## Performance of Internet Kiosks in Rural India: Gender, Caste and Location


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*Article*

# Performance of Internet Kiosks in Rural India

## Gender, Caste and Location

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### Abstract

We investigate the determinants of revenue of small-scale entrepreneurs in a developing nation. We study these entrepreneurs in the context of a very widely applied model for the delivery of IT services to rural and poor populations. The model is one where limited intervention to support infrastructure and coordinate resources is combined with market-based delivery of IT services to the end user (what we call here the 'sustainable franchise model'). Though this model has been deployed world-wide by governments, NGOs, and development institutions in the past few years, there has been little quantitative research into the determinants of revenue performance in such a model. In this paper we examine the case of n-Logue, a franchise (at the time of sampling) of over 1000 locally owned, Internet kiosks in rural India. We analyze data from 74 of n-Logue's kiosks. Among other things, we find that gender and education do not affect revenue, while location and other measures of social standing (age and caste) do. We also find that the uses that villagers have for IT services are not so different from those which first world users have. The lessons we draw from this example are that while local social structures must be taken into account (for example,

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the caste system), it is not a foregone conclusion that social biases (for example, against women) cannot be mitigated by good programme design.

**Keywords**

Internet, rural development, entrepreneurship, India, information technology

## Introduction

There has been a debate in the press and in policy circles (for example, Hammond, 2001; *New York Times*, 2000) over whether advanced communication and information technologies (abbreviated IT or ICT) have a useful place in development policy. There has been a corresponding debate in the academic economic literature as to what effect these technologies have on productivity, and hence growth, in general.[1] For most part the results of these parallel debates indicate that ICTs can have a positive effect on productivity and growth, and that it can be a useful tool of development policy.[2] IT and the Internet are never the sole answer, of course; the side of the IT sceptics has been summarised by the pithy observation that 'you can't eat computers' (from Steinberg, 2003). Nevertheless, there are many situations where ICTs can deliver real benefits and cost savings either as an alternative, or as a complement to physical infrastructure development. Specifically, access to ICTs can improve market access for rural residents, reducing price dispersion and transaction costs, thereby promoting market integration.[3]

### *Sustainable Franchise Model*

In this article we take the potential benefits from ICTs as a given. Thus, our goal is not to examine the overall case for IT investment. The main question, from our perspective, is how to deliver IT-enabled services cheaply and effectively at the village level. Simultaneously, one must ask which services are the right ones. To sort through these types of issues,

many who worry about development have adopted the concept of 'sustainability' as a useful benchmark. In essence, the principle of sustainability states that development efforts should be economically or commercially self-sustaining 'eventually', and that preferably they should be made sustainable through some kind of market mechanism. Generally, this line of thinking leads to the conclusion that IT should be promoted with as limited an intervention as possible, to overcome barriers that were keeping a market from developing on its own. This approach clearly meets some objections of sceptics who would argue that IT investment takes away resources from direct interventions in areas such as health and education.

In this article we investigate an example of a very widely applied model for the delivery of IT services to rural and poor populations. The model is one where limited intervention to support infrastructure and coordinate resources is combined with market-based delivery of services to the end user. We will call this the 'sustainable franchise model' since the case that we study is one of a franchise system in rural India.[4] Though not always conceived of directly as a franchise there have been a large number of similar projects worldwide where village-level entrepreneurs are engaged to deliver IT-enabled services with some potential for them to capture part of the profits. Generally, the model is one of government, NGO, or multilateral intervention at the top to support infrastructure and organisational development, transitioning to greater entrepreneurial activity and market mediation at the point where services are delivered to end users. This model has the nice feature that it will fail (or adapt) relatively quickly if it provides services that end users do not consider valuable enough to pay for. It also has the potential to become fully self-sustaining in the long run as a system of for-profit small businesses.

The broad idea of user charges or user fees has been put forward (for example, World Bank, 2003) as a way to avoid over-subscription of primary services that are supplied by governments and public entities in developing countries. The concept is controversial and has been criticised for discouraging (on the margin) the poorest from seeking needed medical, educational and nutritional support (for example, World Bank 2002). The idea of having self-funding programmes that impose some willingness-to-pay requirement on the end user echoes some of the principles of the sustainable franchise model that we study here. The two

concepts are quite different, however. While a system based on user charges does incorporate some price-like features, it is typically discussed in the context of public provision, and hence does not feature the main driving force of efficiency in the market, which is the profit motive. It is often the lack of incentives among public employees actually responsible for delivering services that creates inefficiencies in delivery and waste resources (for example, World Bank, 2006, Chapter 2). In some cases then—though clearly not those where extreme deprivation is the primary concern—the self-sustaining franchise model may be a useful complement or alternative to public provision with user charges.

Though the sustainable franchise model has been deployed in many parts of the world in the past few years, there has been little empirical study of the determinants of its performance, an important exception being Best and Kumar (2008), which examines the performance of kiosks set up in southern India by n-Logue, under a franchise model.[5] In this article we also examine n-Logue, which, at the time our sample was taken, oversaw about 1000 locally owned, Internet kiosks in villages in India. We seek to assess how this particular model worked in practice, by analysing data from 74 of n-Logue's kiosks, covering six consecutive months of performance. Thus, our analysis is based on this short-run revenue performance, and is conditional on the particular organisational implementation undertaken by n-Logue. In fact, as discussed later and analysed in depth by Best and Kumar (2008), problems with n-Logue's own structure and implementation led to the organisation folding a few years after the sample was obtained.

Our article can also be seen as one of the first to use a panel data set of individual firms in a rural village environment to address the topic of what factors drive firm performance. The question of what factors affect the success of the individual kiosks is very relevant to discussions of the sustainability of efforts by governments and aid organisations when trying to extend similar programmes to other parts of India and across the developing world. We can address this question directly with our data. While revenue performance—which is what we focus on—cannot guarantee long-run survivorship, it is obviously a critical necessary condition for sustainability.

We also discuss the likely effects on the village and on the individuals involved in running the kiosks. As a new economic opportunity and

profit making activity, these kiosks have the potential to accelerate development. They can also serve to increase the level of entrepreneurial and technical skill in the local economy, and generally can lower transaction costs for many activities. Additionally, our data indicates that women and individuals with no formal college education suffer no disadvantage when running a kiosk, which leads us to the conclusion that the kiosks may have a positive impact on social and economic equality as well.

Finally, we have limited data on the uses that rural village customers have made of the Internet. Among the most common uses are email, chat and other communications, online learning, as well as online matchmaking, horoscopes and games. Interestingly, these are also some of the major uses that first world consumers have for the Internet, an observation that we pass on to the reader without much comment except to note that these revealed preferences may not match what centralised policy makers or humanitarian academics would choose for rural populations.

This article is structured as follows. In the next section, we provide a limited survey of similar IT delivery programmes worldwide and compare them to the n-Logue corporation, in order to give a sense of the range of implementations of these programmes. In the third section, we describe the data and the empirical methods we use. The data comes from southern and western India, and provides information on characteristics and performance of individual Internet kiosks supported by n-Logue. In the fourth section, we describe our results, which suggest that some socio-economic characteristics of kiosk operators matter for performance, while others do not. In addition, some characteristics of the kiosks themselves matter more than others. In the final section we attempt to synthesise conclusions from our results and make them relevant to other IT-based efforts world-wide.

## Franchise Models for IT-Enabled Service Delivery

At the time of the sampling, n-Logue was a private 'quasi-non-profit' corporation which provided telecommunications infrastructure, and a combination of hardware, software and training for turnkey operation of rural Internet kiosks. While n-Logue itself was registered as a corporation under the Indian Companies Act, its majority ownership lay with a

non-profit corporation (Vishal Bharat Comnet). This corporation, in turn, had ties with a research group at the Indian Institute of Technology (IIT), Madras. The IIT researchers provided many of the technology tools used in the kiosks. At various times, n-Logue also collaborated with state and local governments, the MIT Media Lab, and agro-processing and financial corporations to set up and run the kiosks, and to deliver various services. This loose affiliation of government, academic and private sector to start the project and support it from above is closer to a fully private enterprise than some of the other examples of IT delivery programmes from other parts of the world discussed later in this section. This type of collaboration can work in India due to its well developed academic and technical institutions and its high level of technical sophistication at the upper end.

At its peak, n-Logue was involved in over 1000 rural Internet kiosks, primarily in southern and western India.[6] In managing this network, n-Logue used a tiered franchise model, in which geographic clusters of kiosks were sometimes assigned under contract to a 'local service partner' (LSP), which engaged in ongoing management of the kiosks. In some cases, n-Logue played this role itself. Kiosk owners themselves operated under a franchise arrangement, paying fixed fees for the equipment, maintenance and training required, but keeping all marginal revenues. Kiosk owners were selected through a process of advertisement and applications, and there was some effort to include a cross-section of society: thus gender and caste diversity play a role in selection. Minimum education levels were required, but the standard was only completion of some high school, and detailed training was provided to selected operators. N-Logue was the largest of several organisations implementing this model in rural India.[7]

The technology used by n-Logue was a combination of off-the-shelf components and hardware and software developed in conjunction with IIT, Madras. The franchisees received training and equipment from n-Logue and contracted with the area LSP in order to have voice and Internet connectivity via a wireless base-station. The equipment was typically one computer with microphone and video capabilities along with a receiver to connect to the wireless base-station. Given the unreliability of electric power supplies throughout India, UPS units and battery backups were essential equipment for all kiosks. Kiosks also often

included peripherals such as printers, webcams and digital cameras. The wireless base-stations were used in rural regions where laying long cables would be prohibitively expensive. They provide medium-speed upload and download and simultaneous telephone services. They involved tall towers with 25 km line-of-sight range. The technology was, in many respects, not state-of-the-art, but was initially adapted to function reasonably well in village India.[8]

A number of sources document programmes with similar structures to n-Logue in India and other parts of the world.[9] We briefly describe three of these programmes, to give an idea of the geographic range and scope of implementation of entrepreneurial models of IT delivery built on a foundation of social goals.[10]

The Grameen Bank was an early leader in promoting the sustainable franchise model. One very successful programme to deliver technology to the rural poor is the Grameen Village Phone initiative (Grameen Bank, 2006) which gives loans to by cell phones to small-scale entrepreneurs in areas that have limited or no access to ground lines. Here again, the intervention is top down, providing limited training, awareness, commercial partnerships, and—most importantly in this case—financing, while the entrepreneurs at the village level pursue profits. The programme is active in a number of countries including Uganda, Cameroon, the Philippines, Bangladesh and India.

In Peru, the *cabinas públicas* are small local Internet cafes that are run as for-profit enterprises delivering no-frills Internet and telephone services to local residents. Credit for the *cabinas públicas* phenomenon is often given to José Soriano, a Peruvian journalist. He founded *Red Cientifica Peruana* (RCP—The Scientific Network of Peru), which then founded the first ISP in Peru. Initially, RCP offered free classes in the start-up and management of a *cabinas públicas* encouraging anyone to start one. This is in contrast to the franchise model employed by n-Logue in that there are no franchise fees or any direct relationship between RCP and the *cabinas públicas*. The model is obviously sustainable as all elements are for-profit except for the initial intervention by RCP to educate and create awareness of the opportunity. While this more free-form model has its advantages there is the drawback that without an organised franchise, the competition has been very stiff as many *cabinas públicas* crowd into smaller and smaller territories.

In Hungary, the system of *teleház* (telecommunications houses) offers similar services to the previous examples (phone and Internet mostly) but are run on a slightly different model. The *teleház* is officially owned by a local non-profit or civic institution and supported by the local government which provides a building. The operator is free to make profits in a variety of ways but is also required to provide some services for the public good. The system of *teleház* features a greater degree of intervention and local government control than many other programmes but still retains the important feature that the local entrepreneur receives profit from the kiosk. This example and the Peruvian one show how the level of government involvement can vary greatly depending on the goals of the programme and the local situation.

The list of similar programmes goes on and on. Though they often differ in the details, the common framework involves some non-market intervention by the government, NGO or multilateral development institution at an organisational and infrastructure level to 'prime the pump' for local entrepreneurs and businesses that deploy services to the end user. The intervention often occurs at a higher level and serves as much to motivate and empower the local entrepreneur as it does to attract larger corporate entities. Often, the private sector has to be educated to the fact that there may be profit-potential from selling equipment and services to the smaller, more fragmented rural IT market. Often no direct subsidies are needed, only impetus and coordination.

While many of these programmes are described in glowing terms by those who create and promote ICT based development, some are more successful than others. There is an art to the design of such programmes. It is very difficult to know beforehand how much intervention will be necessary and how exactly to design the programme to recruit, train and support the entrepreneurs. We hope this study will add to the body of knowledge that is relevant for such decision making and programme design.

## Data and Empirical Strategy

We used six consecutive months of data on kiosk performance for 74 kiosks, covering the period April 2004 to September 2004. These kiosks


**Figure 1.** Location of Sample Kiosks

**Disclaimer:** Map not to scale.
**Source:** Authors' research.

were distributed across four states in southern and western India, as indicated in Figure 1. The kiosks were selected through a stratified random sampling process, conditional on complete data for the period being available. As illustrated in the figure, the bulk of the kiosks were in the southernmost state of Tamil Nadu. Basic economic characteristics of the four states are presented in Table 1. All four states are at least somewhat above the nationwide average in income, urbanisation and literacy, and have poverty rates lower than the all-India average. Tamil Nadu stands out among the four in being the most densely populated of the four states. Of course, within each state there is considerable variation.

**Table 1.** Economic Characteristics of Sample States

| | Population 2001 (million) | | Area 2001 | NSDP Per capita 2003–04 | Literacy 2001 | Rural Poverty 1999–2000 |
|---|---|---|---|---|---|---|
| | Rural | Urban | ('000 sq. km.) | (INR, 1993–94 prices) | (Per cent) | (Per cent) |
| Gujarat | 31.7 | 18.9 | 196.03 | 16,780 | 69.97 | 13.17 |
| Karnataka | 34.9 | 18.0 | 191.79 | 13,141 | 67.04 | 17.38 |
| Maharashtra | 55.8 | 41.1 | 307.72 | 16,479 | 77.27 | 23.72 |
| Tamil Nadu | 34.9 | 27.5 | 130.06 | 12,976 | 73.47 | 20.55 |
| INDIA | 740.7 | 271.5 | 3276.28 | 11,799* | 65.38 | 27.09 |

**Sources:** Population, literacy, area—Census of India, 2001; Rural poverty, NSDP—Reserve Bank of India, 2006.
**Notes:** *All-India figure is for Net National Product.
INR = Indian Rupee, NSDP = Net State Domestic Product.

## *Data Characteristics*

The nature of the data collected is as follows. We have monthly data on total revenue, as well as on the number and types of services offered by each kiosk.[11] The kinds of services offered are summarised in Table 2. Note that several of the services used IT capabilities without requiring the Internet; computer games also featured prominently. Very broadly, the purposes served by the use of IT included information gathering, document preparation, entertainment and general communication or information exchange. Given the universality of these needs, it is not surprising that the range of services was not that different from what is popular in developed countries at higher income levels—there are no doubt differences in sophistication and intensity of use that come with greater wealth, but even relatively poor and uneducated people find that ICTs are useful or beneficial.

**Table 2.** Kiosk Services

| Service Category | Frequency* | Category Definition |
|---|---|---|
| Education | 137 | Online learning |
| Games | 124 | Online or offline computer games |
| Browsing | 62 | Internet browsing, online match-making, horoscopes, etc. |
| DTP | 51 | DTP access |
| Communications | 32 | Email, videophone, chat |
| Offline Services | 22 | Photoshop, printing, word processing, etc. |
| Results | 9 | Standardised test and academic results |
| Other | 7 | All other |

**Source:** Authors' research.

**Note:** *Frequency refers to number of times that a service in this category was listed as the service generating the most revenue in a given month. DTP = Desktop publishing.

An important factor for revenue is pricing, and, while we do not have complete price data, fieldwork by the second author indicates that the list prices (which also serve as maximum prices) are typically set according to a schedule created by n-Logue, with 'price points' chosen to be affordable and socially acceptable. Thus, many basic services were priced in the range INR 5–20. Internet use pricing was based on time spent online. The most expensive service was the provision of horoscopes, which are

detailed documents used for match-making. These were priced at about INR 150, most of which went to a specialised and centralised provider of horoscopes, and not to the kiosk operators.

## *Determinants of Performance*

Since, in most cases, the marginal cost of providing these services is very low relative to the fixed costs of kiosk set-up and operation, the level of revenue is *the* crucial determining factor in the economic success of a kiosk, and the economic sustainability of the model.[12] The major costs of operation were fixed telecommunications access fees paid to n-Logue or the LSP, telecommunications usage charges, facility rental and utilities. The last of these was relatively low. Access fees were essentially constant across kiosks and can be ignored. Usage charges would likely be proportional to revenues, and therefore not influence our results. This leaves the facility rental as a major cost item to be considered. We take two approaches, including the rental cost as an explanatory variable, as well as subtracting it from the revenue to obtain a net revenue figure. Our results are robust across both specifications.

While there was little flexibility in pricing, kiosk operators had control over which services to provide and emphasise, how to market them and the general level of customer service they provided. We cannot observe operator effort, but can measure operator and kiosk characteristics that may affect both effort and ability. We can also observe various village characteristics which may affect demand. Our goal then is to measure how characteristics of operator, village and kiosk affect the revenue performance of the kiosk Variables used in our analysis are listed in Table 3.

## *Salient Features of the Dataset*

The dataset shows various similarities and differences across operators, village, and kiosks, as summarised below.

### *Operators*

As a rule the operators of the kiosks tended to be in their late twenties and early thirties, though the age range extended from 20 to 45yrs (see Table 4). There were more males than females by a ratio of slightly

**Table 3.** Kiosk and Operator Variables

| Operator Characteristics | Village/Kiosk Characteristics |
|---|---|
| Age | Province |
| Gender | State |
| Education | Population of village |
| Caste | Distance from district HQ |
| Household size | Distance from big city/metro |
| Own building–Y/N | Monthly facility rent |
| | Services on offer |
| | Kiosk location w/in village |
| | Size of initial loan |
| | Kiosk Investment (self) |

**Source:** Authors' research.

**Table 4.** Operator Characteristics Summary Statistics

| Characteristics | Mean or Frequency* | Std. Dev. | Min. | Max. |
|---|---|---|---|---|
| Age | 29.5 | 5.5 | 20 | 46 |
| Gender (male) | 0.70* | – | 0 | 1 |
| Education: | | | | |
| Some High School | 0.07* | – | 0 | 1 |
| High School Graduate | 0.39* | – | 0 | 1 |
| College/Technical Degr. | 0.54* | – | 0 | 1 |
| Caste: | | | | |
| BC/SC | 0.27* | – | 0 | 1 |
| Other | 0.73* | – | 0 | 1 |
| Household size | 4.6 | – | 2 | 12 |
| Own building—Y/N | 0.23* | – | 0 | 1 |

**Source:** Authors' research.
**Note:** * denotes frequency rather than mean.

greater than 2:1 and the males tended to be more educated (see below for more discussion of this point). Only 23 per cent of the sample owned the building in which they operated, a trait that we find correlates with total revenues but which is not significant when other factors are controlled for. The caste composition of the operators was quite heterogeneous, and many of the original caste designations were locally specific. Hence we have aggregated this variable into two salient categories: (*a*) the backward and scheduled castes (BC/SC)[13]; and (*b*) other castes.

## *Gender/Education Relationship*

One aspect of the operator data is that there were no men in the least educated subgroup. The sample is 70 per cent male and 30 per cent female. We created three educational categories based on the various responses we found for kiosk operator education level that correspond to 'some high school', 'high school graduate' and 'post secondary degree' (the surveys did not show reports of 'some college' so we assume anyone with only some college will be categorised as a high school graduate). Of the women, approximately one quarter were in the 'some high school' category though there were no men in this category (see Table 5). This may represent some feature of the selection process, or it may simply reflect differences in the educational achievement rates for men and women. In India, rural male and female literacy rates were 71.2 per cent and 46.6 per cent respectively, for the country as a whole in 2001. This disparity was greater for adults, at 54.9 per cent for males and 24.9 per cent for females.[14] Given the disparity in the larger population, the fact that no men with only 'some high school' were observed in the sample may be a purely random outcome.

**Table 5.** Gender and Education (per cent)

| Gender | Some HS | High School | Post Sec. Degree | Total |
|---|---|---|---|---|
| Male | 0.00 | 25.68 | 44.59 | 70.27 |
| Female | 6.76 | 13.51 | 9.46 | 29.73 |
| Total | 6.76 | 39.19 | 54.05 | 100.00 |

**Source:** Authors' research.

### *Villages and Kiosks*

Most of the villages were small in absolute size (mean population just over 5000), and they were relatively distant from large cities.[15] Though the average distance of 69 km to the nearest city may seem like a quick drive, most of the villagers would not have access to a car and would have to rely on slow or infrequent buses and other modes of transport. The kiosks were somewhat closer to district headquarter towns (28.1 km on average), which simply reflects the administrative geography of India.[16]

The sample has a large fraction of new kiosks, only a few months old at the start of the observation period. This was due to an effort by n-Logue to sign up new franchisees shortly before the sample period. The nature of the sample may imply that many kiosk owners in this data set were still learning how to operate effectively. This gives an opportunity to examine whether there are learning effects in the data, which would be less likely in a sample of mature kiosks.[17]

A summary of the village and kiosk-related characteristics is presented in Table 6. As noted, the kiosks were relatively young, being less than seven months old on average. The average revenue may appear to be quite small, at only INR 3380. This works out to less than US$ 3 per day. Since amortised costs of infrastructure and operating costs were in the range INR 1000–2000 per month, the net earnings of kiosk operators were in the region of US$ 1 per day, which is the well-known basic international poverty line. However, to the extent that kiosks provided employment to otherwise unemployed, educated rural residents, these earnings could be acceptable, aside from the human capital acquisition that is facilitated thereby. From an economy-wide perspective, those services that are new (and not replacements for costlier methods of delivery) represent a potentially significant addition to economic development.[18] The average total investment for the sample, at INR 63,000, is representative of the total costs of kiosk equipment for a variety of such examples, though it did not include the cost of the back-end communication infrastructure.[19] Finally, in the context of revenues, the high figure reported in Table 6 represents a single extreme outlier—we found that our regression results were highly sensitive to including this kiosk, and our main analysis excludes this observation.

## *Empirical Strategy*

Most of the variables in our analysis do not vary over time, having been determined either prior to selection as a kiosk operator (for example, age, gender, caste, etc.) or having been fixed during the kiosk set-up process (for example, monthly rent). We do have time series observations of the main outcome variable, kiosk monthly revenues as well as a limited number of other variables at monthly frequency, namely data on how

**Table 6.** Village/Kiosk Variables Summary Statistics

| Characteristic | Mean or Frequency* | Std. Dev. | Min. | Max. |
|---|---|---|---|---|
| Population of village | 5318.3 | 6103.8 | 1061 | 35000 |
| Distance from district HQ (km) | 28.1 | 20.5 | 1 | 105 |
| Distance from big city/metro (km) | 69.3 | 35.4 | 5 | 133 |
| Monthly facility rent | INR 583 | INR 1383 | INR 0 | INR 12,000 |
| Kiosk age | 6.8 | 5.4 | 1 | 31 |
| Monthly revenue | INR 3380 | INR 2853 | INR 100 | INR 23,000 |
| Kiosk location w/in village: | | | | |
| Bus stop | 0.24* | n.a. | n.a. | n.a. |
| Main road | 0.28* | n.a. | n.a. | n.a. |
| Gov't bldg/commercial centre | 0.22* | n.a. | n.a. | n.a. |
| Neighbourhood | 0.26* | n.a. | n.a. | n.a. |
| Size of initial loan | INR 42,222 | INR 20,281 | INR 0 | INR 60,000 |
| Kiosk investment (self) | INR 20,757 | INR 24,470 | INR 0 | INR 100,000 |

**Source:** Authors' research.
**Notes:** At first month of observation, INR/$ = 43.8.
* denotes frequency rather than mean.

many services were requested by customers and which ones generated the most revenue. Since we do not have good instruments to extract the exogenous variation in the number of services chosen, we do not focus on it in our analysis.[20] This leaves us with essentially no time variation on the right hand side (RHS). Nevertheless, because we have time-series observations of the left hand side (LHS) variable, which reflect new shock realisations and new choices of effort each period, we are able to treat the dataset as a panel for some specifications.

With these thoughts in mind, we conducted several standard tests to get a better sense of the stochastic structure of our data and to decide which specific techniques are called for. In summary, we find that there is strong evidence of an individual effects component in the error terms (F-test, not reported). A Breusch–Pagan Lagrange Multiplier (LM) test rejects the null of zero variation in the group effects. Both these results indicate the need to use unobserved effects models rather than simple pooled ordinary least squares (OLS). We find no clear evidence either way of autocorrelation in the error structure, based on the test from Baltagi and Wu (1999).[21] The adjusted LM test statistic from Baltagi and Li (1995) only rejects the null of no serial auto correlation at 10 per cent but not 5 per cent. A similar test from Baltagi and Li (1991) of the joint hypothesis of no random effects or serial autocorrelation rejects the null (of neither) at 1 per cent. We find that the Hausman test does not reject the null that the random effects model parameters are unbiased; indicating the random effects regression is valid, at least on this basis. This test has limited applicability in our data, however, as the only parameters tested for bias are those on variables which do not time-vary (namely, the number of revenue generating services). A likelihood ratio test indicates that the panel displays heteroskedasticity in the error structure so we use robust errors when possible.

There are no econometric techniques that we know of which were developed specifically for a data set that has no time variation on the RHS but which exploit efficiently the variation of the LHS variable. Our approach then has been to check for robustness by running a series of regressions using various techniques. We have chosen the between-effects estimator[22] as our primary estimation technique. In addition to the 'practical' consideration of wanting to incorporate both time varying and non-time-varying variables, between effects is also 'theoretically' desirable when conducting out of sample predictions (Green, 2003). The

coefficients estimated by between effects can be used to formulate a prediction of the revenues that would be generated by a new kiosk with certain fixed characteristics. In contrast, estimates using fixed effects net out the individual effect and the impact of time invariant variables, making such a prediction impossible since the fixed effect for an out of sample kiosk is unknown. We would like our results to be relevant to policy discussions which inherently involve out of sample predictions to different locations and situations than the exact ones represented in our sample. We have chosen between-effects for this additional reason.

We have supplemented the use of the between-effects estimator with the random effects estimator, a pooled OLS regression, and the estimator proposed in Baltagi and Wu (1999) which assumes an auto-regressive AR(1) structure in the error terms. Lastly, we have attempted to see what effect varying the number of services has on the total revenue generated by the kiosk. In measuring this effect, there is the obvious problem of endogeneity between the total number of revenue generating services (which are a product of customer need and the efforts of the entrepreneur to promote different services) and the amount of revenue. We attempt to address this by instrumenting the number of services in a two-stage procedure but were faced with limited choices of instruments. The instruments we used were a set of dummies for the category of service which was reported as having generated the most revenue in a given period. A Sargan–Hansen test of the over-identifying assumptions associated with the instruments cannot reject the null that they are valid instruments; however the instruments we use display very little time variation and are not ideal in that respect.

## Results

In our primary regression specification we use both the owner/operator and the village/kiosk characteristics, putting total revenues on the LHS. As an alternative, we also estimate a regression with revenues net of facility rent on the LHS: those results are presented after we discuss the results from the initial specification. As discussed in the third section we have chosen the between-effects estimator as our primary estimation technique for a variety of reasons and supplemented this technique with

other techniques for robustness. Our primary regression results are presented in Table 7a and 7b, with the main estimating equation being the first column of Table 7a labelled 'Between Effects—Baseline'. As noted earlier in this section, we omitted a single outlier in these specifications.[23] Looking at the baseline specification, we see that the age variable as well as the dummy for backwards and scheduled castes and the dummies for being located on the main road or commercial centre are all significant at the 5 per cent level.[24] Household size and the state dummy for Karnataka State are also significant at the 10 per cent level. This pattern plays out fairly consistently across the other specifications and is discussed below.

We also run a more parsimonious regression with fewer kiosk characteristics and dummies for education and schooling collapsed into binary indicators. This specification did not find any significant deviations from the above results indicating that multi-collinearity is not likely a problem. Similarly, we employ the technique from Baltagi and Wu (1999) which accounts for autocorrelation in the residuals and the results are largely the same. Finally, we split the sample as a robustness check and conduct some regressions using instrumental variables to sort out the relationship between the number of services reported as having generated revenue and the total revenues. The results of these regressions are discussed below.[25]

## *Location*

Kiosks which are near a main road of their village or a commercial building were significantly more profitable than those in other locations within the village (divided into main road, residential, commercial/government building and bus stop). Despite the age-old maxim that the three most important determinants of success in retail are location, location, location, we still find this result surprising. The villages where these kiosks operate are relatively small and the advent of an Internet kiosk should be relatively well known whether it appears in a visible central location, or not.

In many villages, neighbourhoods segregate by caste. This can cause certain parts of town to be undesirable destinations for some village residents from other areas. A main road or commercial centre location would

**Table 7a.** Regression Results

| Total Revenues (LHS) | Between Effects^—Baseline | t | Between Effects^^—Parsimonious Specification | t | Random Effects^—Baseline | z | Between Effects ^—Tamil Nadu Only | t |
|---|---|---|---|---|---|---|---|---|
| Total Services | | | | | | | | |
| Population | −0.013 | −(0.38) | −0.030 | −(0.99) | −0.012 | −(0.49) | −0.057 | −(1.24) |
| Pop*Town | 0.012 | (0.34) | 0.029 | (0.95) | 0.011 | (0.44) | 0.057 | (1.23) |
| Age | **78.937** | **(2.20)** | **98.491** | **(3.02)** | **76.044** | **(1.87)** | **121.717** | **(2.84)** |
| Female (d) | 178.299 | (0.39) | 313.052 | (0.75) | 170.089 | (0.35) | 466.833 | (0.76) |
| HH Size | **209.379** | **(1.77)** | **198.388** | **(1.80)** | **215.060** | **(2.14)** | 186.779 | (1.32) |
| Kiosk Owner (d) | 819.352 | (1.52) | **820.833** | **(1.69)** | 856.520 | (1.36) | −125.977 | −(0.12) |
| *Education Dummies:* | | | | | | | | |
| Some HS (d) | (omitted dummy) | | (omitted dummy) | | (omitted dummy) | | (omitted dummy) | |
| HS (d) | 1132.877 | (1.27) | | | 1081.869 | (1.25) | 822.862 | (0.83) |
| Some College (d) | 660.954 | (0.72) | | | 610.580 | (0.87) | 763.051 | (0.73) |
| ---Educated(d) ^^^ | | | 1026.706 | (1.40) | | | | |
| Low Caste (d) | **−1160.023** | **−(2.03)** | **−940.519** | **−(2.40)** | **−1156.618** | **−(2.73)** | −860.356 | −(1.03) |
| Self Invest | −0.004 | −(0.28) | | | −0.004 | −(0.17) | 0.001 | (0.04) |
| Loan Size | −0.011 | −(0.88) | | | −0.013 | −(0.75) | −0.017 | −(1.02) |
| Monthly Rent | 0.215 | (1.19) | 0.215 | (1.60) | 0.219 | (1.05) | −0.428 | −(0.35) |
| Kiosk Age | −33.169 | −(0.83) | | | −46.733 | −(1.41) | 0.307 | (0.01) |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Location Dummies:* | | | | | | | | |
| Comm Bldg (d) | **1066.307** | **(1.75)** | | | **1080.888** | **(1.95)** | **1251.414** | **(1.77)** |
| Bus Stop (d) | 534.597 | (0.94) | | | 546.533 | (1.11) | **1501.159** | **(1.96)** |
| Main Road (d) | **1605.500** | **(2.73)** | | | **1641.365** | **(2.01)** | **2143.774** | **(2.84)** |
| Residential (d) | (omitted dummy) | | (omitted dummy) | | (omitted dummy) | | (omitted dummy) | |
| ----Non–residential (d) ^^^ | | | **1048.242** | **(2.59)** | | | | |
| Distance HQ | –5.343 | –(0.38) | | | –5.025 | –(0.33) | 1.747 | (0.10) |
| Distance City | 2.137 | (0.22) | | | 1.493 | (0.15) | 10.851 | (0.79) |
| Karnataka (d) | **–1611.066** | **–(1.73)** | **–943.575** | **–(1.99)** | –1586.722 | –(1.24) | | |
| Gujarat (d) | 1531.892 | (1.25) | **1703.390** | **(2.04)** | 1514.316 | (1.16) | | |
| Maharashtra (d) | 409.218 | (0.54) | 31.494 | (0.05) | 375.241 | (0.61) | | |
| _cons | –671.730 | –(0.32) | –2275.739 | –(1.51) | –355.380 | –(0.17) | –2644.750 | –(0.99) |
| ^(i = 73, t = 6) ^^(i = 47, t = 6) | N = 438(73 grps) **Pseudo-$R^2$ = .26** | | N = 438(73 grps) **Pseudo-$R^2$ = .23** | | N = 438 **Pseudo-$R^2$ = .26** | | N = 282 **Pseudo-$R^2$ = .23** | |

**Source:** Authors' research.

**Notes:** (d) = dummy variable, Bold underline are significant at 5%, Bold are significant at 10%.

^^^ Educated is HS graduate and above. Non-residential is a dummy for all three of commercial building, or bus stop, or main road.

**Table 7b.** Supplementary Regression Results

| Total Revenues (LHS) | AR(1) Errors (RE)^—Baseline | z | Between Effects^^—Bootstrapped | Boot-Strapped z | Random Effects^—IV on Services | z | Pooled OLS—Baseline | t (Robust) |
|---|---|---|---|---|---|---|---|---|
| Total Services | | | | | 105.529 | (0.60) | | |
| Population | –0.013 | –(0.43) | –0.013 | –(0.28) | –0.015 | –(0.46) | –0.013 | –(0.88) |
| Pop*Town | 0.011 | (0.39) | 0.012 | (0.26) | 0.014 | (0.42) | 0.011 | (0.79) |
| Age | **77.732** | **(2.60)** | **78.937** | **(1.80)** | **78.071** | **(2.30)** | **78.003** | **(3.81)** |
| Female (d) | 151.425 | (0.39) | 178.299 | (0.33) | 92.139 | (0.20) | 175.650 | (0.70) |
| HH Size | **207.391** | **(2.09)** | 209.379 | (1.63) | 181.968 | (1.46) | **211.212** | **(3.88)** |
| Kiosk Owner (d) | **824.675** | **(1.82)** | 819.352 | (1.07) | 705.933 | (1.24) | **831.348** | **(2.61)** |
| *Education Dummies:* | | | | | | | | |
| Some HS (d) | (omitted dummy) | | (omitted dummy) | | (omitted dummy) | | (omitted dummy) | |
| HS (d) | 1130.229 | (1.51) | 1132.877 | (1.35) | 1036.396 | (1.22) | **1116.415** | **(2.56)** |
| Some College (d) | 657.474 | (0.85) | 660.954 | (0.79) | 570.033 | (0.65) | 644.696 | (1.74) |
| Low Caste (d) | **–1186.460** | **–(2.46)** | **–1160.023** | **–(2.07)** | **–1141.444** | **–(2.09)** | **–1158.924** | **–(4.93)** |
| Self Invest | –0.004 | –(0.33) | –0.004 | –(0.21) | 0.000 | –(0.02) | –0.004 | –(0.35) |
| Loan Size | –0.011 | –(1.01) | –0.011 | –(0.70) | –0.011 | –(0.89) | –0.012 | –(1.37) |
| Monthly Rent | 0.211 | (1.39) | 0.215 | (0.31) | 0.201 | (1.16) | **0.216** | **(2.17)** |
| Kiosk Age | –33.270 | –(1.19) | –33.169 | –(0.74) | –33.889 | –(0.97) | –37.547 | –(1.75) |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Location Dummies:* | | | | | | | | |
| Comm Bldg (d) | **1052.424** | **(2.05)** | 1066.307 | (1.34) | **1028.195** | **(1.75)** | **1071.013** | **(3.56)** |
| Bus Stop (d) | 552.775 | (1.16) | 534.597 | (0.63) | 537.864 | (0.99) | **538.450** | **(1.75)** |
| Main Road (d) | **1601.052** | **(3.25)** | **1605.500** | **(2.05)** | **1556.019** | **(2.71)** | **1617.075** | **(3.79)** |
| Residential (d) | (omitted dummy) | | (omitted dummy) | | (omitted dummy) | | (omitted dummy) | |
| Distance HQ | –5.332 | –(0.45) | –5.343 | –(0.28) | –7.062 | –(0.51) | –5.240 | –(0.63) |
| Distance City | 2.197 | (0.27) | 2.137 | (0.19) | 2.156 | (0.23) | 1.929 | (0.35) |
| Karnataka (d) | **–1647.603** | **–(2.10)** | –1611.066 | –(1.37) | **–1730.769** | **–(1.88)** | **–1603.209** | **–(2.54)** |
| Gujarat (d) | 1436.112 | (1.39) | 1531.892 | (0.89) | 1647.656 | (1.38) | **1526.220** | **(2.10)** |
| Maharashtra (d) | 432.760 | (0.68) | 409.218 | (0.38) | 473.150 | (0.64) | 398.252 | (1.08) |
| _cons | –639.606 | –(0.37) | –671.730 | –(0.30) | –807.166 | –(0.39) | –569.631 | –(0.52) |
| ^(i = 73, t = 6), ^^(i = 47, t = 6) | N = 438 **Pseudo-$R^2$ = .26** | **rho-AR = .25** **LBI = 1.8** | N = 282 **Pseudo-$R^2$ = .26** | 50 b.s. iteration | N = 438 **Pseudo-$R^2$ = .30** | | N = 438 **$R^2$ = 0.33** | |

**Source:** Authors' research.

**Notes:** (d) = dummy variable, Bold underline are significant at 5%, Bold are significant at 10%.

^^^ Non-residential is a dummy for all three of commercial building, or bus stop, or main road. Educated is HS graduate and above.

likely be a caste-neutral spot that would encourage the greatest number of customers to visit the kiosk without fear of being seen on the 'wrong side of town'. In the paired-down specification ('fewer regressors' in Table 7a) we find that a combined dummy coding for non-residential location is highly significant.

Another possible explanation may be that some remote villages are not located along a 'main road' and do not have a large commercial centre at all and that this choice may not have been available to those kiosk owners. Thus the measured effect of 'main road' may proxy for a more developed village that is along a main road rather than the effect of relative location within the village.[26]

A final factor that may play a minor role in this result is that many of the kiosks were founded a short time before the beginning of the sample period. The increased local visibility by being in a commercial centre may have driven initial revenues especially to individuals from surrounding areas who enter the village infrequently. In any case, the positive impact of location represents an illustration of a classic demand side effect on commercial activity, even in a non-traditional setting.

## *Social Status*

It seems that social status as measured by greater age and caste plays a significant role in determining the revenues generated by each kiosk. While we cannot be sure of the channel through which this effect operates, some obvious candidates come to mind. Individuals with higher social standing may have larger and more affluent social networks through which to advertise their services to the village and surrounding areas. They may be more effective in convincing a sceptical population of the value of these services. They may also possess greater human capital, making them more effective business operators in other ways.

In addition to capturing these 'supply' characteristics, low caste may also be a proxy for demand side factors. Most directly, villagers may be less likely to patronise a kiosk run by a lower caste operator. Interestingly, the caste variable was least significant and of smallest magnitude in Tamil Nadu, which underwent an early social revolution involving the rise of scheduled and backward castes in a 'self-respect movement'.[27]

Tamil Nadu is also more densely populated, and relatively urbanized, factors which may contribute to greater contemporary social fluidity. It is also possible that lower caste operators were in villages or neighbourhoods with poorer or more disadvantaged populations. We did examine the possibility that caste could be proxying for an unobserved characteristic of the district within which the kiosk was located, by replacing state-level dummies with district dummies. However, none of the district dummies was significant in the estimated regressions. The possibility of unobserved village or neighbourhood effects remains.

## *Household Size*

Household size is significant at 10 per cent in the main specification and in a number of the alternate regressions. This most likely indicates that household members are being conscripted to work at the family business, allowing longer hours and service of more customers. It could also represent larger a social network through which to advertise services, though we believe that the former effect is likely to have a greater impact.

## *Insignificant Factors*

Almost as interesting as the statistically significant factors are those which are not significant. Much attention is paid in development circles to concepts of fairness, income inequality and empowerment of women. We find that while caste is a significant determinant of success, gender and education are not.[28]

### *Gender*

While fully one third of the sample are women, the gender dummy is not even close to significant in any specification. We believe this argues in favour of the notion that entrepreneurial opportunities are not significantly biased against women at the village level. There may still be biases in terms of educational attainment and other factors. However, these biases, if they exist, are not measurably affecting the outcome and are probably corrected during the entrepreneur selection process. It is

notable that women are over-represented in the least educated subgroup indicating that the franchisee selection process is not holding women to a higher educational standard.[29]

### *Education*

None of the education dummies are significant at 5 per cent or 10 per cent in the main specification nor in any of the supplementary regressions except pooled OLS, which shows an advantage that is greater for high school than for college grads. Statistically, having finished high school and/or some college gives no advantage over having never finished high school at all, where this last category does have more than a minimal level of secondary education. This result is noteworthy given the technical nature of the tasks that operators must perform. The fact that n-Logue screens and trains individuals on the equipment may help correct for lack of education beyond the basic cut-off level.

Given that it is often the economically disadvantaged who achieve lower levels of education, we take these results as a hopeful sign that the sustainable franchise model offers opportunities to groups which have been disadvantaged in the past. This feature is a nice one as it indicates benefits of the model that extend beyond the direct economic impact of the services which it delivers.

### *Population*

None of the specifications reported indicate that the size of the village has any bearing on the amount of revenues generated by the kiosk. This result is somewhat surprising, but very robust (in unreported regressions, all variables which significantly correlate with population were dropped sequentially and the coefficient was still not significant, indicating multicollinearity with other village characteristics is not confounding the results).

The result is surprising to the extent that one would expect the size of the economic catchment would be a measure of market size and a significant determinant of the level of revenues. However, we believe that the size of the village is not at all a measure of the relevant economic catchment, and that either the kiosks are catering to markets larger than the village due to customers' willingness to travel, or markets which are smaller than most of the villages in the sample. Based on field observations and discussions with n-Logue management, we believe that

both explanations play a role. Thus, in the sample, there are 15 villages with less than 2000 people, that are likely close to other villages from which they may draw clients, as well as 11 villages or towns with populations above 10,000, in which the sample kiosks may not be the only alternative.[30]

### *Revenue Services*

We attempted to instrument the number of services reported as having generated revenue using dummies for which category of service was reported as being the top revenue generator. In Table 7b, the estimated parameter on instrumented number of revenue services is not significant. This most likely reflects the weakness of the instruments and we do not take it as a conclusive finding. While the instruments pass a likelihood ratio test for over-identifying restrictions, they do not vary much over time within kiosk (most kiosks report the same top service across the six months; a few show the top service changing over time). In the raw data, these two variables (total revenue and number of revenue generating services) are very highly correlated. We cannot differentiate between the conclusion that choosing the number of revenue services to offer causally influences the amount of revenues generated and the alternative that the number of revenue generating services is determined by demand and therefore only correlated with revenue. Without better instruments, we find it difficult to determine causality with respect to the choice of services offered in the kiosks.

## *Net Revenue Regression*

As an alternative to including the facility rent as an explanatory variable, we also estimate a specification where the dependent variable is the revenue net of the facility rent. This specification therefore uses an alternative measure of success, which is one step closer to economic profit.[31] As we argued in the third section, other costs are either constant across kiosks, relatively small or closely tied to revenue. In this case, in order to reflect the notion of economic profit somewhat better, we also impute a rental cost for self-owned facilities. There are only a small number of such observations, and we use the minimum rent paid in the district where the relevant kiosk is located. Our results are not sensitive to this

imputation procedure. However, we do drop an additional outlier, where the rent and revenue are both very high compared to the rest of the sample. These results are reported in Table 8, and they indicate that all our major results are robust to the alternative specification.

**Table 8.** Regression Results with Net Revenues on LHS

| Total Revenues (LHS) | Between Effects^LHS = Profits | t (Robust) |
|---|---|---|
| Total Services | | |
| Population | –0.016 | –(0.45) |
| Pop*Town | 0.014 | (0.41) |
| Age | **77.197** | **(2.14)** |
| Female (d) | 216.201 | (0.47) |
| HH Size | **211.815** | **(1.80)** |
| Kiosk Owner (d) | 983.803 | (1.26) |
| *Education Dummies:* | | |
| Some HS (d) | (omitted dummy) | |
| HS (d) | 1121.963 | (1.26) |
| Some College (d) | 639.914 | (0.70) |
| Low Caste (d) | **–1296.823** | **–(2.13)** |
| Self Invest | –0.004 | –(0.29) |
| Loan Size | –0.011 | –(0.84) |
| Monthly Rent | –0.176 | –(0.18) |
| Kiosk Age | –34.761 | –(0.86) |
| *Location Dummies:* | | |
| Comm Bldg (d) | **1082.032** | **(1.78)** |
| Bus Stop (d) | 570.436 | (1.01) |
| Main Road (d) | **1637.938** | **(2.78)** |
| Residential (d) | (omitted dummy) | |
| Distance HQ | –3.024 | –(0.21) |
| Distance City | –0.307 | –(0.03) |
| Karnataka (d) | –1511.528 | –(1.60) |
| Gujarat (d) | 1272.572 | (1.02) |
| Maharashtra (d) | 288.584 | (0.38) |
| _cons | –828.572 | –(0.39) |
| ^(i = 72, t = 6) | N = 432 | |
| | **Pseudo-$R^2$ = .28** | |

**Source:** Authors' research.

**Notes:** (d) = dummy variable, Bold underline are significant at 5%, Bold are significant at 10%.

One rent outlier was dropped as its rent was an order of magnitude greater than other firms.

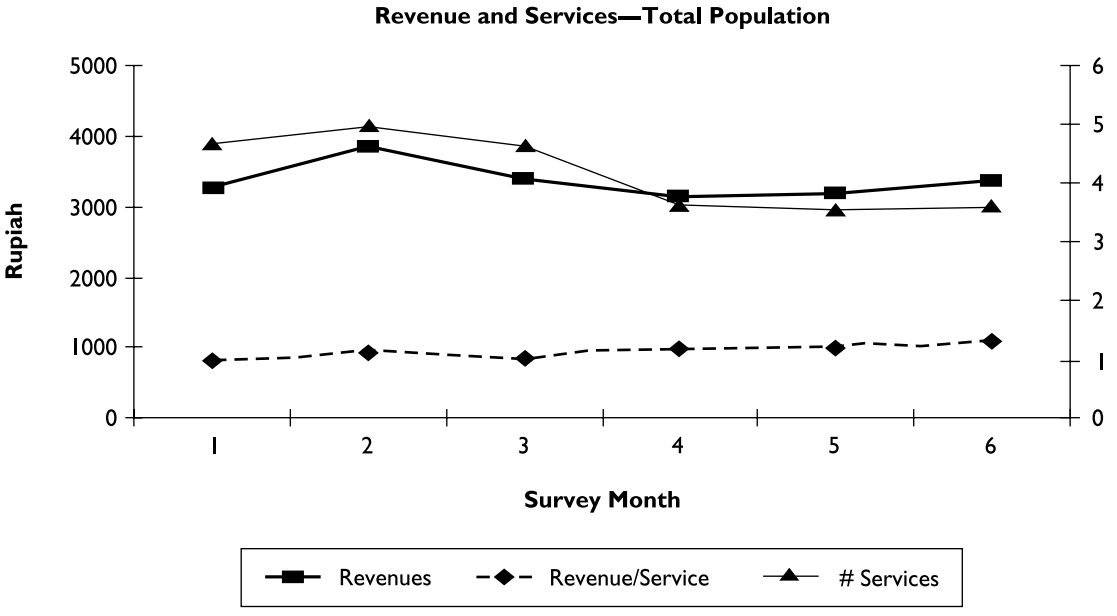
## *Pent-up Demand, Learning by Doing and Seasonality Issues*

The median kiosk age in month one of the survey was only six months and many kiosks were only a month or two old when the survey started. This allowed us to investigate the revenue dynamics in the early stages of the kiosk life. One hypothesis might be that the kiosks should initially see large revenues as they fill pent up demand due to curiosity or one-off tasks which are not soon repeated (emails to overseas relatives, photo-shopping of old wedding photos, etc.) but that the demand would shortly drop off to its steady state level. An alternative hypothesis would be that as kiosk owners learn their business and generate awareness in their local market their revenues should build from an initially low level. Fieldwork by one of the authors (Singh, 2004) suggests that, depending on the situation, both effects operate in practice.

In Figure 2 we have plotted the average revenue and the number of revenue services reported over time in three different groups, the youngest 50 per cent of kiosks, the oldest 50 per cent and the total sample. Clearly, seasonal effects seem to be at play given that the older and younger samples both have similar variation over time. To the extent that trends differ in the young kiosks versus the old we can learn something about how the new kiosks are transitioning to the steady state. We can see that the newer kiosks have growing revenues over time and growing revenues per service as opposed to the older kiosks which exhibit no trend in either. Though the effects are small relative to the seasonal variation, this is consistent with a description allowing for positive learning effects. If there is learning, however, it is impossible to determine whether it is learning by the operator, the village population or by n-Logue.

It is interesting to note that the average revenue of the youngest 50 per cent of kiosks is somewhat higher than in the older sample. As can be seen in Figure 3, the firms fall into two fairly distinct age groups that reflect the initial and recent recruitment campaigns on the part of n-Logue. The higher average revenue of the newer kiosks may reflect a learning curve on the part of n-Logue in their selection process and training regime.[32]

In both the new and old kiosks, there seems to be a seasonal component to revenues, evident as the sinusoidal variation in both samples. The sample period starts just before the monsoon season and carries through until September as the monsoons are just beginning to ebb.



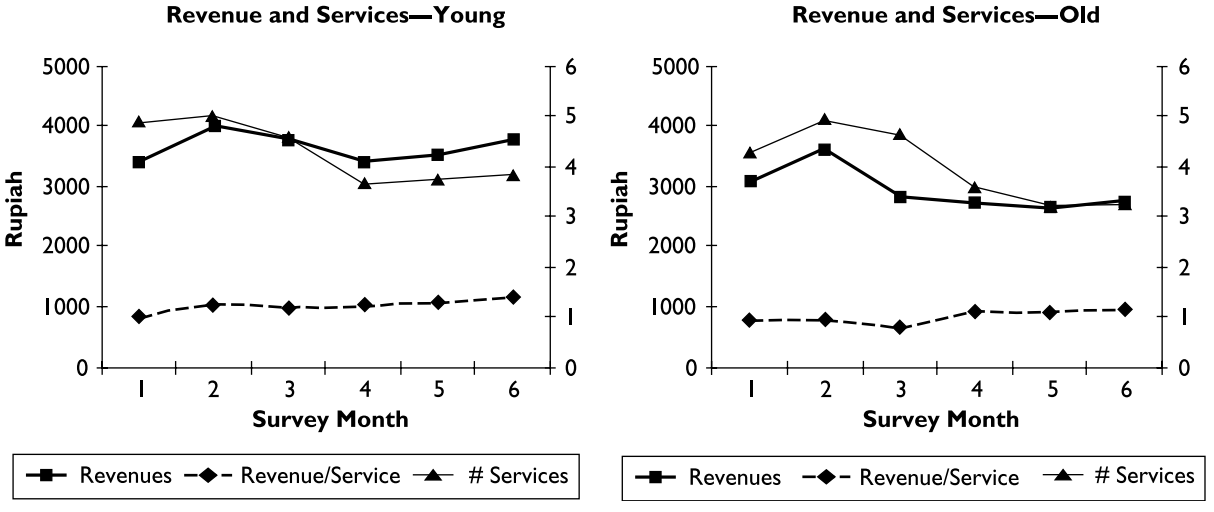



**Figure 2.** Revenue and Services Dynamics

**Source:** Authors' research.

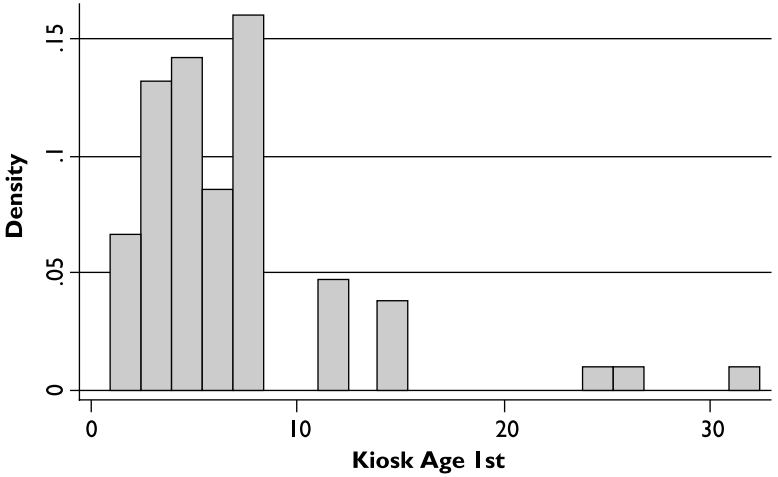



**Figure 3.** Histogram, Kiosk Age at Start of Survey

**Source:** Authors' research.

During this time, farmers will likely have made a large investment in seed, fertiliser and other agricultural inputs and will not receive pay-off until late September or early October when much of the harvest is sold. This may account for the initially high revenues which drop off during July, August and September (a pattern we observe in both the young and old kiosk groups). If a seasonal variation in income affects demand or if a main driver of demand is harvest related tasks such as price discovery, government services, banking, purchases of farming inputs, etc., then for both these reasons we might expect the seasonal component of demand faced by the kiosks to be low and or declining in this period as it is in the data.

## *Uses for Services*

We have limited data on the services that were requested by the customers of the Internet kiosk. In the development literature, many have speculated as to the beneficial uses that rural village residents would have for

telephones and the Internet. Often these speculations have centred on commercial activities and access first world markets and distant services. Being able to sell local products to first world consumers, accessing medical care via videophone, price discovery for agricultural production, are some oft cited examples. Our data are not fine grained enough to completely address the usage question directly but we do have a rough indication of what services were being requested. In Table 9, we have listed the top three reported revenue generating services by state. In general, education and desk top publishing (DTP) services are the highest requested service followed closely by games with games seeming to play a slightly more prominent role in the richer state of Maharashtra, but also in somewhat poorer Tamil Nadu. Both states do have high literacy rates, though this may or may not be a determining factor in the demand for online games.

**Table 9.** Highest Revenue Generating Services by State

| Maharashtra | Frequency as Highest | Tamil Nadu | Frequency as Highest | Gujarat | Frequency as Highest | Karnataka | Frequency as Highest |
|---|---|---|---|---|---|---|---|
| Education | 0.40 | Games | 0.37 | Education | 0.44 | Education | 0.83 |
| DTP | 0.18 | Browsing | 0.21 | Offline | 0.28 | Games | 0.11 |
| Games | 0.17 | DTP | 0.12 | DTP | 0.11 | DTP | 0.04 |
| Comm. Svcs. | 0.10 | Education | 0.12 | Test Results | 0.11 | Offline | 0.02 |

**Source:** Authors' research.

Going back to the full list of services in Table 1, we can reiterate the earlier point that the mix of services are not much different than what one might expect from Internet users in a developed country (browsing, chat and VOIP, education, games, on-line match making, horoscopes, etc.).

We should add here that fieldwork interviews by one of the authors (Singh) with users, kiosk operators and n-Logue staff suggested that, through a process of social norms and expectations, kiosk operators provide a certain amount of free services that include remote health diagnosis, agricultural techniques and disease information and basic education.

## Conclusions

Our empirical results point to a number of factors that determine the success, as measured by revenue generation, of a franchise model in the rural context and a number that do not, on both the demand and supply sides, all at the level of the individual kiosk, rather than the overseeing organisation. We find that education and gender do not significantly affect kiosk profits but that the caste designation and age of the kiosk operator does. It seems that while local social norms and practices can have a negative impact on profits (caste discrimination), stringent entrepreneur selection standards and good training can overcome some barriers (such as gender bias).[33] This leads us to the conclusion that, as programme designers choose where to locate their programmes, who to recruit, etc., they should carefully take into account the local social structures but not be biased by preconceived notions of who will be successful and what modes of operation will work best. Additionally, they may want to look for opportunities to target goals beyond the delivery of IT-services such as developing entrepreneurial and technical skills in the population and empowering women and other minorities.

Seasonality and learning effects seem to be significant factors that may pose special challenges for designers of similar programmes in other parts of the world. N-Logue has a phased cost approach where the kiosk operator's franchise fees increase gradually over the course of a year so that the operator has time to learn the business and generate awareness. This approach seems to have worked well in giving operators a necessary grace period.

Clearly, our analysis does not provide a definitive determination of the factors that influence the success of rural Internet kiosks, even in the limited—though important—dimension of revenue generation. In particular, more detailed data on economic characteristics of the specific locations would increase the explanatory power of the regressions. Furthermore, a longer panel would allow one to examine sustainability in the sense of long-run survival, though, as we have noted, higher revenues are a critical necessary condition for such survival.

The important study of Best and Kumar (2008) highlights and analyses in detail the impact of failures to offer a broad enough range of services (especially e-governance), innovations in the set of offered services, and especially the lack of adequate institutional support, as key

factors in the failure of the n-Logue kiosks that they examined. All of these factors would have fed into the level of revenue that was realised. We have also noted the problem of technological choice, where even the n-Logue technology was leapfrogged by new mobile networks.

In the longer run, it should also be possible to examine the economic and social impacts of such efforts to provide rural access to information technology, in addition to their economic viability, as Jensen (2007) and Goyal (2010) have done for different ICT applications in rural India.[34] In particular, the role of ICTs in fostering market access and market integration is an important one that needs more attention, including factors that enhance the viability of supplying access to IT, as we have focused on here. These issues are part of a broader research agenda in development.

## Appendix

**Table A1.** First Stage Regression Results: N-Logue Internet Kiosks

| | Random Effects*—Baseline Spec. | |
|---|---|---|
| Total Revenues (LHS) | First Stage Results | z |
| Population | 0.0000358 | (1.070) |
| Pop*Town(d) | –0.0000348 | –(1.040) |
| Age | –0.0105292 | –(0.310) |
| Female (d) | 0.6738766 | (1.500) |
| HH Size | **0.2569407** | **(2.240)** |
| Kiosk Owner (d) | **1.378179** | **(2.650)** |
| *Education Dummies:* | | |
| HS (d) | 0.7001664 | (0.810) |
| Some College (d) | 0.659057 | (0.740) |
| Low Caste (d) | –0.229302 | –(0.410) |
| Self Invest | **–0.0000305** | **–(2.450)** |
| Loan Size | –0.0000184 | –(1.520) |
| Monthly Rent | 0.0001574 | (0.900) |
| Kiosk Age | **–0.0867934** | **–(2.960)** |
| *Location Dummies:* | | |
| Comm Bldg (d) | 0.4644386 | (0.790) |
| Bus Stop (d) | 0.095259 | (0.170) |
| Main Road (d) | 0.8091332 | (1.430) |
| Distance HQ | 0.0134687 | (0.980) |
| Distance City | –0.0028189 | –(0.300) |

(*Table A1 continued*)

(*Table A1 continued*)

| Total Revenues (LHS) | Random Effects*—Baseline Spec. First Stage Results | z |
|---|---|---|
| Karnataka (d) | 1.239556 | (1.350) |
| Gujarat (d) | –1.017261 | –(0.850) |
| Maharashtra (d) | –0.7239633 | –(0.980) |
| *Instruments:* | | |
| Browsing Svcs (d) | **–1.184415** | **–(4.430)** |
| Offline Services (d) | –0.3490263 | –(0.890) |
| Test Results (d) | 0.2563924 | (0.460) |
| Education Svcs. (d) | **–0.8900884** | **–(3.640)** |
| DTP (d) | **–0.9173647** | **–(3.300)** |
| _cons | **4.090367** | **(2.100)** |
| *(i = 73, t = 6) | N = 438 | |

**Notes:** (d) = dummy variable, bold are significant at 5%, instruments are jointly significant.

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## Notes

1. Much of the debate has focused on the United States, with Jorgenson (2001) and Stiroh (2002) finding positive productivity impacts of IT, while Baily (2004) and Gordon (2000) offer cautionary conclusions. The consensus seems to have shifted toward accepting that IT has had measurable positive effects on productivity. For developed countries more generally, several recent studies have also found positive impacts at the aggregate level (for example, Daveri, 2000), Jorgenson (2004)). Micro-level studies for developed countries also tend to find positive productivity impacts of IT use, when appropriate organisational changes are introduced as well (for example, Bresnahan et al., 2002; Brynjolfsson and Hitt, 2003; Black and Lynch, 2004 OECD, 2004). For developing countries, there is little econometric evidence at the micro-level, and aggregate evidence is more mixed (for example, Dewan and Kraemer, 2000), but overall, positive impacts of IT seem to be emerging from many studies (for example, Indjikian and Siegel, 2005).

2. Secretary-General Kofi Annan stated in his Millennium Report, 'New technology offers an unprecedented chance for developing countries to "leapfrog" earlier stages of development. Everything must be done to maximize their peoples' access to new information networks'. (United Nations, 2001)
3. Two recent important studies that quantify the benefits of ICTs in the context of a developing country are Jensen (2007) for fishermen using cell phones in south-western India, and Goyal (2010) for farmers using Internet kiosks in central India.
4. As we discuss later in the article, this particular franchise organisation (n-Logue) did not survive itself, but its goals were clearly aligned with our conceptualisation here.
5. Best and Kumar (2008) compare the n-Logue kiosks with those supported by a local NGO, both groups being part of a government-supported project, Sustainable Access in Rural India. They find that the NGO provided financial and other support, which allowed their kiosks to survive whereas n-Logue kiosks mostly shut down. Their conclusions are summarised later in our article.
6. Best and Kumar (2008) focused on kiosks in one district of the southern state of Tamil Nadu, where initial efforts were focused. Our sample draws on this district too, but also on other regions where n-Logue expanded its operations.
7. ITC, an India-based agribusiness multinational, has more kiosks, but uses a very different organisational structure. It does not charge its operators, and even gives them commissions on crop procurement through its kiosks, implicitly making money through resulting cost savings in its supply chain. See Goyal (2010) for details. Drishtee has a similar structure to n-Logue, but is somewhat smaller in scope and operations. See Singh (2007), Kaushik and Singh (2004) and Dossani et al. (2005) for more details on various Indian cases. Note that our investigation of factors influencing performance focuses on operator and location characteristics, rather than those of the implementing organisation. Best and Kumar (2008) carry out that exercise, of comparing organisational factors, in a revealing analysis.
8. See Paul (2004), Dossani et al. (2005) and Singh (2007) for more discussion of and information on the technologies used in n-Logue and similar cases. There is a useful subsidiary point to be made here, that the fall in costs of ICT components has allowed a substantial degree of technological leap-frogging by developing countries. Perhaps the most striking example of this is the common use of mobile phones by developing country populations that have never had fixed-line access. The rapid development of the mobile

phone infrastructure probably played a role in undermining n-Logue, since its revenue model included provision of voice telephony along with Internet services.

9. See, for example, Best and Maclay (2002), Intel (2006), Kovacs (2001), Pal (2007), Parthasarathy et al. (2004), Rangaswamy (2006), Toyama et al. (2005), among many others. None of these papers consider a panel regression analysis as conducted here.
10. For other examples from around the globe, including non-entrepreneurial models, see Hawkins (2002), McNamara (2003), and Tongia et al. (2005).
11. While we have a rank ordering of services by revenue contribution for each kiosk, we do not have the exact revenue breakdown by service.
12. As noted elsewhere in our article, organisational support is difficult to measure in this context. However, see Best and Kumar (2008) for one possible empirical approach to this issue.
13. Both these terms are specific legal and administrative terms used by the Indian government. Scheduled castes are essentially former 'untouchables', and backward castes are other disadvantaged castes with low social status, though not traditionally untouchable.
14. Literacy statistics are from Planning Commission (2002): while these are reported as being based on the census, the latest census figures for overall literacy (Table 1) show some upward revision for Gujarat, though not the other states. There is also evidence that girls are more likely to drop out of high school than boys, especially in rural India (Planning Commission, 2002, Chapter 4).
15. Both these characteristics are a deliberate consequence of n-Logue's strategy of targeting truly rural populations, as opposed to those in small towns or on the outskirts of cities.
16. The district is India's main local administrative unit. The mean area of a district is roughly 5400 square km, which would be a circle with a radius of about 40 km.
17. Of course, the relative newness of the whole enterprise implies that 'maturity' can have a limited scope, that is, even long-standing kiosks are just a few years old, and potentially subject to learning effects.
18. Building on the analysis of Romer (1994), Singh (2008) shows theoretically that ICTs, by reducing transaction costs, may enable the production and exchange of new goods and services, thereby raising long-run productivity and development.
19. The cost of towers and central equipment is either subsidised or recovered through monthly fees for access charged to kiosk operators. Dossani et al. (2005) document kiosk equipment and infrastructure costs, and make a case for public subsidies for access. Jhunjhunwala (2000) argues that high

interconnection charges and other entry fees unnecessarily raise the cost of network access well beyond basic hardware costs.

20. Since the pattern of services demanded and the effect on revenue of the types of services offered is still of interest, we did explore some instrumental variable regressions including the number of services—these results are reported on briefly in the paper.
21. The LBI test statistic of Baltagi and Wu (1999) is 1.81 when including the variables from our standard specification. This is below the critical value of 2 but as the test statistic is highly sensitive to the normality assumption, many authors require a value less than 1.5 to indicate a conclusive result.
22. The between effects estimator (BEE) regresses group means of the LHS on group means of the RHS variables exploiting only cross sectional variation but using all observations.
23. The full sample results are reported in the third regression in Table 7b, and are quite different in their implications. On the other hand, omitting further outliers, as in the third regression in Table 7a, or just estimating the specification for Tamil Nadu (the second regression in Table 7a) makes little difference to the results, in terms of signs and significance of coefficients.
24. To get a higher resolution view of the social/cultural effects driving the significance of caste and age we tried interacting the variables age, caste, education, and gender with each other in various specifications but found no statistically significant interaction terms.
25. All our regressions are linear in the variables. Log–log and semi-log regressions preserved the signs, but statistical significance was lost because the degree of variation in the data was reduced by the log transformation.
26. The level of development can obviously affect the demand for IT-enabled services. For example, in remote villages with poor transportation facilities, a higher percentage of the farming activity may be dedicated to subsistence farming rather than commercial farming that would be complementary with Internet services for conducting price discovery, orders of farming inputs, and financial transactions.
27. See, for example, Béteille (1965) for an early discussion of the sociological and political impacts of this movement on rural Tamil Nadu.
28. In addition to the fact that gender and education were not significant, we were also surprised by the fact that ownership of the kiosk was not a significant determinant of success. We investigated this issue further by estimating a probit regression on the determinants of ownership and found that none of the owner or village variables were significant in affecting whether a kiosk location was owned or rented.
29. While it is possible that women are used as 'fronts' for men if the selection process is designed to favour women in some way, there was no indication

from the second author's field interviews that this was happening. Best and Maier (2007) examine gender issues from the perspective of users and usage patterns: the connection between the gender of the operator and of users remains formally unexplored, we believe.

30. N-Logue management indicated that 2000 to 3000 people was considered a viable customer population—smaller villages were chosen if other conditions were favourable: this selection effect would also tend to nullify the impact of population.
31. This alternative specification also deals with potential endogeneity in the facility rent variable.
32. We note that average kiosk ages do not differ significantly across the four states, so that geographic variation at that level cannot be the explanation for the observed pattern as discussed here.
33. While our analysis did not bear out anecdotal claims that woman entrepreneurs do better than men, the fact that they do no worse in a non-traditional, entrepreneurial occupation is itself a noteworthy finding.
34. In the context of the SARI project and n-Logue, also see Kumar and Best (2006a, b) on social impacts.

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