

The Indian Business Process Outsourcing Industry: An Evaluation of Firm-Level Performance

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May 30, 2009

Abstract: Even though offshoring significantly affects a host country, most research on offshore production still focuses on its demand side. In this paper, we introduce the factors that affect the performance of Indian suppliers in an outsourcing relationship, popularly called the Business Process Outsourcing (BPO) firms. In the absence of a sound theoretical framework on BPO firms, we combine suitable elements from the model of an intermediate input producer of the Aghion et al (1999) endogenous growth theory, Arora and Asundi (1999) software outsourcing firm model and the Antràs (2005) internalization theory. By applying these models, we support an econometric framework of firm performance comprising of factors crucial for the BPO industry. Our empirical results indicate that in 2001-02, prior experience, the number of office locations, funding from a venture capitalist, the number of markets and the number of clients had a positive influence on a BPO firm's performance while information security certifications negatively affected a supplier's performance.

Keywords: Productivity, Outsourcing, Supplier

JEL Classification: F14, L22, L23 and L84

Acknowledgements: I am extremely grateful to Ashish Arora, Giorgio Barba Navaretti, Abdul Azeez Erumban, Gene Grossman, Lokendra Kumawat and Partha Sen for their helpful insights. I would also like to thank the participants of the CESifo conference on productivity and growth, The 2008 World Congress on National Accounts and Economic Performance Measures for Nations, the CDE-Econometric Society 2008 Winter School and the Centro Studi Luca d'Agliano conference on Internationalization, Innovation and Global labor markets.

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Section 1: Introduction

Firms in high wage nations are increasingly viewing offshoring of services as a strategic and essential element of their business strategy. Even though offshoring has also significantly affected the host nations, most research on offshore production is still concentrated on the demand side of this relationship. As a first step in investigating the supply side of this phenomenon, we find that there is an absence of a sound theoretical or empirical framework on Business Process Outsourcing (BPO) firms. In this paper, we use the representation of a supplier from various strands of literature in formulating an econometric model to explore the factors that explain its performance in India.

India is a labor abundant country with relatively lower wages vis-à-vis the U.S. and thus, is a potential ground for providing labor intensive services. Offshoring of services, as per the Heckscher-Ohlin factor price equalization predictions, has decreased the relative wage gap between India and the US. If the price of services is indexed to wages, then the volume of offshoring business for pure cost arbitrage reasons will fall. India, where the BPO industry is more than a decade old, is witnessing such problems. In the last few years, employee salaries have gone up by an average of over 14 per cent every year (Hay Group, 2008, Forbes, 2008a) and price for the traditional voice-based services decreased from \$16 per hour per agent to \$12 per hour per agent, implying a decline in gross margins by 40 to 60 percent (Greene, 2006). Wage inflation, high attrition, sluggish growth of outsourcing business, Indian currency appreciation and competition from other Asian and East European countries have made high margins unsustainable for Indian outsourcing firms. By identifying the factors that affect a service provider's productivity, we would be able to offer suggestions to BPO firms for offsetting the negative effects of these exogenous factors.

At a micro level, an understanding of the BPO industry is important from the standpoint of the service provider as well as the sourcing firm. From the view point of a supplier, it is crucial to know how a change in one variable filters through the organization to affect its bottom-line performance. A supplier must optimally choose to allocate its resources among potential areas like infrastructure, quality certifications, business continuity planning (BCP), employee training and re-skilling, expanding service line/process offerings, marketing front-ends and personnel to consolidate its position in the industry. From the perspective of a sourcing firm, offshoring of labor intensive fragments to a low wage nation raises its productivity by lowering its cost of production and also allowing it to concentrate on its core activities¹ (Amiti, and Wei, 2006, Görg and Hanley, 2005, Egger and Egger, 2006). An increase in the efficiency of the supplier will therefore act as an additional source of productivity gain for the buyer.

¹ For example, E-Serve, Citibank's back-office, processes are claimed to be 15-20% more efficient than Citibank's internal processes.

From a macro perspective, it is important to analyze the factors determining the productivity of a BPO service provider for two reasons. First, as the existence of a strong supply side is critical for the growth of any market, in the same manner, a BPO supplier's performance is a key to the expansion of the global outsourcing industry. Second, in many countries, like India, the BPO industry makes a crucial contribution to their host economy through trade. In 2005-06, the ITES and the Information Technology (IT) sectors together contributed to 33 percent of its foreign exchange flows, about 7 percent of GDP and employed 2.1 million people in 2007-08 (Forbes, 2008b)². Export revenue and employment growth in the BPO industry in India have been phenomenal, ranging between 40–70% and 35–60% respectively. Table 1 details the revenue, employment and export growth in this sector from 2001-02 to 2005-06.

To the best of our knowledge, there is no theoretical research that explores the supply side of a business process outsourcing relationship. Standard supplier models cannot be directly applied because the existence of a BPO industry in an international setting is unprecedented where a typical BPO firm differs from a conventional supplier. BPO services are extremely sensitive to labor quality as most services are customized to the needs of the sourcing firm. Therefore, factors that can measure service quality become extremely important in determining productivity. Further, the BPO supplier industry has still not reached its mature stage of development³, while the existing supplier models solve for a long-run equilibrium situation.

To formulate an empirical specification, we exploit the existing literature where the representation of a firm closely resembles a typical BPO firm. We combine suitable elements from the representation of an intermediate good firm of the Aghion et al (1999) endogenous growth theory, the Information Technology (IT) outsourcing firms of the Arora and Asundi (1999) model and the supplier of the Antràs (2005) internalization theory to formulate the factors that can potentially affect a service provider's performance.

An intermediate good supplier of the Aghion et al (1999) model resembles a firm in the BPO industry because both provide differentiated inputs and need to continuously upgrade their technology for maintaining a competitive edge. The Aghion et al model also emphasizes on a firm's source of finance, which is crucial in a BPO context as well because some firms in the industry are financed by venture capitalists. Another dimension typical of a BPO industry is the pressure to adopt certain quality norms, which has been discussed in the Arora and Asundi (1999) model in the context of software outsourcing firms. This model is useful for our study because software outsourcing firms

² It also employed 5 million indirectly in transportation, catering, training and security services required by this sector.

³ There is still a lot of flux in the BPO industry, for example, the year 2006 witnessed many Indian BPO firms exiting the industry due to high labor turnover rates and the managers devoted themselves to designing strategies to sustain their human capital. In the next year, there were increasing concerns on data thefts and the managers of BPO firms were seen under pressure to implement information security measures.

are similar to BPO firms as they both supply inputs to a sourcing firm on a contractual basis. In fact, the development of the two types of outsourcing industries in India has also been rather similar. Software industry in India started with low-tech jobs, which, over a period of time evolved to high end software solution provider. In the same manner, the BPO industry in India started with captive call centers and has now advanced to include risk analytics and other knowledge based processes. Lastly, we take advantage of the existing internalization literature in the vertical production transfer context. The Antràs (2005) model differentiates between an affiliated and an unaffiliated supplier and argues that the input of a high-tech good is produced offshore by an affiliated supplier. This combined with the fact that high-tech goods are associated with larger technology spillovers suggests that a captive center should perform better vis-à-vis a third party vendor (TPV).

Given the distinctive features of the BPO industry, the above described models are suitable in building and identifying a parsimonious econometric model of firm performance. In our model, we find that the variable – the number of clients is endogenously determined with firm performance and hence we estimate our model using the Instrumental variable technique. Our estimation of BPO firm performance indicates that in the year 2001-02, prior experience, the number of office locations, the number of markets, funding from venture capitalists and the number of clients positively affect a firm's performance while investment on information security certification, which may be a mandate from the client, does not benefit the supplier firm, at least in the short run.

The paper beyond this point is organized in the following manner. In section 2 we review the relevant theoretical models and their applicability to firms in the Indian BPO industry. Section 3 gives the details of the data sources. Section 4 builds the intuition of our econometric model through preliminary analysis of data. Section 5 gives the empirical specification of the model and Section 6 presents and discusses the empirical results. The final section concludes the paper.

Section 2: Features of the BPO Industry and Related Models

In this section, we bring out the similarities between a BPO firm and the intermediate good supplier in the Aghion et al (1999), the Arora and Asundi (1999) and the Antràs (2005) model to justify using them for our empirical framework.

Section 2.1: Intermediate Good Supplier in the Endogenous Growth Model and the BPO Firm

There are distinctive similarities between an intermediate good supplier of the Aghion et al (1999) endogenous growth model and a service provider in an outsourcing contract. In both cases, the supplier provides differentiated inputs. For example, suppliers of offshored services provide

services⁴ like customer care, finance and accounting, payroll services etc. and within each vertical, there are differentiated services. For example, customer care service can be provided through online chat, telephone calls or emails interaction and a sourcing firm may choose to buy either service. Final good producers use the available varieties of intermediate inputs to produce the end product, as is also typical of a sourcing firm. Production of the final good y , is given by:

$$y = \int_0^N A_\tau x_\tau^\alpha di$$

Where x_τ is the intermediate input of variety τ ⁵, N is the number of varieties of intermediate inputs, A_τ is the productivity parameter which measures the quality of x_τ and $0 < \alpha < 1$ is the elasticity of substitution across inputs. The inverse demand for inputs is given as:

$$p_\tau(x_\tau) = A_\tau \alpha x_\tau^{\alpha-1}$$

The demand for input of a supplier depends positively on its productivity parameter, A_τ which falls with the age of firm's vintage. This creates an incentive for continuous technological enhancement. Like the intermediate good supplier of the Aghion et al model, a BPO firm is also under constant pressure to adopt the leading edge technology else its margins drop with the age of the firm's vintage. In the Aghion et al model, the net flow of profit for a profit maximizing supplier, $\pi_{i,\tau}$, of vintage τ at date t is given by:

$$\pi_{i,\tau} = \Psi(\underline{w}, g, u) e^{gt}$$

Where \underline{w} is the steady state wage rate adjusted for firm productivity, g is the steady state growth rate of all costs (which includes, variable costs, that is, wages and fixed cost of buying the technology as well as fixed operating or maintenance cost) borne by the firm and $u = (t - \tau)$ is the age of the firm technology. For sufficiently large u , $\Psi(\underline{w}, g, u) < 0$, that is, if the age of the supplier's technology is very large, production entails a loss. Profits decline with the age of the firm technology, that is, $\Psi_u < 0$. It is therefore critical for the supplier to periodically upgrade its technology in order to earn positive profits.

Frequent technology up-gradation is critical for a BPO firm to tailor its products to the demands of its clients, for providing greater value to the sourcing firm by improving its processes and for cutting costs and delivering a higher quality service at a lower price. In this context, the BPO industry has developed Business Process Management System (BPMS) that promotes business effectiveness and efficiency while striving for innovation, flexibility and integration with technology.

⁴ The wide range of services offered by the Indian BPO industry are broadly defined in Appendix A.1

⁵ τ also refers to the suppliers vintage.

Aghion et al broaden their analysis by also including suppliers that are financed from outside. The manager of such a firm cares about her private benefit and avoids technology adoption till the firm can remain solvent. If the private benefit of the manager from remaining solvent is large and she is sufficiently impatient, then Aghion et al find that the objective function for a non-profit maximizing firm has an inverted U-shape with respect to the pace of technology adoption. That is, the net benefit from postponing technology adoption initially increases and then decreases, (see figure 1). There is a maximum \tilde{T} such that the benefits exactly equal the cost of technology adoption and the supplier finds it optimal to upgrade its technology. Per contra, the objective function for profit maximizing supplier is downward sloping and therefore the self-financed supplier updates her technology more frequently vis-à-vis a supplier financed from outside when competition is low. In this regard, the level of competition in the industry is important. Increase in competition produces the usual Schumpeterian result⁶ of decreasing the pace of technology adoption for profit maximizing suppliers because a decline in market share discourages innovation. Per contra, competition positively affects the technology adoption rate for a supplier backed by external finance because its solvency becomes more critical when competition is high. In figure 1, the time gap between subsequent technology adoptions for non-profit maximizing suppliers falls from \tilde{T} to $\tilde{\tilde{T}}$ when competition rises. The emphasis on a supplier's source of finance is important in the context of a BPO industry as well because non-profit maximizing firms of the Aghion et al model are analogous to BPO firms financed by a venture capitalist and they would be expected to behave in a similar way.

Predictions of the model for the BPO Industry

In the Aghion et al model, a higher pace of technology adoption is the key to higher performance because it affects the quality and demand for its inputs. Technology adoption rate depends on the supplier's costs, source of finance and the level of competition. From the perspective of a BPO firm, operational cost variables resonate in factors like worker attrition rate, efficient utilization of fixed office space and maintenance costs. BPO business is highly capital intensive and requires huge fixed operating costs, for instance, investment in office space in India costs about \$10,000-15,000 per seat, while costs relating to technology, redundancy and communications, dialer running are \$1.5 per person per hour, maintenance and bandwidth are also quite substantial.

In the Indian BPO space, Venture Capitalist (VC) funds have invested more than US\$ 300 million from 2001 to 2003. As predicted by the Aghion et al model, in the first stage of BPO industry's development, when competition was low, firms backed by VC did not perform well.

⁶ Schumpeter (1942) suggested that more competition implies a lower probability of winning the market, which naturally discourages individual firms' R&D efforts.

Examples include firms like Tracmail, Epicenter Technologies and Infowavz which have now touched the stage of insolvency while Transworks and FirstRing have already closed down. However, in the past decade, competition in the Indian BPO industry has grown tremendously and as per Aghion et al model top firms like World Network Services (WNS) and 24/7 Customer are supported VCs (by Warburg Pincus and Sequoia Capital respectively).

In the Aghion et al model, a high fixed (and variable) cost of operation⁷ decreases the pace of technology adoption and hence firm performance. Applying the Aghion et al model on BPO firms explains low performance in firms with high proportion of voice based processes. On the cost side, firms with a high proportion of voice processes have relatively higher fixed costs of operation (like dialer running and maintenance, bandwidth costs) as well as high employee wages⁸ and related expenses, while on the revenue side, voice processes are among the ones with lowest billing rates. Voice processes typically require low entry-level skill which induces higher competition and thus drives down prices⁹. For instance, Wipro BPO, Spectramind blames its poor performance in the past to a high proportion of voice processes and there had been a clear mandate to reduce this proportion from 84% in 2005 to 60% in a span of 18 months for improving its margins.

Aghion et al model also implies that higher wages lower the pace of technology adoption and hence firm performance. This is intuitive because high labor cost not only increases the cost of adopting a new technology but it also lowers the expected profit from adopting a new technology. In the Indian BPO industry, employee attrition¹⁰ rates average about 40% per annum, which are a big drain on the resources^{11,12}. Large BPO firms like GENPACT, spends about \$10 million and over 1.5 million man hours per annum on training and it takes at least three months for a new employee to reach an optimum productivity level. To combat high worker attrition, GENPACT maintains a buffer of 15% employees on bench, which further increases a firm's labor costs and lowers its

⁷ The cost of operation varies within a country as well and hence one location may be preferred to the other depending on parameters like – people (Number, Quality, Education System), Infrastructure (Power, Telecom, STPI, Physical, Roads, Airports), Financial (Cost of Living, Real Estate Prices) and Catalysts (Government Support, Supporting Industries, Social & Political Stability, Competing Companies, Development of City, Weather). KPMG-NASSCOM (2004) and NeoIT (2004) have carried out a study of state and city location attractiveness for BPO firms in India.

⁸ Average salary for a voice based employee is 12-15% higher than their non-voice counterpart because of odd working hours and stress.

⁹ These firms demonstrate the standard Schumpeterian result (for example see Aghion and Howitt, 1992) that high competition lowers the pace of technology adoption because they attract less venture capitalist interests.

¹⁰ The average age of employee in the Indian BPO industry is 24 years and this is the age of a number of changes in personal life. Other factors that contribute to attrition in the Indian BPO sector could be odd working hours – night shifts, pay packets not in line with expectations, quality of the work environment, lack of growth prospects.

¹¹ Call center service lines are characterized by high labor turnover. For example, the labor turnover rate in the American call center industry is about 100-120% vis-à-vis a 50% attrition rate in the Indian call center industry.

¹² The average attrition rate in the IT sector is about 10-15% which is much lower than the BPO sector. The increasing attrition rate is indicative of the yawning gap between demand and supply. Although India produces 2 million college graduates a year, the services industry has a shortage of seasoned professionals.

performance¹³. High bonuses, salary hike, incentives, door-to-door transportation services and offsite team events are some of the traditional strategies to fight worker attrition which additionally pushes up the average labor cost of the industry. It is worth noticing that voice-based processes, which are characterized by high levels of stress and odd working hours, are again at a disadvantage due to high attrition rate. Attrition in voice based processes averages between 50-55% as against an average of 30-35% for non-voice work. As the cost of labor rises in India, voice-based BPO firms may be unsustainable in future if higher rates of attrition persist.

To offset high labor and operational costs, firms should efficiently utilize its office space. This is termed as shift or seat utilization. Ideally, a firm can use its office for 3 eight hour shifts a day. However, shift utilization of Indian BPO firms is about 1.5-2 shifts mainly because 80% of the outsourced business in India comes from the US, which implies that most of these seats are vacant for 16 hours. To increase seat utilization, BPO firms should actively look for clients across the US, (from the east coast to the west coast), as well as in UK and Australia and also seek to provide services to domestic firms. To optimize seat utilization, BPO firms may handle their voice-based services during business hours and use non-business hours to answer queries through e-mail. This may also enable a healthy balance of voice and non-voice processes and thereby help evade the problems typical of a voice based process.

Operational cost or the cost of technology adoption can also be minimized by taking advantage of scale economies and servicing greater number of clients. A large client base encourages a higher pace of technology adoption because the cost per client for technology adoption would be lower. A small client base lowers the service provider's bargaining power on proposals for cost sharing. Working with multiple customers also provides the vendor with an opportunity to learn and develop best practices of each of its client and share them across their organization to improve quality and reduce costs for all its customers. For example¹⁴, in 2002-03, 61% of IBM-Daksh's total revenue came from one client and as this figure reduced to 32% in 2003-04, its revenue per employee increased from \$9000 per annum to \$12000 per annum, a 33% improvement in firm performance in one year.

Section 2.2: Firms in the Software Outsourcing Industry and the BPO Firm

Arora and Asundi (1999) give directions to suppliers for attracting more number of clients. They believe that quality certification is one way to place the "foot on the door" and signal potential customers. The modeling of software outsourcing firms in Arora and Asundi comes very close to a

¹³ The impact of attrition depends on the service line. CRIS INFAC (2006) quantifies the impact of attrition on operating margins for three different categories of service lines – voice based, Transaction Processing and Knowledge Process Outsourcing (KPO).

representative BPO firm due to the commonalities between IT outsourcing firms and BPO firms. The Arora and Asundi model empirically evaluates the impact of investment in International Standard for Organization (ISO) quality certification on the revenue and employment for 95 software outsourcing firms in India between 1992-93 and 1996-97. An investment in ISO quality certification has two effects: One, it raises the quality of the output of a software outsourcing firm which directly increases its billing rate or price per unit. This is termed as the “quality effect”. Two, implementing ISO quality certification is an indication of higher quality and thus attracts higher number of clients through the “signaling effect”. This raises the number of clients, the demand for the supplier’s service and hence the firm’s size. A rise in billing rate and an increase in its size naturally raise a supplier’s profit.

Arora and Asundi model specifies the profit of a firm, π , as a function of its billing rate or price, p , as well as the number of employees, N . Price, p , and employee size, N , are in turn a function of the investment z on quality level, θ . Quality certification signals the level of quality attained by a supplier. The profit of a supplier, π , is given by:

$$\pi = [p(z(\theta)) - w]N(z(\theta)) \quad (1)$$

Where w is the wage rate.

Partially differentiating the profit function with respect to investment in quality, z we get:

$$\frac{\partial \pi}{\partial z} = \underbrace{\left[\frac{\partial p(z(\theta))}{\partial z} \right]}_{\text{QualityEffect}} N(z(\theta)) + \underbrace{[p(z(\theta)) - w]}_{\text{SignalingEffect}} \frac{\partial N(z(\theta))}{\partial z}$$

In the above equation, the increase in profit due to the effect of an increase in investment in quality on price is the “quality” effect while the increase in profit due to an increase in investment in quality on firm size is the “signaling” effect.

Predictions of the model for the BPO Industry

Indian vendors are striving to adopt international industry standards in quality such as SEI-CMM (Software Engineering Institute developed the Capability Maturity Model), ISO, TQM (Total Quality Management), Six-Sigma, Customer Operations Performance Center (COPC), e-SCM (E-Sourcing Capability Model) for continuous quality process enhancement. The implementation of quality certification in a process implies that it is well defined, standardized, documented and is measured for key variables that can impact the process performance. Therefore, adoption of a quality certification should theoretically improve a supplier’s performance.

¹⁴ Wipro Spectramind had a heavy reliance on a single client that accounted for 44 percent of its revenue in 2002-03.

Besides quality certifications, we propose that other factors like information security certifications, number of locations and the degree of specialization¹⁵ can also impact a BPO firm's performance through a similar quality and signaling effect highlighted by Arora and Asundi. Sourcing firms are alarmed at the prospects of data theft from supplier's premises. In this regard, acquiring an information security certification pacifies the client as it ensures end-user privacy and maintains client confidentiality. Where end customer information is extremely sensitive, like in credit card firms, sourcing firms make it mandatory for BPO firms to have information security certification. Indian BPO firms are optionally opting for international security standards such as ISO-17799, COBIT (Control Objectives for Information and related Technology) and ITSM (IT Service Management) in order to attract clients that appreciate a safe and secure supplier.

An increase in the number of plants/locations may attract sourcing firms who worry about a back-up plan in case of business disruption. Given the current security situation around the world, clients want their suppliers to formulate a proper Business Continuity Plan (BCP), that is, an alternative delivery service center in cases of high seasonal demand or any disruption in the main center. Having an alternative plant/service center sends a positive signal to sourcing firms about the seriousness of a supplier for business and hence gets more contracts from the same client or attracts newer clients.

The degree of specialization or customization of a service by the supplier can also have the "quality" effect highlighted in Arora and Asundi. In equation (1), the profit maximizing price will be determined by the degree of customization by the supplier. Pricing model in BPO industry ranges from the traditional time-based calculation to more value based mechanisms. Specialized BPO firms use output based approach for billing, that is, they charge on the basis of the solutions they provide, which incorporates domain knowledge, technology and processes. This stops commoditization of high end service because not every call center can offer a solution and hence introduces high entry barriers. Per contra, broad based service providers usually cater to low-end processes and charge their clients based on the number of seats per hour used for the client's job. This is the input method and is usually employed in pricing standardized services.

Standardized services like transcription services and voice processes have lowest billing rates and hence the lowest margins among BPO businesses. BPO firms are realizing the importance of specializing in niche services and therefore strategically graduating to more value-added businesses like transactions processing, human resource (HR) and consulting to get better margins¹⁶. For example, Wipro Spectramind moved away from the low-end customer service business to specific

¹⁵ Higher levels of specialization or customization can potentially beat competition in the BPO industry because higher value added work fetches higher billing rates and attracts more clients with specialized work. Thus, it has both the quality and the signaling effect.

business verticals such as travel, insurance and healthcare. Similarly, Technovate now focuses on the travel and hospitality industry. Even relatively small players like Trinity Focus are keen on being pure-play specialists and entering verticals like mortgage and banking industry. The basic reason for this make over in the entire industry relates to the large client firms. Most sourcing firms have specific requirements and are seeking an expertise treatment of their problem. Therefore, it is uninteresting for a domain specialist to outsource to a broad-based service provider. This is a change from first generation outsourcing work where general and low-end work was transferred to India. The need of time has changed and to sustain itself in the longer run, a BPO firm must specialize and develop a particular area of expertise.

Section 2.3: Affiliated/Unaffiliated Suppliers in the Internalization Theory and the BPO Firm

In this section, we sought to answer whether the organizational mode of offshoring can affect a supplier's performance. In this regard, we exploit the Antràs (2005) model in combination with Denny et al (1992) result. Consumer preferences in the Antràs (2005) model are such that a unique producer, i , of good y faces the following isoelastic demand function:

$$y = \lambda p^{-\frac{1}{1-\alpha}}$$

Where p is the price of the good and λ is a given parameter known to the producer.

Final good y is produced by combining the high-tech input, x_h , and the low-tech input, x_l , with intensity $1-z$ and z respectively. The production function for the final good y is given by:

$$y = \left(\frac{x_h}{1-z} \right)^{1-z} \left(\frac{x_l}{z} \right)^z$$

The model assumes that: (i) only the low-tech input can be offshored (ii) the sourcing firm makes relationship specific investment (RSI) only in the high-tech input while the supplier makes RSI only in the low-tech input (iii) the value of these inputs outside the relationship is zero (iv) RSI in each input is sunk before the final good is produced and the total surplus is realized. This creates distortions in RSI because of assumption in (iii). Therefore, the goal of the Antràs (2005) model is to characterize the optimal organizational form of offshoring that would lead to least distortion in RSI.

The low-tech input can be offshored to the host country (south) through intra-firm transfer or external contract. In both the organizational modes, the final good producer has to part with a fraction of his revenue. As suggested in Hart and Moore (1990), the bargaining power of the final good producer is higher in an intra-firm relationship vis-à-vis an outsourcing contract because if the subsidiary manager makes sub-optimal investment, she can be fired and a proportion of the

¹⁶ For example, Progeon, Infosys' BPO firm is consciously trying to minimize its dependence on voice-based BPO.

output can yet be appropriated. Let this proportion be δ . If ϕ is the proportion of revenue accruing to the final good producer in an outsourcing relationship, then the sourcing firm's share in revenue in a vertically integrated relationship with a supplier is given by:

$$\bar{\phi} = \delta^\alpha + \phi(1 - \delta^\alpha) > \phi$$

In an outsourcing relationship, the final good producer maximizes his profits π , given by:

$$\pi = \phi(p \cdot y) - w^N x_b$$

Where w^c is the wage rate in country c , $c \in \{N, S\}$ for north and south respectively and $w^N > w^S$.

The profit maximizing price of good y is given by:

$$\hat{p} = \frac{(w^N)^{1-\alpha} (w^S)^\alpha}{\alpha \phi^{1-\alpha} (1-\phi)^\alpha}$$

Since the two types of suppliers, unaffiliated and affiliated, differ only with respect to the bargaining power, the expression for the profit maximizing price in an integrated relationship remains as above with ϕ being replaced by $\bar{\phi} > \phi$.

From the price expression, it can be inferred that for a high-tech good (low α), a lower share in surplus for the final good producer ϕ , introduces higher distortion in price. This can be explained as follows: For a high-tech good, the RSI of the sourcing firm is far more critical vis-à-vis the RSI of the supplier. Therefore, it is important to motivate the sourcing firm to make an optimal RSI. Property rights theory suggests that optimal RSI can be achieved if the residual right of control is assigned to the agent contributing more to the value of the relationship, which would be a sourcing firm in case of a high tech good. Thus, vertical integration or subsidiary production would be optimal for a high-tech good while outsourcing is preferred for low-tech goods.

Now if we combine the Antràs (2005) result with the Denny et al (1992) result¹⁷ on technology adoption and productivity, which is known to be higher in high-tech industries, then we can conclude that an affiliated supplier is likely to experience higher technology spillovers¹⁸ as well as technology adoption rates as they are linked with high-tech good producers. Therefore, we would expect the affiliated supplier to have higher rates of technology adoption vis-à-vis an unaffiliated supplier. Since the pace of technological spillovers and technology adoption is higher for captives, therefore by the Aghion et al (1999) model the performance of a captive is expected to be higher vis-à-vis a third part vendor (TPV).

¹⁷ They computed productivity growth rates for high-tech industries from mid-1960s to the mid-1980s and found that although the aggregate slowdown was common across the United States, Japan and Canada, high-tech industries either did not exhibit any slowdown or the slowdown was not as pronounced as in other industries.

¹⁸ High-tech industries are important sources of R&D spillovers. For the U.S, Bernstein & Nadiri (1988) estimated the social rate of return between two and ten times the private rate of return. High social rates of return imply that high-tech industries are an important source of productivity gains for producers linked to them in the production chain.

Predictions of the model for the BPO Industry

The genesis and the initial growth of the Indian BPO industry can be attributed to multinationals like American Express and General Electric, who established their subsidiary BPO outfits in 1990s. Captives have remained dominant in the Indian BPO industry since then. The revenue of captives has increased remarkably from \$710m in 2000-01 to \$ 4600m in 2005-06 whereas the growth of TPV during this period was not as phenomenal as the captives. See figure 2.

A captive unit has the ability to amass large amount of capital, make new investments, and attract better talent. Captives are usually large and in the BPO industry it matters a lot to attain a critical mass to exploit the economies of scale and make further investment for expansion. Only a large vendor with an innate ability to work in the domestic market may perhaps outperform a multinational captive. Captive units also have an advantage over TPV when it comes to attracting talent because they come with an established brand name and offer 20-25% higher pay package than a TPV. With higher wage, firms get higher worker stability and hence lower attrition rates¹⁹.

The Indian BPO industry also has captive centers of the international BPO players like Convergys, Accenture, and SITEL who have tremendous experience in handling back office operations of other firms. These firms have a chance of performing better than the domestic vendors because experience has helped them grow their size above a critical level, accumulate capital and other resources. Per contra, many Indian BPO service providers are still struggling to grow their manpower above one thousand employees and are in real trouble for lack of funds. Consider, for example, the captive center of Convergys Corp in India. In November 2001, Convergys, a \$1.3 billion firm with 45000 employees and 46 facilities worldwide, entered the Indian BPO industry. In just 18 months after its entry in India, Convergys employed 4,464 employees in its Indian operations, a growth rate of 40 employees per week. Global third-party BPO majors like these are a biggest threat to India's domestic outfits like Progeon, Wipro, and Datamatics etc. Even though some of the Indian BPO firms are on a high growth path and are operating in their home market, it is difficult to match the financial power of the international BPO players and the way they use it to drive down prices. Besides, Indian BPO firms do not offer any special advantage that the Indian operations of these global BPO players cannot offer.

It is important to mention here that some Indian BPO firms come with prior experience either in outsourcing IT services or other Indian businesses and hence may stand well to compete with these global BPO firms. For example, BPO offshoots of IT firms²⁰ like Infosys is thriving as Progeon, Wipro's BPO arm is called Wipro Spectramind and so on. Similarly, Hiranani Group launched Zenta, Kalyani Group also has a BPO arm called the Epicenter Technologies. Can prior

¹⁹ The employee attrition in captive firms is close to 35%, while for third-party players it is above 40%.

²⁰ For examples of Indian IT firms with BPO offshoots, see Appendix A.2.

experience be helpful in outdoing other outsourcing service provider firms? From the client's perspective, there is a close fit between IT and ITES or BPO service offerings and hence the reason for many IT firms to foray into this area. Existing customer relationships and client base offers the foremost advantage for IT firms to set up a BPO arm. Besides, IT outsourcing firms are familiar with the overseas market, have a better perception of the outsourcing business model and are known globally for delivering quality output. IT outsourcing firms have an understanding of the processes and practices of outsourcing businesses and vertical domain knowledge in the overseas markets which can be extremely useful in offering BPO services.

Section 3: Description of the Data

There are various sources of firm level data for the Indian BPO Industry – CMIE, CRIS INFAC, Dataquest India, Voice&data and NASSCOM. However, all of these sources, except NASSCOM (National Association for Software and Services Companies, the apex body for managing the IT and ITES sectors in India), provide information for at most 50 domestic third party firms. NASSCOM provides information on all its members in its annual directories. We choose to work with the 2002 directory because this is the only directory that provides comprehensive information exclusively for BPO firms for the year 2001-02. This directory includes ITES (IT enabled Services, a casual synonym for BPO) business of firms that are not exclusively BPO firms.

For preliminary data analysis, we use all sources of data along with data from Business world. For our econometric exercise we primarily use the 2002 NASSCOM directory. For our econometric study, we augment NASSCOM dataset variables on revenue, employment, key clients, number of markets, number of verticals, prior experience, year of establishment, quality certifications with venture capitalist funding and information security certifications. These two variables are obtained for most firms from their website, Dataquest or phone interviews. For some of the firms, the number of quality certifications, number of locations and the number of clients were missing. We complemented this data from CRISINFAC database, voice&data and phone interviews.

From the above sources, we are able to gather information on critical variables for 118 firms with ITES Business. To emphasize the importance of our study, we present the percent contribution to revenue and employment in the year 2001-02 by our sample of firms vis-à-vis the total number of third party vendors in India in table 4. Table 4 is indicative of the fact that the firms included in our study comprise of 61% of the total number of BPO firms in India and its contribution to employment and revenue is about 44% and 54% respectively.

Even though we have the revenue and manpower figures for different points in time, we are unable to construct a panel from these data sources as we are missing on key independent variables. For example, in NASSCOM publications quality certification of a firm is reported “as of” the year it is being published rather than the year when the certification was actually implemented. A time series of number of clients is also not available. Even if we had the series available across time, variables like the number of quality certifications or venture capitalist funding do not change significantly from one year to another and hence their effect on firm level performance cannot be seen within a span of three to four years. We are tightly constrained by data availability and manage to build a parsimonious econometric model with a single cross-section for the year 2001-02.

Section 4: The Indian BPO Industry: Preliminary Data Analysis

Measuring Productivity: Arora and Asundi (1999) believe that in a fairly competitive industry, firm performance must be reflected in its economic outcomes and hence they relate firm performance to its revenue and employee strength. Knowledge@Wharton (2005) research suggests that the performance of outsourcing majors in India is best indicated by their revenue per full-time employee (FTE). Higher revenue per FTE reflects higher billing rates which can be justified when processes are specifically tailored to the needs of the clients thereby reflecting greater customer centricity on the part of the service provider firm. A high degree of customization of a service locks in the customer for long and enhances growth prospects of the BPO firm. Athreye (2005), in her empirical study on productivity growth in the Indian Software outsourcing industry also uses revenue per employee for measuring productivity. In this paper, we would also use revenue per employee as a measure of firm level performance.

Outsourcing industry in India constitutes both the IT and BPO sectors. However, we do not to combine the IT outsourcing firms with BPO firms in our study for four reasons. One, in terms of export revenue, the IT outsourcing industry in India is about three times the size of its BPO/ITES counterpart (table 2). The distribution of revenue among firms is also similar in the two industries, that is, in 2001-02, top 30 firms in both industries contributed to about 60-70% of total revenue. Therefore, the combined data of equal number of firms in each sector would be biased. Two, IT Outsourcing in India started in 1980s while ITES is merely a decade old set-up reflecting the fact that the two industries are at different stages of maturity. Therefore the set of factors which affect the two industries are different. For example, worker attrition rate is a much bigger problem in the BPO sector vis-à-vis the IT sector. Three, the work content and skills required for IT and BPO jobs are

different along with the fact that IT is usually project based while BPO is process driven²¹. Four, academic research specifically focused on the BPO industry is rather neglected relative to IT outsourcing. For example, Dibbern et al. (2004) in their literature review highlight that ‘current outsourcing research appears to be heavily tied to IS’ and similarly, Rouse and Corbitt (2004) comment on the absence of academic publications on BPO.

Our preliminary data analysis suggests that the mix of services provided by a BPO firm impact their performance. The rationale for this result may be traced in the dispersion in per hour billing rates for various service lines as well as their future growth prospects. In table 3a we make a comparison of billing rates across the key verticals and in table 3b we give the revenue per employee by key verticals across years. Table 3b reveals that finance and payment services have higher potential in terms of improving productivity for a BPO firm as they bring in greater revenue per employee because of higher billing rates (table 3a). Figure 3 plots the percent revenue contribution in aggregate revenue by each vertical. Customer care industry is the top contributor to aggregate revenue across the three years. Since this vertical has invariably low billing rates as well as revenue per employee, therefore, a high contribution by this vertical is not a healthy sign for a BPO industry.

By applying the three models discussed in section 2, we believe that the performance of a BPO firm is influenced by factors which affect employee cost, the cost of buying new technology, organizational and management structure and quality certifications. We classify these factors into six categories – Source of Funding, operational cost variables, operational risk variables, signaling variables, organizational form and Experience related variables. The variables corresponding to each of these categories are enlisted in table 5 and Appendix A.3 defines each of these variables. Before calculating the correlation coefficient, we test for normality of the revenue per employee series and find that this series is non-normal in most cases; except in a few small sample size cases. In small samples, there is a bias to accept the normality hypothesis. Thus, we use non-parametric measures of correlation coefficient – Spearman’s R (and Kendall’s Tau if sample is small) for continuous variables and the Fischer’s exact test for categorical variables and test the significance of correlation coefficients for these variables with a BPO firm’s performance. Table 5 gives the results obtained.

Looking at the correlation coefficients and p-values for the significance test in table 5, we can infer that the operational cost variables as well as experience related factors have significant correlation with a BPO firm’s performance. VC funding, the number of clients, implementation of a special kind of quality certificate, namely, COPC is also expected to have a significantly positive influence on a supplier’s profitability. We compare the performance of a TPV vis-à-vis a captive and

²¹ One key challenge for offering BPO service is to plan for its business continuity of BPO as it is a continuous process. Moreover, the BPO market can be tapped primarily in English speaking regions which is unlike IT services that is not much

our intuition from the Antràs (2005) model is found to be correct. Fischer's exact test gives a p-value of 0.07 indicating that direct governance by the parent firm has a positive and significant influence on a supplier's performance. However, since we do not have more information on captives in India, we cannot accommodate this variable into our econometric model.

Section 5: Empirical Specification

The factors gleaned from the above preliminary data analysis provides the background and a perspective for a more formal analysis of firm level performance of a TPV. Aghion et al (1999) model suggests that a BPO firm's performance depends on VC funding and operational cost variables while the Arora and Asundi (1999) model justifies the role of signaling variables in the BPO firm performance. These theoretical models help us formulate an empirical model of firm performance in the following equation:

$$\pi = \alpha + \beta_1 VC + \beta_2 \text{Operational Cost Variables} + \beta_3 y + \beta_4 \text{Signaling Variables} + \beta_5 \text{Prior Experience} + \xi \quad (2a)$$

Where π is the measure of firm performance, given by revenue per employee, Operational cost variables, signaling variables, experience related factors are enlisted in table 5 and y is the number of clients. We do not have firm level information on operational cost for all firms in our sample to use this variable in our estimation. ξ , the error term corresponding to equation (2a) therefore includes this variable as well as other factors like mergers and acquisitions, the number and nature of alliances formed by a BPO firm with other firms (eg. Msource with Accenture) or the mix of verticals provided by the BPO firm. Aghion et al (1999) model suggests that we should expect $\beta_1 > 0$ if the level of competition is high in the industry, as is the case in the year 2001-02. Arora and Asundi (1999) model suggests that $\beta_3 > 0$ and $\beta_4 > 0$. We would expect $\beta_5 > 0$ because BPO firms with prior experience²², are familiar with the domestic labor market (and perhaps with the outsourcing business) and therefore can optimally choose its service, market, scale and talent.

In our model, it is likely that some variables may be endogenously determined with firm performance. Variables like the number of locations, the number of markets, information security or quality certifications are a firm's choice variables. These variables along with venture capitalist funding depend on a firm's performance in period $t-1$ rather than in the same period and therefore

dependent on the market language. Further, the BPO model throws up a whole new set of HR challenges which these IT firms planning to offer BPO services will need to address.

²² Per contra, we cannot use the number of years of experience as a control in (2a) because this variable affects firm productivity by attracting a larger number of clients, but not directly.

cannot be endogenous. On the other hand, the variable – the number of clients may be determined endogenously with the firm level performance because clients are attracted to vendors that have higher productivity. We hypothesize that the variable – the number of clients, is endogenous and is determined in the following equation:

$$y = \alpha + \gamma_2 \text{Operational Cost Variables} + \gamma_3 \pi + \gamma_4 \text{Signaling Variables} + \gamma_5 \text{Experience} + \varepsilon \quad (2b)$$

Where ε is error term corresponding to equation (2b). The error term may capture a supplier’s marketing or advertising strategy. Arora and Asundi (1999) theory suggests that $\gamma_4 > 0$. Further, we would expect firms with lower cost and more experience to attract more clients, implying that $\gamma_2 < 0$ and $\gamma_5 > 0$. We expect $\gamma_3 > 0$ because a more productive firm attracts larger number of clients. In our model, we test for the endogeneity of the variable – the number of clients, using the Durbin-Wu-Hausman procedure, and once confirmed we would re-estimate equation (2a) using the Instrumental variable (IV) technique.

Section 6: Econometric Results

We run OLS regression of firm performance, as measured by revenue per employee, on a set of independent variables given by equation (2a), excluding the variable on operational costs due to lack of data. We find that the number of quality certifications has a negative, though insignificant effect on firm performance (column 1 and 2 in table 6). This is unlike Arora and Asundi (1999) model where ISO quality certification is found to be crucial in raising a software outsourcing firm’s revenue and employment. Our result is line with Asundi (1999) who find that quality certification does not have a significant effect on the revenue per employee of software outsourcing firms in India. They believe that Indian software vendors have not been able to advance their effectiveness in providing services and reap the benefits of superior software quality practices. Our interpretation of the insignificance of quality certification coefficient is however different. Given our data, we should not expect a positive significant coefficient for quality certification for two reasons: One, the price of the service is fixed in a contract for at least a year and hence there can be no “quality effect” in our cross-section. Two, models discussed in section 2 are long run equilibrium models, that is, it takes time to prove a record of quality and signal potential clients²³. Therefore, for our cross-section of one year (2001-02) where the median age of firms is only two years we cannot expect to find “signaling

²³ As Arora and Asundi (1999) put it, “the actual quality of service may depend not only on whether the firm is certified but for how long it has been certified”.

effect". We ran regression for equation (2b), (table 8) that is, regressed the number of clients on quality certifications and found a positive but insignificant coefficient. Quality certifications may not significantly affect the number of clients in the short run because investment in quality is a sunk cost while it takes time to prove a record of high quality and hence attract new clients. However, in the short run high quality of work may get rewarded by the same client providing repeat business or larger and more complicated work which may not get reflected in the number of clients. The insignificance of the coefficient relating to quality in our model is therefore inconclusive. We need a more detailed study like Arora and Asundi (1999) or Asundi (1999) over a longer period of time to assess the impact of quality certifications on the BPO industry.

In our regression, columns (1) and (2) of table 6, we find that prior experience, the number of locations, the number of markets, venture capitalist funding and the number of clients are positive and significant in affecting firm level performance while the number of verticals is insignificant in affecting firm performance. The impact of implementing information security certification on firm performance is negative, which is counterintuitive to the result of Arora and Asundi (1999) model. This is probably because most firms in our sample is young (with median age 2 years and mean age 3.5 years) while it takes time to establish reputation as an information security certified firm in order to attract potential clients and influence firm performance.

To confirm the validity of our OLS regression result, we test for the presence of heteroskedasticity. We report the result from White's test in table 7. Looking at the p-values in table 7, we cannot reject the null hypothesis of homoskedasticity. We re-run the OLS with significant variables and report the results in table 6, columns (3) and (4). The significance of variables does not change in this restricted regression.

Economic intuition makes a case that the variable – the number of clients that a BPO firm attracts depends on its productivity, quality of service, experience factor and the degree of specialization. A vendor with a higher productivity (high revenue per employee) is expected to have larger number of clients for our given cross-section. Therefore, we are suspicious of a simultaneous equation system whereby the number of clients is determined endogenously with the firm performance.

To check whether firm performance affects the number of clients, we estimate equation (2b) and report the results in table 8 columns (1) and (2). We find that a BPO firm's performance significantly affects the number of clients while signaling variables like information security and quality certifications positively affect the number of clients a BPO firm can attract, even though they are insignificant. Further, a client is also attracted to firms with larger years of experience, while firms providing large number of verticals are perceived as broad based and firms requiring specialist treatment of their problem are not enticed to such BPO firms. The number of verticals and the

number of locations, however remain insignificant. To check for endogeneity of the number of clients using the Durbin-Wu-Hausman (DWH) test we obtain the residuals from this regression of our “suspicious” variable, that is, the number of clients on a set of instruments available. We call this residual series “Residual_DWH_S1”. In the second step of the DWH test, we regress firm performance on the set of independent variables from our first OLS (table 6, columns 1 and 2) regression along with the residual variable “Residual_DWH_S1” from client regression. We then test for the significance of this additional variable. The regression output for the second step of the DWH test is tabulated in columns (5) and (6) of table 6. We find that the variable Residual_DWH_S1 is significant which confirms the endogeneity of the number of clients. Therefore, we need to re-estimate our model using the IV procedure in order to get unbiased and consistent estimates.

One may question the efficiency of IV estimators in a small sample as they are consistent only asymptotically. Nelson & Startz (1990a and 1990b) found that the IV estimate will be concentrated around a value more biased than the plim of the OLS estimate and the ratio of the two biases falls as the correlation between the endogenous variable and the structural error rises (as the degree of endogeneity rises). Further, the true distribution is not well approximated by the asymptotic distribution because the true distribution is bimodal and the probability density is zero at a point between the modes. However, Woglom (2003) finds that the pessimistic conclusions of Nelson & Startz (1990a and 1990b) do not hold in a general model, especially if the correlation of the instrument with the endogenous variable is not weak (first stage R^2 is less than the inverse of number of observation). In particular, the IV estimates will never concentrate on a value more biased than OLS. In addition, the central tendency of the t-statistic of the bias in IV estimator is always smaller vis-à-vis the OLS estimator. Therefore, to minimize the bias in IV in small sample, we would need a strong instrument for our endogenous variable.

To find an instrument corresponding to the number of clients, our best candidate is the number of years of experience. The number of years of experience has a high correlation with the variable – the number of clients (0.74) and relatively lower correlation with the dependent variable, that is, the firm level performance (0.04). As pointed in footnote 22, these correlations make economic sense as well. The number of years of experience signals a client that the supplier has the know-how to deal with an outsourced process, the familiarity of doing similar work and therefore can handle it error free. This attracts greater number of clients to more experienced vendors. Since the number of years of experience does not affect firm performance directly, we observe a high correlation of our instrument with the number of clients rather than firm performance.

The regression output obtained from IV technique is tabulated in column (7) and (8) of table 6. These results clearly indicate that prior experience, the number of locations, the number of clients,

the number of markets and funding from venture capitalist have a positive impact on an Indian third party BPO firm's performance. On the other hand, investment on information security certifications negatively affects a BPO firm's performance, at least in the short run. Clients place increasing importance on data security measures undertaken by a vendor, particularly if the outsourced process requires the vendor to have access to the end consumer's bank account numbers, credit card numbers, pass codes or pin numbers. Implementing information security certification increases the sales cycle time as clients prefer to physically examine the vendor's site, check their references and conduct network checks in order to ensure that the necessary security measures are in place. Given the nature of the process that is outsourced, a BPO firm must comply with information security certifications required by the client. Even though this may trap a supplier's resources in the short-run, it helps in getting more work from existing clients as well as it entices more clients with similar processes in the long-run. As mentioned earlier, our model is incapable of capturing the dynamics of acquiring an information security certification because it is based on a cross-section for the year 2001-02.

It is useful to assess the strength of the relationship between the instruments and the potentially endogenous regressors. Staiger and Stock (1997), suggests that when the partial correlation between instruments and the endogenous variable is low, instrumental variables regression is biased in the direction of the OLS estimator. Staiger and Stock recommend that the F-statistics from the first-stage regression of IV estimation be reported in applied work. The F-statistic tests the hypothesis that the instruments should be excluded from the first-stage regressions (i.e., the relevance of the instruments). When the F-statistic is small, the thumb rule is less than 10, the instrumental variable estimates and the associated confidence interval are unreliable. The F-statistic from the first stage OLS of the IV methodology for our regression of the number of clients on the set of instruments is 63.9, which is much higher than 10. Further, when we compare the point estimates of the independent variables of our OLS results relative to the IV methodology, that is, table 6, column (1) and (2) with column (7) and (8) respectively, we find that the point estimates for most variables are revised downward as we graduate from OLS to the IV technique, which is what we expect of a good IV estimation. This indicates that the instrument used is not correlated with the stochastic error term. Therefore, our choice of instrument, the number of years of experience used for the number of clients, is not weak and the significance tests based on normal approximation are valid. Significance tests in the IV estimation results, column (8) of table 6, indicate that all variables (as in the standard OLS result, columns 1 and 2) remain significant.

Section 7: Conclusions

Our paper focuses on the factors that impact the performance of a BPO service provider in India. In the absence of theoretical and empirical models on BPO firms, we borrow relevant elements from the Aghion et al (1999) endogenous growth theory, Arora and Asundi (1999) model on IT outsourcing firms and Antràs (2005) internalization theory. These models together suggest that a supplier's performance depends on the operation costs variables like worker attrition, seat utilization, operational risk variables like the number of clients, the source of funding, the organizational form for offshoring and experience related factors. These models lay the foundation for our econometric framework. Using a data set on domestic third party firms from the Indian BPO industry for the year 2001-02, we build an econometric model to evaluate the factors which affect their performance.

We hypothesize and test if the variable – the number of clients of a BPO firm, is determined simultaneously with a BPO firm's performance. The Durbin-Wu-Hausman test for endogeneity is found to be positive and therefore we re-estimate our model using an Instrumental Variable or two stage least square procedure. Our empirical model indicates that prior experience, number of locations of a service provider, venture capitalist funding, the number of markets and the number of clients positively impact a domestic third party firm's performance, while information security certifications tend to dampen its performance levels.

We understand that with the limited data available in hand, our results are not completely representative of the firms in the BPO industry. However, given that there is no perspective available to the theory of a supplier firm in an outsourcing relationship even an imperfect beginning seems justified. Future research should focus on arranging for detailed firm surveys to highlight the trends in the BPO industry and extrapolate firm performance parameters, changes in human resource requirements, skill-upgrading and contractual problems from a supplier's viewpoint.

References

- Aghion, P; Dewatripont M and Rey, P., "Competition, Financial Discipline and Growth," *The Review of Economic Studies*, 66 (4), 1999, pp. 825-852.
- Amiti, M. and S. Wei, "Service Offshoring and Productivity: Evidence from the United States", *National Bureau of Economic Research*, Working Paper, No. 11926, 2006.
- Antràs, P., "Incomplete Contracts and the Product Cycle," *American Economic Review*, 2005, pp. 1077-1091

- Arora, A. and J. Asundi, "Quality Certification and the Economics of Contract Software Development: A Study of the Indian Software Industry", *National Bureau of Economic Research*, Working Paper No. w7260, 1999
- Asundi, J.M., "Quality Certification and Performance of Indian Software Service Companies", Submitted to the *Dept. of Engineering and Public Policy* as a PhD. qualifier paper, Jan 1999.
- Athreye, S. , "Evolution of productivity in outsourced services: Empirical evidence from the Indian software sector", Paper presented at the Druid Tenth Anniversary Summer Conference on "Dynamics Of Industry And Innovation: Organizations, Networks And Systems", Copenhagen, Denmark, June 27-29, 2005
- Bernstein J. I. and M. I. Nadiri. "Interindustry R&D Spillovers, Rates of Return, and Production in High-Tech Industries." *American Economic Review Papers and Proceedings*, 1988, pp. 429-34.
- CRIS INFAC, IT Enabled Services Annual Review, 2006
- Denny, M., J. Bernstein, M. Fuss, S. Nakamura and L. Waverman. "Productivity in Manufacturing Industries, Canada, Japan, and the United States, 1953-1986: Was the 'Productivity Slowdown' Reversed?" *Canadian Journal of Economics*, 25(3), 1992, pp. 584-603.
- Dibbern, J., Goles, T., Hirschheim, R. and Jayatilaka, B., "Information Systems Outsourcing: A survey and analysis of the literature", *The Data Base for Advances in Information Systems*, 2004 35(4): 6–102.
- Egger, H. and P. Egger, "International Outsourcing and the Productivity of Low-skilled Labour in the EU", *Economic Inquiry*, 2006, 44(1), pp. 98-108.
- Forbes, "Indian Employees Enjoying Swiftest Pay Hikes", 20th February, 2008a
http://www.forbes.com/2008/02/20/hewitt-india-salaries-markets-econ-cx_rd_0220markets01.html
- Forbes. "The Coming Death Of Indian Outsourcing", 29 Feb 2008b
www.forbes.com/2008/02/29/mitra-india-outsourcing-tech-enter-cx_sm_0229outsource.html
- Greene, W., "Growth in Services Outsourcing to India: Propellant or Drain on the U.S. Economy?", *United States International Trade Commission*, Working Paper # 15865, January 2006
- Grossman, S. and O. Hart, "The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration," *Journal of Political Economy*, 1986, 94(4), pp. 691-719
- Görg, H. and A. Hanley, "International Outsourcing and Productivity: Evidence from the Irish Electronics Industry", *North American Journal of Economics and Finance*, 2005, 16(2), 255-269.
- Hart, O. and Moore, J., "Property Rights and the Nature of the Firm," *Journal of Political Economy*, 1990, 98(6), pp. 1119-1158.
- Hay Group, "World Pay Report", September 2008

- Knowledge@Wharton, “How Some BPO Providers Seek To Build and Protect Their ‘Turf’”, January 14, 2005
- KPMG-NASSCOM Study 2004, “Choosing a location for offshore operations in India,” 17 Jun, 2004
- Nelson, C.R., and R. Startz (1990a): “The Distribution of the Instrumental Variable estimator and its t-Ratio When the Instrument Is a Poor One,” *Journal of Business*, 63, (Part 2) S125-S140.
- Nelson, C.R., and R. Startz (1990b): “Some Further Results on the Small Sample Properties of the Instrumental Variable Estimator,” *Econometrica*, 58, 967-976.
- NeoIT, “India: Comparison of Locations”, Vol 2 (11), November, 2004
- Rouse, A.C. and Corbitt, B. (2004). IT Supported Business Process Outsourcing (BPO): The good, the bad and the ugly, *Proceedings of Eighth Pacific Asia Conference on Information Systems* (Shanghai, China, July 2004) 8–11.
- Schumpeter, J. A. Capitalism, socialism and democracy. New York, New York: Harper and Brothers, 1942.
- Staiger, D. & Stock, J.H., “Instrumental Variables Regression with Weak Instruments,” *Econometrica*, 1997, 65(3), pp. 557-586.
- Woglom, G. “More Results on the Exact Small Sample Properties of the Instrumental Variable Estimator”, *Econometrica*, 2003, 69(5), pp. 1381-1389.
- Yeaple, S.R, “Firm Heterogeneity, International Trade, and Wages”, *Journal of International Economics*, 2005, 65 (1), pp. 1-20.

Figures and Tables

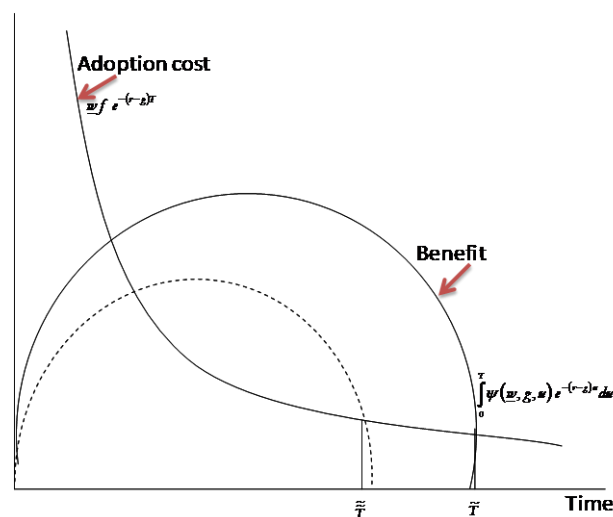


Figure 1: Impact of increase in Competition on a non-profit maximizing firm

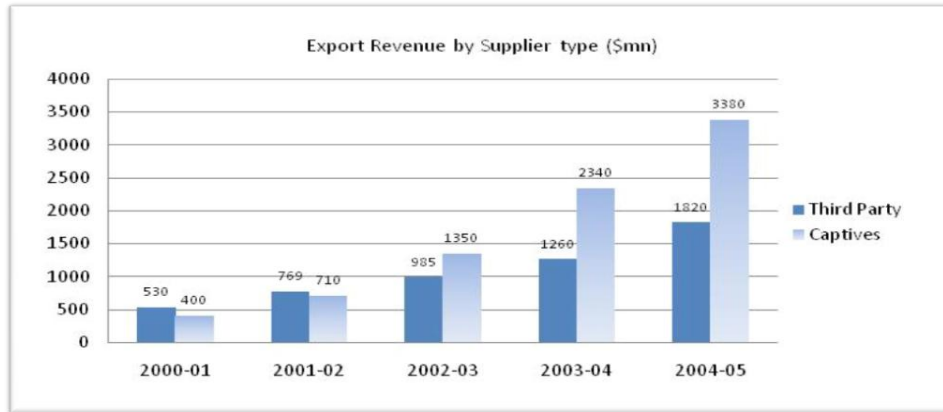


Figure 2: Contribution to Export by captives versus third party BPO Firms

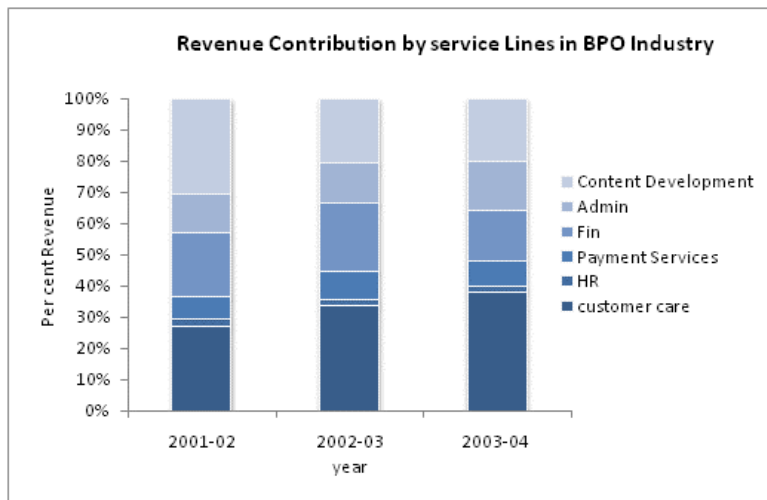


Figure 3: Per cent contribution to Revenue by key verticals

Source for figure 2 and 3: NASSCOM

	2001-02	2002-03	2003-04	2004-05	2005-06
Revenue (\$bn)	1.6	2.7	3.9	5.8	8.1
Export (\$bn)	1.6	2.5	3.6	5.2	7.3
Employment (000)	106	171	245	348	470

Table 1: Revenue, Export and Employment generated by the Indian BPO industry

Year	BPO (%)	IT Services (%)
1999-2000	14	86

2000-01	14.5	85.5
2001-02	19	81
2002-03	24	76
2003-04	23	77
2004-05	30	70

Table 2: Relative Revenue contribution by the IT and ITES sector

Vertical	Billing rate (\$/hr)
Customer Care	10-14
Finance, Administration and Payment Services	15-17
Human Resources	12-15
KPO based services	25-35

Table 3a: A comparison of billing rates across key verticals for FY 2003-04

<i>Revenue per employee in \$ 000</i>				
Service Line	2001-02	2002-03	2003-04	2004-05
Aggregate	15.09	15.79	15.92	16.67
Customer Care	13.33	12.50	12.50	13.11
Payment Services	15.71	19.17	20.48	21.7
Finance	20.00	21.18	20.37	22.1
Administration	13.21	12.50	13.50	14
Human Resources	20.00	21.43	16.67	16.50
Content Development	11.54	10.63	10.78	10.3

Table 3b: Revenue by key verticals of the Indian BPO industry

Source for tables 1, 2, 3a and 3b: NASSCOM

	(Revenue Rs mn)	Employment	Number of firms
Our sample	21797.51	37222	118
All Third party BPO firms	40470.00	84800	193
% contribution of the sample	53.8	43.8	61.1

Table 4: Per cent contribution to revenue and employment in the Indian BPO Industry in 2001-02

Source: NASSCOM

Variable	Year	RPE Data source	Var. Data Source	Obs	Corr Coeff	p-value
Funding Source						
VC funded*	2001-02	Various**	Various	118	FE	0.000
Operational Cost Variables						
Voice versus non-voice	2002-03	BW***, V&D****	BW, V&D	15	SR/KT	0.04/0.00
Attrition rate	2003-04	Dataquest	CRIS INFAC	19	SR/KT	0.03/0.01
Seat Utilization	2003-04	Dataquest	CRIS INFAC	23	SR/KT	0.13/0.15
Seat Utilization	2001-02	Various	Various	93	SR – 0.78	0.000
Employee satisfaction survey	2003-04	Dataquest	E-SAT 2004	11	SR/KT	0.03/0.01
Risk Concentration						
% Contribution by top client	2002-03	V&D	V&D	13	SR/KT	0.42/0.37
Number of clients	2001-02	Various	Various	118	SR – 0.291	0.001
Signaling Variables						
COPC implemented*	2003-04	Dataquest	V&D, CRIS INFAC	29	FE	0.09
Quality certifications	2003-04	Dataquest	V&D, CRIS INFAC	29	SR/KT	0.25/0.20
Quality certifications	2001-02	Various	Various	118	FE	0.009
Information security Certification*	2003-04	Dataquest	V&D, CRIS INFAC	29	FE	0.38
Information security Certification*	2001-02	Various	Various	118	FE	0.041
Number of locations	2001-02	Various	Various	118	SR – 0.420	0.00
Broad-based versus Niche firms*	2002-03	V&D	V&D	15	FE	0.57
Organizational Form						
Third Party versus Captives*	2003-04	Dataquest	Dataquest	19	FE	0.07
Domestic versus global TPV*	2003-04	Dataquest	Dataquest	17	FE	0.23
Experience Related Factors						
Prior Experience*	2001-02	Various	Various	118	FE	0.16
Years of experience	2001-02	Various	Various	118	SR -0.31	0.000
Number of markets	2001-02	Various	Various	118	SR -0.16	0.079
Number of Verticals	2001-02	Various	Various	118	SR -0.73	0.000

Table 5: Correlation coefficient of various factors with firm level performance

*These are dummy variables with value 1 for the first variable

**“Various” data source refers to all the sources we used in building our database for the econometric exercise.

***BW: Business World

****V&D: Voice and Data

RPE: Revenue per employee

SR: Spearman’s R

FE: Fisher’s exact test

KT: Kendall’s Tau

	OLS		OLS		DWH Step 2		IV	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variable	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
No. of Clients	0.014	0.000	0.014	0.000	0.021	0.000	0.009	0.042
Information Sec Cert.	-0.104	0.028	-0.099	0.030	-0.103	0.024	-0.105	0.028
No. of Locations	0.010	0.109	0.010	0.078	0.009	0.137	0.010	0.090
No. of Markets	0.032	0.000	0.034	0.000	0.027	0.000	0.036	0.000
Prior Experience	0.165	0.000	0.172	0.000	0.159	0.000	0.168	0.000
Venture Capital	0.370	0.000	0.373	0.000	0.349	0.000	0.384	0.000
No. of Quality Cert.	-0.007	0.855			-0.008	0.826	-0.006	0.872
No. of Verticals	0.006	0.419			0.004	0.576	0.008	0.329
Residuals_DWH_S1					-0.021	0.003		
R-squared	0.44		0.43		0.48		0.42	
Adjusted R-squared	0.39		0.40		0.44		0.39	

Table 6: OLS, Durbin-Wu-Hausman(DWH) and IV estimation of firm level performance

F-statistic	0.728	Probability	0.879
Obs*R-squared	41.60	Probability	0.795

Table 7: White Heteroskedasticity Test

	(1)	(2)
Variable	Coefficient	Prob.
Revenue Per Employee	5.942	0.000
Information Sec Cert.	0.602	0.451
No. of Locations	-0.110	0.282
No. of Markets	0.127	0.348
Prior Experience	0.661	0.391
Venture Capital	-0.018	0.986
Years of Experience	1.247	0.000
No. of Quality Cert.	0.203	0.735
No. of Verticals	-0.210	0.119
R-squared	0.66	
Adjusted R-squared	0.63	
Wald test (F-Statistics)	63.9	

Table 8: OLS estimation for number of clients – Durbin-Wu-Hausman test, step 1

Appendix

A.1: Description of key verticals in the Indian BPO Industry

Customer Care: Call centers, telesales and telemarketing, web sales, help desks, clerical support, data entry, word processing, mass emailing, contact centers, IT and technical support help desks electronic- customer relationship management (CRM), collections, market research, customer phone support warranty registration, catalogue sales, order fulfillment, up-selling and cross-selling and CRM.

Payment Services: Credit card and debit card services, check processing services, loan processing, electronic data interchange

Finance & Accounting: Accounting and accountancy services, billing and payment services, banking processing, sales ledger, general nominal ledger accounting, financial reporting, customer supplier processing, document management, legal services, transaction processing, equity research support, accounts receivable, accounts payable, cost accounting, payroll and commissions, stock market research, mortgage processing, credit charge and card processing and check processing.

Administration: Tax processing, claims processing, asset management, document management, legal and medical transcription and translation.

Human Resources: Personnel Administration, hiring and recruiting, training and education, records and benefits payment administration, payroll services, health benefits administration, pension fund administration, retention and labor relations.

Content Development: Engineering and design services, automation programming, digitization, animation, network management, biotech research, application development and maintenance, web and multimedia content development and e-commerce.

A.2: Examples of BPO firms which are offshoots of IT firms

IT Firm	BPO Outfit
TCS	Intelenet Global
Wipro	Wipro Spectramind
HCL Technologies	HCL BPO
Mphasis BFL	Msource
Hinduja TMT	Hinduja TMT
Polaris	Optimus
NIIT	NIIT Smartserve
Hughes Software Systems	Hughes BPO Services

A.3: Measuring variables of interest:

- *Firm level performance* – Revenue per employee
- *Voice versus non-voice processes* – Proportion of total revenue of a firm that is solely contributed by voice process
- *Attrition rate* – Percentage of current workforce that leaves within a year
- *Seat Utilization* – Number of times a particular office space can be used for 8 hour shifts during a day
- *Contribution by top client* – Percentage of revenue that comes from that one client who contributes the highest in the firm's revenue
- *Employee Satisfaction Score* – Reported from Dataquest. Calculation based on 11 parameters, like – employee size, Per cent of last salary hike, cost to company, company culture, etc. and it is weighted and indexed on a score of 100.
See http://www.dqindia.com/content/top_stories/2005/205111001.asp for details.
- *Information security certifications* – Number of certifications implemented for information security to comply with the mandate of the customer.
- *Quality certifications* – Number of certifications, like six sigma, ISO implemented for quality control

Besides the above continuous variables, we have the following dummy variables:

- *Captive versus third party* – If a production sharing arrangement occurs through a subsidiary in the host country rather than an unaffiliated party or outside contractor, then the set up is called captive, else a third party. In our case, we consider only those firms as captive centers that service their parent firms only. The third party provider is assigned a value 1 and a captive is assigned a value 0
- *Domestic versus international TPV* – A third party service provider whose headquarter is in a foreign country (in our case, any country besides India), is called an international TPV. The domestic third party vendor is assigned a value 1 while the international TPV is assigned a value 0
- *Prior experience of outsourcing in IT* – when the firm has prior experience, the variable assumes a value 1 else 0
- *VC funding* – If the firm is supported by venture capitalists in the year 2001-02, then, the variable takes a value 1, else 0
- *Niche versus broad-based firms* – if a firm is broad-based, then variable is assigned a value 1, else 0
- *COPC certification* – the variable is given a value 1 if the firm has implemented COPC as given in the CRIS-INFAC report and Voice&data
- *Number of Verticals* – The number of verticals a firm provides from the given list of verticals in Appendix A.1
- *Number of Markets* – The number of countries in which a BPO firm provides its services.