Outsourcing Information Technology to India:

Explaining Patterns of Foreign Direct Investment and Contracting

in the Software Industry

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Abstract

In the past decade, U.S. software firms have increasingly utilized the low-cost information technology (IT) labor force in India. Companies wishing to capture the benefits of outsourcing can engage in contracting (hiring an Indian contracting company to perform the service) or foreign direct investment (FDI, opening an Indian subsidiary and hiring Indian employees). Modern FDI theories predict that Indian software outsourcing should occur primarily in the form of FDI. Contrary to the FDI theories, however, many U.S. companies are hiring Indian software contracting companies in order to use the lower-cost Indian IT labor force. This paper analyzes Indian IT outsourcing firms in order to understand the prevalence of contracting. The paper then refines previous FDI theory by recognizing a Hybrid Model in which contracting companies provide their clients with a combination of the advantages of both FDI and contracting.
I. Introduction

Changes to the Indian economy in the 1980s and 1990s paved the way for U.S. companies to utilize lower-cost Indian labor, especially in the information technology (IT) sector. Over the past decades, U.S. software companies have increased their use of lower-cost Indian software developers. U.S. companies have not, however, organized their use of the Indian software developers in a way that is consistent with the foreign direct investment (FDI) theories of Williamson, Wells, and Huang. This paper provides background on the Indian economy and FDI theories and refines previous FDI theory to recognize how the U.S. companies are actually making use of the lower-cost Indian labor force.

Section 2 provides background on the reform of the Indian economy, the role of Indian software workers on the IT boom in the U.S. in the late 1990s and early 2000s, and a discussion of the current level of outsourcing to India in the software industry.

Section 3 discusses how prevailing FDI theories predict U.S. firms should make use of the lower-cost Indian IT labor.

Section 4 provides evidence that U.S. software companies are utilizing the lower-cost Indian labor in a manner that is different from that predicted by prevalent FDI theories and expands on those theories in an attempt to explain actual investment patterns.

Section 5 proposes a follow-on study to investigate the patterns of U.S. software outsourcing.
II. Background

A. The Indian Economy

The Indian economy in the latter half of the twentieth century, prior to economic reforms in the 1980s and 1990s, was controlled through a bureaucratic system often called the “License Raj.” The system employed centralized government decision-making bodies to control which companies entered particular market sectors. The Indian government instituted the system because it believed that centralized government control of the market would protect the Indian economy from domination by foreign actors. The system regulated domestic and foreign entry into sectors of industry, controlled diversification of companies, and controlled the allocation of resources and government investments. As a result, once a company was licensed to operate in a certain sector, it was relatively free from market competition. This system led to corruption and stifled the Indian economy, which grew at a rate of under four percent per year during that time.

In the 1980s, the government of Rajiv Gandhi made minor reforms to “encourage capital-goods imports, relax industrial regulations, and rationalize the tax system.” In 1991, the Indian government engaged in more drastic economic reform. The reforms included reducing the number of industry sectors covered by government licensing.
schemes, simplifying the procedural rules and regulations governing industry, opening previously public-only market sectors to private actors, reducing funding for selected public sector undertakings, and liberalizing foreign direct investment, trade, and exchange rate policies.  

During the 1980s, under the partially relaxed government controls, the Indian economy grew at a rate of just under six percent per year. Since the 1991 reforms, the annual growth in Indian gross domestic product (GDP) has continued at six percent. Even though the early reforms were modest, Rodrick and DeLong see these early reforms as the starting point for India’s long-term economic growth, providing not only legal reforms, but also initiating a change in attitude towards relaxed government regulation. Panagariya, on the other hand, believes that expanded borrowing in the 1980s produced India’s initial economic boom and that this boom would have been unsustainable without the more substantive reforms in the 1990s. Regardless of the exact reasons, however, thirty-five years of sustained growth provides persuasive empirical evidence that the reforms adopted in India, be they attitudinal or regulatory, have enabled change in its economy. This economic change has opened the door for both domestic production and investment by foreign actors.

The reforms also included increased protection of intellectual property (IP).

Whereas intellectual property laws are considered to be stronger in India than in China
and other developing countries, they are not typically considered as strong as IP laws in the U.S.\textsuperscript{15} Both patent and copyright laws are important in the software industry.\textsuperscript{16} Starting in 1994, Indian copyright law provided copyright protection for computer programs.\textsuperscript{17} From 2002 to 2005, however, computer programs were \textit{per se} excluded from patent protection.\textsuperscript{18} As of January 1, 2005, those restrictions were relaxed in order to comply with the World Trade Organization Agreement on Trade-Related Aspects of Intellectual Property Rights. Specifically, India now excludes only “a computer programme per se other than its technical application to industry or a combination with hardware.”\textsuperscript{19} Whereas this is not as broad as software patent protection in the U.S., which does not provide additional patentability restrictions on software,\textsuperscript{20} the 2005 changes provide increased patent protection for software. However, as noted by Professor Agarwal of the Indian Institute of Management, like the U.S. before it, India may need years to develop the expertise in its patent office and its courts before the public can reliably predict what is and is not patentable with respect to software.\textsuperscript{21}

\textsuperscript{16} Patents protect software algorithms from being duplicated in competing products. Copyright laws protect against direct copying of software code.
\textsuperscript{17} India’s Copyright Act of 1957 (No. 14 of 1957), as amended by the Copyright (Amendment) Act of 1994 (No. 49 of 1994).
\textsuperscript{18} India’s Patent (Amended) Act of 2002 (No. 38 of 2002).
\textsuperscript{19} India’s Patents Bill (No. 32-C of 2005).
\textsuperscript{20} State St. Bank & Trust Co. v. Signature Fin. Group, 149 F.3d 1368, 1375 (Fed. Cir. 1998) (holding that software programs are not excludable from patent protection \textit{per se}). See also Diamond v. Diehr, 450 U.S. 175, 187 (1981).
B. Indian IT Workers

During the IT boom that started in the mid-1990s in the U.S. and around the world, thousands of talented Indians immigrated to the U.S. to take up positions in the software industry. For example, in 2002, of the 74,000 immigrants to the U.S. obtaining H-1B visas to work in the software and computer-related industries, over 47,000 (63%) were from India – more than four times as many software and computer-related workers as from China and Europe combined.\(^\text{22}\) The percentages were similar in 2000 and 2001: in 2000, 68%, and in 2001, 71% of H-1B computer-specialist immigrants were from India.\(^\text{23}\) In addition to the newly arrived temporary workers, there are a number of U.S.-trained and U.S.-born software workers of Indian descent. The National Science Foundation found in a recent survey that approximately one of four mathematicians and computer scientists are foreign born.\(^\text{24}\) Whereas that survey did not specify in what country the computer scientists were born, related data for H-1B visas suggest that a significant percentage may have been born in India.

This strong presence of people of Indian descent, and particularly people who were born and trained in India, may have provided the foundation for the recent increase of software outsourcing to India. Some of the Indian software workers have started or joined

\(^{22}\) H-1B visas allow non-U.S. citizens to enter the United States to work in their field of specialization for 3-6 years. In 2002, the 47,000 software and computer-related workers from India represent 73% of the total specialized H-1B immigrants from India in all specializations. Other specializations of note were “architecture, engineering, and surveying” at 9% and “medicine and health” at 4%. 2002 U.S. DEPT. OF HOMELAND SEC., YEARBOOK OF IMMIGRATION STATISTICS, 152 (2003), available at http://uscis.gov/graphics/shared/statistics/yearbook/2002/2002Yearbook.pdf.


their own software outsourcing companies. These workers in particular provide networks of previous colleagues and clients to their outsourcing companies. One of the interviewees whose experience is related in this paper is such an Indian-born entrepreneur. Whereas there is no empirical data on the subject, it is possible that the high level of productivity and excellent work produced by teams that have included workers that were born and trained in India may have increased confidence in the Indian software contracting industry. At the very least, it can be said that some companies will consider this when making their choice among software outsourcing providers.

C. Outsourcing to India

Companies are outsourcing software and computer-related work to India. A recent survey from ITtoolbox found that approximately 30% of information technology companies outsource overseas and that, of those, 74% outsource to India.25 The ITtoolbox survey also found that companies more often outsourced “technical jobs,” such as software development, maintenance, and support, than the less technical jobs, such as help-desk support, training, and education.26 The type of work outsourced is important to note since the technical jobs are often considered the core of an IT company’s business, and may lead to increased risk of theft or loss of IP for the U.S. firm (discussed at length below). The value of work outsourced to India is significant. The total amount of work

26 Id.
outsourced in the software industry was estimated at twelve billion dollars in 2004 and is expected to grow 19% in 2005.27

III. Foreign Direct Investment Theories

Williamson, Wells, and Huang laid the theoretical foundation for determining how firms should choose to capture the benefits of lower-cost foreign labor. These theorists consider two alternative business structures, the Contracting Model and the Foreign Direct Investment Model (FDI Model). In the Contracting Model, a U.S. software firm28 hires an Indian software contracting firm to perform work on a per-contract basis. In doing so, the U.S. firm agrees to pay the Indian firm for work performed and the Indian firm provides software or related services to the U.S. firm. In the FDI Model, the U.S. firm opens a subsidiary in India and hires Indian IT workers to develop software and provide related services. In both models, the U.S. firm is able to reduce its overall software development costs by utilizing the lower-cost Indian workers.

In a market without transaction costs or risk, companies will use the Contracting Model in order to best take advantage of the lower cost of employing Indian software professionals. In such a market, competitive bidding would allow U.S. firms to capture the lower cost of software professionals without substantial overhead from the Indian contracting firm.

28 We will be assuming a U.S. software firm throughout. However, most of what is said here can be generalized to non-U.S. firms that are utilizing Indian outsourcing for cost savings. In addition, the theories described are applicable to non-Indian contracting firms that are able to provide services below the market rate for U.S. software development.
A. Williamson and Huang

Williamson identifies two combinations of environmental and human factors that will render the Contracting Model untenable and result in a firm internalizing functionality using the FDI Model.\textsuperscript{29} The first combination occurs when the human factor of \textit{opportunism} is combined with the environmental factor of \textit{small numbers}.\textsuperscript{30} This combination is important to consider in some contexts. However, except in situations where an Indian software contracting firm holds a monopoly on expertise needed for a software project, this combination of factors is unlikely to occur in software outsourcing. So far, there has not been a shortage of Indian contracting firms willing to do business with U.S. companies. If, for example, a few Indian firms began to dominate a particular market sector, then the few remaining firms may engage in opportunism and escalate prices. Assuming that Indian labor remained cheaper than comparable U.S. labor, then U.S. firms would internalize the lower-cost Indian labor through FDI and thereby bypass the opportunistic Indian contracting firms. This, however, is not currently the case.

The second combination of environmental and human factors that Williamson identifies is more germane to the current situation in India: a U.S. firm may have incentive to open an Indian subsidiary under the FDI Model when \textit{environmental uncertainty} is combined with \textit{bounded rationality}, a human factor.\textsuperscript{31} Simon states that bounded rationality occurs when the human mind’s capacity “for formulating and solving complex problems is [overwhelmed by] the size of the problems whose solution is required for

\textsuperscript{29} OLIVER WILLIAMSON, MARKETS AND HIERARCHIES: ANALYSIS AND ANTITRUST IMPLICATIONS 9 (1975).
\textsuperscript{30} Id. at 9-10.
\textsuperscript{31} Id.
objectively rational behavior” (emphasis removed). In the case of cross-border projects discussed herein, the environmental uncertainty may include exchange-rate risk, expropriation risk, and legal risk, as well as economic and market uncertainty.

**Exchange-Rate Risk**

The exchange-rate risk is similar for both the FDI Model and the Contracting Model. If, under the Contracting Model, a contract is negotiated in Indian rupees, the U.S. firm will take on the risk of the rupee-to-U.S. dollar exchange-rate fluctuation. This risk could be substantial, especially for longer contracts, considering that the Indian rupee has nearly tripled in value relative to the U.S. dollar over the last 15 years. If the contract is negotiated in U.S. dollars, then the Indian contracting company may build a premium into the contract to account for potential exchange-rate fluctuations. Under the FDI Model, if a U.S. firm opens an Indian subsidiary, then the U.S. firm takes on the exchange-rate risk of paying employees, taxes, property costs, and incidentals in rupees. If a U.S. firm can negotiate a contract in U.S. dollars, it may prefer the Contracting Model to the FDI Model in order to pay an up-front premium to minimize exchange-rate risk. However, given that the premium charged by the Indian contracting firm should be at least as high as the expected exchange-rate risk, the U.S. firm may be better off, on average, negotiating the contract in rupees or adopting the FDI Model. Consequently, the similarity in effect to both contracting and FDI makes exchange-rate risk a less important consideration when deciding between the two models.

32 HERBERT A. SIMON, MODELS OF MAN 198 (1957).
Expropriation Risk

India is attempting to reassure potential investors that investment in India is safe. To this end, in an address to a joint session of the U.S. Congress in July of 2005, Indian Prime Minister Manmohan Singh showcased India as a safe destination for foreign investment and strongly encouraged increased U.S. investment.\(^{34}\) However, the ongoing battle between the Indian government and Bechtel and General Electric in the Dabhol power project attests to the potential for expropriation risk in India.\(^{35}\) Vernon and Moran note that, before investment monies have been spent on infrastructure, foreign investors have considerable leverage over the sovereign government. Once project funds have been spent on infrastructure that is fixed in the foreign country, the leverage shifts, and one can expect an increased risk of expropriation.\(^{36}\) In the Dabhol power project, where over one billion U.S. dollars in infrastructure were fixed in India, Vernon and Moran would argue that expropriation was made possible, and was in some ways incentivized, once the physical infrastructure was in place.

The obsolescing bargain noted by Vernon and Moran is less likely to affect FDI in the software industry. The software industry is human capital-intensive. That is, the ratio of the cost of buildings and equipment relative to the cost of staff is much lower in the software industry than in the energy or manufacturing industries. In the software industry, there are rarely, if ever, large infrastructure costs. The government would have little

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\(^{34}\) [INDIAN P.M. STRESSES COMMON INTERESTS IN US ADDRESS - TEXT OF SPEECH](http://www.bbc.co.uk/mg/), BBC Monitoring International Reports, July 19, 2005.

\(^{35}\) In the Dabhol Power Project case, even though an independent tribunal ruled in favor of Bechtel and GE as to the expropriation in September of 2003, there has been a continued struggle for Bechtel and GE to regain their investment. Bechtel and GE are, however, expected to receive a settlement from the Indian Government in the coming weeks. See id.

incentive to expropriate a software subsidiary in order to obtain computers, desks, chairs, and an office building or a lease to an office building. Therefore, unlike the energy and manufacturing industries, in the software industries the FDI Model poses little risk of expropriation. As a result, expropriation risk is unlikely to affect a U.S. firm’s choice between the FDI Model and the Contracting Model in the software industry.

**Market and Economic Risk**

There is market and economic uncertainty associated with the software industry. Market uncertainty may provide U.S. software companies incentive to adopt the FDI Model. Consider the situation where a U.S. firm hires an Indian software development team (either through FDI or contracting) to expand into an area in which it predicts growth – for example, enterprise software. The software will take one year to build and test. If, while the firm is still developing the software, Microsoft deploys substantially identical enterprise software which it will sell for one half of the price that the U.S. firm is expecting to sell its product, then the U.S. firm may terminate its enterprise software project. If the firm adopted the FDI Model, it may be able to terminate the project and recoup the sunk human capital costs by altering the project. If the altered project is sufficiently similar, some of the software code may be reusable. Even if the altered project were not similar, the expertise developed by the team working on the project would be useful on other projects.

If the U.S. firm adopted the Contracting Model, it could break contract and completely terminate the project. The U.S. firm is likely to be responsible for payments reflecting the percentage of work already completed and a portion of the uncompleted work. Theoretically, the U.S. firm could renegotiate with the Indian contracting company
in order to gain some of these post-termination advantages seen for the FDI Model (software code reuse and access to expertise), but the U.S. firm will be in a poor bargaining position. The Indian contracting company will have monopoly rights on the expertise created by the programmers during the first project and will be able to negotiate a higher price (relative to its costs) for this retained expertise. Roetzheim notes that a new software team will take up to 80% more time on a follow-on software project than would the original team.\textsuperscript{37} In a world of perfect information, the Indian contracting company may be able to negotiate up to the value that the expertise would provide to the U.S. firm. Even in a world of imperfect information, the Indian contracting firm will be able to negotiate some of the value of the expertise created by the first project and thereby force the U.S. firm to pay again for the expertise it originally paid the Indian contracting company to develop. Given the better potential to recoup losses (in terms of expertise and code reuse), market uncertainty may lead U.S. firms to favor the FDI Model.

**Legal Uncertainty**

The area of strongest environmental uncertainty in Williamson’s framework for the software industry is the legal uncertainty. An area of particular legal uncertainty in India is the protection of intellectual property. The uncertainty surrounding IP in India should lead U.S. firms to adopt the FDI Model over the Contracting Model. In order for an Indian contract firm or a foreign subsidiary to function, IP and expertise must be transferred to the Indian development team. The expertise and IP will come in many forms. In some software projects, knowledge of how internal software modules operate

may be transferred to the Indian team. In more complex software projects, such as
revamping software systems, the entire code or portions of the code will be transferred to
the Indian team. With that code, and time working on it, the Indian team will gain
knowledge of the algorithms and the particular implementation. All of these things are
intellectual property in the broad sense. Some will be trade secret; some will be patented
or patentable; and the code will be protectable under copyright law. Some of this
intellectual property will constitute part of the U.S. firm’s significant competitive
advantage. When a U.S. firm engages in the Contracting Model, the IP and expertise that
are transferred to the Indian contracting firm are protected by the contract agreement and
the intellectual property laws in India. The Indian intellectual property law and contract
law provide some protection, but there is still uncertainty with respect to those protections,
as discussed above. In addition, some of the expertise that is transferred, such as the
ability to use the U.S. firms’ internal software system modules, is not protectable under
contract or intellectual property law.

Huang predicts that if expertise is transferred, then companies will be more likely
to choose the FDI Model.38 Under the FDI Model, the U.S. firm gains additional
protection of its IP, beyond the protection offered by IP law, through employment law and
workforce coherence. The U.S. firm may require its employees to enter into non-
disclosure agreements and other legal agreements, thereby increasing the number of legal
devices it has at its disposal if the firm’s IP is leaked. The Contracting Model does not
provide this additional layer of cognizable legal protection to the U.S. firm.

38 YASHENG HUANG, SELLING CHINA: FOREIGN DIRECT INVESTMENT DURING THE REFORM ERA 51-52
(2003).
Workforce coherence, which is easier to control under the FDI Model, will cause U.S. software firms to favor the FDI Model over the Contracting Model. Workforce coherence is easier to maintain under the FDI Model because the U.S. firms have direct control over the hiring and firing of India-based employees. Under the Contracting Model, workforce coherence is only maintained if the U.S. firm uses the same Indian contracting company for follow-on projects and the Indian contracting company retains its employees and places the same employees on the U.S. firm’s follow-on projects. Furthermore, a U.S. firm has limited influence over which employees the Indian contracting company retains and is less likely to know which employees of the Indian contracting company are important to retain.

Workforce coherence is important for a number of reasons. First, increased workforce coherence means that employees are less likely to leak expertise or other IP. Expertise and other unprotectable IP may not be valuable enough or recognizable enough for a third party to try to elicit. If the employee leaves, however, a future employer is much more likely to recognize and have access to the expertise or other unprotectable IP held by the former employee. Therefore, if the employee does not leave the company, it is much less likely that any competing firm or other third party will be able to obtain the expertise or obtain advantage from it.

A second reason that workforce coherence is important is that retained expertise can provide cost savings to the U.S. firm. Consider, for example, a U.S. firm that has experience in designing and building applications for cellular telephones, which is different from designing applications for computers, but does not have in-house development capacity to make a new solitaire card game for the telephones. If the U.S.
firm wishes to hire an Indian software contracting company build the solitaire game, then it would improve the return on investment for the contract if it trained the Indian team to develop software for telephones. This training is a transfer of expertise that is not protectable, or at least is unlikely to be protectable, under patent, trade secret, or copyright law (though it may be protectable under contract law through non-compete agreements).

Under the Contracting Model, the only way that the U.S. firm can continue to gain from this initial investment in training the Indian team is to continue to use the same Indian software contracting company for future telephone software projects. This, however, may bring about the first situation in which Williamson predicts contracting becomes less desirable – the combination of the environmental factor of reduced numbers with the human factor of opportunism. The Indian software contracting firm will be in a position to negotiate a higher price for the contracting work. Similar to the discussion above with respect to market uncertainty, the Indian software contracting company will be able to negotiate a price up to the amount it would cost another Indian software contracting company to perform the task. Furthermore, the Indian software contracting company will be able to estimate with certainty what the cost would be for another contracting company to complete the task by determining how much it would cost for a different, non-expert team inside their company to perform the task. Since the Indian software contracting company is able to capture part of the savings inherent in the repeat-player expertise it gains, and the U.S. firm loses, some of this cost savings under the Contracting Model. Under the FDI Model, on the other hand, the expertise is internalized and the U.S. firm will be able to capture the expertise-related gains in follow-on projects.
A third, related reason that workforce coherence, as well as an employer-employee relationship, is important is that the U.S. firm retains the ability to negotiate with particularly valuable employees. Consider the example where a U.S. firm is developing software for a telephone. If there is only one India-based employee who can consistently and efficiently program the graphical display on the telephone, then that employee is particularly valuable. Under the FDI Model, if that employee attempted to leave, the U.S. firm could attempt to retain her by increasing her compensation up to the cost savings she provides on projects. An Indian software contracting firm operating under the Contracting Model, on the other hand, would have less incentive to retain her. Given the plenary nature of the software contracting industry, the Indian contracting firm is likely to be utilizing her specialized skills less and her general software skills more than would the more specialized U.S. firm under the FDI Model – causing a relative under-valuation of these specialized skills. Therefore, the Indian contracting firm will not have as much surplus with which to negotiate for her higher salary as would the U.S. firm under the FDI Model and, therefore, will be more likely to let her go.\footnote{This assumes that the Indian software contracting firm is likely to have fewer telephone software development projects than the U.S. firm. If the Indian software contracting firm were more specialized and had more telephone software jobs, then it would have more incentive and available surplus to pay the specialized worker. This, however, is not generally the case. Software contracting firms tend to perform a broader range of work than in-house software development teams.}

Trade secret law is also available to the U.S. firm for protection of IP or expertise that is transferred to an Indian team using either the Contracting Model or the FDI Model. Trade secret law, often through the use of non-disclosure agreements or other contracts, can protect the U.S. firm from theft of the trade secret by either employees or contractors, and therefore is applicable to both the Contracting Model and the FDI Model. However,
the FDI Model provides a further form of trade secret protection through increased workforce coherence. Since most of the cases in which trade secrets are stolen are brought against former employees or contractors, the FDI Model should expose the U.S. firm to at most as much, and most likely much less, opportunity for theft of trade secrets. Furthermore, as noted above, employees with valuable knowledge are more likely to be retained under the FDI Model than the Contracting Model.

In addition to the transfer of expertise and IP from a U.S. firm to the Indian team working on its projects and its implications for the choice of utilizing the FDI Model or the Contracting Model, one must also consider that, in the software industry, much expertise and IP is created by the Indian team. The U.S. firm will have at least as much incentive to utilize the FDI Model when expertise and IP are created by the Indian team as when the expertise and IP are transferred to the Indian team.

The U.S. firm may have additional incentive to utilize the FDI Model over the Contracting Model when expertise and IP are created by the Indian team. Consider an example similar to the one above: a U.S. firm wants to develop a solitaire game for a cellular phone and has never done so before. If the U.S. firm adopts the Contracting Model and hires an Indian software contracting firm to develop the game, then the U.S. firm will obtain the game at a lower cost than it would if it hired U.S.-based developers to produce the game. The U.S. firm will be able to negotiate beforehand in order to obtain any patent rights. Given that the Indian contracting company will be in a position of default ownership with respect to any protectable IP developed, it may seek additional rents with respect to the IP developed during the job. However, given the desire to obtain

the contract with the U.S. firm and the uncertainty with respect to the protectability of and value of any IP developed, the Indian contracting firm may forego negotiating the rents with respect to developed IP.

Even if the Indian contracting firm does not attempt to seek undue rents for IP that it develops under the Contracting Model, the U.S. firm will be in a poor negotiating position when non-patentable expertise is created by the Indian team – such as the ability to efficiently program graphics for the telephone, as highlighted in the example above. In order to benefit from the expertise created by the Indian team, the U.S. firm will be exposed to Williamson’s reduced numbers dilemma. The Indian software contracting company will be able to negotiate follow-on contracts at a higher price relative to its costs, which will have been reduced due to the expertise gained during the first contract with the U.S. firm. Furthermore, the U.S. firm will be at a further disadvantage, since it will have difficulty identifying the expertise developed. In the telephone software example, where programming graphics is particularly difficult, the Indian firm may not even know to tell the U.S. firm that expertise was developed in telephone graphics programming and, without first-hand knowledge, the U.S. firm will not know to look for such hidden expertise creation. If the U.S. firm is unaware of the value of the expertise created by the Indian team, then the firm will not be in a position to negotiate for any of the cost savings created by the expertise before the contract is signed, after the product is delivered, or upon negotiation of follow-on contracts.

On the other hand, if the U.S. firm follows the FDI Model, it will be able to better protect and benefit from the expertise and IP created by the Indian team in the same way that transferred-in expertise and IP were protected. Through increased workforce
retention, a U.S. firm utilizing the FDI Model is more likely to benefit from the IP and expertise that are created by the Indian team, even if the expertise is not identified. Furthermore, given the potentially closer relationship between the Indian team and the U.S. firm under the FDI Model, the U.S. firm is more likely to discover the IP or expertise created by the Indian team and again be in a better position to retain particularly valuable employees for the same reasons as described above with respect to transferred expertise.

Even though expropriation and exchange-rate risks do not weigh in favor of either the Contracting Model or the FDI Model, the market and legal uncertainty factors, combined with the bounded rationality inherent in such complex problems, weigh in favor of U.S. firms choosing the FDI Model. Therefore, the theories put forth by Williamson and Huang predict that most U.S. software firms would utilize the FDI Model over the Contracting Model.

B. Wells

Wells theorizes that a U.S. firm will only follow the FDI Model in India if the U.S. firm has an advantage over Indian companies that provide competitive products and if it has a reason to internalize that advantage using the FDI Model as opposed to the Contracting Model. Similar to the case study described by Wells, the U.S. software firms have a market advantage over potential Indian competitors, which may want to utilize the same low-cost Indian IT labor to produce products. U.S. firms have greater access to the more lucrative Western customer markets. Whereas India’s domestic software market is growing, it is still just a fraction of the size of the U.S. and European

42 Id.
software markets. Access to and understanding of the software markets are important for the success of a software firm. Without an understanding of the needs of the lucrative U.S. software market, a U.S. (or Indian) software development firm would simply not be able to produce viable software products.

The understanding of the U.S. software market comes from a variety of sources. These sources include potential customers, who describe needs during customer meetings; investors, who are often looking to fulfill particular needs for other companies in which they invest; strategic partners, who are often looking to fill needs in their organization; and employees who have come from other companies and may have an understanding of the needs of their previous employers and those employers’ customers. In all, the network of customers, employees, and employers provides knowledge of software needs in a way that is difficult to replicate.

The market advantage provides U.S. firms with the ability to produce valuable software innovations. U.S. firms are able to determine what is needed in the market and design and develop software products to meet those needs. The process of creating the innovative products will lead to market risk, creation of IP and expertise, and transfer of IP and expertise among software development teams for the reasons discussed above. Consider the example of a U.S. software firm that has developed numerous software applications for telephones. If the U.S. firm finds a customer need for a telephone solitaire card game (the firm’s market advantage) and decides to utilize an Indian software

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team for its development, then the U.S. software firm will transfer expertise or IP to the Indian team (whether the U.S. firm adopts the FDI Model or the Contracting Model). On the other hand, if the U.S. software firm had never before developed software for a telephone, then the U.S. firm’s India-based software team will create the needed expertise. Regardless of whether the expertise and IP are transferred to or created by the Indian team, the U.S. firm should internalize the market advantage using the FDI Model rather than the Contracting Model for the reasons discussed above. Therefore, since the U.S. firm has a market advantage over potential Indian software companies that may want to produce competitive software products, and the U.S. firm has reasons to internalize that advantage through FDI, Wells’ theories predict that U.S. software firms should choose FDI over contracting.

IV. Investment patterns in India

A. Investments are not Following the Patterns Predicted by the FDI Literature

Some firms are engaging in FDI as predicted by Williamson, Wells, and Huang. For example, Agile, an enterprise software company; SAP, a collaborative business solution company; and Intel, a leading computer chip manufacturer, have all opened IT development centers in India. However, many firms are hiring Indian contracting companies in order to capitalize on the cost savings and expertise of Indian IT workers. Whereas it is difficult to precisely determine what percentage of companies utilize Indian

46 Approximately 30% of the IT companies surveyed in the 2004 ITtoolbox survey outsource to foreign contract agencies (with 74% of those being outsourced to India). Supra note 24.
software contracting firms as opposed to engaging in FDI, the empirical evidence suggests that companies utilize contracting notwithstanding the predicted relative benefits of FDI.

As described by DiMaggio and Powell in their work on New Institutionalism, a few U.S. firms may have adopted contracting (over FDI) for rational, efficient reasons, and that other U.S. firms may have followed their lead, even if the choice was not efficient for the follow-on firms. This could lead to what appears to be an inefficient adoption of the Contracting Model. Perhaps, however, as noted in Powell’s critical analysis of his previous work, apparently sub-optimal practices may arise from a complex arrangement of internal and external forces as well as from differences among industries.

In order to better understand why U.S. software firms are choosing contracting over FDI, I interviewed two people who have much experience with U.S. firms that choose contracting: vice presidents (VPs) at two Indian software contracting firms. The following section draws freely, without citation, from the information obtained in the two interviews.

B.D. Goel is VP of Solutions at Aztec Software and is responsible for Aztec’s creation of client software solutions and for Aztec’s IP and technology service capabilities. Aztec is an Indian software contracting firm with offices in Silicon Valley and London and a development center in Bangalore, India. Over 90% of Aztec’s 1500 employees work in the Bangalore software development center. Aztec provides clients with software systems on any scale: from small projects, such as building software

installation programs, to large projects, such as developing customer support management (CSM) software suites.

Dr. Shafy Eltoukhy is VP of Manufacturing Operations at Open Silicon. Open Silicon is an Indian software contracting firm with offices in Silicon Valley and Bangalore. Both offices house software development teams. The Silicon Valley office also acts as the primary sales and marketing office. Open Silicon provides computer chip design services. Even though Open Silicon is not a traditional software company, its interaction with its customers is software-based and its contracting business shares many similarities with traditional software contracting firms. Open Silicon’s clients provide the company with software code that describes the desired functionality of the client’s chip. Open Silicon utilizes software-based computer chip simulators to incorporate other functions that the clients may desire and to vet the overall chip design. For example, a client may come to Open Silicon with a design for a new mobile central processing unit (CPU) for a personal data assistant (PDA). The client provides Open Silicon with a software program that defines the functionality of the CPU. Open Silicon incorporates in the software design other functionality needed to complete the PDA design, for example off-the-shelf display processor and memory chips. Open Silicon will then design the “layout” for the chip and test the completed PDA board to ensure that the integration of the various components works properly – all in software.\textsuperscript{49} This completed design is provided, as software, to the client, who may then send the design to a computer chip fabrication facility, which will create and test the physical chip.

\textsuperscript{49} “Layout” refers to the placement of the conductive material on the chip.
Aztec and Open Silicon operate with similar project models. A U.S.-based management team provides project leadership and day-to-day software design management and India-based developers (and occasionally U.S.-based developers in Open Silicon’s case) provide the work product. The U.S.-based management acts as the primary interface between the U.S.-based customer and the India-based development team.\textsuperscript{50}

**B. Contracting Companies are Providing a Hybrid Model**

In order to understand why U.S. firms are not adopting the FDI Model with the frequency expected, one must look to the structure and offerings of Indian software contracting companies like Aztec and Open Silicon. These Indian contracting firms internalize some of the FDI structure in order to provide U.S. firms with a hybrid of the FDI Model and the Contracting Model. This Hybrid Model provides U.S. firms with some of the advantages and disadvantages of both the FDI and Contracting Models.

First, software contracting companies like Open Silicon and Aztec provide U.S. firms with U.S.-based corporations with which to negotiate contracts. Though the mere existence of a U.S. corporation on paper is unlikely to improve the relations of U.S. firms and foreign contracting firms, it is likely that the extent of the U.S. presence that the Indian contracting firms provide does improve its relations with its U.S. customers. Aztec has sales, marketing, and management teams in the U.S. Open Silicon has the majority of the company in the U.S., including software development teams. The extent of on-shore presence combined with the legal structure provides potential U.S. customers with a

\textsuperscript{50} Open Silicon also provides some customers the option of U.S.-based development teams. However, even in this case, the U.S.-based client rarely interacts with the U.S.-based development team. All communication is handled by the U.S.-based management teams.
familiar accountability structure, which improves their comfort with utilizing an India-based development team.

Second, the hybrid U.S./Indian contracting firms have substantial on-shore assets. Unlike other traditional outsourcing industries, such as the manufacturing industry, the software industry is human-capital intensive. The placement of workers is tied to only a small percentage of the assets that a contracting firm may have. For example, a software contracting company will typically have few fixed assets other than computers and software licenses tied to those computers. Some companies may own their office buildings and furniture. Unlike manufacturing and other outsourced industries in which companies have expensive fixed assets like factories and machinery overseas, the value of fixed assets in the software industry (computers, licenses, etc.) that are maintained overseas are likely to be of similar value to the assets maintained in the U.S. for use by the U.S.-based management teams, at least on a per-employee basis. Moreover, many of the assets maintained by Indian software companies, and software companies in general, may be held as liquid assets or easily liquefiable assets, such as stocks and other securities.

Given that there are few fixed assets tied to the Indian development teams, Indian software contracting companies can provide the lower-cost Indian IT labor while maintaining a substantial portion of their total assets in the U.S. Therefore, Indian software contracting companies can provide substantial U.S. assets for attachment to contracts. For example, Aztec Software provides bonding for the services it offers, in addition to the implied potential to attach to its U.S. assets if litigation were brought against it by one of its clients.
Third, Indian contracting companies like Aztec and Open Silicon partially counter the potential problems with IP creation and IP transfer that should theoretically favor the FDI Model. The approaches to countering these IP-related disadvantages include “IP isolation” and distinguishing strategic versus merely necessary development. Both Aztec and Open Silicon employ IP isolation techniques to 1) reduce the risk that one client’s IP may leak to another client and 2) reduce the risk that IP is stolen. The first step in IP isolation is identifying which clients have potentially conflicting IP. This is accomplished by disclosing current client lists to new clients and investigating any potential conflicts that the client identifies. Furthermore, conflicts are policed by management and staff. Once a potential client conflict is identified, the Indian contracting firm engages in IP isolation.

One form of IP isolation is accomplished by physically isolating teams from one another if they are working on projects that have potential IP conflicts. The physical isolation may include placing competitive projects in separate buildings or floors. Where physical separation is not possible, Indian contracting firms can create “ethical walls” between groups that are working on potentially conflicting projects by informing groups of the conflicts and directing workers not to communicate about those projects. Both the ethical walls and physical separation reduce the risk of inadvertent leakage of IP from one client’s project to another’s and reduce the risk of IP theft by reducing the number of workers who have access to a particular client’s IP.51 For example, Aztec Software has two clients that are direct competitors with one another, Metreo and Vendavo, both of

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51 Indian contracting companies also provide IP isolation over time. Aztec, for example, provides clients with a 2-year non-compete agreement, which states that Aztec employees who have worked on a client’s project will not work on any competitive project for 2 years.
whom build price management software. Since the conflict has been identified, Aztec can maintain an ethical wall between the projects by ensuring that employees are not cross-assigned between competitive projects, instructing the teams to forgo communication about the projects with others working on competitive projects, and physically separating infrastructure and personnel as appropriate.

Indian contracting firms also encourage their clients to determine what is “strategic” to their business and what is merely “necessary” to completion of a project and to hire the contracting firm to work only on the latter. Mr. Goel noted on this topic that “getting a software installation program to work correctly is necessary for product roll-out, but it is not strategically important. The merely ‘necessary’ development is the kind of work we want from our clients.” He also noted that only a small percentage of the software and IP created for any particular system is strategic to the competitive advantage of the company. The rest of the software and IP are necessary but do not provide the client with competitive advantage. If U.S. software companies can successfully separate the strategic IP from the necessary IP and hire the Indian contracting firms to work only on that which is merely necessary, then the potential damage due to theft or leakage of IP will be reduced.

Dr. Eltoukhy described a similar strategy utilized by Open Silicon. Open Silicon’s clients can provide their IP (their chip functionality) in two ways: as computer code that represents the actual “logical structure” of their chip or as “black box” computer code that describes the size, connections, and functionality of the chip, but hides the logic used in the chip. The code describing the logical structure exposes the client’s IP more than the black box code does. Open Silicon can supplement either type of code with additional
functionality in order to design the chip that the client desires. If the logical structure is provided, then Open Silicon is better able to modify the chip layout to optimize chip size or improve power usage. If black box code is provided, then Open Silicon will have less flexibility in optimizing the chip design but will be able to design the completed chip without ever having access to the strategic IP related to the client’s chip design. Therefore, Open Silicon’s clients can provide strategic IP in black box form and avoid potential loss of strategic IP, albeit at the price of lost optimization.

It may be difficult for a U.S. software firm to determine what in its business constitutes the firm’s strategic IP. The U.S. firm will know how it differentiates itself from competitors, but the IP related to that differentiation may not be the company’s strategic IP. For example, the U.S. firm developing games for a cellular phone may feel that it differentiates itself from its competitors by providing more exciting games. However, the company’s strategic IP may not be related to game play in particular but, instead, may be an algorithm for efficiently displaying graphics on the cellular phone. If the U.S. firm successfully identifies and avoids outsourcing strategic IP, then the firm will have more actual IP protection.

Dr. Eltoukhy noted that reputation is one of the most important factors in the Indian contracting industry and that Indian contracting firms must demonstrate not only that they can efficiently create the software required by the clients, but also that they can protect their clients’ IP. If an Indian firm acquires a reputation for poor IP protection, then it will lose most or all of its business. Since information on the Indian contracting firms is widely available and, in particular, any failure to protect a client’s IP may be litigated and publicized, U.S. software firms have the knowledge they need to identify reliable Indian
contracting firms. The Indian firms with good reputations will tend to receive business. Therefore, market forces should lead to the survival of Indian contracting firms that protect IP well and the demise of those that do not.

Perhaps the Indian contracting firms described here as “hybrid” could be considered variations on the contracting firms traditionally considered under the Contracting Model. However, the fact that these firms have substantial U.S. presence, tend to have significant attachable U.S. assets, and are structured to provide some of the advantages of the FDI Model seems to warrant a discussion of them separate from the foreign contractors typically considered under the Contracting Model.

C. Advantages and Disadvantages of the Hybrid Model

Advantages of the Hybrid Model

The Hybrid Model combines some of the advantages of the Contracting and FDI Models. The Hybrid Model reduces exposure to Williamson’s dilemma of bounded rationality combined with environmental uncertainty by avoiding some of the legal uncertainty related to the Contracting Model. Under the Hybrid Model, all conflicts can be brought under U.S. law. There is no need for Indian law, international law or international arbitration. The fact that the two corporations making the initial contract, the U.S. firm and the U.S. branch of the Indian contracting agency, are both incorporated in and maintain substantial assets in the U.S. means that any contract disputes or other litigation can be governed by U.S. law, settled by U.S. courts, and have judgments laid against U.S. assets. Since U.S. law and subsequent judgments are more familiar and may be (or at least may appear to be) more predictable than international arbitration or
adjudication in Indian courts, U.S. firms may be more comfortable with Indian contracting companies that provide the Hybrid Model.

In addition to reducing general legal uncertainty, the Hybrid Model reduces the legal uncertainty associated with the transfer and creation of IP, primarily through IP isolation and encouraging client retention of strategic IP. IP isolation reduces the risks of IP theft and IP leakage. If a client retains strategic IP and hires the Indian contracting firm to work only on merely necessary IP, then the potential damage caused by a leak or theft of IP is greatly reduced.

In addition to avoiding any marginally higher costs associated with setting up an Indian subsidiary under the FDI Model, the Hybrid Model, like the Contracting Model, allows a U.S. firm to engage in short-term expansion of its development team. If Mr. Goel’s description is representative, U.S. firms develop strategic IP for particular products in-house and quickly expand their software development capabilities using Indian contracting firms. The Indian contracting firms quickly create the software and IP necessary to bring the products to market. As the need for the expanded development team declines, the U.S. firm can scale back the involvement of the Indian contracting firm. In the FDI Model, as in any model where employees are hired, such expansion and reduction of development teams is difficult. It may require either firing employees once they have built your products or retaining employees when there is little work for them.

However, since software projects are large and can be worked on by development teams of different sizes, U.S. software firms adopting the FDI Model may hire a smaller team of Indian employees to complete the software development, thereby increasing the time to complete the software project. The smaller teams and longer-duration tasks will typically result in a more stable need for the employees’ services under the FDI Model. In contrast, the Hybrid Model, like the Contracting Model, will result in an opportunity for the U.S. firm to engage as large a development team as is efficient to work on a particular software project, thereby creating the product in a shorter time than can be achieved by a smaller development team hired under the FDI Model.

**Disadvantages of the Hybrid Model**

The Hybrid Model has some disadvantages, many of which are associated with the Contracting Model. First, even though the risk of IP theft and IP leakage under the Hybrid Model is less than that under the Contracting Model, the risk is not eliminated. The FDI Model will better protect IP that is transferred to the Indian development team. This is due to improved workforce retention, primarily due to the ability to negotiate directly with particularly valuable employees, and the additional legal protection of employment law. As noted above, however, if the U.S. firm sends only necessary IP to the Indian contracting company, then the potential damage caused by IP theft or leakage is greatly reduced.

Second, the Hybrid Model, like the Contracting Model, has the disadvantage of loss of expertise. In the FDI Model, employees are retained and, therefore, so is the expertise gained by working on the U.S. firm’s projects. In both the Hybrid Model and the Contracting Model, employees of the Indian contracting company gain that expertise
while working on client projects. Furthermore, even in the situation where a U.S. firm utilizes the same Indian contracting company in multiple, related software projects, the Indian contracting company will be in a position to negotiate for a portion of the savings associated with the retained expertise, thereby reducing some of the benefit to the U.S. firm of using the same Indian contracting firm. However, the Hybrid Model and the Contracting Model have some advantage over the FDI Model in that the U.S. firm will have access to the aggregate expertise built up during the Indian contracting company’s work with other clients.

D. The Hybrid Model and the Software Industry

A company’s ability to shift assets to the U.S. differs by industry. In an industry that requires many fixed assets, a contracting firm will not be able to shift as substantial a portion of its total assets to the U.S. For example, in the manufacturing industry, project costs such as machinery and manufacturing facilities will be geographically tied to the inexpensive labor in India. The India-based assets are more difficult to include as collateral or attach in a U.S. legal action than are the moveable, liquid assets available in the software industry. The Hybrid Model works well in the software industry in part due to the higher proportion of liquid assets available for attachment to contracts and U.S. litigation.

There may also be a bias toward utilizing contracting companies in the software industry. Circumstantial evidence from Aztec and Open Silicon, as well as the author’s own experience, suggests that U.S. firms will often engage Indian contracting firms for what they believe to be short-term projects – even if these projects are later extended. The U.S. firm may expect that the need for the expanded workforce is temporary and that,
once the contracting project is completed, the U.S. firm will have the capital to bring the expertise and IP in house (and that, if the project fails, there will be no need for in-house expertise). Since shorter projects imply that any disadvantages related to contracting are reduced, U.S. firms are more comfortable utilizing an Indian contracting company or, for that matter, any contracting company.

Software development is also amenable to contracting because it is location-agnostic. The products built by the Indian software contracting companies can be sent to their clients at the speed of light and at marginal cost. Geographically distributed software development teams can work from anywhere in the world on software systems, even systems tied to particular hardware servers in particular locations. Additionally, since the lower-cost Indian software developers are not tied to fixed assets in India, they can go to the U.S. client’s site if required. This is in sharp contrast to traditional, non-digital outsourcing, where products have to be shipped among geographically disparate locations, and transportation of the inexpensive labor would be impossible because the labor force must have access to fixed assets such as machinery. The location-agnostic nature of software development overcomes the multi-site coordination problems normally inherent in establishment of new contract-based projects in India, thereby improving the viability of contracting in the software industry.

E. The Future of Outsourcing in India

With the increasing strength of IP protection in India, U.S. software companies should be less likely to adopt the FDI Model and more likely to adopt the Hybrid Model or Contracting Model. As IP laws are strengthened and the Indian courts establish enforcement of the strengthened IP laws, U.S. firms will have more confidence in Indian
contracting companies. Given the discussion above, this trend may mean greater use of the Hybrid Model. If, however, U.S. firms regard Indian IP laws as sufficient to protect their interests, even against Indian contracting firms that do not have substantial U.S. assets, then the Contracting Model may gain favor over the Hybrid Model. The primary reason for favoring the Contracting Model would be that India-only contracting companies should have lower overhead. Indian software contracting companies under the Hybrid Model will be inefficient relative to their India-only counterparts because of the resources expended in U.S. sales, marketing, and management. On the other hand, it is conceivable that, in order to compete in the market with the Hybrid Model firms, the India-only firms would have to maintain a similarly substantial presence in the U.S., thereby reducing the Contracting Model’s relative advantage.

V. Conclusion

This paper explores an expansion of the theories of foreign direct investment and contracting in the Indian software outsourcing industry, and describes how a new breed of Indian software contracting companies that adopt the Hybrid Model are approaching the opportunities in that industry. There is, however, much more work to be done. First, there may be differences in the patterns of investment among large, medium, and small U.S. firms that are outsourcing software projects to India. Understanding these differences may illuminate more about what drives U.S. firms to engage in FDI versus contracting and traditional contracting versus contracting under the Hybrid Model. Second, the types of IT functions outsourced to foreign countries may be important. A U.S. firm may

53 Large companies (1000+ employees) are 2-3 times as likely to outsource to foreign contracting companies as smaller. Supra note 24.
outsource software development, maintenance, testing, technical support, and end-user support, among other functions. The expertise needed, the necessity of transferring IP, and the importance of workforce coherence differ substantially for each of the listed functions. Knowing how companies approach outsourcing each of these different functions may provide a refined detail related of how U.S. firms make decisions with respect to entrusting software-related projects to foreign entities.