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The Limits of Asset-Light: Bottlenecks and Asset Ownership in Platform Markets

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ABSTRACT

By allowing firms to grow without major investments in physical assets (the so-called “asset-light” approach), platforms can significantly enhance firms’ performance, which has led firms in various industries to adopt asset-light platform approaches. At the same time, the literature on ecosystems suggests that platform firms may experience bottlenecks that require investments in physical infrastructure. However, thus far the literatures on platforms and ecosystems provide only limited insights into the specific bottlenecks that may induce firms to forgo asset-light approaches. To investigate how bottlenecks drive firms to deviate from an asset-light approach and invest in physical assets, we use a qualitative case study in the mobility sector. We identify three main bottlenecks that incentivize firms to invest in physical assets and differ in the immediacy of their impact on firms: (1) supply, (2) reputation, and (3) innovation bottlenecks. In addition, for each of the bottlenecks, we identify firm-external antecedents, which we use to develop a novel theoretical framework showing the circumstances under which firms forgo platform approaches. Overall, we contribute to the literature by providing a contingency perspective on platforms, providing a more dynamic, long-term perspective on platform strategies and helping to bridge the related, but separate, literature streams on platforms and innovation ecosystems.

Keywords: Platforms; bottlenecks; asset-light; asset ownership; case study

INTRODUCTION

In recent years, the concept of digital platforms has attracted increasing interest from academics in the field of strategic management (Chen, Tong, Tang, & Han, 2022). Digital platforms¹, defined as IT-enabled multi-sided marketplaces that facilitate interaction between different user groups via a technological interface (McIntyre & Srinivasan, 2017), form the basis of the strategies of many of the world's most valuable companies, such as Google, Facebook, and Amazon. This has induced firms in many industries to invest considerable resources in platform approaches to complement or replace their existing products and services.

Given the increasing diffusion and strong popularity of platform businesses, it is not surprising that scholars have become interested in understanding the underlying drivers and processes of platform implementation (Gawer, 2014; McIntyre & Srinivasan, 2017). The literature shows that one important advantage of platforms is their ability to reduce interaction costs for users. Another advantage of platforms is that they rely on reprogrammable digital technology, which makes them highly flexible with regard to their application (Cusumano, Gawer, & Yoffie, 2019; Gawer, 2021). One of the most interesting features of platforms, however, is that they require only limited investments in physical assets (so-called "asset-light" approaches). This allows platform firms to quickly scale up their business without major capital investments, generate network effects, and achieve high profits in relation to their invested asset base (Evans & Gawer, 2016). Firms in many industries have therefore sought to replicate the success of Google, Facebook, or Amazon by developing an asset-light platform approach.

¹ The growing body of literature on platforms and ecosystems has conceptualized platforms in many ways. From an economics perspective, platforms have been defined as multi-sided markets that facilitate exchange and conceptualized as multi-sided markets facilitating interaction between different user groups via the technological interface of the platform (McIntyre & Srinivasan, 2017). Hence, the concept used in this paper is also in line with the type of platforms that Gawer (2021) labels "transaction platforms" (e.g. Uber). We consider the multiple sides of the platform as users providing services or products and users purchasing said services or products via the platform (Gawer, 2021).

Interestingly, as platform approaches spread, evidence is emerging that asset-light approaches, despite their many advantages, might not be beneficial under all circumstances. Specifically, the literature on ecosystems stresses that platform firms may see the emergence of bottlenecks in their ecosystem, which constrain value creation and require investments in physical assets (Baldwin, 2015, 2019; Kapoor, 2018). Ecosystems can be defined as “the alignment structure of the multilateral set of partners that need to interact in order for a focal value proposition to materialize” (Adner, 2017: 40). In other words, ecosystems describe the phenomenon that often firms no longer develop, produce, and market products on their own. Instead, they rely on other firms producing components and complementary products and services, such that customer value is created by a set of firms (i.e., the ecosystem) (Kang & Suarez, 2023). In the case of platforms, much of the value is created by the platform users (e.g., sellers on Amazon), implying that bottlenecks in value creation among the users reduce the value the platform provides to the user. The literature on ecosystems suggests that in such situations platform firms may be required to strategically address the bottleneck by investing physical assets (Jacobides & Billinger, 2006; Kapoor, 2013). For example, to address strategic bottleneck in its ecosystem, Amazon invested in delivery trucks to set up its own delivery service (Gawer, 2021).

While the literature on ecosystems suggests that bottlenecks may undermine platform performance, thus far we know very little about the specific bottlenecks platform firms face that may induce them to invest in physical assets to address them (Cusumano et al., 2019). Initial studies have pointed to challenges and bottlenecks that platforms may face due to their lack of control over assets, such as quality issues or shortages in asset supply (Gawer, 2021, 2022). However, thus far, we lack systematic empirical studies that explore the bottlenecks and their antecedents in the context of platforms to understand the circumstances under which the limits of an asset-light approach are reached.

To address these shortcomings, we use a qualitative multiple case study with an embedded design in the mobility sector. This setting is well suited to our purpose because mobility firms increasingly invest in digital platforms to offer transportation services, but in several instances firms (both those investing in platforms and not) actively decided against asset-light approaches. This heterogeneity allowed us to study the bottlenecks that drive firms to reject asset-light platform models and to make three core contributions. As the first and most important contribution, our study provides a contingency perspective on platforms. While recent work has started to investigate the challenges of asset-light approaches, we are the first to provide a systematic overview of the bottlenecks that drive platform firms to invest in assets. Specifically, we present a framework showing that investing in assets is useful when such firms face (a) supply, (b) reputation, and (c) innovation bottlenecks. For each of these bottlenecks we identify specific antecedents in the firm's ecosystem, thereby providing useful guidance for firms considering investments in platform approaches.

Second, we add to the literature on transaction platforms by providing a more dynamic, long-term perspective on platform strategies (e.g., Gawer & Henderson, 2007). The previous literature suggests that asset-light approaches are connected with superior long-term performance. Our findings suggest that this assumption may not hold under all circumstances, since asset-light approaches might lead to situations where firms face constraints on their ability to innovate, since they lack the possibility to experiment with alternative ways of using assets. We also show that the three bottlenecks we identify differ in the immediacy of their impact on the firm. While supply bottlenecks have an immediate effect, as they make exchange impossible, reputation bottlenecks pose a challenge for the business primarily in the medium term, while the impact of innovation bottlenecks will primarily be felt in the more distant future.

Third and finally, our study helps to bridge the distinct but related research streams on platforms and innovation ecosystems (e.g., Granstrand & Holgersson, 2020). While the literature on platforms stresses the role of asset-light approaches, the literature on innovation ecosystems recommends that firms strategically occupy bottlenecks by investing in physical complements. With our analysis, we contribute to the literature by showing the specific bottlenecks that emerge in the context of platforms and that under some conditions it may be crucial for platforms to address these bottlenecks in their ecosystem, even if this means investing in physical assets.

THEORETICAL BACKGROUND

Platforms and Strategy

Over recent years, strategy scholars have taken an increasing interest in the concept of platforms. Platforms can take many different forms, but the literature distinguishes two primary kinds: innovation and transaction platforms. The former refers to technological platforms and their complementary products (e.g., the iOS operating system on the iPhone and complementary apps). The latter describes multi-sided markets that connect the supply side with the demand side, essentially functioning as matchmakers between groups that previously had no access to each other (e.g. eBay, which connects private buyers and sellers of goods) (Cusumano et al., 2019; Evans & Schmalensee, 2016; Grabher & van Tuijl, 2020). Transaction platforms allow users to exchange goods, services, or information via a digital interface (Evans & Gawer, 2016). Although hybrid forms also exist, this study focuses on the concept of platforms as transaction platforms (Cusumano et al., 2019).

For the firms that operate them, platforms promise significant market power resulting in high profits, which is why they have become a central element of firms' strategies in many industries (Eisenmann, Parker, & van Alstyne, 2006). The platform provider who can capture a significant

market share early on has a significant advantage and may end up dominating the market (so-called “winner-takes-all” markets). This is because platforms are often characterized by network effects, i.e., adding more users will increase the value of the platform, creating an additional incentive for further users to join and use it (Gawer, 2021). For example, the value of using a social media platform such as Facebook is significantly higher if the platform is used by more individuals. As a consequence, a platform owner needs to ensure that both sides are well populated in order for network effects to arise (Schüßler, Attwood-Charles, Kirchner, & Schor, 2021).

Once a platform market has tipped in favor of a single provider, network effects from the platform coupled with high switching costs often discourage users from leaving. Therefore, it becomes more difficult for new entrants to succeed in the market (Eisenmann, Parker, & van Alstyne, 2011; Gawer, 2021). For the same reason, many firms favor first-to-market strategies to lock in resources, complementors, and users (Schilling, 2020). Many platform firms accept significant early losses (e.g., Uber) with the goal of acquiring a large market share and ultimately becoming the dominant platform. Such dominance confers great market power on the platform and may allow it to recoup its early losses (Kretschmer, Leiponen, Schilling, & Vasudeva, 2020).

However, research on platform strategy has also pointed to an alternate approach to winner-takes-all dynamics. In some cases, it may be more beneficial for platforms to assume a unique identity in the market (pursuing platform distinctiveness) rather than positioning themselves in the largest available market segment to achieve rapid growth (pursuing winner-takes-all dynamics) (Cennamo, 2021; Cennamo & Santaló, 2013). Acquiring scale quickly may give platforms a head start, but this advantage can also quickly disappear (Cennamo, 2018). Instead, prior research has stressed the importance of thoughtfully selecting the appropriate strategy to avoid some of the pitfalls that other platforms have experienced (e.g., unfocused growth, overlooking complementors’ value to the

platform) (Cennamo & Santaló, 2015). Rather than scaling rapidly, platforms may instead decide to undercut the competition to enhance their attractiveness to users on either side (Panico & Cennamo, 2020), pay more attention to market communication activities (Shi, Li, & Chumnumpan, 2021), provide first-party content on the supply side themselves to set a qualitative example and provide a starting point for acquiring further demand-side users (Cennamo, 2018; Hagi & Spulber, 2013) or strategically decide which complementors to promote (or not promote) in order to boost ecosystem value (Rietveld, Schilling, & Bellavitis, 2019).

Asset-light as a Specific Characteristic of Platforms

Apart from offering the prospect of winner-takes-all markets, a key characteristic of platforms is that the firms operating them do not have to make major investments in physical assets—a so-called “asset-light” approach (Davis, 2016; Gawer, 2021). For instance, Airbnb, despite being a platform for booking vacation homes, has no physical housing stock of its own, while Uber, although it provides taxi services, owns no fleets itself (Goodwin, 2015). Instead, platform firms connect with asset-heavy firms that own the assets they require and shift the responsibility for physical logistics onto them (Grabher & van Tuijl, 2020; Köbis, Soraperra, & Shalvi, 2021). The platform firm itself, meanwhile, usually focuses on orchestrating the users on both sides of the platform by means of digital technologies (e.g., big data, algorithms) (Gawer, 2022; Kenney & Zysman, 2016; van Alstyne & Parker, 2017). Instead of selling physical goods, profits in platform-based approaches are usually generated by hosting third-party advertisements on the platform or charging a fee per transaction (Bonina, Koskinen, Eaton, & Gawer, 2021).

According to the literature, the fact that platform firms need not make major investments in physical assets offers at least three advantages. First, it directly reduces firms’ costs and raises profits as it reduces capital requirements and related interest payments as well as the costs connected to

maintaining physical assets. By reducing the amount of equity that is required, platform approaches also allow firms to achieve high profit margins (e.g., return on assets). Second, previous studies suggest that by pursuing an asset-light approach, firms can quickly scale up their business and capture market share. Indeed, using a digital platform allows a business to grow without having to make any major investments at all (Chen et al., 2022; Gawer, 2021). Third, platforms provide firms with the flexibility to quickly change their strategic orientation, since changes in the environment do not require them to go through the onerous process of adjusting physical assets (Gawer, 2022; Pelzer, Frenken, & Boon, 2019; Thelen, 2018). Digital technologies allow assets to be reprogrammed and repurposed, hence enabling companies to shift the functionality of their assets if their old purpose has become obsolete (Yoo, Henfridsson, & Lyytinen, 2010). Prior research has argued that for these reasons, transaction platforms represent the most general form of platforms, capable of being deployed in a wide range of societal environments without major requirements regarding skills or technologies (Kirchner & Schüßler, 2020).

Ecosystem Bottlenecks as Drivers of Asset Investments

The previous section suggests that pursuing a platform approach offers considerable promise to firms and that the advantages are particularly large if firms forgo investments in assets. Recent research, however, has started to question whether an asset-light approach is advantageous under all strategic circumstances (Köbis et al., 2021). Specifically, the literature on ecosystems suggests that as firms forgo investments in physical assets, they become dependent on other firms that provide components or complementary products and services. This, in turn, may make them vulnerable to the emergence of bottlenecks in the ecosystem. Bottlenecks are those elements in a complex system whose performance limits the performance of the system as a whole (Baldwin, 2015, 2019; Kapoor, 2018). In ecosystems, they can emerge both upstream and downstream and, by constraining a

customer's ability to derive the full benefit of the ecosystem's solution, inhibit value creation for all ecosystem members (Adner & Kapoor, 2010). For example, Amazon depends on both its sellers and its delivery suppliers. If, for some reason, there is a bottleneck in dispatch or delivery, this reduces the value Amazon creates for its customers, since customers have to wait longer for the items they purchased.

Given that bottlenecks can inhibit value creation, the literature suggests that firms must strategically address them, e.g., by collaborating with suppliers and complementors or vertically integrating into bottleneck positions (Jacobides & Billinger, 2006; Kapoor, 2013). For platform firms, this implies that they might have to strategically invest in physical assets to remove bottlenecks (Agarwal & Kapoor, 2023) since recent research has also suggested that platforms cannot take the existence of complementors for granted, but have to strategically support and foster their growth as well (Shi et al., 2021). By vertically integrating, firms can innovate system-wide (Kapoor, 2013). Firms may also benefit from greater transparency, improved value-chain monitoring, better efficiency, or enhanced innovation efforts (Jacobides & Billinger, 2006). This explains why even successful platform companies, such as Apple or Amazon, have made strategic investments in physical assets to regain or maintain control over their ecosystem (Shi et al., 2021). For example, despite pursuing a platform approach, Amazon invested in delivery trucks to set up its own delivery service (Gawer, 2021).

Bottlenecks in Platform Approaches

While the literature on ecosystems suggests that bottlenecks may undermine platform performance, thus far we lack systematic empirical evidence about the specific bottlenecks platform firms face that may induce them to invest in physical assets to address them (Cusumano et al., 2019). Previous studies indicate that one reason why firms invest in assets may lie in the fact that an asset-light approach entails a loss of control over the services and goods a platform offers (Parker & van Alstyne, 2014; Shi et al., 2021). Specifically, the literature has pointed to three main domains in which such loss of control may occur, potentially hurting the platform.

First, platform firms that forgo asset ownership may run into quality problems with their goods and services. Since platform companies do not manufacture or directly sell the products themselves (Shi et al., 2021), they run the risk of opportunistic behavior on the part of asset owners on the supply side of the platform, which in turn results from information asymmetries between the asset owner and the platform firm (Evans, 2012). Platform complementors may even try to take advantage of free-riding effects, which can undermine value creation on the platform for both users and the platform itself (Cennamo & Santaló, 2019). In order to manage the bottleneck and regain control and reduce uncertainty, platform firms can impose different governance mechanisms, e.g., introduce quality standards or regulate the type of participation allowed on the platform (Chen, Richter, & Patel, 2021; Zhang, Li, & Tong, 2022). Reviews or rating systems have become a particularly popular means to control quality standards on both sides of a platform (Cameron & Rahman, 2022; Evans, 2012; Lygnerud & Nilsson, 2021). Yet even these mechanisms cannot completely make up for platform owners' lack of control over the products or services offered (Köbis et al., 2021; Lygnerud & Nilsson, 2021; McIntyre, Srinivasan, Afuah, Gawer, & Kretschmer, 2021). As Parker and van Alstyne (2014)

point out, quality issues become particularly problematic for platforms if low-quality offers drive out high-quality ones.

Second, by forgoing asset ownership, platform firms limit their own control over the supply of assets, which may lead to situations in which critical asset providers decide to stop cooperating with the platform, thus creating a bottleneck in asset supply for the platform. If a platform firm does not own and operate the assets itself, a competing platform may enter the market and encourage asset providers to join their new platform as well (Hermes, Guhl, Schrieck, Weking, & Krcmar, 2021)—the process sometimes referred to as “multi-homing” (Parker & van Alstyne, 2014). For the incumbent platform, multi-homing reduces the supply of assets (i.e., creating a bottleneck) and poses a threat to the survival of their business, since the availability of assets is a critical determinant of platform attractiveness and network effects. An example of a company that has suffered from multi-homing is Uber, since many Uber drivers also work for other platforms, such as Lyft (Zhu & Iansiti, 2019). To address this bottleneck in the supply of drivers and discourage multi-homing, Uber has subsidized the supply-side of its platform. This has imposed a heavy financial burden on the company but brought only limited success: drivers are still multi-homing, the overall supply of drivers remains a bottleneck to the platform (Rietveld & Schilling, 2020). The lack of control over workforces that are mediated through the platform represents another challenge that platform companies face (Rahman & Valentine, 2021).

Third, firms that forgo asset ownership can face potential reputation and legitimacy issues resulting from precarious working conditions on the part of asset providers. When firms decide to use others’ assets, they usually also outsource the corresponding services to avoid formal labor relationships with employees (Frenken, Vaskelainen, Fünfschilling, & Piscicelli, 2020). The fact that asset operators compete with others on the platform for customers, however, has led not only to a

bottleneck in ensuring service quality (see above) but also to a proliferation of poor working conditions and low social standards among asset operators (Köbis et al., 2021). Even though these conditions are not directly controlled by the platform firm, customers still often hold it accountable, since they are unaware that asset operators are not employed by the platform or see the platform as the root cause of social issues. For example, Uber has faced legal action over drivers' precarious working conditions (e.g., no welfare support for contract workers), which has harmed the company's image. These reputational issues pose a problem for the platform, since they can harm its business in the long term (Afuah, 2013; Garud, Kumaraswamy, Roberts, & Le Xu, 2022). In several countries, these issues have also led to the emergence of regulations that limit the network effects of platform companies, thereby fundamentally undermining their strategy (Paik, Kang, & Seamans, 2019; Thelen, 2018).

Research Gap

Overall, the arguments presented above suggest that asset-light approaches are linked with a loss of control, implying that such approaches may not be advantageous for firms under all circumstances (Chen et al., 2022; Gawer, 2021). Thus far, however, we lack systematic empirical studies that explore in detail the bottlenecks that motivate firms' investments in physical assets in the context of platform strategies (Lygnerud & Nilsson, 2021; McIntyre et al., 2021). In fact, the literature on platforms has focused on investigating the advantages of asset-light approaches and sheds little light on the reasons why platforms may invest in physical assets (Cusumano et al., 2019). Those studies that do examine the challenges of asset-light approaches focus on individual problems without providing comprehensive and systematic evidence on why firms (whether platform or otherwise) choose to own assets (or not). In contrast, by highlighting the role of bottlenecks, the literature on innovation ecosystems provides compelling arguments for why platform firms should invest in

physical assets. Yet this literature has focused on investigating bottlenecks in general without providing evidence for the specific types and antecedents of bottlenecks in the context of platforms.

To address this shortcoming, in this paper we pose the question of how do bottlenecks induce firms to invest in physical assets in the context of platform strategies. Addressing this question is important, as it sheds light on the contingencies of platforms, thereby helping to advance theories on platform economy (Kyprianou, 2018) and innovation ecosystems (Kapoor, 2018). Specifically, our study can help platform companies decide when a strategic decision to deviate from an asset-light approach may help them to overcome bottlenecks and grow (Rindova, Yeow, Martins, & Faraj, 2012). Furthermore, it is crucial for firms pursuing a conventional asset-ownership approach to understand the situations in which an asset-light platform approach is likely to be fruitful and when it might be better to maintain asset ownership.

METHOD

In order to investigate how bottlenecks and their antecedents drive firms to deviate from an asset-light approach and invest in physical assets, we employ a multiple, embedded case study. Case studies are especially useful to analyze empirical phenomena in detail and an embedded designs are most useful for complex phenomena with different subunits of analysis (Scholz, 2002; Yin, 2018).

Research Setting

As our research setting, we chose firms that provide mobility service solutions for ground transportation in Germany. From a theoretical sampling perspective, this setting is ideal since many firms in the mobility services segment in Germany have begun to introduce platforms. However, they still rely on assets to provide their services, since transportation itself cannot be digitized. Hence, the firms must definitely confront the question of whether and to what extent they should own assets. At

the same time, some of the firms in our sample shifted from an asset-light toward an asset-heavy approach or the other way around, while others opted for one approach or the other and stuck with it. The wide variance of firms and their business approaches allowed us to study ecosystem bottlenecks that make asset-light platform approaches less attractive or motivate firms to decide against such approaches from the beginning.

Germany as a country is well-suited for a study since (a) Germany has introduced ambitious political goals to decarbonize the transport sector, which calls for a shift from mobility approaches such as individual car ownership towards new digital solutions that build on mobility as a service; and (b) since Germany has a strong car industry, the mobility sector traditionally plays an important role, which has induced many new and old players to capture market share in the new service-based market segment.

To understand the bottlenecks that motivated firms to deviate from an asset-light platform approach, we followed a polar sampling logic (Eisenhardt & Graebner, 2007). We sampled three main types of firms, namely (a) firms that have a digital platform to provide users with mobility service offers and pursue an asset-light approach, (b) firms that have invested in digital interfaces but pursue a traditional asset-heavy approach, and (c) firms that have used both approaches and are situated in between the two polar groups. We chose to analyze firms committed to an asset-light approach (Group A, e.g., Uber, FreeNow) to find out why they stick to this approach and considered firms that remained asset-heavy (Group B, e.g., MOIA, Share Now) to understand what advantages come with asset ownership. The firms from Group C helped us understand under what circumstances and with what motives an asset-heavy or asset-light approach was suitable. In following an embedded case study design, we purposefully sampled firms across different types of mobility services, i.e. (1) scooter sharing, (2) bike sharing, (3) car sharing, (4) ride hailing, (5) on-demand ride pooling, (6)

long-distance bus ride services, and (7) train ride services. We adopt this sampling approach because we are interested in analyzing bottlenecks, which requires us to take an overarching ecosystem perspective. In contrast to standard case studies where scholars are interested in studying strategies at the level of firms and therefore contrast different firms as cases, in our study, every mobility form represents a case (consisting of multiple firms as the subunit of analysis), which we contrast to derive insights for the overall ecosystem (Scholz, 2002; Yin, 2018). Each of the different mobility services builds on distinct physical assets that differ considerably in complexity and capital intensity, allowing us to derive common bottlenecks and their antecedents for the investment in physical assets across mobility forms. As the attractiveness of an asset-light approach depends on the cost of purchasing and operating assets, we initially assumed that the type of asset would have a strong impact on whether a firm chooses an asset-light approach or not. Thus, for the purposes of our analysis, each type of mobility service represents a case, since assets within each category are relatively similar, while they differ across mobility service types. Comparing platform strategies within and across mobility types thus allowed us to identify the bottlenecks firms experience in the context of asset-light platform strategies, as well as their antecedents.

Data Collection and Analysis

We drew on two main sources, namely (1) archival data and (2) interviews with industry experts and company representatives of firms active in the mobility services segment. Table 1 provides an overview of our data sources.

Insert Table 1 about here

In the first phase, we used archival data covering a period between 2014 and 2022 to develop a detailed understanding of the dynamics and strategies of different players in the mobility services

domain in Germany. We chose this time periods since the German long-distance bus market was liberalized in 2013 and the market for shared urban and long-distance mobility forms began to flourish afterwards. Toward this end, we used the NexisUni database to collect an extensive corpus of press articles from journals, newspapers, and magazines (total of 2,682 articles). Using the gathered data as a basis, we set up archival data dossiers for the most important domains in mobility services, i.e., across different mobility types and firms. The dossiers contained information on firms' business approach, asset ownership structure, and strategies. Based on the dossiers and drawing on the literature on platforms, we then developed initial propositions on what bottlenecks influence platform firms' decision to invest in physical assets. For example, we inferred that platforms will most likely invest in assets if they cannot control the quality of their service by the means available to them via an asset-light approach (e.g., reviews, quality standards).

In the second phase, we conducted 43 semi-structured interviews in the period between 2020 and 2022 with industry experts (n=23) and company representatives (n=20) to deepen our understanding of the mechanisms that drive platforms to invest in assets. The industry experts in our interviews were strategy consultants, mobility consultants, and research associates from the field of new mobility and digital transformation. To identify suitable companies and recruit our company interview partners, we drew on our archival research, company websites, and social media. In addition, we used snowball sampling, asking interview participants to recommend other firm members we could speak to. Typically, the company representatives we talked to were responsible for the firm's platform strategy or business development more broadly. Generally, our interviews lasted between 26 and 84 minutes (54 minutes on average) and were audio-recorded and transcribed afterwards.

Interviews were conducted via phone or video conferences. During the interviews with firm representatives, we asked them to what extent their firm owned the assets relevant for the services it provided. We asked them what role the supply of physical assets played in setting up their mobility services and the associated platform. If their firm had opted for an asset-light approach, we asked them what had motivated the firm to pursue this approach, and what challenges (i.e., bottlenecks) they had experienced. If the firm used an asset-heavy approach (or something in between), we asked what factors drove the firm to take formal ownership over the assets. We also asked our interviewees if their approach had changed over time and, if so, why. Industry experts were asked similar questions but focusing on the industry as a whole or on specific companies the experts had consulted for or had detailed knowledge about. Asking these questions allowed us to identify the detailed bottlenecks driving platforms toward asset ownership. For example, we noted that if companies worked in a market with a limited number of asset providers, they might have to purchase assets themselves to allow scaling effects to arise. In later phases of the project, we also probed specific bottlenecks that had emerged as important in previous interviews and tried to identify the circumstances under which investments in assets were important to resolve them.

To derive theoretical insights from the interviews, we used an iterative approach in gathering data and developing theory, until we reached saturation (Miles & Huberman, 1984). Based on the first interviews, we refined the theoretical propositions derived during the archival research by developing an initial theory framework. As we progressed, we then systematically compared insights within and across mobility types according to our embedded case study design (Yin, 2018). We conducted further interviews until we reached saturation and further data only led to minimal improvements in our framework (Eisenhardt, 1989). In order to ensure the validity of our results, we used data triangulation between the interviews and our archival data.

We used inductive coding in developing a scheme and used the data analysis tool MaxQDA. More precisely, this meant that we used the initial findings from our archival data analysis as a starting point. From this, we developed five broad code categories: First, we coded whether firms in a mobility group opted for an asset-heavy or an asset-light approach, and second, whether they had altered their approach over time. Third, we coded the firm-external bottlenecks that drove firms in a mobility group towards asset ownership, and fourth, the detailed nature and antecedents of the bottlenecks. The fifth and final coding category captured the benefits that asset ownership brought for the firms in a mobility group and how they resolved the bottlenecks. We then analyzed whether differences and similarities across cases existed to identify ecosystem-wide bottlenecks. Whenever we found evidence that was not part of our coding scheme, we added an appropriate code to reflect it. Once we had finished coding, we assessed our coding scheme, which had become very detailed and contained many subcodes (e.g., listing all the bottlenecks and their various antecedents). To make our framework more comprehensive, we merged codes that described similar reasons or could be combined under one overarching code. We then developed our theoretical framework by drawing the causal connections between bottlenecks and external antecedents as derived from our archival and interview data.

RESULTS

The following sections present our findings on how bottlenecks drive mobility service firms to deviate from an asset-light approach and invest in physical assets. Toward this end, we first outline what offers are available in the mobility services market and whether the firms involved have opted for an asset-light or asset-heavy approach (or something in between). We then explain bottlenecks firms experienced as they chose to pursue an asset-light approach. We use the codes “IE,” “FR,” and

“AD” throughout to indicate our data sources (industry experts, firm representatives, and archival data, respectively).

Asset Ownership in the Mobility Services Market

Table 2 provides an overview of the different service types offered in the German mobility market for ground transportation. A major difference between mobility services lies in the type of asset involved, i.e., whether passengers travel on e-scooters and bicycles, cars, buses, or trains. For each of these asset categories, firms offer different types of services, such as sharing (i.e., short-term rental), ride hailing (i.e., requesting a car and driver to come immediately and directly take one to a desired location), on-demand ride pooling (i.e., a driver taking a group of passengers in a large car or minibus between two individually selected stops upon request), or ride services (i.e., transporting larger groups of individuals along scheduled routes). Also, different firms active in the sector have specialized in different service types. For example, while firms such as Lime, Tier, Voi, and Bolt are active in scooter sharing, the domain of bike sharing is dominated by firms such as Nextbike, Jump, and Call a Bike. Firms offering car sharing services are WeShare, Share Now, cambio, Flinkster, and Bolt. Ride hailing services are offered by Uber, Bolt, and FreeNow. MOIA, CleverShuttle, and ioki offer on-demand ride pooling services. Finally, FlixBus dominates the market for long-distance bus ride services and has recently joined the market for train rides.

Insert Table 2 about here

Most importantly, however, Table 2 shows stark differences in terms of firms’ adoption or rejection of an asset-light approach. Our findings show that firms offering scooter and bike sharing services, on-demand ride pooling, as well as train ride services follow a traditional asset-heavy approach. In contrast, firms offering ride hailing and long-distance bus rides use an asset-light

approach, while in the categories of car sharing and train ride services, we find both asset-heavy and asset-light approaches. How can we explain these striking differences?

Bottlenecks and Asset Ownership

Our analysis revealed three bottlenecks that induce firms to invest in assets despite the general advantages of asset-light platform approaches, namely (1) supply bottlenecks, (2) reputation bottlenecks, and (3) innovation bottlenecks. The bottlenecks differ in the immediacy of their impact on the firm. Moreover, each of these bottlenecks is closely connected to specific firm-external antecedents, i.e., drivers in firms' environment that contribute to the emergence of the bottlenecks and induce firms to favor an asset-heavy strategy over an asset-light one. In the following, we describe the three bottlenecks and their corresponding antecedents in more detail.

Supply bottlenecks. As the first bottleneck, we find that forgoing an asset-light platform strategy ensures asset supply and allows a firm to scale more quickly when it lacks a sufficient supply of assets. If the number of assets that providers are willing to offer via the platform is limited, this may pose a serious and immediate threat to a firm's growth prospects, since without assets the firm cannot provide any service. At the same time, if asset scarcity limits the growth of platforms, this may also have severe consequences for platforms' profitability, since margins in platform business are often small, such that overall profitability depends on scale. As one interviewee pointed out: "The [mobility] world could work without the asset-light [platform] providers but, of course, not without the asset-heavy providers" (FR08). As another interviewee stressed, although platforms may be quite attractive, they "only realize the intended scaling potential where there is no limitation [on the number of assets]" (IE08).

There are two main reasons why the availability of assets may be limited. First, the availability of assets in the market depends on the number of asset providers. For example, firms active in the

long-distance bus market benefit from the vast availability of asset providers. According to our interviewees, Germany has a plentiful supply of companies providing buses and driving services: “Germany is the country of medium-sized companies, and it feels like every village has its [...] own bus operator” (FR02). This has enabled FlixBus, the largest asset-light platform offering long-distance bus rides in Germany, to grow and scale up its platform. However, FlixBus struggled to expand its platform to the train segment, since it is harder to find partners who can provide trains and the associated personnel: “That’s also one of the main challenges our team still has, which is, how do we get these trains?” (FR06). Since even asset purchase poses a challenge, due to the limited supply of physical assets in the market, the firm searched for asset-owning parties for more extensive cooperation. Working with such firms, FlixBus decided to renovate trains and jointly invest in the assets so it could work with a sufficient asset base of good-quality trains: “We have made the decision to spend real money and completely refurbish these trains” (FR06). In the end, however, this cooperation failed to remove the bottleneck to growth, leading FlixBus to shift from an asset-light approach with investments in partners’ assets toward an asset-heavy approach. Early in 2022, the company announced that it was preparing to invest around €1 billion in purchasing trains (AD1). Achieving full control over the assets may enable the firm to grow and scale more easily despite higher asset costs.

Second, a limited availability of assets may result from asset owners being unwilling to share their assets on the platform. We found that one reason for this reluctance was asset owners’ wish to maintain control over the customer interface, which they lose if they join a platform. For instance, one of our experts pointed out: “I don’t want to give the customer interface to FlixBus, to Uber [...] because then I don’t know who my customer is and what my customer wants, and I can’t accommodate that somehow” (FR10). In order to maintain control over their data, asset owners may decide not to

cooperate, which forces some platforms—e.g., in ride hailing, long-distance bus trips, or car sharing—to invest in the assets themselves if they cannot find any other partners.

Another reason why individuals are unwilling to share their assets on platforms is inconvenience. For example, in the case of peer-to-peer (P2P) car sharing, providers (i.e., individual private car owners) must ensure that users can access the vehicles. This process can pose a challenge, since it may require human contact and the exchange of keys for the rental, which creates a lot of friction for P2P car sharing users (AD2). In some cases, this may be solved by new technology, but it still requires coordination on behalf of the platform firm and trust on the part of asset providers.

A third reason why individuals in the car-sharing domain may be unwilling to share their assets is vandalism, which looms large in this sector. Since users drive the rented vehicles themselves, asset owners have no direct control over the assets, exposing them to the risk of customers misusing or abusing their vehicles. Our analysis showed that these problems pose a major concern for scooter, bike, and car sharing firms. For example, bicycles in sharing systems are often subject to vandalism or theft and require frequent repairs (AD3). One company representative reported that “in Berlin [...] an incredibly high number of bicycles always had their tires slashed” (FR14). Hence, finding individuals or firms willing to share their assets on the platform becomes more difficult “because there is simply no one who actually wants to provide you with these vehicles. Because that would probably be rather negative for the vehicle provider” (FR19).

Given the aforementioned factors that limit the availability of assets, some firms—especially in the domains of scooter, bike, and car sharing, as well as train rides—have opted for an asset-heavy approach. In the case of scooters, the asset-heavy approach was facilitated by the fact that the assets are cheap: “If you want to become a scooter supplier, call China. There you can get a scooter for €200 and then if you order a hundred of them, [...] for €10,000 you can have a fleet of scooters” (FR10).

In fact, even platform firms we interviewed mentioned that the availability of assets was a major concern and had induced them to systematically invest in selected assets. For example, Uber in Germany started with an asset-light approach, but struggled to find cars and drivers, such that they started to cooperate with car-rental companies that provide the necessary drivers and assets: “For the most part, almost all drivers are employed by the car rental companies with which we cooperate” (FR14). Only by doing so were they able to pursue their asset-light approach and grow. Nonetheless, in ride hailing, the supply of drivers with vehicles represents a challenge even for asset-light firms: “There are either too few cars or too few licenses” (FR24).

In addition to enabling business growth, asset-heavy approaches also became necessary, since in markets characterized by a limited availability of assets, asset-light approaches might not be profitable for platform operators. If assets are limited and margins in a market are tight, this may lead to a situation where firms do not reach the necessary scale to achieve sufficient overall profits—especially given the high market power that limited asset availability confers on asset operators. Firms operating according to an asset-heavy model have an advantage in such a highly competitive market, since they do not have to share their margins with asset operators and can secure access to assets.

For example, Germany is historically characterized by a well-established public transport system that is governmentally subsidized and dominated by large incumbent players, and where “core mobility [...] has extremely low margins” (IE03). In response to the fierce competition and struggle to access assets, several companies in our sample reported that they purposefully opted for an asset-heavy approach to enhance their margins. For example, to be better able to compete with Deutsche Bahn, FlixBus announced that they would shift from an asset-light toward an asset-heavy approach and acquire their own trains. Similarly, some car sharing providers explained that in their case a platform approach simply would not work, since once the margin was divided up, the business

would become even less attractive than it already was: “You would have to find a partner who owns and operates the cars. Of course, you’d also have to pay them, so that doesn’t really make much sense in terms of the overall construct” (FR03). To keep a greater share of the margin, most car sharing providers (e.g., WeShare, cambio) decided to stick to an asset-heavy approach. Furthermore, asset ownership made it impossible for competing asset-light firms to simply take over the assets, as described by a representative of Share Now: “[If you followed an asset-light approach] you could also be replaced quickly. So, we have to look at who we grant access to our fleet” (FR03). If assets are scarce, owning assets protects the firm from competition, as one of our interviewees stressed: “It just can’t be copied that quickly. The garage founder won’t somehow come along with a hundred cars tomorrow” (FR03).

Reputation bottlenecks. As the second bottleneck, we find that investing in assets can give firms greater control, helping them avoid the reputational issues that they face when pursuing an asset-light approach. In general, even though platform firms do not directly control the assets they use, it is still crucial that they organize their business in a way that guarantees high service quality and generates value for the customer. While quality problems and a lack of value generation hinder platform growth less directly than supply bottlenecks, they still reduce the extent to which the platform is able to attract new users on the demand side, which can reduce its growth in the medium term.

Our analysis showed that reputation bottlenecks can result from multiple sources. Specifically, in the case of mobility services, a lack of control over assets may impair the maintenance or standardization of those assets. This, in turn, may result in customers perceiving assets as low-quality, which reduces user satisfaction and platform success. As one of our interviewees put it, “Control is an important point. That’s hard, and that’s why peer-to-peer car sharing services have not been so successful” (FR20). In the case of peer-to-peer car sharing, the vehicles are sourced from private

owners, so it is difficult for platform firms in this domain to ensure a certain service quality. This is why most firms offering car sharing have so far used an asset-heavy and business-to-consumer approach: “We see the customer is more satisfied when things work well. Cities are more satisfied when things work well, and you simply have control when you do it yourself” (FR24). We only found one firm, Flinkster, that operates with a hybrid approach, combining both asset-light and asset-heavy approaches.

Moreover, as noted above, assets such as cars, bikes, or scooters offered on vehicle sharing platforms are also frequently damaged by customers, which reduces their functionality and may—in the worst case—lead to accidents for subsequent users. In the case of scooters, we found that some firms decided to take asset ownership and operations into their own hands—“not only for reputational and social reasons, I’d say, but also for legal and security reasons” (FR14). This decision may have arisen from poor working conditions for the staff taking on the charging and redistribution of the scooters or accidents resulting from incorrect vehicle charging. Avoiding such reputational and operational problems by taking ownership of assets also gives firms more influence over the quality of their services, which can help them provide a better customer experience. In fact, as one of our interviewees pointed out, some scooter providers initially started with an asset-light approach, but “they [...] realized the scooter, the driving device, has an important influence on whether it is booked more or less” (FR20). To improve service quality, they deviated from an asset-light approach and purchased the necessary assets themselves, since “you really only have good operational control if you do it yourself” (FR24).

Finally, when firms do not employ drivers directly, but connect drivers and users via a platform instead, this may lead to reputational and liability issues, since many of the drivers who offer their services are insufficiently trained, face poor working conditions (including low social security

standards and unclear overtime policies), and may not be insured in case of accidents. In the case of on-demand pooling services such as MOIA, we found that “the control of the operational implementation plays a very, very important role” (FR09), since in on-demand pooling, “If I can control the assets, I can offer a better customer proposition” (FR20). The same applies to firms such as CleverShuttle. These firms depend on reliable staff and assets to provide a high-quality service because they often cooperate with public transportation providers. CleverShuttle, in particular, has cooperated extensively with public transportation firms, which requires “that the drivers be very reliable, that they know how to handle such an electric car, that they can also take people with limited mobility reliably from A to B” (FR18). Taking formal control over their assets via ownership seemed the best option for the firm.

Similar considerations apply to FlixBus and their entry into the train business having gained the major market share in long-distance bus travel in Germany. As our interviewees pointed out, the firm decided to take control over the assets to provide better services, which is easier than dictating standards to third parties—especially when there is only a limited supply of asset-owners, as mentioned above. FlixBus strengthened their control still further by applying for the necessary permit in long-distance train services themselves: “If the entity applying for a train route is the partner, then the partner has the right to operate the train route and not us, which is not ideal” (FR12). For their bus business, the firm also co-funded the renovation of station buildings so their bus operators could stop there: “FlixBus has been very aggressive in this and has even taken over some of the financing for the expansion of the bus stations” (FR20). In doing so, the firm secured a crucial asset for their services and could enhance the service quality at local bus stops for their customers. In this manner, greater control over the assets and the associated infrastructure gives FlixBus more ability to control service quality in comparison to an asset-light approach.

Innovation bottlenecks. The final bottleneck that induces firms to opt for asset ownership instead of an asset-light platform approach is a limited scope to experiment with alternatives when they need to find operational innovations. Even though an asset-light approach may help firms to improve operations in the short term, such innovation bottlenecks may still impact them in the long run by preventing them from entering new markets and updating assets, both of which are important to prevent supply and reputation bottlenecks. In fact, many of the firms in our sample dealt with mobility services that were relatively new: “Major hurdles exist because you don’t just want to introduce a platform, but also a new form of transport at the same time” (FR22). The novelty of services, in turn, meant that firms initially had to learn how to set up their services, use the relevant technologies, and manage their operations in the most efficient way. For example, in the case of scooter sharing, the asset type was initially so new that the vehicles, which were only intended for private use, lasted less than a year in rental services before they had to be disposed of. Therefore, some scooter sharing firms used the asset-heavy approach to let their learnings flow into the development of new scooters intended for sharing services: “[We] have developed and built the first four generations of scooters completely in-house. So, these are our own scooters, which were also built specifically for sharing operations” (FR24). Similarly, the battery technology of the vehicles initially posed a challenge as well. The first batteries required a lot of charging, and hence redistribution, because the empty batteries could not be retrieved from the scooters.

The on-demand pooling services MOIA and CleverShuttle faced similar challenges to the scooter rental firms. Although the assets themselves are not much different from conventional buses, they run on electricity, which poses challenges in the operations, e.g., due to charging times and driver breaks: “Shift schedules for on-demand services are not the same as shift schedules for bus schedules. That is something completely different” (FR18). Furthermore, the service itself is run by an algorithm,

which requires some knowledge of running the buses in order to optimize it. On-demand pooling firms must therefore gather knowledge about what levers to use to optimize operations.

Our interviews indicate that learning and innovating in operations, in turn, is much easier if the firm directly owns, controls, and operates the assets. As one of our interviewees stressed, “It is worthwhile to also make this extra effort in development” (FR24). For example, owning the assets allowed the firms offering scooter sharing to experiment with technological improvements in partnership with technology firms: “This e-scooter industry has now gone through four product cycles in 18 months” (IE11). The innovation efforts that resulted in retrievable batteries and more resistant assets improved the operational efficiency for these companies. The same applies to the bike sharing service Jump, “which then also had replaceable batteries over time” (FR14).

The need for innovation also triggered investments in physical assets for the long-distance bus operator FlixBus. When FlixBus sought to experiment with electric buses, they did not rely upon partners, but instead purchased a few electric buses “to test how it works to travel electrically” (FR20) and evaluated whether this was a possible option to optimize their business from a sustainability perspective. Here, deviating from an asset-light approach allowed the firm to gain experience and experiment to improve upon their existing service. Similarly, the on-demand pooling service provider CleverShuttle invested in physical assets as a basis for gaining experience and optimizing their routing algorithm “for two years until [...] you have actually tried all the problems [...] once” (FR05).

While our findings indicate that investing in physical assets is generally useful for firms to gain hands-on experience with their services and learn, we also find that owning assets for the sake of innovating becomes particularly important if the complexity of assets and operations increases. FlixBus learned this the hard way when launching their train services. They found that the system was very complex (e.g., due to regulation) and that they had very little prior knowledge about it. One

of our interviewees stressed the complexity of the system by pointing out: “Why have all third parties somehow failed miserably [in setting up train services] at that point so far? Because it’s just complex as all hell” (FR13). Investing in proprietary physical assets opens up the possibility to simplify the service setup. Although this represents a deviation from the asset-light approach, for FlixMobility it was a necessary step, since “influence on the product is needed to achieve a stable service [...]” (FR13).

Concluding the presentation of findings, Table 3 provides additional quotes from our interviews for each of the three bottlenecks that drive firms to forgo asset-light strategies.

Insert Table 3 about here

DISCUSSION

The previous section described how bottlenecks drive firms to forgo asset-light approaches. In the following, we first present the theoretical framework that emerged during our research. Subsequently, we discuss the contributions our study makes to the literature on strategic management and platforms. We conclude our discussion by highlighting the implications of our findings for managers and policymakers.

Theoretical Framework

In summarizing our findings, Figure 1 displays the theoretical framework we developed, which illustrates the bottlenecks and their firm-external antecedents that drive firms to forgo an asset-light approach. Specifically, as laid out in the previous section, we identify three main motives for firms to invest in assets despite the general advantages that asset-light approaches offer, namely: (1) supply bottlenecks, (2) reputation bottlenecks, and (3) innovation bottlenecks. Our results show that these factors can operate either singly or in combination and differ in the immediacy of their impact

on the firm. While supply bottlenecks directly hinder growth by limiting asset supply, reputation bottlenecks primarily affect firms in the medium term by reducing customer value and satisfaction. Innovation bottlenecks, in turn, are of greatest importance in the long run, since they restrict firms' opportunities to offer attractive assets and enter new markets.

Insert Figure 1 about here

Moreover, each of the three bottlenecks is connected with specific firm-external antecedents that drive their emergence. First, firms may forgo an asset-light approach to address supply bottlenecks if (a) there is a limited number of asset providers in the market, (b) asset sharing is inconvenient, or (c) assets are frequently damaged. All three antecedents reduce the supply of assets to the platform, thereby limiting its growth. At the same time, when assets are scarce, firms may deviate from an asset-light approach to (d) enhance their profit margins if margins in the industry are low and (e) take control over assets to protect against the risk of new entry by competing platforms.

Second, investing in assets allows firms to address reputation bottlenecks, which becomes particularly important if (a) the quality of services provided by asset owners is low, (b) the functionality or safety of the asset is limited, (c) working conditions among asset operators are poor, (d) asset operators are insufficiently trained or insured, or (e) the complementary infrastructure required by the platform is of a low quality. If liability and reputational issues exist or may arise, this may pose a threat to platforms' success in the market, since the success and network effects of a platform are tightly connected to a sufficient service quality.

Third, owning assets is advantageous to address innovation bottlenecks if (a) assets are subject to rapid technological change, (b) there is a strong need to improve the performance and longevity of assets, and (c) a firm has limited experience with the operation of assets. If firms encounter a

technology or service that is relatively new or displays great potential for optimization, they may want to invest in assets to be able to directly experiment with and gather information on alternative options.

Contributions to the Literature

Our study makes several contributions to the literature on platforms. As the main contribution of this paper, we provide a contingency perspective on platforms. The previous literature emphasizes the advantages of so-called “asset-light” approaches (e.g., Gawer, 2022; Yoo et al., 2010), which has led managers in many industries to pursue platform approaches. Interestingly, however, platform firms, such as Amazon, increasingly deviate from the principle of asset-light and make strategic investments in assets (Gawer, 2021), raising the question of under which conditions it may be necessary to hold assets despite the promises that asset-light approaches offer. Indeed, recent studies have started to investigate the challenges and downsides of platforms, pointing out that asset-light strategies go hand-in-hand with a lack of control (e.g., Parker & van Alstyne, 2014), which may lead to a lower quality of goods and services and the risk of asset providers withdrawing their support, as well as reputational and liability issues. Some studies have also pointed to the fact that some platform providers have underestimated the complexity of rolling out their business (Paik et al., 2019). Thus far, however, studies have focused on challenges of individual companies connected with asset-light approaches, such that we lacked systematic studies that investigate the ecosystem bottlenecks that drive firms to invest in assets in the context of platform strategies (Rietveld & Schilling, 2020).

Addressing this shortcoming, we develop a theoretical framework that shows in detail why and when firms forgo asset-light approaches. Specifically, our results indicate that firms’ decision to invest in assets is driven by three primary bottlenecks, namely (1) supply bottlenecks, (2) reputation bottlenecks, and (3) innovation bottlenecks. Each of these bottlenecks comes to the fore in the presence of specific firm-external antecedents (see previous section).

The first two bottlenecks—supply and reputation bottlenecks—are in line with previous work that has studied the challenges of platform approaches (e.g., Garud et al., 2022; Rietveld & Lampel, 2014). However, while previous work has primarily focused on discussing how platforms can deal with these shortcomings (e.g., by using rating systems and subsidizing asset suppliers) (Cameron & Rahman, 2022; Rietveld & Schilling, 2020), our study shows that these issues may be so fundamental that they induce firms to completely forgo or abandon asset-light approaches. Moreover, while previous work has pointed to multi-homing and quality issues as a problem for platforms (Parker & van Alstyne, 2014), we show that shortages in asset supply and issues of liability and reputation may arise for various reasons, including inconvenience around asset sharing, frequent damage to assets, and inadequate asset functionality and safety.

More importantly, in addition to allowing firms to overcome asset scarcity and increase control to avoid reputational issues, we identify the importance of experimentation with and innovation in assets as a novel, critical factor that leads firms to forgo asset-light approaches. If assets and related services are novel, immature, or subject to rapid change, firms may need to experiment with alternative assets and ways of operating them. Research from other sectors and businesses (e.g., automotive manufacturing) has also pointed to the high degree of vertical integration in emergent industries (Langlois & Robertson, 1989). According to our interviewees, such experimentation is much easier if the firm directly owns and controls the assets. By pointing to asset ownership as a precondition for innovation, our study adds a dynamic, long-term perspective to the literature on transaction platforms, which thus far has tended to take a relatively static perspective (e.g., Cusumano et al., 2019).

With our analysis, we add to the literature on transaction platforms by providing a more dynamic and temporal perspective encompassing the observation that distinct bottlenecks differ in

their temporal impact. So far, the literature has largely addressed the short-term implications platforms face if they encounter bottlenecks (Gawer, 2021). We show that supply bottlenecks induce challenges to platforms that they will have to solve in the short run to maintain their business approach. If they fail to do so, they may not be able to continue their business using an asset-light approach. By contrast, reputation bottlenecks primarily cause problems in the medium term. Unlike supply bottlenecks, reputation or quality issues do not directly undermine the platform's functioning—yet they must still be addressed (e.g., either through control measures or an asset-heavy approach) if the platform is to stay in business. Lastly, innovation bottlenecks are most relevant in the long term since platforms that fail to update processes and assets will find it hard to remain competitive in the future. Hence, we show that all three bottlenecks have implications for distinct time dimensions and should therefore be adequately addressed.

Prior research has also shown that asset-light approaches provide firms with great flexibility to change their business. However, they seem particularly appropriate if the assets and services are relatively mature (Kenney, Bearson, & Zysman, 2021). In fields where assets change quickly, firms that directly control assets may have an advantage if innovation allows them to offer new types of services, or those of higher quality. In this context, recent research has stressed the importance of platform operators' relationship to their partners in determining platform survival (Wormald, Shah, Braguinsky, & Agarwal, 2022) and that, in some cases, it may be better if the activities were solely performed by the platform (Chen et al., 2022). Moreover, if firms do not invest in assets, they risk that other firms occupying strategic bottlenecks in their ecosystem, thereby further reducing their ability to remain competitive and grow. For example, in e-commerce, if there is a shortage of firms delivering goods to customers, margins shift toward this segment and Amazon's competitive advantage over retail stores is eroded. By showing that even asset-light platforms have a strategic

interest in investing in physical assets in response to bottlenecks, our study bridges the two distinct but related literature streams on platforms (e.g., McIntyre & Srinivasan, 2017) and innovation ecosystems (e.g., Granstrand & Holgersson, 2020). The literature on ecosystems recommends that firms strategically occupy bottlenecks in upstream or downstream parts of their ecosystem, which stands in contrast to the idea of pursuing an asset-light platform approach. By describing bottlenecks and their antecedents that induce firms to forgo asset-light approaches and occupy these bottlenecks, our paper helps to reconcile the contradictory suggestions presented in the two literatures on platforms and innovation ecosystems. In fact, most firms in our sample preferred to vertically integrate and deviate from an asset-light approach to ensure full control, sufficient service quality, and flexibility in case of unforeseen circumstances.

Practical Implications

In addition to advancing the literature on platforms, our research holds important practical implications for managers. We reveal the circumstances under which an asset-light approach may be possible or promising, which is critical when designing firm strategies in the context of platforms. In recent years, asset-light platform approaches have become the holy grail of firm strategies, since they allow firms to scale up their business very quickly without requiring any major investments in physical assets (Evans & Gawer, 2016). As platforms grow and the concept is applied in an increasing number of industries, however, one can observe that some platform firms deviate from the principle of asset-light and invest in assets, while firms seeking to introduce platforms in industries other than IT struggle to make the concept work (Garud et al., 2022; Kretschmer et al., 2020).

By exploring the bottlenecks that induce firms to forgo asset-light strategies, we help managers assess whether platforms are suited to the specific context within which they operate. This helps to prevent unexpected failures and serves as a basis for platform businesses to identify the areas

where they may need to invest in assets. In fact, while we focus on the case of mobility services, practical observations of developments in other sectors suggest that our findings are also relevant for industries such as food, energy, or accommodation. For instance, to acquire market share and learn about the perishable goods business, Amazon bought Whole Foods in 2017. Thereby, Amazon gained the opportunity to quickly absorb its subsidiary's knowledge about the food business, use it for its in-house service Amazon Fresh, and experiment and innovate (Kang, 2022). Back in 2018, Amazon launched check-out free Amazon Go stores and implemented the same tried and tested technology in some Whole Foods stores, showing that asset ownership may be beneficial for platforms to drive innovation in established but developing fields (Wingfield, 2018). A second example that shows that our findings are not limited to mobility is the case of Enpal, a firm that rents out solar cells to property owners so they can generate renewable energy. The firm started its business 2017 as a platform, hiring independent contractors to install the solar panels on the houses of Enpal's customers (Enpal, 2021). However, skilled installers of the type required by Enpal are in short supply in the market, and many firms compete for them. To overcome this staff shortage, Enpal founded its own academy to educate contractors in the installation of their solar systems. Investing in assets (e.g., an in-house academy) helps the firm deal with asset scarcity and safeguards service quality (Enpal, 2022).

Limitations and Future Research

Our study has several limitations that provide avenues for future research. First, we investigated the role of assets in the context of mobility services in Germany. While this setting is very well suited to investigating our research question, it raises the question of the extent to which our findings are generalizable to other geographic regions. It seems plausible to assume that asset ownership may be affected by institutions (such as cultural norms, values, and public policies) that

vary across countries. We therefore call for future research that investigates the extent to which the findings of our study are moderated by institutional or country characteristics.

Second, we have focused on a wide array of firms active in the domain of mobility services, with incumbents and new entrants equally represented. However, it would be interesting to examine to what extent incumbent firms can compete against new entrants, since new firms are particularly likely to employ platform approaches. Previous research has shown that incumbents can successfully adopt a platform approach (Kretschmer et al., 2020). Future research could investigate whether incumbents face different challenges than new players when adopting a platform approach, especially when they already own assets.

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Table 1
Data Sources

Data source	Type	No. interviews
Interviews	Industry experts	23
	Bike & scooter sharing	3
	Car sharing	4
	Ride hailing & on-demand pooling	7
	Long-distance bus rides	3
	Long-distance train rides	3
	Sum	43
Archival data	Scooter sharing	181
	Bike sharing	33
	Car sharing	115
	Long-distance bus trips	1,654
	Long-distance train rides	699
	Sum	2,682

Table 2

Asset Ownership Approach in Different Mobility Services Offers

Service type	Definition	Sample companies with asset-heavy approach	Sample companies with asset-light approach
Scooter sharing	A shared transport service in which electric motorized scooters (also referred to as “e-scooters” or “kick scooters”) are made available to use for short-term rentals. E-scooters are typically “dockless,” meaning that they have no fixed home location and are dropped off and picked up from any location within the service area. Users can usually access the vehicles via a smartphone application.	Lime, Tier, Voi, Bolt	
Bike sharing	A shared transport service with (electric) bicycles that are available for short-term rentals. Some bike sharing systems are “dockless,” while others work with fixed home locations (i.e., stations). Users can usually access the vehicles via a smartphone application.	Nextbike, Jump, Call a Bike	
Car sharing	A shared transport service in which users can access cars for short-term rental. Users can access the cars independently. Usually, the car sharing provider works with either a stationary or a free-floating car sharing system. In the former, trips must start and end at the stations. In the latter, the rental can begin and end anywhere in the city. Access is usually granted with a smartphone application and/or a key card. Users need a driver’s license to access the vehicles.	WeShare, Share Now, cambio, Flinkster, Bolt	Flinkster
Ride hailing	A passenger requests a car and driver to come immediately and take them to their chosen destination. It is similar to a taxi trip, but drivers do not necessarily have to hold a taxi permit. The trips can be booked via a smartphone application or a phone call.		Uber, Free Now, Bolt
On-demand ride pooling	Passengers are transported by a driver in a large car or minibus between two individually selected stops upon request. Other passengers can join the ride if all passengers are traveling in the same direction. An algorithm usually optimizes route planning. Trips can usually be booked via phone call or a smartphone application.	MOIA, CleverShuttle, ioki	
Long-distance bus ride service	Large motorized vehicles transport large groups of people on cross-country trips to predetermined stops (i.e., cities) using the pre-existing road network. Tickets can be booked in ticket offices, via smartphone applications, or at the service provider’s website.		FlixBus
Train ride service	Large groups of passengers travel in trains along predetermined journeys and stops. The trains are dependent on the track infrastructure that is available. Tickets can be booked via vending machines, ticket offices, the website of the service provider, or smartphone applications (depending on the service provider).	FlixBus, Deutsche Bahn	FlixBus

Table 3

Additional Exemplary Quotes Supporting our Findings

Bottlenecks	Exemplary quotes
Supply bottlenecks	<p>“There are too few assets in this cab and rental car business. So we actually always have a much, much greater demand from users than rides that are being made.” (FR24)</p> <p>“For this business model, you reach a limit when you can no longer find operators of high quality, whom this business depends on.” (IE09)</p> <p>“In the bus market, it's much easier, yes. Because anyone can buy a bus. [...] But with trains, it's really a scaling issue how to get that done.” (FR06)</p> <p>“Deutsche Bahn gets the subsidies that other rail products do not get, and that is why I think the EU Commission or the Competition Court is suing, because big players are protected, and this makes it relatively difficult for small start-ups to enter the market.” (FR02)</p>
Reputation bottlenecks	<p>“It is not always the best approach to save as much as possible on staff, and this can also have a very negative effect in the long term if you then lose your reputation accordingly.” (FR14)</p> <p>“Once I only provide the framework and am no longer responsible for the content, I run into huge challenges with respect to quality and control, security.” (FR22)</p> <p>“Of course, there's a big debate happening now in the train industry, in that you can add value to the customer because of deep integration into the operations.” (FR08)</p>
Innovation bottlenecks	<p>“So even when it comes to things like sustainability or social aspects, these are all things where most scooters are produced somewhere in China [...] if it belongs to you, you have a completely different handle than if it belongs to some third-party supplier.” (FR24)</p> <p>“That I can change the battery, that I can add a few gimmicks, like a cell phone holder, that I wouldn't have otherwise. And things like that have already become important.” (FR20)</p> <p>“And I can only do that if I plan my battery swaps very efficiently. If I know exactly which scooter needs a battery and when? [...] And that's all in this back end, where the customer also books it in the front end in our own app. [...] And it has to go hand in hand with this front end.” (FR11)</p>

Figure 1

Framework Showing Bottlenecks and Firm-External Antecedents that Drive Firms to Forgo Asset-Light Approaches

