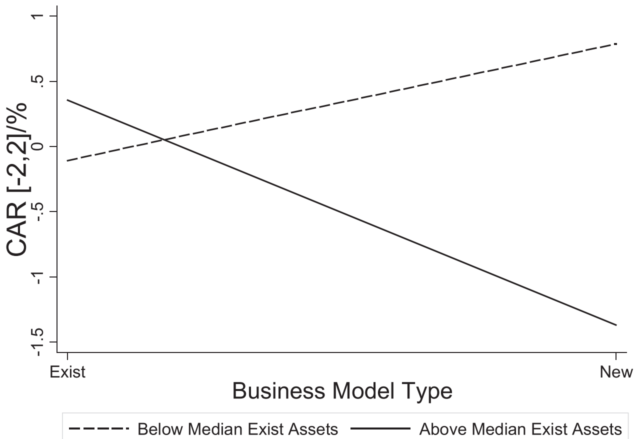
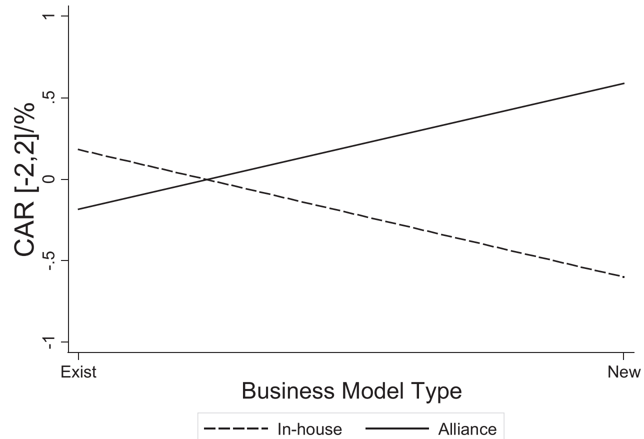


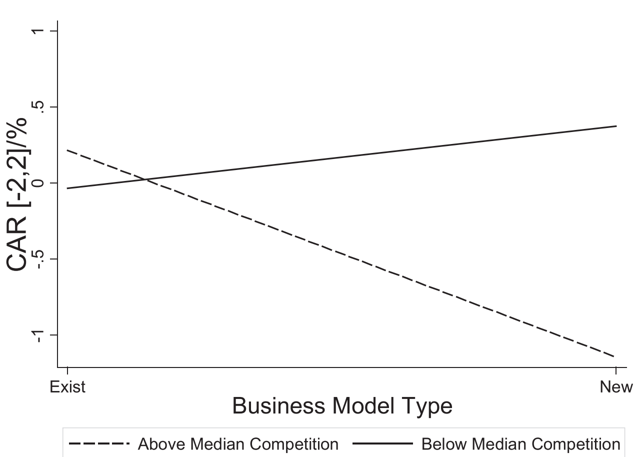
Figure 4. Estimated Effect of *Alliance* on CAR for Investments Within the Existing (Centralized) and New (Decentralized) Business Models



for H1–H3 with the exception that the interaction term for *New Model* × *Alliance* is positive but at an insignificant level ($p = 0.27$) in Model 6. This could be because of the inherent noisy nature of CAR, which results in low power of significance tests (e.g., MacKinlay 1997, Kothari and Warner 2008), and that this effect is likely magnified with a narrower CAR window. Model 8 uses a three-day window prior to the announcement [–3,–1]. This window is used to ensure that the change in firm value is indeed driven by the focal investment event. As expected, all of the estimates for the interaction terms are no longer statistically significant.

In Models 9 (CAR [–2,2]) and 10 (CAR [–1,2]), we use the coarsened exact matching approach (CEM) to address the potential endogeneity bias with respect to firms' investment decisions and the confounding effects among observables (Iacus et al. 2011).[11] We match observations using all the covariates in the main analysis except *Debt-equity*, *Ownership*, and *Rating*,

Figure 3. Estimated Effect of *Nocompetition* on CAR for Investments Within the Existing (Centralized) and New (Decentralized) Business Models



which are very similar (t-statistic < 0.10). These variables were all coarsened into 10 strata using the default algorithm utilized by the CEM Stata routine. Observations for investments in the centralized and decentralized models are then matched using the coarsened values of these covariates. Observations are dropped from the sample if there are no corresponding observations associated with the other business model in a strata associated with any covariate in the initial matching step. We then conduct the regression analyses on these matched observations (174 of 512 original observations), excluding the variable *Certain*, which does not vary across the matched samples, using year fixed effects only. The estimates using the CEM approach are qualitatively similar to our main results and continue to provide support for the hypotheses. The slightly higher p-value of 0.21 for the *New Model* × *Alliance* interaction term could be due to the low sample size.

In Model 11, we use an alternative measure for *Existing Model Assets*, which is the log-transformed count of unique generators owned by the firm. In Model 12, we exclude announcements related to smart technologies as these could support both models. In Model 13, we include 30 announcements that contain descriptions of both models and code them as decentralized. In Model 14, we include all investment announcements beyond the first associated with a specific activity. The results of Models 11–14 continue to support H1–H3.

Further, given that the earlier period may constitute significantly greater uncertainty with respect to the decentralized model, we performed an additional analysis only for investments announced between 2008 and 2011. As can be seen from Model 15, H1–H3 continue to be supported, and we observe that the coefficient for *New Model* is statistically significant and negative, suggesting that the initial investments may be subject to greater adjustment costs for all incumbents.

Table 4. Robustness Checks

Model	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
Dependent variable	(CAR[−1,1])	(CAR[−1,2])	(CAR[−1,−3])	(CAR[−2,2])	(CAR[−1,2])	(CAR[−2,2])	(CAR[−2,2])
Transmission	−0.0587	0.00138	0.0299	−0.00644	−0.00710*	0.0197	−0.0205
	(0.0416)	(0.0488)	(0.0303)	(0.00526)	(0.00331)	(0.0406)	(0.0540)
Distribution	0.0135	−0.0159	−0.0263	0.0260	0.0266†	−0.0749†	−0.0795†
	(0.0368)	(0.0391)	(0.0216)	(0.0189)	(0.0143)	(0.0406)	(0.0421)
Retail	0.0128*	0.00531	0.0155†	0.000158	−0.0105	0.0175	0.0202
	(0.00616)	(0.00630)	(0.00898)	(0.0134)	(0.0106)	(0.0134)	(0.0134)
Size	0.000356	0.0126	−0.00329	−0.00186	−0.00663	0.00474	−0.00940
	(0.0102)	(0.0121)	(0.00794)	(0.00801)	(0.00466)	(0.0171)	(0.0189)
Performance	0.152	0.0415	0.310*	0.551	0.301	0.0899	−0.119
	(0.146)	(0.160)	(0.120)	(0.321)	(0.301)	(0.182)	(0.198)
Plant Age	−0.0000502	−0.000455	0.0000364	−0.000768	−0.00128†	−0.000480	−0.000656
	(0.000594)	(0.000624)	(0.000539)	(0.000756)	(0.000629)	(0.000620)	(0.000772)
RTO	0.00576	0.0106	0.00281	0.0131	0.0152	0.00920	0.00808
	(0.00644)	(0.00643)	(0.00462)	(0.0129)	(0.00940)	(0.00674)	(0.00698)
Incentives	0.00343	0.00649	0.00915	0.0126	0.00225	0.00789	0.0110
	(0.00648)	(0.00770)	(0.00693)	(0.00900)	(0.00682)	(0.0115)	(0.0129)
Light Intensity	−0.0181	0.0181	0.0475*	0.0109	0.0177	0.0278	0.0428
	(0.0252)	(0.0272)	(0.0184)	(0.0136)	(0.0115)	(0.0282)	(0.0258)
Market Share	0.0112	0.00879	−0.00902	0.0116	0.00588	0.00832	0.00455
	(0.0127)	(0.0157)	(0.00666)	(0.0275)	(0.0185)	(0.0133)	(0.0101)
Existing Model Cap. Share	0.0106**	0.00237	−0.00647	−0.0163	−0.00686	−0.00773	0.00290
	(0.00356)	(0.00485)	(0.00414)	(0.0190)	(0.0166)	(0.00578)	(0.00849)
New Model Penetration	−0.00745	−0.0180	−0.0126	−0.0353	−0.0350	−0.0128	−0.0545
	(0.0255)	(0.0365)	(0.0220)	(0.0533)	(0.0389)	(0.0328)	(0.0395)
Certain	0.000583	−0.00456	0.000447			−0.00642	−0.00616
	(0.00454)	(0.00518)	(0.00482)			(0.00678)	(0.00685)
Debt-Equity	0.00187	0.00232†	0.00264**	0.00531**	0.00523**	0.00153	0.00188
	(0.00167)	(0.00138)	(0.000784)	(0.00138)	(0.000928)	(0.00180)	(0.00213)
Ownership	−0.00434	−0.0203	0.0341†	0.0258	−0.00676	−0.00502	−0.0117
	(0.0301)	(0.0308)	(0.0185)	(0.0425)	(0.0331)	(0.0282)	(0.0299)
Rating	0.00239	0.00545	−0.00502	0.00779	0.0106	0.00337	0.00285
	(0.00385)	(0.00482)	(0.00406)	(0.0118)	(0.00913)	(0.00519)	(0.00553)
Existing Model Assets	−0.0000819	0.000640	0.00265	0.0107**	0.0107**	0.00758	−0.00305
	(0.00294)	(0.00278)	(0.00265)	(0.00389)	(0.00291)	(0.0112)	(0.00285)
Nocompetition	−0.00357	0.00149	−0.00847	−0.00274	−0.0235*	0.00656	0.0106
	(0.00488)	(0.00593)	(0.00562)	(0.0144)	(0.00965)	(0.00741)	(0.00923)
Alliance	0.00107	−0.000834	−0.00696*	0.00591	0.00691	−0.00337	−0.00235
	(0.00307)	(0.00355)	(0.00290)	(0.00701)	(0.00506)	(0.00387)	(0.00420)
New Model	−0.00376	−0.00906*	−0.00174	−0.00733	−0.00860†	−0.00633	−0.00801
	(0.00383)	(0.00435)	(0.00375)	(0.00629)	(0.00424)	(0.00596)	(0.00802)
H1: *New Model × Existing Model Assets*	−0.00791**	−0.00973**	−0.00215	−0.00830†	−0.00810*	−0.0117*	−0.00990*
	(0.00132)	(0.00187)	(0.00183)	(0.00397)	(0.00286)	(0.00482)	(0.00394)
H2: *New Model × Nocompetition*	0.0138*	0.0230**	0.00706	0.0199†	0.0182†	0.0185*	0.0153
	(0.00632)	(0.00769)	(0.00657)	(0.0107)	(0.00863)	(0.00727)	(0.0113)
H3: *New Model × Alliance*	0.00605	0.0141*	0.00529	0.0120	0.0136*	0.0137†	0.0170†
	(0.00540)	(0.00526)	(0.00576)	(0.00928)	(0.00503)	(0.00749)	(0.00945)
Number of observations	512	512	512	174	174	512	481
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	No	No	Yes	Yes
R^2	0.125	0.141	0.139	0.273	0.283	0.125	0.147

Note. Standard errors in parentheses.
$^†p < 0.1$; $^*p < 0.05$; $^{**}p < 0.01$.

In Model 16, we include three additional covariates that place announcements into three categories. Category 1 is for the first announcement in the sample for a particular firm, Category 2 is for the second to fifth announcements, and Category 3 is for the sixth or later announcements. We do this to evaluate whether earlier

Table 4. (Continued)

Model	Model 13	Model 14	Model 15	Model 16	Model 17	Model 18
Dependent variable	(CAR[−2,2])	(CAR[−2,2])	(CAR[−2,2])	(CAR[−2,2])	(CAR[−2,2])	(CAR[−2,2])
Transmission	0.0214	0.0161	−0.0175	0.0472	0.118	−0.00127
	(0.0376)	(0.0346)	(0.192)	(0.0418)	(0.0798)	(0.00404)
Distribution	−0.0695*	−0.100**	−0.0852	−0.0695	−0.0664†	−0.00377
	(0.0315)	(0.0282)	(0.0542)	(0.0415)	(0.0353)	(0.00519)
Retail	0.0170	0.00823	0.0258	0.00978	0.00273	−0.00571
	(0.0120)	(0.00845)	(0.0233)	(0.0117)	(0.0362)	(0.0102)
Size	0.00919	−0.0132	−0.0742	0.0175	0.00974	−0.00369
	(0.0127)	(0.0109)	(0.0667)	(0.0133)	(0.0197)	(0.00222)
Performance	0.00773	0.0946	−0.268	0.0865	−0.0735	−0.0413
	(0.172)	(0.141)	(0.350)	(0.176)	(0.165)	(0.117)
Plant Age	−0.000417	0.000848	−0.00356	−0.000456	−0.00114†	0.000162
	(0.000645)	(0.000545)	(0.00257)	(0.000706)	(0.000650)	(0.000182)
RTO	0.0106†	0.00597	0.0836**	0.00852	0.00788	−0.00509
	(0.00630)	(0.00601)	(0.0225)	(0.00661)	(0.00800)	(0.00390)
Incentives	0.0100	0.00826	0.307	0.00829	0.00750	0.00239
	(0.0126)	(0.0124)	(0.406)	(0.0118)	(0.0115)	(0.00523)
Light Intensity	0.0315	0.0712*	−0.0260	0.0192	0.0832	0.00147
	(0.0368)	(0.0334)	(0.205)	(0.0332)	(0.0914)	(0.00431)
Market Share	0.0116	0.0137	0.0210	0.00544	0.00465	0.00896
	(0.0110)	(0.0154)	(0.0744)	(0.0117)	(0.0120)	(0.00849)
Existing Model Cap. Share	−0.00572	−0.00710	−0.00373	−0.00831	−0.00824	−0.00682
	(0.00557)	(0.00558)	(0.114)	(0.00657)	(0.00851)	(0.00416)
New Model Penetration	0.000460	0.0128	−0.105	−0.00797	0.0328	0.00425
	(0.0351)	(0.0388)	(0.485)	(0.0359)	(0.0446)	(0.0113)
Certain	−0.00719	−0.00500	−0.00866	−0.00651	−0.00729	−0.00730
	(0.00646)	(0.00472)	(0.00899)	(0.00682)	(0.00729)	(0.00584)
Debt-Equity	0.00165	0.00404**	−0.00132	0.00211	0.000615	0.00105
	(0.00184)	(0.00134)	(0.00313)	(0.00193)	(0.00195)	(0.000878)
Ownership	−0.00200	−0.00746	−0.0352	−0.00777	0.0106	−0.0112
	(0.0268)	(0.0206)	(0.0795)	(0.0310)	(0.0302)	(0.0111)
Rating	0.00397	0.00751	0.00205	0.00289	0.00800	0.000603
	(0.00520)	(0.00476)	(0.00891)	(0.00555)	(0.00627)	(0.00304)
Existing Model Assets	0.000431	0.00180	0.00137	0.0000502	−0.000151	0.00274†
	(0.00336)	(0.00409)	(0.00435)	(0.00335)	(0.00266)	(0.00153)
Nocompetition	0.00331	0.00457	0.0401**	0.00827	0.0202**	0.00210
	(0.00750)	(0.00639)	(0.0106)	(0.00787)	(0.00650)	(0.00390)
Alliance	−0.00381	−0.00145	−0.00477	−0.00326	−0.00278	−0.00318
	(0.00385)	(0.00254)	(0.00517)	(0.00400)	(0.00410)	(0.00307)
New Model	−0.00723	−0.00748	−0.0191†	−0.00876	−0.00798	−0.00687
	(0.00488)	(0.00507)	(0.00972)	(0.00583)	(0.00679)	(0.00512)
H1: *New Model × Exist Model Assets*	−0.00780**	−0.00662*	−0.0144**	−0.00991**	−0.0109**	−0.00739**
	(0.00227)	(0.00292)	(0.00335)	(0.00255)	(0.00315)	(0.00183)
H2: *New Model × Nocompetition*	0.0133†	0.0170	0.0391**	0.0232*	0.0238*	0.0264**
	(0.00702)	(0.0112)	(0.0125)	(0.00864)	(0.0101)	(0.00686)
H3: *New Model × Alliance*	0.0124†	0.0138*	0.0275†	0.0158*	0.0167*	0.0138†
	(0.00672)	(0.00610)	(0.0150)	(0.00734)	(0.00812)	(0.00718)
Number of observations	542	681	326	512	512	512
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	No
R^2	0.127	0.102	0.203	0.141	0.172	0.0622

Note. Standard errors in parentheses.
†$p < 0.1$; *$p < 0.05$; **$p < 0.01$.

investments have a different impact on firm value than later investments, but we did not find any statistical evidence of such an effect. Finally, we include state fixed effects in Model 17 and exclude firm fixed effects in Model 18 to assess the robustness of our main analysis, and observe very similar results.

Post Hoc Analysis

Our predictions with respect to incumbents' assets and competitive environment are premised on adjustment costs, especially those associated with the sharing of resources and managerial attention across business models and the conflict between managers within each model vying for limited resources exacerbated by the cannibalization of demand of one model by the other (e.g., Kim and Min 2015, Ahuja and Novelli 2016). While we find strong support for our predictions, we also looked for additional descriptive evidence that gets closer to the theorized mechanisms around adjustment costs.

We went through the annual reports of the firms in our sample from 2008 to 2015. While almost all incumbents mentioned the threat associated with the decentralized model as a major business risk, there was limited commentary with respect to the actual management and the performance of the new model itself. This is likely because of the low market penetration of the decentralized model in the United States, resulting in firms not explicitly reporting the performance or the challenges associated with their activities within the new model. The only exception was NRG, who reported large losses from their pursuit of the decentralized model, resulting in the CEO, David Crane, getting fired (e.g., Ferris et al. 2016, Lacey 2017). The CEO's departure was followed by a number of articles in the trade press describing the internal conflicts between the centralized and decentralized businesses, unforeseen delays and cost overruns during the implementation of the decentralized model, and the extensive competition that NRG faced from new entrants pursuing the decentralized model. Coincidently, NRG in our sample has among the highest level of generation assets and operates among the most competitive markets. Further, the following quotes from an employee and an analyst capture the challenges that NRG faced as it simultaneously pursued the emerging decentralized model in parallel to the existing centralized model:

> If each business [model] were fundamentally successful they would destroy each other. (Ferris et al. 2016)

> We hate to be the bearer of bad news [reality], but we have to remind investors that NRG receives ~80% of its earnings from traditional [centralized] fossil fuel power," wrote analyst firm CreditSights. "Management spends only 20% of its time talking about this side of the business and 80% on the much smaller green [decentralized] businesses. (Ferris et al. 2016)

Additionally, we also looked for descriptive evidence in global markets with a greater penetration of the decentralized model. Australia has the highest penetration of rooftop solar (16% of homes had rooftop solar in 2016) and Germany is among the highest (4%) (Abdelilah et al. 2016). Both of these markets are also highly competitive. As was the case for NRG, we found some descriptive evidence of similar challenges faced by incumbent utilities in Australia (Parkinson 2016) and in Germany (Richter 2013). For example, Parkinson (2016) highlights the difficulties faced by a large Australian incumbent utility, AGL, while pursuing the new model in tandem with the existing dominant model. The following quote captures the tension that AGL faced.

> This is the inherent contradiction in CEO Andrew Vesey's strategy. Vesey quite clearly "gets it" [the threat of the new decentralized model]... But for the next few decades at least, AGL's profits, and shareholder satisfaction, will be underwritten by its massive portfolio of brown coal-fired generators in Victoria's Latrobe Valley and black coal generators in NSW, along with its market-dominant gas plants in South Australia [i.e., the centralized model].

Similarly, Richter (2013, p. 1232) highlights, based on his fieldwork, the struggles of German utilities as they initiated their foray into the decentralized model but were unable to allocate sufficient attention and resources toward the new model. While many utilities saw the threat from the decentralized model, they struggled internally in justifying the value proposition, as depicted in the following quote from a manager.

> The main problem is to develop a product or service that offers sufficient value to the customer to be attractive, but also generates sufficient value to the utility to be profitable. I have been working on this for two years now and so far I haven't found a satisfying solution.

Although these strands of evidence are anecdotal, they help to demonstrate some of the challenges that incumbent utilities face in simultaneously managing the centralized and the decentralized model. This helps to reinforce the validity of our theorized mechanisms around adjustment costs.

Finally, we also investigate whether our findings may simply be driven by incumbents deploying new technologies (i.e., solar PV, battery) without any consideration of the differences in the business models. We ran a separate analysis of investments without specifying whether they were in the centralized or the decentralized models. We did this for all investments and only for those investments associated with solar PV and battery technologies. None of the theorized effects around asset stocks, competition, or alliance were found to be statistically significant. Taken together, these findings offer strong support for our theory and help us draw clearer inferences with respect to the underlying mechanisms.

Discussion

We examine the early stage of industry change in which incumbents face the emergence of a new business model that threatens the dominance of the existing model, but there is significant uncertainty with respect to whether and when the new model will dominate the industry. We focus on the challenges that incumbents face as they proactively pursue the new model in tandem with the existing model. Our theory is premised on the adjustment costs incurred by incumbents as they pursue both models (e.g., Helfat and Eisenhardt 2004, Argyres et al. 2015, Ahuja and Novelli 2016), and we argue that these adjustment costs will increase with the level of an incumbent's assets that are specific to the existing model, and the intensity of competition faced by the incumbent. We further argue that alliances, especially with partners from outside the industry, can help incumbents offset such adjustment costs.

We find support for our arguments in the context of the U.S. electric utility industry, which is undergoing a significant change from a centralized to a decentralized model of electricity generation and delivery. Incumbent electric utilities with a significant level of assets in centralized generation are the ones that are most threatened by the decentralized model as these assets cannot be deployed within the new model. However, as we observe, when these utilities are responsive to the forces of industry change and invest in the decentralized model, they suffer from lower valuations relative to when they invest in the centralized model. In contrast, we find that when utilities with a lower level of generation assets invest within the decentralized model, they achieve higher valuations relative to when they invest within the centralized model. In considering the nature of the competitive environment, investments in the new model are associated with lower valuations relative to those in the prevailing model when utilities operate in more competitive markets. Somewhat ironically, we find that incumbents who are likely to suffer from lower valuations when they invest in the new business model are the ones potentially most threatened by the change—that is, the incumbents who have accumulated significant asset stocks that cannot be deployed in the new model and those subject to a greater degree of market competition. This presents a dilemma for such firms: their sustainability may be contingent on their adaptation to industry change, but their attempts to adapt appear to be associated with lower firm valuations than simply continuing to participate in the existing business model. One way to resolve this incumbent's dilemma is through pursuit of the new model via alliances that helps to mitigate adjustment costs. Indeed, we find that incumbents' pursuit of the new model is associated with higher firm valuations when it is undertaken via alliances than when it is undertaken in-house.

The study makes several contributions to the strategy literature on industry change. It is among the first to explicitly consider the challenge that incumbents face in simultaneously managing the existing business model that generates most of the value and a new business model that threatens the existing model during the nascent period of industry change. In so doing, we show that the challenges of incumbency may not just be driven by issues of obsolescence of competences or inertia hindering the pursuit of the new model (e.g., Tripsas and Gavetti 2000, Gilbert 2005, Christensen 2006, Kapoor and Klueter 2015), but also challenges stemming from adjustment costs as incumbents proactively pursue the new model in tandem with the existing dominant model. This also helps to shed light on the difficulties that executives may face as they manage the balance between increasing value for their shareholders in the short term and staying relevant in the long term. The following quote highlights such a challenge that the major automotive manufacturers (e.g., General Motors, Ford Motor Company) are facing today with the advent of the emerging model of ride-hailing services using autonomous vehicles:

> The firm's [GM] difficulty lies in . . . spending enough to stay in this race but not too much on businesses that, at present, bring no returns. (A similar conundrum led to the ousting of Ford's chief executive, Mark Fields, last month.) (*The Economist* 2017)

Further, the study moves beyond the literature's focus on exploring the differences between incumbents and entrants to also considering the differences among incumbents (e.g., Eggers and Park 2018). Such an emphasis helps to identify why some incumbents may be able to navigate the changing industry landscape and others may stumble, despite being proactive in pursuing the new model. We highlight that incumbents can vary in their adjustment costs associated with the simultaneous pursuit of the new and existing business models. These differences stem from incumbents' asset bases and their competitive environments, which can exacerbate their adjustment costs, and the pursuit of the new model via alliances that can help mitigate these costs. At the same time, our findings speak to the scenario in which the new model may not fully replace the existing model for a prolonged period (e.g., Ahuja and Novelli 2016). Under such a scenario, it might be better for some incumbents (i.e., those with a high level of assets that cannot be deployed in the new model and those subject to more competitive environments) to hold back on allocating significant resources toward the new model. Hence, while the literature on industry change has emphasized the need for incumbents to respond swiftly in the face of the industry change, we suggest that at least for some incumbents, a slower response may actually be an appropriate response rather than a symptom of organizational inertia (e.g., Hill and Rothaermel 2003, Kapoor and Klueter 2015).

Finally, the study makes several empirical contributions. Extant research on industry change has primarily explored incumbent outcomes using market share or sales. Such an approach, while useful in assessing how incumbents fared in the new industry landscape once the change has been realized, is unable to evaluate the specific strategic decisions at the time during the nascent but critical stage of industry change. Through observing the implications of firms' strategic investments using CARs, we are able to directly evaluate the trade-offs faced by managers and the heterogeneity among incumbents. Further, by observing differences in firms' asset stocks and the extent of market competition in our empirical context, we are able to evaluate the effect of these important strategy constructs whose effects have been difficult to identify in other industry settings. Finally, much of the strategy literature has explored the phenomenon of industry change through the lens of new technologies (e.g., Agarwal and Tripsas 2008). This has at times masked the fact that new technologies can be commercialized across existing as well as new business models, as is the case with solar PV or battery technologies in our empirical context. If we were to only consider the solar PV and battery technologies in isolation from the different business models in which they can be deployed (i.e., centralized power plants versus decentralized rooftop systems), we would not be able to uncover the challenges that incumbent utilities are facing. Today, executives are much more concerned about new business models disrupting their industries than simply heeding the advent of new technologies (e.g., De Jong and Menno 2015). Hence, our findings have a high degree of relevance in today's environment.

The study has a number of limitations, which provide opportunities for future research. First, the analysis is carried out in a single industry context, and the generalizability and boundary conditions of the findings need to be established through studies in other settings. Relatedly, we are unable to account for the differences in the quality of the investments that incumbents make within the new and the existing business models. Second, examining the impact of incumbents' decisions on their firms' value using stock price data may not necessarily correspond with firms' performance in the long-run. Further, we make a key assumption that the change in firm's value is reflective of adjustment costs in the short-run. It is possible that some incumbents, despite incurring significant adjustment costs in the short-run, will still be able to successfully navigate the industry change in the long-run (e.g., Rosenbloom 2000). Future studies could explore both short- and long-run effects through different firm-level measures. Third, while we posit and provide some evidence that the adjustment costs for incumbents are likely to be greater with respect to new business models than with respect to new technologies (in existing business models), we are unable to systematically examine the differences between new technologies and new business models. Some of our theoretical mechanisms may also hold in the context of technological change even if there is no significant change to the business model, and we hope that future studies could explore this line of inquiry. Fourth, because of data nonavailability, we are unable to explore how firms may be able to lower their adjustments costs through specific types of internal organizational designs and processes (e.g., Taylor and Helfat 2009, Lavie et al. 2010). This could be an important avenue for future research.

Despite these and other limitations, the study offers an important contribution to the strategy literature. It focusses on the problem of allocating resources across existing and new business models during the nascent period of industry change. By exploring the impact of such decisions on firms' values, it identifies why some incumbents may be more likely to successfully adapt while others may struggle. Ironically, those incumbents potentially most threatened by the change seem to be the ones who are least rewarded for their efforts to renew themselves.

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Endnotes

[1] We note that some of our theoretical arguments may also hold in the context of industry change entailing only technological change with no significant impact on the prevailing business model. Consistent with the literature stream on business model change (e.g., Tripsas and Gavetti 2000, Christensen 2006, Markides 2006), we posit that adjustment costs for incumbents are greater with respect to new business models than with respect to new technologies in existing business models. Hence, while the directionality of the effect may be the same, the magnitude of the effect with respect to adjustment costs is likely to be greater for new business models than for new technologies.

[2] Another possible strategy for incumbents could be to abandon the existing model and to exclusively pursue the new model. However, this "switching" strategy (Ahuja and Novelli 2016) is unlikely to be undertaken during the nascent period of industry change when there is high degree of uncertainty with respect to the viability of the emerging

business model. Hence, in most industries subject to new business models, incumbents face the challenge of managing the existing and new business models simultaneously (e.g., Markides and Charitou 2004, Lavie et al. 2010, Tushman et al. 2010). Indeed, in our empirical setting, all incumbent firms continue to maintain the existing business model while pursuing the new model during 2008–2015.

[3] Alternatively, firms can pursue the new model through a variety of organizational designs. For example, firms can manage the new business model within their existing organizational structure, create a new internal organizational unit, or even create a separate legal entity. Each of these design choices might have a unique set of challenges around managing change as well as leveraging existing assets and competencies (Taylor and Helfat 2009). We are unable to explore these design choices because of data nonavailability but hope to explore them in future work.

[4] To test the robustness and completeness of our matching of subsidiaries to parent companies, we compare parent-level data on electricity generation capacity and number of customers for a sample of 30 firms for which parent-level data are available from public sources (e.g., company annual reports and 10-Ks) to the aggregate parent-level data captured from the EIA-861 and EIA-860 data. For both variables, there is no statistically significant difference between our imputed values using EIA-aggregated data and publicly available data for a given parent.

[5] Firms not included in the sample are small utilities that are not publicly listed, self-generating entities (e.g., large organizations that generate their own power), and global independent power producers who are not considered utilities as they do not sell electricity to consumers.

[6] These keywords are determined by one of the coauthors, who was previously a strategy manager in a large utility and who has undertaken multiple consulting engagements in the industry over a seven-year period.

[7] As robustness checks, we include all announcements beyond the first announcement in the analysis and code the 30 announcements as consistent with the decentralized business model.

[8] The abnormal return for firm i on day $t(AR_{it})$ is given by the equation $AR_{it} = R_{it} - (\alpha_i + \beta_i R_{mt})$, where R_{it} is the rate of return on the stock price for firm i on day t and R_{mt} is a market (m) index return on day t. β_i, the systematic risk of firm i, and α_i, the rate of return of the firm when R_{mt} is 0, are estimated using ordinary least squares (OLS) regression of R_{it} versus R_{mt} over a defined period prior to the announcement. We measure abnormal returns using EVENTUS software with Center for Research in Security Prices (CRSP) data and the CRSP-weighted market index as the proxy for market return in which α_i and β_i are estimated over a 255-day period starting 46 days prior to the announcement.

[9] The Database of State Incentives for Renewables and Efficiency (DSIRE) developed by North Carolina State University and funded by the U.S. Department of Energy captures incentives by state for a wide range of differing technologies at the residential, commercial, and industrial levels.

[10] Effectively, the interaction term evaluates the difference between [CAR (*Alliance/New Model*) – CAR (*Alliance/Existing Model*)] and [CAR(*In-house/New Model*) – CAR(*In-house/Existing Model*)].

[11] We use the CEM Stata Routine (http://gking.harvard.edu/cem) to perform this analysis. For the regression estimates, we use analytical weighted regression (using the Stata aweight function), enabling us to cluster our standard errors at the firm level.

References

Abdelilah Y, Collier U, Daszkiewicz K, Pharoah LF, Mercer M, Sakuma Y, Bahar H (2016) Renewable energy: Medium-term report. International Energy Agency, Paris.

Agarwal R, Tripsas M (2008) Technology and industry evolution. Shane S, ed. *The Handbook of Technology and Innovation Management*, vol. 1 (John Wiley & Sons, Chichester, UK), 3–56.

Ahuja G, Novelli E (2016) Incumbent responses to an entrant with a new business model: Resource co-deployment and resource redeployment strategies. Folta TB, Helfat CE, Karim S, eds. *Resource Redeployment and Corporate Strategy* (Emerald Group Publishing Limited, Bingley, UK), 125–153.

Ansari SS, Garud R, Kumaraswamy A (2015) The disruptor's dilemma: TiVo and the U.S. television ecosystem. *Strategic Management J.* 37(9):1829–1853.

Argyres N, Bigelow L, Nickerson JA (2015) Dominant designs, innovation shocks, and the follower's dilemma. *Strategic Management J.* 36(2):216–234.

Ba S, Lisic LL, Liu Q, Stallaert J (2013) Stock market reaction to green vehicle innovation. *Production Oper. Management* 22(4):976–990.

Barney J (1991) Firm resources and sustained competitive advantage. *J. Management* 17(1):99–120.

Bergh DD, Gibbons P (2011) The stock market reaction to the hiring of management consultants: A signalling theory approach. *J. Management Stud*. 48(3):544–567.

Bun MJG, Harrison TD (2018) OLS and IV estimation of regression models including endogenous interaction terms. *Econometric Rev*., ePub ahead of print March 8, https://doi.org/10.1080/07474938.2018.1427486.

Caldecott B, McDaniels J (2014) Stranded generation assets: Implications for European capacity mechanisms, energy markets and climate policy. Working paper, Smith School of Enterprise and the Environment, University of Oxford, Oxford, UK.

Chan SH, Kensinger JW, Keown AJ, Martin JD (1997) Do strategic alliances create value? *J. Financial Econom.* 46(2):199–221.

Chatterjee S, Lubatkin MH, Schweiger DM, Weber Y (1992) Cultural differences and shareholder value in related mergers: Linking equity and human capital. *Strategic Management J.* 13(5):319–334.

Christensen CM (2006) The ongoing process of building a theory of disruption. *J. Product Innovation Management* 23(1):39–55.

Cretys J, Guccione L (2015) The economics of grid defection. Report, Rocky Mountain Institute, Boulder, CO.

Das S, Sen PK, Sengupta S (1998) Impact of strategic alliances on firm valuation. *Acad. Management J.* 41(1):27–41.

De Jong M, Menno VD (2015) Disrupting beliefs: A new approach to business-model innovation. *McKinsey Quart*. (3):66–75.

Delmas M, Russo MV, Montes-Sancho MJ (2007) Deregulation and environmental differentiation in the electric utility industry. *Strategic Management J.* 28(2):189–209.

Dierickx I, Cool K (1989) Asset stock accumulation and sustainability of competitive advantage. *Management Sci*. 35(12): 1504–1511.

Doukas J, Switzer L (1992) The stock market's valuation of R&D spending and market concentration. *J. Econom. Bus.* 44(2):95–114.

Dyer JH, Singh H (1998) The relational view: Cooperative strategy and sources of interorganizational competitive advantage. *Acad. Management Rev.* 23(4):660–679.

Economist, The (2013) How to lose half a trillion euros: Europe's electricity providers face existential threat. (October 12), https://www.economist.com/briefing/2013/10/15/how-to-lose-half-a-trillion-euros.

Economist, The (2017) General Motors is getting smaller but more profitable. (June 24), https://www.economist.com/business/2017/06/24/general-motors-is-getting-smaller-but-more-profitable.

Eggers JP, Park KF (2018) Incumbent adaptation to technological change: The past, present, and future of research on heterogeneous incumbent response. *Acad. Management Ann.* 12(1): 357–389.

Ferreira MA, Matos P (2008) The colors of investors' money: The role of institutional investors around the world. *J. Financial Econom.* 88(3):499–533.

Ferris D, Klump E, Kahn D (2016) Why NRG's green crusade faltered. *Energywire* (March 7), https://www.eenews.net/stories/1060033507.

Gilbert CG (2005) Unbundling the structure of inertia: Resource vs. routine rigidity. *Acad. Management J.* 48(5):741–763.

Girotra K, Terwiesch C, Ulrich KT (2007) Valuing R&D projects in a portfolio: Evidence from the pharmaceutical industry. *Management Sci.* 53(9):1452–1466.

Gulati R, Lavie D, Singh H (2009) The nature of partnering experience and the gains from alliances. *Strategic Management J.* 30(11): 1213–1233.

Haans RFJ, Pieters C, He Z-L (2015) Thinking about U: Theorizing and testing U- and inverted U-shaped relationships in strategy research. *Strategic Management J.* 37(7):1177–1195.

Hair JF, Anderson RE, Tatham RL, Black WC (1998) *Multivariate Data Analysis*, 5th ed. (Prentice Hall International, New York).

Hannes B, Abbott M (2013) Distributed energy: Disrupting the utility business model. White paper, Bain & Company, Boston.

Hashai N (2015) Within-industry diversification and firm performance—An S-shaped hypothesis. *Strategic Management J.* 36(9):1378–1400.

Helfat CE, Eisenhardt KM (2004) Inter-temporal economies of scope, organizational modularity, and the dynamics of diversification. *Strategic Management J.* 25(13):1217–1232.

Henderson RM, Clark KB (1990) Architectural innovation: The reconfiguration of existing product technologies and the failure of established firms. *Admin. Sci. Quart.* 35(1):9–30.

Hill CWL, Rothaermel FT (2003) The performance of incumbent firms in the face of radical technological innovation. *Acad. Management Rev.* 28(2):257–274.

Hummel P, Houchois P, Dewhurst J, Gandolfi A, Hunt S, Lesne D, Oldfield S, et al. (2014) Will solar, batteries and electric cars re-shape the electricity system? Global Utilities, Autos & Chemicals: UBS Analyst Report, UBS Limited, London.

Iacus SM, King G, Porro G (2011) Causal inference without balance checking: Coarsened exact matching. *Political Anal.* 20(1): 1–24.

Joseph J, Ocasio W, McDonnell M-H (2014) The structural elaboration of board independence: Executive power, institutional logics, and the adoption of CEO-only board structures in U.S. corporate governance. *Acad. Management J.* 57(6):1834–1858.

Joskow PL (2006) Introduction to electricity sector liberalization: Lessons learned from cross-country studies. Sioshansi FP, Pfaffenberger W, eds. *Electricity Market Reform: An International Perspective*, 1st ed. (Elsevier, Oxford, UK), 1–32.

Kale P, Dyer JH, Singh H (2002) Alliance capability, stock market response, and long-term alliance success: The role of the alliance function. *Strategic Management J.* 23(8):747–767.

Kapoor R, Klueter T (2015) Decoding the adaptability-rigidity puzzle: Evidence from pharmaceutical incumbents' pursuit of gene therapy and monoclonal antibodies. *Acad. Management J.* 58(4): 1180–1207.

Kim SK, Min S (2015) Business model innovation performance: When does adding a new business model benefit an incumbent? *Strategic Entrepreneurship J.* 9(1):34–57.

Kothari SP, Warner JB (2008) Econometrics of event studies. Eckbo BE, ed. *Handbook of Empirical Corporate Finance*, Handbooks in Finance (Elsevier, Amsterdam), 3–36.

Lacey S (2017) NRG fully exits the home solar installation business. *Greentech Media* (October 12), https://www.greentechmedia.com/articles/read/nrg-sheds-the-final-remnants-of-its-home-solar-business.

Lavie D, Stettner U, Tushman ML (2010) Exploration and exploitation within and across organizations. *Acad. Management Ann.* 4(1): 109–155.

Leslie J (2017) Utilities grapple with rooftop solar and the new energy landscape. *Yale Environment 360 (Yale School of Forestry & Environmental Studies)* (August 31), https://e360.yale.edu/features/utilities-grapple-with-rooftop-solar-and-the-new-energy-landscape.

Lubatkin M (1987) Merger strategies and stockholder value. *Strategic Management J.* 8(1):39–53.

MacKinlay AC (1997) Event studies in economics and finance. *J. Econom. Lit.* 35(1):13–39.

Markides C (2006) Disruptive innovation: In need of better theory. *J. Product Innovation Management* 23(1):19–25.

Markides C, Charitou CD (2004) Competing with dual business models: A contingency approach. *Acad. Management Executive* 18(3):22–36.

McWilliams A, Siegel D (1997) Event studies in management research: Theoretical and empirical issues. *Acad. Management J.* 40(3):626–657.

Montgomery C, Singh H (1987) Corporate acquisition strategies and economic performance. *Strategic Management J.* 8(4): 377–386.

Nizalova OY, Murtazashvili I (2016) Exogenous treatment and endogenous factors: Vanishing of omitted variable bias on the interaction term. *J. Econometric Methods* 5(1):71–77.

Parkinson G (2016) AGL Energy's Jekyll and Hyde pitch to consumers and investors. *RenewEconomy* (November 16), https://reneweconomy.com.au/agl-energys-jekyll-hyde-pitch-consumers-investors-11408.

Petersen MA (2009) Estimating standard errors in finance panel data sets: Comparing approaches. *Rev. Financial Stud.* 22(1): 435–480.

Pfarrer MD, Pollock TG, Rindova VP (2010) A tale of two assets: The effects of firm reputation and celebrity on earnings surprises and investors' reactions. *Acad. Management J.* 53(5): 1131–1152.

Porter ME (2008) *Competitive Advantage: Creating and Sustaining Superior Performance* (Simon & Schuster, New York).

Rhee E, Fiss P (2014) Framing controversial actions: Regulatory focus, source credibility, and stock market reaction to poison pill adoption. *Acad. Management J.* 57(6):1734–1758.

Richter M (2013) Business model innovation for sustainable energy: German utilities and renewable energy. *Energy Policy* 62: 1226–1237.

Rosenbloom RS (2000) Leadership, capabilities, and technological change: The transformation of NCR in the electronic era. *Strategic Management J.* 21(10/11):1083–1103.

Rothaermel FT (2001) Incumbent's advantage through exploiting complementary assets via interfirm cooperation. *Strategic Management J.* 22(6-7):687–699.

Schwieters N, Flaherty T (2015) A strategist's guide to power industry transformation. *strategy+business* (Issue 80, Autumn), http://www.strategy-business.com/article/00355.

Taylor A, Helfat CE (2009) Organizational linkages for surviving technological change: Complementary assets, middle management, and ambidexterity. *Organ. Sci.* 20(4):718–739.

Toh PK, Kim T (2013) Why put all your eggs in one basket? A competition-based view of how technological uncertainty affects a firm's technological specialization. *Organ. Sci.* 24(4): 1214–1236.

Tripsas M (1997) Unraveling the process of creative destruction: Complementary assets and incumbent survival in the typesetter industry. *Strategic Management J.* 18(S1):119–142.

Tripsas M, Gavetti G (2000) Capabilities, cognition, and inertia: Evidence from digital imaging. *Strategic Management J.* 21(10-11): 1147–1161.

Tushman ML, Anderson P (1986) Technological discontinuities and organizational environments. *Admin. Sci. Quart.* 31(3): 439–465.

Tushman ML, Smith WK, Wood RC, Westerman G, O'Reilly C (2010) Organizational designs and innovation streams. *Indust. Corporate Change* 19(5):1331–1366.

United States Department of Energy (2003) *"Grid 2030"—A National Vision for Electricity's Second 100 Years* (U.S. Department of Energy, Washington, DC).

Woolridge JR, Snow CC (1990) Stock market reaction to strategic investment decisions. *Strategic Management J.* 11(5):353–363.

Zott C, Amit R, Massa L (2011) The business model: Recent developments and future research. *J. Management* 37(4): 1019–1042.

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