Creating Value with Homogeneous Technology:

Electronic Business Service Providers*

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Abstract

We study the determinants of market pricing for vendors providing "hosting and related services." We propose a novel typology linking firm features and firm behavior to pricing. We test between two views about the creation of value in technology commodity markets, one affiliated with mobility of assets from old to new, and the other affiliated with business acumen and efficiency. We labeled these as *origins* and *strategic behavior*, respectively. Our analysis finds that both of these factors contribute to the variance of prices between contracts. However, the variance in prices between firms with different origins is much smaller than the variance in prices for firms pursuing different strategies. Overall, our findings stress that this market is far from homogeneous, because firms find a myriad of ways to differentiate themselves.

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1. INTRODUCTION

The growth of commercial applications for the World Wide Web in the late 1990s spawned a number of markets for Internet infrastructure services. A Web presence became a necessity for businesses of all sizes—either as a source of information or as a selling channel. By one estimate, seventy percent of small businesses in the United States had such a channel by 2005.[1] This enormous growth in demand induced a large supply response. We study the determinants of market value for one set of these new entrants, namely, those providing "hosting and related services."

We present a case study rich in detail about this market's organization. Although technically advanced, the basic elements of the service—such as memory for hosting a catalogue—are seemingly homogeneous and common. The open question is whether differences between firms, such as their branding efforts or investment in customer service, contribute much to preventing market prices from tending towards incremental cost. More generally, this paper asks, what factors allow vendors to construct private value in the face of commonalities in a technically intensive market place? The answers inform an old and unsettled debate about the sources of value during the early phases of a technology markets' development.

Our approach frames this question in terms of a statistical analysis about pricing behavior. This turns out to be easier to say than do. During our study period, which is 2001, this market had only a handful of firms with more than a couple years' experience. It had few normalized procedures for measuring inputs or outputs, and in the eyes of the participants, the hosting and related services market had only recently become stable. There was no widely acknowledged industry norm for analyzing why some businesses had higher prices than others.

We propose a novel typology linking valuable firm features and firm behavior to pricing. Supplemented with novel data, we examine different hypotheses about which factors command higher or lower prices in spite of apparent commonalities. The first broad category of the typology highlights features that firms developed prior to entering the hosting market. We label these "*origins.*" For example, some firms developed brands prior to entering this market. Others already had a customer base in a concentrated region. The second broad category highlights

[1] According to a survey conducted in April 2005, by Harris Interactive.

behavior of firms after entry. We label these "*strategic behavior."* For example, some firms offer only high quality designs and expensive high-quality services. Such a choice is expensive to design but not very costly to manage once it is designed. We also examine the strategic behavior of firms of different origins. For example, the value from offering phone support might be higher for an unknown firm without a reputation than for a branded firm. Finally, we examine some strategic choices that are not as costly to alter, such as how much a hosting site discounts the entry-level contract.

We apply this framework to the menu of prices and characteristics for 433 contracts offered by 145 firms based in the United States in 2001. The data draw on several sources, which we describe subsequently. Assembling this data is novel, so our descriptive statistics are the first striking findings. There is a notable heterogeneity in firms and their strategies, especially given the expectation that this is a homogeneous commodity market. Specifically, there is a remarkably large combination of possible origins and strategic behaviors. Firms approach this market with three different origins, four different strategic behaviors to arranging portfolio upgrades, and more than five qualities of services ranging from basic to very advanced. Yet the variety does not end there: Within those broad differences are even finer-grained differences. In addition, we also observe a wide variance in the competitive conditions for a specific type of contract—some firms offer services for which there are many close substitutes and some do not.

Such variety begs a question: Do these differences affect price levels? If so, by how much? Addressing this question forms the second set of our findings. We estimate a price regression for each contract as a function of a firm's origin, strategic behavior, and degree of competition. This approach allows us to address whether high prices arise from origins or strategic behavior. As is well known, this type of approach cannot identify the profitability of contracting features when firms can trade-off higher (lower) mark-ups for lower (higher) market share. However, hosting has a number of special features that allow a researcher to identify the separate contributions of costs and demand in some instances; in that latter case, we can also make inferences about which choice is more profitable.

We demonstrate that neither origins nor strategic behavior alone explains pricing outcomes. Both of these factors contribute to the variance of prices between contracts. However, the variance in prices between firms with different origins is much smaller than the variance in prices for firms pursuing different strategies. Of variance in strategies, the variance of value

affiliated with quality of service matters most for variance in prices. Strategic pricing of an "entry-level" contract also shapes the variance in pricing, but not as much.

We reach two types of conclusions. One type of conclusion is about particular actions. For example, the open source software for structuring electronic retailing is both high quality and low variable cost, so it has strategic advantages for those firms who are able to deploy it. Related, the low mark-up affiliated with origins suggest that origins cannot support high profitability unless it translates into large market share, which – based on trade press reports of industry events – we doubt occurred in this market at this time. The second type of conclusion is the broad pattern of behavior in this market. These findings suggest that, when examined at close range, there is much less homogeneity in the supply of services than is usually assumed. Moreover, it arises because firms create a multitude of ways to differentiate from each other through strategic behavior, which can and does produce large differences in the market price. Such behavior could support profitability for firms with targeted user communities with inelastic demand, which – based on trade press reports – appears quite plausible at this time.

We perform a wide set of checks for statistical robustness. We provide and test different specifications for the pricing equation. We also attempt a second less straightforward statistical approach, which examines the determinants of the range of prices offered by a firm, again as a function of the same determinants. This statistical test largely confirms the findings of the prices regressions.

Our paper unfolds in the following manner: The rest of Section I provides a literature review. In Section II, we provide a review of the marketplace. Then, in Section III, we discuss our data and provide a review of our key hypotheses. In Section IV, we discuss the key results, and finally in Section V we present our conclusions.

1.1. Literature review

How do vendors construct viable and valuable on-going economic entities in a young and evolving and technically intensive market place? Our study informs an old and unsettled debate about the sources of value in newly formed technology markets.

In one set of theories, rents accrue to those firms that successfully redirect assets inherited or developed in prior market episodes. These firms differentiate from others by investing in services and operations that build on a history others cannot imitate. In another set

of theories, the rents accrue to firms that develop savvy strategies, or possess business acumen and efficient execution. These firms can be either newly founded or established firms. They differentiate from others by investing more cleverly than others, leading their organizations to perform unique services at lower costs. In our typology, the first argument is represented by *origins* while the second is represented by *strategic behavior*. In other words, if we find that *origins* creates substantial value among hosting firms then we infer that the history of these firms conferred advantages, as the first argument asserts. If we find that *strategic behavior* is associated with value then we infer the latter argument has merit.

Related issues arose in a recent debate about the factors shaping the value chain in the "new economy." This debate reached a fever pitch during the late 1990s and early 2000s, during and after the frenzy of financial investment in dot-com businesses. One view interpreted this market opportunity in terms of the strategic choices facing established firms, foreseeing economic value arising primarily from investments and actions with strong links to existing organizational goals and historically developed assets – particularly those that could not be easily imitated. An alternative view emphasized the ability of the new firms to build organizations that displaced incumbent firms with a new value chain.[2] In our typology we would support the first argument if *origins* shape a substantial portion of market value, while we would support the second if *strategic behavior* does.

These prior debates also distinguish between strategic behavior that requires a firm to commit to a sunk investment, and those that take recurring (fixed or variable) expense. Typically the former applies to all the organization's products, such as the quality of the design of its product line. The latter applies to facets that are easily changed during regular operations, such as the number of units sold, potentially at a licensing cost per contract if the hosting firm resells the software of another firm.

These and related issues have motivated prior investigations into the sources of value at organizations serving Internet markets. This literature has not focused on the sources of value for the type of upstream hosting we examine. This service is sold to retailers who want an electronic web presence, but do not want to build and manage their own retail operation. The most closely

[2] This first view was articulated earliest by Porter (2001), and expanded on by Forman, Goldfarb and Greenstein (2005). For a review of these types of arguments and different assessments about which ones have held up to further scrutiny, see, e.g., Norton (2003), Hanson (1999), Kenney (2003), or Ehrmann (2003).

related literature about hosting activities has tended to be case-based. It has focused on identifying the needs of managers or entrepreneurs by helping them both achieve operational excellence and recognize the factors that shape their market position without repeating errors of the recent past.[3] Another related literature has provided insight into the pricing behavior of other on-line participants, such as retailers and intermediaries – though not the hosting firms we study.[4]

Our approach is related to the small body of statistical studies of the sources of value from differentiation among computing and Internet firms serving evolving markets. As with these studies we closely examine a snapshot for an industry and relate features of firms to their pricing. As in this work, we link firm decisions to differences between the market environments facing firms.[5] In comparison, in our study, we have greater information about the aspects and sources of differentiation and its value than other studies, but our data about market share and market demand will be weaker.

Our statistical approach resembles the few other empirical studies of contracting in technology markets, i.e., we closely examine each contract's features and classify these features.[6] As in other research where contracting practices have never before been analyzed, we focus on establishing the statistical regularities and identifying the underlying economic relationships determining value. In this sense, we also resemble empirical studies of pricing of other high technology firms.[7]

We know of only one paper examining pricing in related markets and firms, namely, Thompson and Thompson (2005), in which the authors estimate a hedonic price equation for a sample of hosting firms gathered from the *FastFind Directory*. We ask quite a different question

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[3] See e.g., Hanson (1999) and Kalakota and Whinston (1999).

[4] See, e.g., Spulber (1999), Lucking-Reilly and Spulber (2001), Clay, Krishnan, and Wolff (2001), Brynjolffson and Smith (2000), Elfenbein and Lerner (2003), Friberg (2003), Scott-Morton, Silva-Russo, and Zettelmeyer (2001), and Ellison and Ellison (2005).

[5] For example, Bresnahan, Stern, and Trajtenberg (1997) highlight two dimensions of differentiation, the technological frontier and branding, and link these to a demand model. Augereau and Greenstein (2001), and Greenstein (2000) focus on differences in the quality and breadth of services offered by Internet Services Providers (ISPs) in geographically local markets, highlighting whether such firms offer high-speed service, networking services, hosting, or Web design services.

[6] See, e.g., Lerner and Merges' (1998) study of contracts between venture capitalists and biotech firms or Elfenbein and Lerner's (2003) study of contracts between Internet portals and their online partners.

[7] Much of this dates to Griliches (1961). For recent work see, e.g, White, Abel, Berndt and Monroe (2004) on prices for operating systems, Berndt, Griliches and Rappaport (2005) on prices for personal computer hardware, or Berndt and Rappaport (2005) on pricing of mobile computers.

from their study, so our data sets differ considerably. We add additional information for the market's structure or strategic behavior, documenting the origins of firms, the role of local geography, the firm's approach to upgrade of contracts, etc'. We also analyze an essential institutional practice, the propensity of some types of firms to resell third-party carts (which we describe below) while others develop their own cart. This practice shapes observed quality. Such data is hard to collect, so their data set has more observations than ours. We view this as a trade-off between a rich description of a small data set and a narrow description of a large data set. We chose the former because it suits our research goals.[8]

2. *TOWARD A FRAMEWORK FOR THE ELECTRONIC BUSINESS SERVICE PROVIDER MARKET*

We examine electronic business service providers (eBSPs) operating in 2001. In this section we provide information about how the structure of this market shapes our study.

By 2001, the commercial Internet had diffused to over half the households in the United States and to virtually all medium and large businesses—with estimates for retail electronic commerce exceeding $32 billion a year in the United States.[9] This demand grew from almost nothing six years earlier, motivating a rapid build-out of the network infrastructure supporting the commercial Internet, most of it in applications of the World Wide Web.

In the late 1990s, the growing demand for the commercial Internet motivated the entry of a wave of many providers of infrastructure services to make the network operate efficiently. It also motivated, more infamously, a large number of short-lived dot-com entrants, many of whom formed part of the customer base for the hosting firms we study. Ultimately, hosting services survived the dot-com boom and bust, becoming a durable upstream service in this market. Many "brick and mortar" outlets demanded their services for on-line sales channels.[10]

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[8] We also think this does not cause misleading interpretations. For example, Thompson and Thomson argue that their data supports the hypothesis that large firms can charge a premium for their product. Yet, they use the number of contracts a provider offers as a proxy for the size of the provider. We too find that prices increase as firms offer more contracts, but we show that this has little to do with firm size. In our view it is an instrument for price-discrimination.

[9] See e.g., Table 6, U.S. Electronic Shopping and Mail Order Houses (NAICS 454110) for total sales in 2002 in E-Stats, http://www.census.gov/eos/www/papers/2002/2002finaltables.pdf.

[10] It is difficult to estimate the total value of this activity. The activity described in this study falls into several different areas: "Web-Site Hosting" by ISPs reached over $600 million in 2001 for NAICS 514191, which is On-

These few years can be characterized as a period of rapid "learning by trying" and market-based experimentation (Cusumano and Rosenbloom 1987, Rosenberg 1994), where firms explored a variety of service offerings and pricing strategies for those offerings, learning about the fundamentals supporting costs and demand. We know from interviews that by 2001 most of the larger and more experienced firms had grown out of their entrepreneurial origins, developing professional sales staffs and routine administrative procedures.[11]

The eBSPs were the largest class of infrastructure firms that provided hosting services. They offered solutions for businesses. These businesses users were interested in creating an on-line store or in improving their already existing on-line storefront, but they were not interested in or not capable of performing activities related to its maintenance and set up. That is, these businesses users anticipated the value of an on-line outlet, but were small or medium-sized, and without a large set of employees devoted to information systems operations. Hence, they generally preferred to outsource development activity and operational tasks. Large business users with in-house staff also may have preferred to hire an eBSP if the needs of the storefront exceeded the capabilities of the staff (e.g., because its scale was large).

An eBSP offers a bundle of services, namely, disk space along with storefront software. In the most common configuration, this software includes a store-builder and a store-manager. The store-builder helps with creating the on-line store—designing the store's layout—usually within the limits of a predefined template. The store-builder also helps with recording the products' characteristics: name, price, picture, and quantity (most store-builders require a manual entry of each and every product, while some offer automatic loading). Once the store has been created, the store-manager accepts on-line transactions, calculates taxes, manages quantities, and

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line Information Services (see Table 3.4.2 in of the U.S. Census Bureau 2001). However, many of the other related activities, such as consulting, Web-site design, and Web-site and maintenance, are in other subcategories throughout national statistical data, such as, for example, NAICS 5142, or Data Processing Services, so $600 million is an underestimate.

[11] For example, in one colorful ad a few years later, Affinity used a slogan "You don't have to pay your sister's boyfriend's neighbor's cousin to design your web site anymore." Then below it says in small type "Let the real experts at Affinity design, develop and host your web site—we even include monthly updates. Once that's up and running, take a look at our marketing and optimization services to get the most out of the web. To speak to a professional, call…." (*PC World* September, 2005 ,p. 69).

produces reports. We refer to these storefront templates as *carts,* the industry label that is short for *electronic shopping cart.*[12]

Carts include many features. We describe them in some detail because we subsequently will use this detail to catalogue cart quality. Most carts have the following:

1. *Templates:* Different layouts, color schemes, and styles for the storefront display;
2. *Inventory Controls:* An inventory manager that prevents backorders and sets the quantity in stock;
3. *Shipping Calculators:* A feature that automatically calculates the cost of shipping the products to the customer, primarily on the basis of weight and location;
4. *Tax Calculators:* A feature that automatically calculates the tax on products shipped within the United States;
5. *Customer Reports and Trend Reports:* Overviews of the activity on the store's site, such as a count of viewed pages, the average number of pages each visitor looked at, and which sites and search engines referred the visitors to the site.

In addition, some carts contain the following:

6. *Transaction Data Exporters:* A feature that helps keep track of sales for accounting purposes;
7. *Catalogue Importers:* A feature that enables the use of a database, such that the store data can be uploaded from a file rather than added one by one;
8. *Coupons/Discount Creators:* Ways to create coupons for customers to use in the store;
9. *Site Search:* A search engine for items on the store's site; and
10. *Tools for Saving User Profiles.*

The presence of the five latter features is a symptom of a high-quality cart. Their absence normally signals shoddy or low-quality workmanship.

An eBSP charges a monthly fee that depends on the contract's hosting level as well as on the quality of the cart. Providers have the option to offer contracts with small disk space, large disk space, or both. In some cases, eBSPs can offer a wide array of contracts so a potential

[12] A closely related business line offers "application service provision," where the hosting firm offers regular services associated with database maintenance or security. We confine our attention in this paper to services associated with maintaining an electronic retail outlet.

customer can start with the basic contracts, and if needed, can upgrade to a better contract with more disk space and a higher-quality cart.

Switching costs for the buyer may arise after an initial transaction, depending on the earlier transactions between the eBSP firm and the customer. The customer and supplier must spend time on creating the store, uploading the data, and learning how to use the software. This is a time-consuming learning process and costly set-up activity, some of which becomes sunk once expended. These can be important costs when new customers are uncertain about the scale of the on-line stores they want to build. That is, for some users the scalability of the contract in the future can be a very important consideration. A forward-looking user considers the whole product line offered by the eBSP before choosing a provider. Using industry parlance, we label this as the *upgrade path.*

We observe a variety of approaches, or strategic behaviors, with regard to cart quality and the design of upgrade paths. This empirical variance in the uncommon parts of the business, by itself, is noteworthy because it has never been documented and it seems to be inconsistent with the common belief that this market involves a homogeneous product. As preparation for examining empirical data, we summarize our typology for analyzing this variety in Table 1, and describe it in more detail below. We begin by describing the variety of origins of firms, then continue with cart quality and upgrade paths.

In the first dimension of our framework, we observe entrants with three different origins. We label them *Brand*, *Local*, and *Specialist*. Brand firms, like Microsoft and IBM, charge a premium because of their name and other services users affiliate with their name. These firms attempt to extract rents for their promises of reliability, continuity, and quality service in a market with high turnover and uncertain supplier future.

Before entering the eBSP market, Local firms were in a related business, typically as an ISP. Locals enjoy a pre-existing and often geographically local relationship with a set of customers near their headquarters, to whom they now offer hosting services. In this situation, the Local firm offers complimentary services that take advantage of close relationships between the supplier and buyer or of other factors that underlie trust, which is a valuable factor to some buyers in a market with as much uncertainty as this one.

The third set of entrants is a Specialist. Most of these firms are newly founded. They specialize in all facets of being an eBSP and are typically small firms that develop all their own

software. Specialists and Local firms have headquarters in some location. That location may affect the ability of the hosting services, either by shaping the set of customers in local markets or by shaping the local labor market. In this sense, the location of the provider is also an important element of its origin.

The second dimension of our framework is strategic behavior, which encompasses both cart quality and upgrade path. Stating that the three firm identities coincide with distinct approaches to offering quality is partly a statement about competitive forces. The vast majority of specialists focus on offering high-quality solutions, typically programmed by their own employees. When these firms provide only low-quality carts, they have little to distinguish themselves from others. In contrast, since the storefront services are not the core business of the Local firms, these firms buy a third-party cart and resell it to their customers. The quality of the carts offered by Local and Brand firms varies considerably, depending on the firms' reselling choices.

The upgrade path highlights a firm's portfolio of contracts. By definition, all firms offer either a single product or a product line. Most firms do the latter. Often, there is a natural sequence to the product line, one that suggests an upgrade path for an expanding user. That said, not all firms offer the same potential upgrade paths. When a firm offers a product line, potential buyers may place different valuations on the attributes of the contracts they do not purchase today but may in the future.

Although we discuss the details of the upgrade path subsequently, we now offer a general outline. Suppliers have two broad choices to make: (1) the number of different product varieties offered along the product line, and (2) the "breadth" of the commodity and the advanced feature spectrum. The upgrade path offered by firms generally only pertains to the homogeneous features, while the advanced features apply to all potential goods from the firm. We further define the homogeneous features along two-dimensions: memory size and number of product slots. The advanced features spectrum is multidimensional.

Interviews with firms verified that suppliers have differing costs for producing the homogeneous and advanced features. For example, some firms already employ skilled programmers for other activities and can assign them to this activity for periodic needs. Or, some firms are located in locales with a thick supply of talented programmers available for contract hire and can readily and comparatively cheaply put together the team they need to

support high-quality service, even with employee turnover. Hence, while some firms find it relatively cheap to offer high-quality homogeneous features (e.g., more storage or product slots), others do not. Similarly, while some have relatively lower costs for offering high-quality advanced features, others will not. Because firms face different costs for providing these different options, there is no compelling reason for them to make similar choices. Altogether, these factors lead to the potential for a wide variety of offerings. The open question is whether this variety induces large or small differences in the ability of the firms to charge high or low prices and margins over cost.

The data for this study comes from 2001. By then, market forces had already eliminated a set of risky (or, perhaps, better characterized as intemperate) approaches to upgrades. For example, during 2000, before the dot-com crash, many providers offered their basic contract for free and charged a monthly fee only once the consumer chose to upgrade to a better contract. This strategy was aimed at generating switching costs with users, with firms gaining revenue later as long as the users remained with their existing provider. The crash of 2000 appears to have rendered this pricing strategy ineffective or simply unpopular, as by 2001 the providers who offered free contracts either went out of business or moved to charging a monthly fee for all contracts.

3. HYPOTHESES DEVELOPMENT AND MEASUREMENT

By 2001, the eBSP market contained a large number of providers offering a large variety of Web solutions, from basic hosting to sophisticated store managers. In this section we describe the data we collected about these firms.

To build a comparable set of services, we focus on custom Internet solutions offered to small and mid-sized firms, which offer on-line transactions in addition to help with building and managing the storefront. We include only those observations that (1) offer a store-builder, (2) offer on-line credit card processing, and (3) do not require users to have any knowledge in HTML/ XML or any other computer language.

The data collection process was as follows: We first searched Yahoo! and *thelist*[13] for listings of providers. We then looked at each provider Web site; and for each contract offered, we collected information on monthly prices.[14] We kept observations that were complete. In total, we collected data on 433 contracts offered by 145 firms. As a further check, we randomly called a number of providers to verify the on-line quotes; we found no discrepancies.

We now discuss the definitions of the variables that determine price. As before, our discussion follows the framework in Table 1.

3.1. Origins

Firm Identity before Entry. Does the provider's origin shape its ability to mark up above cost with a targeted customer base? If specialists have a set of custom services in their software, then specialists may command a premium over locals who resell others software.

Firm origin was comparatively easy to assess. The few Brand firms that existed in 2001 were IBM, Microsoft, Yahoo!, and Ameritech. Another prominent branded firm, Intel, had recently exited. All the Local firms were regional ISPs from a wide variety of locations across the United States. There were also a significant number of Specialists. Overall, we have in our data 11 contracts by Brand firms, 389 by Locals, and 33 by Specialists. In our regressions, we define two dummy variables, ***Brand*** and ***Local,*** respectively. Specialist is omitted.

To save degrees of freedom in some specifications, we group Brand and Specialists under the same group, and define it as *Self-developers*. We use the Self-developer group when analyzing the extent to which different types of providers can charge a higher premium for any of the services they offer and use the variable ***SelfDeveloped*** when doing so. Obviously, in this case the omitted variable is Local.

Location of Firm: We expect firms headquartered in locations with more Internet-savvy businesses to have access to thicker labor markets for talented programmers, which then lowers

[13] This site, maintained by Meckler Media, provides ISPs the opportunity to advertise their services. The ISPs fill out a questionnaire where the answers are partially formatted, then the answers are displayed in a way that allows users to compare different ISP services.

[14] Since, in some cases, the pricing quotations advertised on *thelist* were inaccurate, we disregarded these quotes and used only the quotations advertised on the providers' Web site.

costs. We also ask whether Specialist firms react differently to differences in labor market conditions than the other types, who can move labor around multiple tasks.

Geographic location was defined as the city in which the firm locates its headquarters.[15] We form an index of the thickness of the labor market based on several different attributes of a location. We consulted an index of the Internet development of business establishments compiled by Forman, Goldfarb, and Greenstein (2005). Two indices measure two distinct features of a city: (1) the fraction of establishments that have advanced Internet infrastructure and (2) the fraction of establishments that have any basic Internet technology. Following Forman, Goldfarb, and Greenstein, we call these *enhancement* and *participation*, respectively. We found that participation did not predict much, because business use of basic Internet technologies did not vary much across locations, having reached saturation almost everywhere. Hence, we dropped *participation*. As a measure of labor market thickness for technical talent, ***Top25*** is a dummy for whether the firm has a headquarters in one of the top 25 areas for enhancement among the fifty areas in the United States with a population of one million or more; ***enhance25*** interacts ***Top25*** with enhancement.

3.2. Strategic Behavior

Commodity Technology Attribute: If incremental changes in common features are priced at their variable cost, prices are an additive weighted sum of per-unit price. This additive hypothesis is one null hypothesis. An alternative hypothesizes about the presence of economies of scale in the operation and deployment of services. This would result in lower per-unit price at higher levels.

Standard contracts provide users (e.g., store owners) with server space. We define the variables ***Storage*** and ***ProductSlots*** as the available disk space and the maximum number of product slots allowed in the store, respectively. Some firms, however, offer contracts with an unlimited, or infinite, amount of features in either one dimension or both. There were several different but econometrically equivalent specifications for this feature of contracts. We employ the following: In case of an infinite amount of storage or product slots, the variable is set to a somewhat arbitrary number, at a level equal to a step above the highest level in the data. Then

[15] Note that for the Brand firms this index might be meaningless, but following our standard procedures we give each the index for their headquarters (e.g., Redmond for Microsoft, Armonk for IBM, Santa Clara for Yahoo!, and Chicago for Ameritech). These are all major areas at the high end of our index for sophistication, so there is little variation between them and any other specialist in a similar area.

the corresponding dummy variable, that is, ***InfStorage*** or ***InfProdSlots***, is set to one. These arbitrary numbers are 5000 MB for storage and 200,000 for product slots. Note that since from the store owner's point of view, the variables ***ProductSlots*** and ***Storage*** are complements—a store owner would not value a contract with unlimited disk space (or, conversely, product slots) but a very small number of product slots (or disk space) as most of the offered disk space (or product slots) cannot be used. We further discuss this point subsequently.

*Quality of Cart Choice***.** A cart is a combination of a store builder and a store manager and its quality is directly related to the quality of the store-builder and the store-manager software. Higher quality, as measured by Q_k, should command higher value across all contracts. In addition, it is more important for Specialist firms to emphasize their quality to potential buyers that might not otherwise know or trust them. Hence, we look for evidence that the quality of the services from Specialist firms commands a different market value than similar quality from Brand or Local hosting firms.

As was previously noted, we found 10 relevant features for an on-line store that are indicative of the software's quality. Each cart received one point for the availability of each of these features. Hence, in practice, the variable ***Quality*** takes on values between four and ten. We provide descriptive statistics on the carts' quality in Table 2. We call this ***Quality*** in the regression below. We also add one additional measure of quality. ***PhoneSupport*** is a dummy variable that gets a value of one if the monthly price includes *free* phone support. Phone support, which many providers charge extra for, is a very important service for the new on-line storeowner. If the free phone support is given only for couple of months ***PhoneSupport*** gets the relative fraction of these months within the first year. To test for different behavior of self-developer we add ***SelfQual*** and ***SelfPhone,*** which interacts ***SelfDeveloped*** with ***Quality*** and ***PhoneSupport***, respectively.

Our data consists of eight different third-party carts and sixteen Specialist carts. It is necessary to note here that we kept the Brand and Specialist firms separate in our analyses as long as possible, but when we interacted the variables with each other we needed to combine Brand and Specialist firms into the Self-developer group due to the small number of Brand firms available. In Table 2, we still use the separate groups— while dividing the Locals into four

subgroups—and show the distribution of the most common carts[16] along the storage, product slots, price, and quality lines.

The results in Table 2 show that, on average, Local firms tend to offer more storage than Specialists. This is consistent with the higher storage costs that Specialists have. Whereas there is dispersion with the amount of storage offered, with product slots, each third-party firm tends to offer only a specific range. Specifically, Miva and Akopia only offer an unlimited amount of product slots, while AlaCart offers contracts with a comparatively low amount of product slots.

In terms of range of cart quality, Table 2 shows that AlaCart is at the low-end, Miva is in the middle, and Kurant and Akopia are at the high end. The Specialists are found everywhere along the quality line. Accordingly, we define ***Akopia, AlaCart, Kurant, and Miva*** as dummy variables of the major carts and omit the four small carts. We treat these as "fringe" suppliers.

Upgrade Path: We also examine the availability of an upgrade path. We expect contracts to be more valuable if they are part of larger portfolios. We also expect that the two homogeneous features of hosting—memory and product slots—are complementary, so we expect pricing to value upgrade paths that growth both features together without limitation.

With regard to contract position, we ask, Does the position of the contract within the portfolio affect its price? There is no consensus prediction in the literature, so we make no predictions. In the classic Mussa and Rosen (1978) model, mark-ups at the bottom of the product line are distorted upward to induce purchase at the top of the product line, where there is monopoly pricing. More recent generalizations by Rochet and Stole (2002) argue that this effect depends on trade-offs between the participation constraint and valuation of vertical quality dimension. The switching cost literature (e.g., Farrell and Klemperer forthcoming) or the more recent literature on versioning of information goods (Shapiro and Varian 1998, Chen and Hitt forthcoming) suggests a starker prediction. A firm's price will be low at the bottom of the product line to attract consumers who will purchase higher margin products later. In the spirit of this variety of predictions, we test for any departure from pricing norms stemming from the order and position of a contract in a portfolio of products.

In practice, firms offer two types of upgrades: (1) software upgrades with additional features to better manage the on-line store, and (2) hosting upgrades with additional product

[16] Constitute 90% of all observations. The other 10% involve four other uncommon third-party carts.

slots, storage, and e-mail accounts to expand the on-line store. While Self-developers are free to choose their software upgrades, Locals are tied to the upgrades offered by the third-party cart. That is, all Locals that offer the same third-party cart will offer exactly the same software upgrades and can differentiate themselves only with the combined hosting contract.[17] This, however, does not set Locals apart from Self-developers in terms of the number of contracts offered within a portfolio.

Since store owners value portfolios that offer contracts with a balance of product slots and storage, we expect providers to offer portfolios of balanced contracts along which users could grow; actual data, however, seem to defy this expectation.[18] There are two ways to view this: First, in Table 3, we show the storage–product slot offerings distribution. For each storage–product slot range combination, the Table gives the number of contracts offered (top number) and the average monthly price of these contracts (bottom number). The combinations are spread all over the storage–product slot space. Second, the Table shows that providers tend to use a limitation on one dimension of the space (storage or product slots) as a tool to also limit the other dimension. Almost 60% of the contracts in our data limit either storage or product slot space, and of these more than 80% offer an unlimited, or infinite amount of product slots. Note that 10% of the available contracts offer an unlimited amount of product slots with a small amount of storage (less than 50 megabytes, or MB), while there are no contracts that offer unlimited storage with less than 25 product slots. In addition, note that there is plenty of variability in the pricing of the contracts, without any notable trend.

As it turns out, a firm's upgrading path strategy is highly correlated with its origins as well as with the third-party cart the firm offers. In Table 4, we return to using the separate variables of Local, Brand, and Specialist firms. Of the firms that offer more than one contract, most tend to upgrade along the storage line, in which case the number of product slots stays the same for all contracts within a portfolio. While high-quality carts like Akopia and Miva mostly do not limit the number of product slots, lower-quality carts like AlaCart tend to fix the number

[17] Kurant, the only exception, offers carts with two different quality levels.

[18] One interpretation suggested to us was that this represented deliberate attempts at obfuscation by vendors—see, for example, Ellison and Ellison (2005). Another was that this represented a simple marketing strategy to "frame" middle choices, making them appear comparatively more attractive by making the end choices appear to be less attractive. We are agnostic between these and other explanations. As elsewhere, our approach is to characterize this behavior and identify whether it facilitates higher or lower prices, then we discuss the range of interpretations the estimates allow for.

of available product slots at a low level, in which case the marginal benefit from additional storage decreases as the available storage increases. Note that when offering an infinite amount of product slots while limiting the available storage, firms essentially use one dimension to limit the storage–product slot space. Specialists use many different upgrading strategies; however, they tend to use one specific dimension to limit the whole space. That is, they upgrade along one dimension while not limiting the second one.

Given this behavior, we experimented with a variety of specifications for the portfolio choice. Because it is the least common, the choice to fix storage levels is difficult to identify from other behavior. We, therefore, define a dummy variable, ***Notfixed*****,** to account for the differences between contracts that are part of a portfolio where one feature is fixed and contracts that are part of a portfolio in which both features grow. As can be seen from the data in Table 4, 29 firms offer contracts without fixing either storage or products along the upgrade path.

We also define a variable for the position of a contract inside this upgrade path. We define three variables, ***Bottom*****,** ***Top*****,** and ***Position*****.** ***Bottom*** is a dummy variable for the smallest contract in a portfolio. ***Top*** is a dummy for the highest. ***Position*** is a variable number that equals one for the lowest contract, two for the second, and so on. The variable ***Portfolio*** gives the number of contracts the firm offers. ***PortBottom*** and ***PortTop*** interact ***Portfolio*** with ***Bottom*** and ***Top***, respectively.

3.3. Competition.

If a firm has market power, then presence of competitors might not affect pricing. We consider two versions of this hypothesis. In one view, market power arises from firm characteristics, so the presence of competitors has no effect anywhere. In another, firms have little market power at the "entry level" end of their portfolios and more at the high end, which forecasts systematic differences in the sensitivity of prices between the high and low end of a portfolio.

As it turns out, firms tend to offer their homogeneous features at a few modal levels or ranges. Hence, it is straightforward to define competition at a practical level around scalar focal points, such as "between 80 and 100 products." We then define competition around supply within each storage–product slot box as is shown in Table 3. In each segment, firms compete both with contracts offering the same cart as well as with contracts offering different carts. That is, in general, competition within segments depends on the total number of contracts within the

segment, the total number of firms, as well as the total number of different carts. We define the following additional variables: ***marketSize*** is the total number of contracts offered within the segment and the overall number of carts competing within a segment; ***numCarts*** is the number of different carts offered within a segment.

Though each firms treats its rival's decisions as exogenous, we still face an endogeneity issue related to an omitted variable. For example, Table 3 shows that the high end of the space is very crowded. Does the heavy competition on the high end of the product slot space limit the firms' ability to extract high value? Or does high supply simply reflect the presence of more users in these segments? The first (second) process supports a negative (positive) relationship between more competition and prices. In light of these inherent ambiguities, we interpret the coefficients for these variables with caution.

3.4. Interpreting Firm Heterogeniety

Our descriptive statistics support a rather striking observation: There is a considerable heterogeneity in firms and their strategies, contrary to the expectation that this is a homogeneous commodity market. Specifically, our discussion above shows there is a large combination of possible origins and strategic behaviors. Firms approach this market with three different origins, four different strategic behaviors to arranging portfolio upgrades, and more than five qualities of services ranging from basic to very advanced. Moreover, the variety does not end there: Within those broad differences are even finer-grained differences. In addition, we also observe a wide variance in the competitive conditions for a specific type of contract—some firms offer services for which there are many close substitutes and some do not.

Such variety begs a question: Do these differences affect price levels? If so, by how much? This is the question we turn to next in our regression analysis. In this section we discuss the interpretation of these coefficients.

The unit of observation is the contract offered to potential customers. For each contract, *i,* we observe a price offered to customers, as well as a vector, X_i, which represents the features of each contracts. We will assume that there exists a function that maps features into prices. In practice, we might consider a function such as $P_i = f(X_i\beta) + e_i$, where e is an error term, f is chosen by a set of econometric procedures, and β must be estimated. Now we consider the interpretation for estimates of β.

P_i is produced by firm of type *f*, where *f* can be Brand, Local, or Specialist. We observe the vector of characteristics M_i, S_i, Q_i, where these are contract variety *i*'s memory size, number of product slots, and quality of features, respectively. In addition we observe the geographic location of the firm, G_i, its choice of cart K_i as well as the specific upgrade path that the firm offers, U_i. Finally, l is the position of the contract variety within the firm's portfolio, which we define subsequently. It will be an ordinal category, such as lowest, highest, or middle contract within a portfolio offered by an eBSP. We denote by N_c the total number of firms that offer a contract variety with an overall similar level of homogeneous features. In general we write the price function as $f(f,l,M_i,S_i,Q_i,G_i,K_i,U_i,N_c)$, where we have treat all these determinants as exogenous. In practice, empirical data will violate this exogeneity assumption, especially for N_c, which concerns us less because we treat it as a control. We defer a full discussion until later.

Now we discuss the interpretation of the coefficients. We imagine a two step entry process, where firm first enter and then, second, they compete. From the viewpoint of a firm in 2001, most of these entry costs are sunk. We think of contract *i*'s cost function as pertaining to only its variable expenses, while the monetary component of entry costs are debts the firm tries to pay through pricing above variable costs. For reasons will describe momentarily, we write the costs function as $C(M_i,S_i,Q_i,G_f,K_f)$. Hence, we will think of f, l, U_f, and N_c as contributing to contract *i*'s margins above costs, but not costs levels. In some situations we can also interpret Q_i similarly.[19]

Some of this is straightforward. It is clear that increases in memory and product slots, M_i and S_i, raise both unit costs and prices for a contract. Hence, a positive coefficient on either variable is uninformative about margins. In contrast, while it is clear that higher Q_i, should raise prices. Some qualitative improvements involve regular operational expenses that affect unit costs, such as phone support, while other qualitative differences among firm arose from costs incurred at entry, such as software design. We can attribute margins to quality when those qualitative improvements involve little operational cost or the costs are largely sunk, as they are

[19] Note that there was almost no new entry into this market after the dot-com crash. As a result, we do not observe any firms who entered around the time of our survey. Most firms expended the vast majority of their entry costs before we observe them.

for self-developers.[20] However, for a local firm the cart choice, K_f, shapes a firm's prices as well as variable costs, since cart owners may charge licensing fees (except when it is open source). Hence, a coefficient on carts informs us about price, but not margins.

By a similar line of reasoning, upgrades strategies involve few operational expenses, so we interpret differences in price levels affiliated with a firms upgrade strategy, U_i, and a contract's position, l, as indicating differences in margins. By similar reasoning, the level of competition for each contract, N_c, affects margins, not costs.

Finally, when interpreting the firm type, *f, w*e also bring one historical trend to our interpretation. Most of these firms were not mass market providers. Most local firms and specialists attempted to target user communities with inelastic demand. In these cases we associate higher prices for a type of firm with greater margins. We do not expect low mark-up to support high profitability unless it translates into large market share, which – based on trade press reports of industry events – few, if any, of these firms achieved. Judging from news reports, even the branded firms did not realize such aspirations. [21]

4. DETERMINANTS OF CONTRACT PRICING

In Table 5, we present four specifications analyzing the effect of origins as well as strategic behavior and competition on firms' pricing strategies. We follow statistical procedures established by prior researchers (Berndt 1991). For each specification, we present the Ordinary Least Squares estimators with clustered standard errors.[22] The log of prices is the dependent variable.[23] In all our estimates we assume the right-hand-side variables are statistically exogenous and discuss ways in which violation of this assumption might shape the interpretation of coefficients.

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[20] While the coefficient tells us about which designs generated higher or lower margins for a self-develop, it will not tell us whether the total incremental improvement in revenues from increasing quality over the next highest level exceeded the cost of designing it.

[21] As illustrated by Intel's high profile exit prior to our data collection.

[22] We also estimated a random-effect regression, which was superior to a fixed effect regression by standard tests; however it does not add much over the OLS regression with clustered standard errors. Sometimes the coefficients or standard errors change slightly, but not by much or not in qualitatively important ways. For the sake of parsimony and space, we show only the OLS with clustered standard errors results.

[23] Box-cox tests strongly favor the log price specification.

The first two baseline specifications explain much of the variation in prices. The R^2 is high for a cross-sectional regression, exceeding 0.7 in every regression. As specifications III & IV show, additional explanatory variables enable us to explain more of the variation in prices. In addition, the results show that both origin and strategic behavior contribute to the variance of prices between contracts. While both factors are important for explaining differences in prices, strategic behavior seems to explain more of the variation than origin. For example, a price regression with only the Commodity Technology Attributes explains about 33% of variation in prices. Adding origins to this regression (Firm Identity before Entry and Location of Firms) increases the R^2 to 0.35, but an F-test rejects the hypothesis that all the origin variables (*Brand*, *Local*, *Enhancement* and *Top25*) together equal zero.

We next divide the strategic behavior variables into two large subgroups: (1) decisions made when entering the market; and are thus relatively hard to change and thus affect the position of the provider in the market, and (2) decision made after entry; these are more flexible decisions that are easier to change. We include Quality and Carts decision within the first subgroup of strategic behavior, and include the Upgrade Path variables in the second subgroup. Adding the first subgroup of variables to the Commodity Technology Attributes regression pushes R^2 up to almost 0.7. As before, the addition of the origin variables does not increase the percent of variation explained by much. However, an F-test rejects the hypothesis that all origin variables are zero. Finally, the second subgroup of strategic behavior variables increases the R^2 to almost 0.8.

We organize our discussion by our previously defined categories of variables and we summarize the results in Table 8.

4.1. Origins

<u>*Firm Identity before Entry:*</u> In general, a firm's identity before entry affects its ability to charge a premium. In the first specification, the coefficient on ***Brand*** is positive and significant, while the coefficient on ***Local*** is negative and significant. The coefficient on ***Brand*** is in line with our hypothesis that Brand providers can leverage their reputation and charge a premium. In converse, the negative coefficient on ***Local*** accepts our hypothesis that specialists (the omitted variable) charge a premium for their custom software services. Most Locals need to discount their

contracts. The level of discount then depends on the third-party cart the Local firm chose to offer. We will say more below about Specialists.

Location of Firm: In Specification II of Table 5, we examine the effect of the location of the provider. The coefficients on ***enhancement*** and on ***Top25*** are negative, and the coefficient on ***enhance25*** is positive. Since all three coefficients are not significant, we can not reject the hypothesis that location did not affect pricing in this market.[24]

Specification II also adds some information on the ability of Self-developers to charge a premium for cart quality (***SelfQual***) and customer services such as phone support (***SelfPhone***). The results show that Self-developers tend to discount their quality but charge a premium for phone support. After interviewing several companies, we believe this result can be explained by the different labor markets Locals and Self-developers use. Self-developers hire highly skilled programmers to develop and maintain the cart. Therefore, typically the phone-support provided by Self-developers is given by these professional programmers. Locals, in converse, mostly hire information technology professionals for a variety of tasks. They are not as familiar with the software, and therefore probably offer "lower-quality" support. Consequently, we believe that the premium Self-developers charge for phone support can be explained by the higher value but more costly service they offer.

4.2. Strategic Behavior

Commodity technology attributes: As we expected, in all specifications, prices increase when the amount of offered storage and product slots increases. We tried specifying a series of higher-order terms, and standard criteria suggested keeping the number of terms low. We tested multiple specifications for these attributes and box-cox strongly favors logging these attributes. This is the first of many estimates showing that price is *not* a linear sum of the cost of attributes, such as memory and product slots. Rather, over the range of attributes we observe, there are strong tendencies towards lower unit costs for incremental additions at higher volumes, consistent with economies of scale. We cannot draw an unqualified conclusion yet, however, because other factors affiliated with size, such as a contract's position, also shape the price of a contract.

[24] While some of the regressions we ran hint that location actually did affect firms' pricing, this finding was not robust. The results we obtained suggest that the effect of location may be observationally equivalent to higher or lower quality by a Self-developer, taking advantage of local labor market conditions.

We also considered a number of specifications for "unlimited" attributes. Given our procedures, the estimates for ***InfProdSlots*** and ***InfStorage*** could have been positive or negative. As it turned out, they are negative and significant in most estimates, and small in all the estimates. More to the point, the estimates are meaningless by themselves, but the size of the point estimate is suggestive. For example, the first set of estimates suggests that offering unlimited product slots allows a firm to charge a price as if it were a little less than 5000 MB in storage and 200,000 product slots. Because the actual point estimates differ with the specification, we do not make a confident inference about the precise "value of unlimited" other than that it is in the neighborhood of our educated guess. We conclude that our procedure for measuring unlimited yields reasonable outcomes.

Quality of Cart Choice. There is a large variance in the quality of the cart that firms offer, and in particular in the quality the different firms types offer. In our baseline specifications, prices are increasing in quality, even controlling for cart dummies. Furthermore, providers can charge a premium for services like phone support. At a general level, these results are plausible.

While the median quality of a cart offered by a Local firm is 8, the median quality of a cart offered by a Brand firm is 4. We speculate that the large difference can be explained by the return on investment in quality, and simple simulations are consistent with that speculation. From Specification II in Table 5 we can see that increasing the quality of the cart by one unit enables a Local firm that offers an uncommon third-party cart to increase its price by 16%. In converse, a Brand firm can increase its price only by 7% for a quality increase of one unit. The additional level of discount or premium from a Local firm that offers one of the four most common carts varies from a discount of -152% to a premium of 71%.

Neither cart quality nor cost can solely explain this variation in estimates. While the discounting of AlaCart and Miva might be explained by their lower quality, Akopia offers a very high-quality cart.[25] Akopia, however, is an open source and Local firms are not charged per unit when they offer it.[26] Thus, discounting Akopia might be a direct result of the low unit costs providers face. Kurant is the only cart that commands a premium, probably because of the third-

[25] The third column in Table 6 presents the discount/premium a Local firm can charge due to quality.

[26] Nevertheless, this also means that the providers cannot as easily give support for the operation of the cart. There is a basic reason for this. The ISPs often do not understand all the source code well enough to be able to solve all problems for their users. Firms like Kurant or Miva offer support to the ISPs that use them, which enables the ISPs to help its customers solve complex problems.

party brand name the cart has among ISPs together with its high quality. We believe some of this premium is shared with Kurant in licensing revenue.[27]

Our interpretation presumes these cart choices were made at some point in the past and thus are difficult to change, even as the consequences for pricing become known later. To facilitate understanding the importance of this choice, we imagine a counter-factual experiment: how prices would change as an ISP altered its cart choice while not altering other features. This exercise isolates the "brand/quality" effect, except in one case, as we describe below. To illustrate this question, we take as a benchmark a Local firm that did not engage with one of the more common third-party carts—Kurant, Miva, Akopia and AlaCart. The median quality offered by such providers is 5. We take this benchmark and calculate the marginal premium or discount Local firms can charge by switching to one of the common third-party carts. The forth column in table 6 shows the results.

Kurant offers two carts with two different quality levels. While local firms that offer the higher quality cart can charge a premium of about 150%, offering the lower-quality cart allows for a premium of 120%. Local firms offering either of these carts are pursuing a "high-cost and high-quality" strategy. Local firms offering AlaCart, in contrast, are taking a distinct tact, offering a "low-cost and low-quality" strategy.

From this simulation the behavior of Local firms offering Akopia is intriguing. As noted before, Akopia is open source and the discount on Akopia partially reflects the Local firm's lower costs that are derived from offering a cart for which it is not charged. Note, however, it was high quality cart. Once we control for quality differences, the discount for Akopia is mildly smaller than what we discussed before. This finding suggests that Local firms with the technical skills to cooperate in an open source project like Akopia have a cost advantage if users value the quality of Kurant and a quality advantage if they value the price of AlaCart.

We conclude that choice of cart and choice of quality can have a large effect on pricing. The direction and size of the effect, however, depends on the specifics of the choice and the strategic position the provider seeks to achieve. Overall, higher quality commands a high premium over lower quality, except when the quality comes cheap, as it does, for example, in an open source project or from a Specialist. Open source might, therefore, be quite a profitable

[27] However, the cart vendors were reluctant to share information about their historical licensing practices with us, so we could not verify what fraction of this premium stayed with hosting firms who resold it.

strategy when providing hosting services to a targeted customer base. Based on industry accounts, we are more skeptical that most Specialists were able to generate large market shares from low cost and low quality software services. If that is so, then low cost and low premium was not a profitable strategy to pursue.

We now make one more simulation on cart choice, simulating the overall effect from this choice, not just its marginal affect. As table 2 shows, the choice of a third-party cart directly affects the amount of storage and product-slots a Local firm offers, as well as the size of its portfolio. That is, in order to calculate the overall effect of a cart choice, one should take into account the effect of quality as well as the amount of commodity features (as well as the number of contracts). The fifth column in table 6 presents the overall effect of cart choice. In general, the results are qualitatively similar to the quality/brand choice results. The discount for Akopia is not as large as it was before. This is because Locals offering Akopia tend to offer a larger portfolio (see table 2) as well as high levels of storage.

Overall, we conclude that – among the many things that a cart choice determines – the marginal contribution of cart quality is the biggest determinant of price levels. We also conclude that firms who can offer open source software gain a pricing advantage over those vendors who do not or can not offer open source, leaving them offering lower quality at the same price. We cannot conclude which of these high quality choices – open source or Kurant – is most profitable without knowing the precise licensing costs for Kurant and the relevant demand elasticities for Kurant software and substitutes.

Upgrade Path. The third specification in Table 5 adds the effect of ordering and upgrading path on a firms' pricing strategy. The basic pattern suggests the following: Prices increase with the location of the contract within the firm's portfolio. The more contracts a firm offers, the lower the initial price and the higher the top price. The discounts can reach more than 30% for portfolios with four contracts, and the premium for the top contract in these portfolios is around 35%. That is, firms seem to be tilting the whole pricing line in a way that lowers prices for basic contracts and raises prices of top contracts. This is consistent with "entry-level" pricing for small contracts and premium pricing for upgrades.

PortSelf interacts ***Portfolio*** (the number of contracts the firm offers) with ***Self-developers***. The positive and significant coefficient suggests that Self-developers charge a premium for offering large portfolios. As noted before, variables that capture the effect of the

upgrade path affect prices, but do not affect the firms' costs and thus directly affect firms' margins. Consequently, one can conclude from the results that adding one contract to a portfolio of a Self-developer increases the provider's margin by 26%. ***Notfixed*** is positive and significant, supporting the hypothesis that consumers value an upgrading path that balances the amount of storage and product slots. Consumers do not want to pay for storage or product slots they cannot use because of other limitations; therefore, firms must discount such contracts.

To understand better the effect of different upgrade paths, we now analyze two different changes in behavior within upgrade path: (1) changing the number of contracts and position within the portfolio and (2) moving from a portfolio where both storage and the number of slots are not fixed to a portfolio where storage is fixed. The interpretation of this simulation depends on whether we view contract portfolios as statistically exogenous or endogenous. Because cart choice also limits the number of contracts a firm can have, exogeneity for the number of contracts is a plausible assumption, just as it was for cart quality. Hence, we view this simulation as isolating a "portfolio effect" that is distinct from the cart quality/brand effect, though both have been determined simultaneously in the past.

We start with a firm offering four contracts and study what happens if the firm increases the number of contracts to seven. We assume that the firm adds a contract between any two adjacent contracts, such that the bottom contract remains at the bottom; the second contract, however, moves to be third, and the third contract moves to be fifth. The top contract remains top but its position is now seven. Since we want to focus on the effect of a change in the number of contracts, we assume that all other contract characteristics remain the same except for the change in position. We set the level of products and the number of slots of the "added" contracts to be the average of the contract above and below. Note, while adding contracts changes the position of the contract within the portfolio, it also affects competition as there are now more contracts to choose from.

Summarizing the position and competition effects shows the following: There is no positional change for the bottom contract; thus, the price of the bottom contract will increase by only 1%, reflecting the change in competition. The prices of the original second, third, and top contracts increase by 12%, 23%, and 34% respectively. In all three cases, the main effect is the positional effect. The prices of the added contracts (the new second, fourth, and sixth contracts) are 43%, 64%, and 77%, relative to the bottom, third, and fifth contracts, respectively. These

price changes reflect the position of the added contracts as well as the additional storage and product slots these contracts offer relative to the contract beneath them.

All the results so far suggest that firms can use larger portfolios to slice up the product space and better price discriminate among their customers. Assuming that the price increase does not affect the firm's market share too much, we can conclude that larger portfolio would likely increase the firms' profitability. That begs the question about the effect of adding contracts to small portfolios. Consequently, we consider a firm that offers only one contract. Once again, we simulate the answer to this question using the coefficient estimates.

Specifically, the data has 29 observations of firms that offer only one contract; out of which 26 fix storage levels while not limiting the number of product slots. The storage these firms offer varies, starting at 40 MB. The median level of storage is 150 MB. We therefore take for our analysis a one-contract firm that offers storage of 150 MB and does not limit the number of product slots. We then look at two different cases. First, we add only one contract to the firm's portfolio, where the added contract offers 75 MB (half of the original contract's storage). All other contract characteristics are unchanged. Next, we add three contracts, increasing the number of contracts in the firm's portfolio to four. As in the first exercise, we leave the original contract as the top contract and assume the additional contracts offer lower levels of storage. We assume that the storage levels the four contracts offer are 25 MB, 50 MB, 100 MB, and 150 MB. Again, all other contracts characteristics are unchanged.

Our calculations show that when a firm moves from a one-contract to a two-contract portfolio, the firm must discount the added contract by 53%, but can charge a premium of 19% on the original contract. Moving to a four-contract portfolio, however, allows the firm to charge a premium of 49% for the original contract, but the bottom contract must be discounted 75%. The discounts on the second-lowest and third-lowest contracts are 25% and 9%, respectively.

Overall, there are high returns from expanding from one contract to many. That finding further begs the question why 20% of the firms in our sample offer only one cart. Perhaps these firms were not commercially savvy when they made these choice or do not possess the managerial skills to manage the complex situations that a range of contracts might engender among clients. In either case, we are watching a young market and this result seems destined to change. We forecast that this behavior creates too many disadvantages and will not survive under long-term competition.

We now examine the importance of changing the portfolio strategy from an angle consistent with a modal situation, namely, when a firm has four contracts already in its portfolio. But what type of situation should we examine? Although 28% of the contracts in our data are derived from portfolios that offer other contracts with both additional storage and additional product slots, there is no evident typical upgrade path. Hence, to illustrate what an alteration of contracts would produce, we choose a random firm that offers such a portfolio, and analyze the effect of fixing either the amount of storage or the number of product slots on the firm's pricing strategy.

The firm we analyze offers four contracts with the following (storage, product slot) offerings: (50, 50); (150,100); (400,500); (1000, 2000). To begin our analysis, we first fix the available storage in each contract at 1000 MB so that the contracts in the portfolio would only differ by the amount of product slots offered. It is important to note that even though the storage offering is now higher, customers will not necessarily be able to take advantage of this additional storage. The limitation on the number of product slots also limits the amount of storage they can actually use, sometimes mildly and sometimes greatly. Our results show that in this case the firm can increase the prices of the first three contracts it offers by 19%, 18%, and 15%, respectively. Nevertheless, the firm must decrease the price of the top contract by 36%.

The results of the opposite exercise—fixing the number of slots and allowing for differences only in the available storage—are qualitatively similar but the effect is larger. In this case, the firm can increase the price of the first three contracts by 40%, 40%, and 37%, respectively, but again must discount the top contract by 36%. Overall, it appears that restricting the storage–product slot space by limiting just one of these variables is beneficial for firms where the majority of users do not desire the top contract. This qualification is potentially binding; the next results on competition will suggest that demand for top contracts is higher than demand for any other type of contract. Furthermore, it is costly for firms to offer additional characteristics, even if customers cannot take advantage of them at all, and thus it is not always the case that more is better for the supplier.

We must be careful with generalizing these results. Although here the firms could increase the price of most of the contracts they offer, this is not always the case. When a firm limits one of the lines, whether it is storage or product slots, it can charge a premium for the additional storage or product slots offered. Yet, as Table 5 shows, the firm must discount these

contracts by 36%, as customers are not willing to pay for additional characteristics they cannot take advantage of.

Overall, as stated in Table 8, we conclude that the upgrade behavior of a provider can have an enormous effect on the pricing of hosting services. We generally observe patterns consistent with entry level pricing of contracts within a portfolio. Generally, the firms that offer a wider range of contracts with a more balanced set of features are able to charge the highest unit prices. Nevertheless, there also are several exceptions to this last generalization, so we do not draw any broad conclusions other than the observation that such behavior matters a great deal to the variance of observed prices.

4.3. Competition

The fourth specification in Table 5 presents the results for adding the effect of competition. Both measures of competition are significant—rejecting the hypothesis that the presence of competitors does not affect a firm's pricing behavior. The coefficient on ***numCarts*** is negative, which suggests that prices decrease as the number of carts offered within a segment increases. The coefficient for ***marketSize*** is positive and seems to capture an unmeasured demand effect. The variables ***numCartsBottom*** and ***numCartsTop*** are the interactions of ***numCarts*** with ***Bottom*** and ***Top***, respectively. The coefficient on ***numCartsBottom*** is negative but not significant. The coefficient on ***numCartsTop*** is positive and significant. At first blush, it appears these results are in line with the hypothesis that firms have little market power at the low end of their portfolios and more market power at the high end, if they have any.

There is a large variance in the level of competition in the different storage–product slots boxes. The number of contracts within a box varies from only one contract to sixty-three contracts; the number of competing carts within a box varies from one to five. To better understand the effect of competition on a firm's pricing we look at a "monopolistic market"—a box with only one contract, and compare it to the other extreme—a box with sixty-three contracts and five competing carts. The results show that prices in the more competitive box are on average higher by 14% than the monopolistic market. While this result is very surprising on the surface, it is consistent with our findings in the data description section. We speculate that crowded product spaces are crowded because most users are there. The settings are competitive to some degree, but we cannot tell how much difference this competition makes. Endogenous

entry means the statistics are more informative about the size of demand than the competitive intensity of rivalry.

Overall, in our data, variance in other factors better predicts variance in prices. Nevertheless, because of how endogeneity clouds interpretation, we conclude that there is insufficient evidence to infer whether competitive rivalry shapes prices. In addition, many of the other factors shaping pricing are much more important for explaining the observed variance in prices.

4.4. Robustness: Pricing within a Portfolio

Our focus in the previous section was on differences across firms. To better understand a firm's pricing strategy, we next study the difference of prices *within* a portfolio. For each firm *i*, we define $priceDiff^i = \log\left(\frac{P^i_{Top}}{P^i_{Bottom}}\right)$, where P^i_{Top} and P^i_{Bottom} are the prices of the top contract and bottom contract, respectively, offered by firm *i*. We run a regression with ***priceDiff*** as the dependent variable. This is a robustness check for our inferences in the hedonic price equation. This new equation has differenced out unobservables for two contracts coming from the same firm. It is identified from differences between firms. We define the differences in the product slots and storage offering in a similar way, $prodDiff^i = \log\left(\frac{productSlot^i_{Top}}{productSlot^i_{Bottom}}\right)$, $storDiff^i = \log\left(\frac{storage^i_{Top}}{storage^i_{Bottom}}\right)$. We use as many of the same variables as possible, dropping the measurement of competition, which cannot be represented in any clean way in this specification. Because we want to study price ranges, we look only at firms that offer portfolios with at least two contracts. The resulting data set includes 116 observations of 116 firms. In Table 7, we present the results.

There are no surprises. As expected, the results show that price ranges increase with both the range of product slots and the range of storage the firm offers. In addition, price differences increase with the number of contracts the firm offers. This effect is large and significant. Brand firms seem to offer larger price differences, while Locals offer smaller price differences. Both of

these effects, however, are not significant. Local firms that offer AlaCart tend to have lower price ranges.

In the second specification, the coefficients for ***Enhancement*** and ***Top25*** are negative and significant, suggesting that firms in dense locations and in locations with Internet-savvy businesses offer smaller price difference. Yet, the coefficient on the interaction variable, ***enhance25***, is positive and significant. As before, ***enhancement*** and ***Top25*** seem to capture a cost effect. Self-developers as well as the upgrading path do not seem to affect the pricing ranges that firms offer.

This robustness check is largely consistent with the earlier specifications, though with less statistical significance due to the smaller number of observations. This result, along with the lack of difference between OLS and random-effects estimates, leads us to infer that most variation comes from variation between firms rather than within contracts at the same firm. These additional estimates do not contradict our earlier conclusion.

5. CONCLUSION

We examine the eBSP market in 2001. We summarize our results in Table 8. Our analysis offered two levels of results. First, we offered a range of descriptive statistics describing the degree of heterogeneity in firm contracting behavior. Second, we analyzed the determinants of pricing outcomes.

We observe entrants with three different origins. Brand firms, like Microsoft and IBM, manage to charge a premium for features of the service affiliated with their sponsorship. Local firms that were in related business prior to entering hosting, such as ISPs, now offer hosting services. The third set of entrants, Specialist firms, specializes in all facets of being an eBSP. These differences are associated with different pricing outcomes. Overall, the origins of a hosting firm can make a significant effect on price levels.

We also find that these origins partly correlate with one of the key choices of a firm, the quality of the non-commodity services they offer, but we also found considerable heterogeneity around these choices. Brand firms tend to develop their own services and these tend to be of medium quality. Specialist firms also tend to develop their own services and these display a very wide range of qualities. Local firms do not develop their own services, which they prefer to procure from other providers. Their choice of quality comes with their choice of third-party

provider and it varies widely. This quality is an important determinant of variance in prices between firms. Indeed, we found that the range of price differences between highest and lowest quality could be quite large, and much greater than the variation attributable to any other factor.

We observe additional heterogeneous firm behavior layered on top of the origin and choice of cart or quality. Every firm makes choices about how many and what types of contracts to offer potential buyers. Each contract specifies the quality of the storefront software together with the available disk space and number of product slots. Each set of contracts also provides a natural "upgrade-path" from low- to high-end use. We identify four main upgrade-path strategies offered by firms to users: (1) offering no upgrade path, (2) offering the potential to eventually experience higher-quality software, (3) offering the potential to eventually use more disk space, or (4) offering the potential to eventually have a larger catalogue. Each of these different upgrade paths implies that the hosting facility will be able to handle different future needs at lower or higher costs. We found that some firms choose to combine these upgrade paths and others employ only one. Overall, we found that those who offer larger and more flexible upgrade paths were able to command higher prices. We found a large difference in prices between those offering the least and most flexibility, a difference almost as great as the variation attributable to quality.

We began with a question about the source of rents in young technology markets. We tested between two views about the source of rents, one affiliated with mobility of assets from old to new, and the other affiliated with business acumen and efficiency. We labeled these as origins and strategic behavior, respectively. Our analysis finds that both factors can shape price levels. Generally, neither factor alone explains the variance of prices between contracts. Moreover, the variance in prices between firms with different origins is much smaller than the variance in prices for firms pursuing different strategies. These findings are striking, as most observers expected this market to act like a homogeneous technology market. Instead, close inspection reveals that this market is far from homogeneous, because firms find a myriad of ways to differentiate themselves through use of strategic behavior — and those differences correlate with large differences in pricing.

These findings provide a partial explanation for why all three types of firms can co-exist with one another in the same market place. Many of them specialize in customers in a particular location. Many specialize in particular parts of the product space. These differentiating strategies

are sufficient to support large differences between firms, even two firms with different origins in the same location. This finding also provides a partial explanation for the comparative absence of branded firms in this market. Value in this new market did not display strong links to the origins of firms. Branded firms and ISPs gained some advantages from their histories, to be sure, but these could be overwhelmed by the pricing advantages associated with appropriate strategic behavior after entry. This market setting provided ample opportunities to newly founded firms to compete with experienced firms if they executed on appropriate strategies. We observe such behavior from new established specialists, but also from young firms, such as ISPs, who resold third party carts and tailored their offerings to their customer base.

Such findings raise a number of questions about the rationale for the variety of strategic behavior we observe. Some firms choose to offer large portfolios of contracts, while others choose to offer small. Some firms fix the level of one product attribute, while others fix another attribute, and still others do not fix any at all. While we find plenty of evidence that these choices shape the value of different pricing strategies, we attribute all of that variety to a firm's incentive to differentiate from rivals. We did not assess which of the many strategic rationales for each choice best fit actual circumstance.

More speculatively, as in other young technology markets, we expect value to change as firms alter attributes of their service. We expect the rare and valuable attributes today will become more common tomorrow, eliminating them as a source of differentiation. That leads us to predict the disappearance of strategies that did not produce market value and the comparative decline in the value of strategies that produce value within our sample. This change over time will alter the comparative returns to origins and strategic behavior, but we could make forecasts about its alteration in only a few instances, such as the use of open source and larger portfolios (which has advantages). The eventual configuration depends on user willingness to substitute between firms with distinct arrays of attributes, and cannot be predicted on the basis of our study.

We also expect normal procedures for price index construction to misinterpret these changes. Such procedures tend to focus solely on the easily measurable technology attributes – such as product slots and memory. Such procedures will omit important determinants of value, generating an inaccurate or misleading picture at any point in time, as well as over time.

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Table 1: Open Questions about the Determinants of Price

		Definition	Variables	Descriptive Questions
Origins	*Firm Identity before Entry*	**Brand:** Firm with existing reputation. **Local:** Established ISP with relationship with set of users. **Specialist:** Newly founded entrant who specializes in e-Business.	Brand, Local, Specialist	Do Specialists and Branded firms price differently than Locals?
	Location of Firm	Level of Internet sophistication in geographic location of headquarters	Internet Technology Index in businesses	Does location affect pricing for the Local firm? Is the effect higher for Specialists than for Local and Brand firms?
Strategic Behavior	*Commodity Technology Attributes*	Amount of homogeneous features	Level of disk-space & number of product-slots.	Does pricing for commodity remain constant or display economies of scale?
	Quality and Cart Choice	Features included in cart. Determined by own work or by choice of cart from third party vendor.	Quality, phone support	Do higher prices result from quality carts and phone support?
	Upgrade Path	Availability of upgrade options, the size of the portfolio, and the direction of growth.	Position of contract. Fixed level on disk-space or product-slots.	Are there low/high discounts/premiums at top/bottom of the portfolio? Are there returns to upgrade paths that fix levels of homogeneous products?
Competition	*Competition in Product Space*	Availability of contracts from other firms in nearby commodity product space.	Number of firms with similar features.	Does the presence of closer substitutes affect prices? Does its effect vary with the position of the contract in the portfolio?

Table 2: Descriptive statistics for carts

		Median Storage/Products Slots	Median Quality	Median Portfolio	Average Price
Locals:	**Akopia**	200/Unlimit	10	5	29.5
	Miva	250/Unlimit	7	3	82.8
	Kurant	200/500	9	4	249
	Alacart	200/25	5	4	37.9
Specialists		100/500	7	3	126.8
Brand		75/150	4	3	141.8

Table 3: Number of Contracts and Prices in the Products-Storage Space

Product Slots / Storage	**<25**	**26–100**	**101—500**	**501–10000**	**Unlimited**	**Total**
<=50	17 *17.7*	29 *110.7*	7 *193.5*	5 *243.9*	45 *40.7*	103 *76.9*
51–150	24 *27.5*	11 *110.9*	10 *259.5*	15 *324.4*	57 *53.3*	117 *105.8*
151–300	24 *40.7*	12 *87.1*	4 *325*	13 *120.9*	54 *49.3*	107 *70.6*
301–2000	6 *43.1*	1 *64.95*	2 *325*	12 *259*	64 *102.6*	85 *125.3*
Unlimited		16 *134.5*	11 *285.9*	13 *416.8*	7 *55.3*	47 *236.2*
Total	71 *30.9*	69 *111.5*	34 *266*	58 *279*	227 *63.8*	459 *108*

Table 4: Upgrading Strategies

		Fix Storage	Fix Product Slots	Fix None	Total	Comments
Locals	**Akopia**	0	17	0	17	When number of product slots is fixed, product slots = ∞
	Miva	0	18	2	20	When number of product slots is fixed, product slots = ∞
	Alacart	2	17	7	26	When number of product slots is fixed, product slots = 25
	Kurant	14	4	12	30	When number of product slots is fixed, product slots = ∞ More frequently, when storage is fixed, storage = ∞
Specialists		5	3	5	13	When number of product slots is fixed, product slots = ∞ More frequently, when storage is fixed, storage = ∞
Brand		2	0	5	7	
	Other	1	8	3	12	
	Total	20	67	29	116	

Table 5: Price Regression Results

		I		II		III		IV	
		Coef.	**SE**	**Coef.**	**SE**	**Coef.**	**SE**	**Coef.**	**SE**
Commodity Technology Attributes	**Constant**	1.69*	0.45	2.39*	0.69	1.90*	0.66	1.94*	0.67
	Log(ProductSlot)	0.10*	0.04	0.11*	0.04	0.07*	0.03	0.10*	0.03
	Log(Storage)	0.25*	0.05	0.25*	0.04	0.11*	0.04	0.08*	0.04
	InfProdSlots	-0.84*	0.36	-0.89*	0.32	-0.55*	0.24	-0.86*	0.32
	InfStorage	-0.91*	0.24	-0.82*	0.23	0.05	0.22	0.11	0.23
Quality	**Quality**	0.13*	0.04	0.16*	0.04	0.21*	0.04	0.21*	0.04
	Phone support	0.14	0.1	0.10	0.1	0.14	0.1	0.15	0.1
	SelfQual			-0.09	0.08	-0.13*	0.05	-0.13*	0.05
	SelfPhone			0.42	0.4	0.49*	0.24	0.46*	0.24
Carts	**Akopia**	-1.39*	0.21	-1.52*	0.19	-1.65*	0.18	-1.61*	0.18
	Kurant	0.85*	0.21	0.71*	0.17	0.44*	0.15	0.45*	0.15
	Alacart	-0.36**	0.20	-0.34**	0.21	-0.23	0.2	-0.27	0.20
	Miva	-0.08	0.18	-0.1	0.17	-0.01	0.17	-0.02	0.17
Firm Identity before Entry	**Brand**	0.65*	0.26	0.51	0.46	0.15	0.25	0.15	0.25
	Local	-0.27**	0.16	-0.77	0.57	-0.05	0.38	-0.01	0.38
Location of Firms	**Enhancement**			-0.03	0.03	-0.04	0.03	-0.03	0.03
	Top25			-0.76	0.93	-1.51	0.95	-1.40	0.96
	Enhance25			0.06	0.06	0.11**	0.06	0.10	0.06
Upgrade Path	**Position**					0.10*	0.04	0.11*	0.04
	portBottom					-0.07*	0.02	-0.09*	0.03
	portTop					0.09*	0.02	0.04	0.03
	PortSelf					0.26*	0.09	0.26*	0.09
	Notfixed					0.36*	0.11	0.36*	0.11
Competition	**numCarts**							-0.12*	0.05
	marketSize							0.01*	0.004
	numCartsBottom							0.04	0.03
	numCartsTop							0.05*	0.03
		$R^2 = 0.7$ F(12,420) =36.2		$R^2 = 0.71$ F(18,414)=30.88		$R^2 = 0.79$ F(22,410) =66.5		$R^2 = 0.8$ F(26,406) =58.7	

Table 6: Third-Party Carts' Pricing

Third-Party Cart	Cart Quality	Premium/Discount for Quality	Marginal Premium/Discount	Overall Premium/Discount
Kurant	10	80%	151%	102%
Kurant	8	48%	119%	70%
Miva	7	32%	21%	44%
Akopia	10	80%	-72%	-55%
Alacart	5	0%	-35%	-116%

Table 7: Price Differences Regression Results

	I		II		III	
	Coef.	**SE**	**Coef.**	**SE**	**Coef.**	**SE**
Constant	0.39*	0.19	1.03*	0.36	0.93*	0.46
prodDiff	0.04*	0.02	0.05*	0.02	0.04	0.02
storDiff	0.09*	0.05	0.11*	0.05	0.09*	0.05
InfProdSlots	-0.35*	0.11	-0.34*	0.11	-0.31*	0.12
InfStorage	0.10	0.15	0.19	0.15	0.23	0.17
PhoneSupport	0.10	0.08	0.10	0.08	0.12	0.08
Akopia	0.16	0.15	0.11	0.15	0.10	0.15
Kurant	0.03	0.14	-0.05	0.14	-0.08	0.14
Alacart	-0.43*	0.14	-0.42*	0.14	-0.44*	0.14
Miva	0.01	0.13	0.03	0.13	-0.01	0.14
Portfolio	0.20*	0.04	0.20*	0.04	0.21*	0.04
Brand	0.09	0.23	0.07	0.23	0.14	0.24
Local	-0.04	0.14	0.01	0.14	0.08	0.30
enhancement			-0.06*	0.02	-0.06*	0.02
top25			-1.59*	0.69	-1.64*	0.71
Enhance25			0.11*	0.05	0.12*	0.05
portSelf					0.04	0.09
phoneSelf					-0.26	0.22
fixNon					0.10	0.14
	$R^2 = 0.62$ F(12,103)=14		$R^2 = 0.65$ F(15,100)=12.2		$R^2 = 0.65$ F(18,97)=10.2	

SE = standard error

* = significant at the 5% level

** = significant at the 10% level

Table 8: Summary of findings

		Descriptive Question	Answer	Source
Origins	*Firm Identity before Entry*	Do Specialists and Branded firms price differently than Locals?	Yes. Different types of firms choose different levels of quality, types of carts, and up grade strategies. Their identities also allow them to charge different premiums.	Tables 2, 4, 5 and 6.
	Location of Firm	Does location affect pricing for the Local firm? Is the effect higher for Specialists than for Local and Brand firms?	Location does not affect pricing. The effect on Specialists is difficult to identify from the effect of quality on Specialists.	Table 5.
Strategic Behavior	*Commodity Technology Attributes*	Does pricing for commodity remain constant or display economies of scale?	Pricing for commodities displays economies of scale.	Table 5.
	Quality and Cart Choice	Do higher prices result from quality carts and phone support?	High quality carts have higher prices, except when the party resells the open source cart.	Tables 2, 4, 5, and 6.
	Upgrade Path	Are there low/high discounts/premiums at top/bottom of the portfolio? Are there returns to upgrade paths that fix levels of homogeneous products?	Firms act as if they offer entry level pricing. Many firms limit the options of users by fixing one dimension and varying the other.	Tables 4 and 5.
Competition	*Competition in Product Space*	Does the presence of closer substitutes affect prices? Does its effect vary with the position of the contract in the portfolio?	The evidence that competition affects prices is not identified separately from the evidence that firms enter product spaces with more anticipated demand.	Tables 3 and 5b.

Appendix

Descriptive statistics

	Min	Max	Median
ProductSlots	10	∞	200,000
Storage	5	∞	200
Quality	2	10	8
Enhancement	7.8	19.5	13.7
numCarts	1	5	5
marketSize	1	63	44

Dummy Variables:

	Description	**%of observations with dummy=1**
InfProdSlots	InfProdSlots=1 if the firm does not limit the number of Product Slots	50%
InfStorage	InfStorage=1 if the firm does not limit the available memory	9%
Branded	Branded=1 if the firm has a brand name outside the eBSP market	3%
Local	Local=1 if the firm is an ISP	92%
Akopia	Akopia=1 if the firm offer Akopia Cart	18%
Kurant	Kurant=1 if the firm offers Kurant Cart	27%
Alacart	Alacart=1 if the firm offers AlaCart Cart	19%
Miva	Miva=1 if the firm offers Miva Cart	18%
NotFixed	NotFixed=1 if the firm does not fix the number of product slots and the available storage	28%