

## INFORMATION TECHNOLOGY OUTSOURCING AND NON-IT OPERATING COSTS: AN EMPIRICAL INVESTIGATION<sup>1</sup>

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*Does information technology outsourcing reduce non-IT operating costs? This study examines this question and also asks whether internal IT investments moderate the relationship between IT outsourcing and non-IT operating costs. Using a panel data set of approximately 300 U.S. firms from 1999 to 2003, we find that IT outsourcing has a significant negative association with firms' non-IT operating costs. However, this finding does not imply that firms should completely outsource their entire IT function. Our results suggest that firms benefit more in terms of reduction in non-IT operating costs when they also have higher levels of complementary investments in internal IT, especially IT labor. Investments in internal IT systems can make business processes more amenable to outsourcing, and complementary investments in internal IT staff can facilitate monitoring of vendor performance and coordination with vendors. We discuss the implications of these findings for further research and for practice.*

**Keywords:** IT outsourcing, information technology, IT expenditures, IT impacts, IT services, IT labor, IT human capital, non-IT operating costs, business value of IT, IT governance

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### Introduction

Information technology outsourcing has been an increasingly important phenomenon in recent times. IT outsourcing refers to the use of a third party vendor to provide IT services that were previously provided internally (DiRomualdo and Gurbaxani 1998; Gurbaxani 2007). With an increase in offshore outsourcing and the emergence of cloud computing, IT outsourcing is gaining even stronger momentum (Carmel and Agarwal 2002; Hayes 2008). Gartner's forecast shows that global spending for IT outsourcing services reached U.S.

\$314.7 billion in 2011, and will increase with a 4.4 percent compound annual growth rate through 2015 (Gartner 2011). According to a report by Global Industry Analysts (2011), the size of the global business process outsourcing (BPO) market will reach U.S. \$280.7 billion by 2017. According to *InformationWeek* (Vallis and Murphy 2008), on average, U.S. firms spend about 14 percent of their IT budget on IT outsourcing. One of the main reasons for IT outsourcing is the potential for cost reduction due to vendors' production cost advantage. Indeed, a survey by ITtoolbox (2004) found that the top reason for firms' IT outsourcing is cost savings (37.9 percent of total responses). Similarly, according to AMR Research, more than 70 percent of the respondents mentioned reducing operating costs as a key driver behind outsourcing (Fersht and Stiffler 2009).

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Despite the growth of IT outsourcing and its promise to save costs, few studies have empirically examined the impact of IT outsourcing on cost savings. In fact, whether IT outsourcing will lead to cost reduction is largely an empirical question. On one hand, IT outsourcing can save costs for firms through increased efficiency in IT operation and effective use of IT staff, due to vendors' production cost advantage stemming from economies of scale. On the other hand, there are substantial hidden transaction costs associated with IT outsourcing such as transition and management costs (Aubert et al. 2004), which may outweigh the benefits.

Among prior studies on IT outsourcing, many have focused on outsourcing practices and decisions (e.g., Ang and Straub 1998; Lee et al. 2004) or outsourcing contracts and governance (e.g., Dey et al. 2010; Fitoussi and Gurbaxani 2012; Goo et al. 2009; Susarla et al. 2010). Although studies on the outcomes of IT outsourcing have increased over time (Lacity et al. 2010), with a few notable exceptions (e.g., Chang and Gurbaxani 2012; Han, Kauffman, and Nault 2011; Mani et al. 2012), they have mainly relied on anecdotal evidence or practitioners' perceptions (e.g., Grover et al. 1996). These studies provide important insights into the determinants and consequences of IT outsourcing, but the impact of IT outsourcing on cost savings has received relatively limited attention (see Dibbern et al. 2004). Although several case studies document cost savings associated with IT outsourcing (e.g., Lacity and Willcocks 2000; Levina and Ross 2003), these studies focus on the costs directly related to IT (e.g., systems development costs). However, operating costs not related to IT (e.g., sales, general, and administrative costs) account for a much larger portion of firms' total operating costs, sometimes more than four times as large as IT-related operating costs, and can directly influence profitability. Therefore, it is important to examine whether and how much IT outsourcing influences firms' *non-IT* operating costs.

In addition to understanding the relationship between IT outsourcing and non-IT operating costs, there is also a need to understand complementarities between IT outsourcing and internal IT investments. Traditionally, outsourcing and in-house production of IT have been treated as substitutes from a "make-or-buy" perspective based on transaction cost economics (TCE) (Williamson 1985). However, to the extent that the internal IT investments of a firm can make it better leverage the expertise and non-contractible investments of its outsourcing vendors (see Chang and Gurbaxani 2012), the internal and outsourced IT investments can be complements, as well. To date, few studies have examined how IT outsourcing and internal IT investments are related, especially with respect to their impact on firm performance. It is important to examine this relationship in order to understand

how firms should allocate their IT budget so as to maximize the returns to their total IT spending.

This study examines how IT outsourcing and internal IT investments influence non-IT operating costs. We use a panel dataset of approximately 300 U.S. firms from 1999 to 2003 containing firms' actual spending on IT outsourcing, a detailed breakdown of internal IT expenditures (i.e., IT labor, hardware, software, etc.) and operating costs in order to address the following questions: Is IT outsourcing associated with a reduction in firms' non-IT operating costs? Do internal IT investments moderate the relationship between IT outsourcing and non-IT operating costs? Our results suggest that IT outsourcing is associated with a significant reduction in firms' non-IT operating costs. More importantly, we find that the relationship between IT outsourcing and non-IT operating costs is stronger for firms investing more in internal IT, suggesting that internal IT investments and IT outsourcing are complements, rather than substitutes. Our results further indicate that it is IT labor, among other elements of IT expenditures, that is a complement to IT outsourcing.

## Theoretical Framework

This study draws on prior work that broadly investigates how firms determine the degree to which they should "make" or "buy," and how such decisions impact firm performance. Among other perspectives, TCE, which focuses on transaction costs as the major determinant of vertical integration, has been used as a dominant theoretical perspective and has received substantial empirical support (see Gurbaxani and Whang 1991; Lacity et al. 2011). Recently, scholars have augmented the TCE-based view with the resource- or capability-based view, which focuses on firms' relative advantages. For example, Jacobides and Winter (2005) argue that capabilities and transaction costs coevolve in the determination of the vertical scope of a firm. In a related paper, Jacobides and Hitt (2005) argue that firms often engage in *tapered integration*, which occurs when firms pursue vertical integration, but at the same time outsource a portion of their supplies or distribution (Rothaermel et al. 2006) in order to capitalize on the heterogeneous capabilities along the value chain. Similarly, firms often mix internal IT investments and IT outsourcing, to different degrees, in order to capitalize on transaction costs and tap vendors' advanced technologies and expertise at the same time. Nevertheless, the performance implications of such a strategy have rarely been studied, with a few notable exceptions.

Another stream of research has examined the performance implications of vertical integration (e.g., Mayer and Nicker-

son 2005; Nickerson and Silverman 2003). In particular, several recent studies have used detailed firm-level data to examine the dynamics of how outsourcing and vertical integration impact firm performance. For example, Jacobides and Billinger (2006) find that in addition to transactional alignment, firms decide on their *vertical architecture*, defined as the overall structure of a firm's value chain, to improve performance. They also find that increased permeability in the vertical architecture can lead to more effective use of resources and capabilities, which eventually provides dynamic benefits for firms. Novak and Stern (2008) examine the impact of outsourcing on performance over the product life cycle, and find that while outsourcing is associated with higher levels of initial performance, vertical integration is associated with performance improvement over the life cycle. Relatedly, some studies focus on the economic impact of services outsourcing. These studies treat services outsourcing as an intermediate input in a production function, and measure its value by its contribution to output or productivity growth (for a review of the literature, see Olsen 2006).

While prior work provides important insights into the value of IT outsourcing, our understanding of the impact of IT outsourcing on cost savings is still limited. In particular, although case studies indicate that firms can save IT-related costs through IT outsourcing (e.g., Levina and Ross 2003), little attention has been paid to the relationship between IT outsourcing and costs of doing business not related to IT. We seek to understand whether and how much IT outsourcing is associated with reduction in the non-IT portion of firms' operating costs, which directly contributes to profits. In order to provide greater insights, we also examine how IT outsourcing and internal IT investments together relate to non-IT operating costs, a subject that has received little attention so far.

Before moving to an empirical setting, we first discuss why we expect IT outsourcing, internal IT investments, and internal IT labor to have an association with non-IT operating costs.

### ***IT Outsourcing and Non-IT Operating Costs***

We expect IT outsourcing to be associated with a reduction in firms' non-IT operating costs, which consist of operational, sales, general and administrative, R&D, and marketing costs. IT outsourcing can help reduce operational costs, in particular, by increasing the operational efficiencies of existing processes and freeing up and allowing the reallocation of IT resources. First, IT outsourcing can reduce operational costs by improving the operational efficiencies of the existing business processes supported by IT. A case in point is the

National Account Service Company (NASCO), a Georgia-based service provider for the health insurance industry, which processes over 120 million claims annually. By outsourcing its data center operation to IBM, NASCO could substantially increase operational efficiencies and reduce costs in claim processing (*Business Wire* 2000).

In addition, by outsourcing such traditional IT services as application development and maintenance, firms can free up their IT resources, especially their IT staff, and reallocate them to more strategic activities that can increase firms' ability to compete and achieve operational efficiencies. A case in point is Campbell Soup Company, which decided to outsource application development/maintenance and computer systems operation to IBM in 2001 (IBM Global Services 2005). By doing so, Campbell's internal IT team could focus on such activities as linking IT strategies to specific business strategies and delivering higher value solutions at an accelerated pace. In particular, the IT team could quickly deploy IT solutions to support new initiatives and innovations, as outlined by various business units. As a result, Campbell could realize significant savings through increased efficiency and productivity. These arguments and examples are consistent with a study based on 244 companies conducted by the IBM T. J. Watson Research Lab. Their study indicates that companies outsourcing IT realized better long-term improvements in business performance, compared to their sector peers (IBM Global Services 2010).

### ***IT Outsourcing, Internal IT Investments, and Non-IT Operating Costs***

We expect internal IT investments to moderate the relationship between IT outsourcing and non-IT operating costs. A firm's complementary IT investments can enhance the impact of IT outsourcing on non-IT operating costs, at the same level of IT outsourcing, by making business processes more information intensive and facilitating coordination with vendors.<sup>2</sup> Mani et al. (2010) find that more complex and interdependent outsourced processes require higher levels of technological investments to realize the strategic value from business process outsourcing relationships. For example, firms' internal IT systems, such as an ERP system, can make their business processes more information intensive by increasing the codifiability, standardizability, and modularizability of the

<sup>2</sup>A firm can increase its internal IT investment and IT outsourcing spending *simultaneously* by increasing the total IT spending. In order to examine the interaction effect of increasing both internal IT investment and IT outsourcing, we measure them as a percentage of revenue, rather than the relative proportion of the total IT spending.

processes (Mithas and Whitaker 2007). By doing so, internal IT systems can enhance firms' *operational agility*, firms' ability to redesign existing processes and to create new processes for taking advantage of the changes in their operating environments (Sambamurthy et al. 2003). Similarly, firms' agile IT infrastructure can contribute to the success in globally distributed software development projects (Lee et al. 2006). IT outsourcing often requires redesigning business processes (Linder 2004), and firms with greater operational agility can better adapt their processes to IT outsourcing and create agile infrastructure, thereby achieving greater efficiency gains from IT outsourcing.

In addition, firms' investments in "IT coordination applications" (e.g., monitoring technologies) can magnify the gains from IT outsourcing by facilitating communication, monitoring, and enforcement (Whitaker et al. 2011). IT outsourcing typically involves high transaction costs, including monitoring and enforcement costs (Williamson 1985). By investing in various information and communication technologies, firms can reduce transaction costs associated with outsourcing (Gurbaxani and Whang 1991). For example, Delta Air Lines monitors its outsourced call center operations in Mumbai, India, by using software that automatically captures voice and screen data from individual agents' workstations and allows real-time viewing of the data (Robinson and Kalakota 2004).

### **IT Outsourcing, IT Labor, and Non-IT Operating Costs**

Among the components of IT investments, we expect internal IT labor to moderate the relationship between IT outsourcing and non-IT operating costs. Several IT outsourcing studies have argued for the importance of maintaining some IT expertise within the firm and having some in-house IT employees to decide which parts of IT to outsource, how to negotiate a mutually acceptable contract with the vendor, how to monitor the outsourcing alliance, how to tailor the outsourcing contract with the passage of time, and, finally, how to "backsource" (i.e., bring in-house) a function if the outsourcing contract does not work to a firm's advantage (Bloch and Schaper 2006; Hirschheim 2009). No matter how well designed a contract is, even if a vendor can make such employees available on contract, a firm still needs some in-house employees who would put the firm's interest ahead of the vendor's interests for the resolution of conflicts due to changes in the business conditions or economic environment, and to ensure that the vendors continue to make investments in the non-contractible aspects of the relationship (Mithas et al. 2008; Ramasubbu et al. 2008). Related to this, Ang and

Slaughter (1998) find that internal IT employees exhibit significantly more organizational citizenship behaviors in terms of extra-role activities and loyalty, compared to outsourced IT employees.

More importantly, internal IT staff can also serve as trustworthy boundary spanners between business functions and the vendor. IT outsourcing typically involves a great deal of knowledge integration activities between the vendor and the client for bridging the knowledge gap (i.e., technical versus business knowledge) between them (Gopal and Gosain 2010; Oshri et al. 2007). These activities are related to the concept of *boundary spanning* (Carlile 2002). Prior studies emphasize the importance of boundary spanning, in both internal systems development (Levina and Vaast 2005) and outsourcing (Gopal and Gosain 2010; Levina and Su 2008). Internal IT employees' boundary spanning roles can help their firm capture greater value from IT outsourcing, not only because they understand both the technical and business aspects of the outsourced projects, but also because they have the same objective function and profit motive as their internal business clients, unlike between a firm's and a vendor's employees (Ang and Slaughter 1998).

For example, internal IT employees can translate the functional domain knowledge of their internal business clients into a language and technical specifications that the technical IT staff of the vendor can understand. Internal IT staff can also help vendors customize their IT solutions to serve the strategic needs of the enterprise. Moreover, these internal IT employees can also ensure a vendor's compliance to such specifications, safeguarding the client firm if a conflict were to arise between what the business clients expected and what the vendor delivered (Bloch and Schaper 2006; Lacity and Hirschheim 1993). This is the very reason that GM wanted to "bring in-house some more experience, versatile IT professionals...who can broker disputes that devolve into finger-pointing or can act as paramedic if something's perilously wrong [in outsourcing]" (Weier 2009), according to its CIO, Terry Kline.

## **Method**

### **Data and Variable Definitions**

Our analysis comprises the estimation of empirical models using secondary data from two sources. We obtained data on IT investments and IT outsourcing from *InformationWeek*, a leading and widely circulated IT publication in the United States. *InformationWeek* is considered to be a reliable source

of information, and previous studies have used data from *InformationWeek* surveys (e.g., Bharadwaj 2000). The data used in this study pertain to information concerning a firm's IT spending and its breakdown among internal (e.g., hardware purchase, software and applications, salaries and benefits of internal IT labor) and outsourced IT components (i.e., IT outsourcing) for the 1999–2003 period. The data were collected by *InformationWeek* as part of a more comprehensive survey to benchmark a firm's IT infrastructure and managerial practices in its industry. Note that *InformationWeek* data do not include any information on IT outsourcing contracts or deals, but only contain information on firms' overall IT spending and a breakdown of the IT spending in various areas of IT (i.e., hardware, software, IT labor, IT outsourcing, etc.).

We matched the *InformationWeek* data with revenue and operating expenses from *Compustat* for publicly traded firms. We deflated all figures to 2000 constant dollars using GDP deflators. Combining the data from the two sources resulted in an unbalanced panel consisting of 281 U.S. firms and 990 observations. The mean revenue during our sample period was U.S. \$9.6 billion. The minimum and maximum revenues were U.S. \$576 million and U.S. \$212 billion, respectively. Out of 281 firms, 121 firms are from manufacturing sectors, and 160 firms are from nonmanufacturing sectors.

We measure non-IT operating expenses (*OPEXNIT*) by a firm's total operating expenses less IT expenditures as a percentage of its revenue. We calculate total operating expenses by subtracting from revenues the sum of costs of goods sold and operating income. Internal IT investments (*ITIN*) are measured by a firm's total IT expenditures minus outsourced IT expenditures as a percentage of its revenue. IT outsourcing (*ITOUT*) is measured by a firm's spending on IT outsourcing as a percentage of its revenue. IT outsourcing includes firms' spending in such areas as integration, application development, application service provider (ASP), and offshore application development and maintenance (Greene-meier 2001). A firm's spending on IT labor (*ITLAB*), IT software (*ITSW*), IT hardware (*ITHW*), and the remaining part of IT expenditures (*ITREM*) are measured in a similar manner, as a percentage of revenue.

Because the competitive pressure that firms face can affect their operational efficiency and productivity of IT investment (Han, Chang, and Hahn 2011), we control for industry competitiveness. To measure industry competitiveness, we follow prior work and use the Herfindahl-Hirschman index (*HHI*), a measure of industry concentration, which is defined as

$$HHI_i = \sum_{k=1}^{n_i} s_{ki}^2$$
, where  $s_{ki}$  is the market share of firm  $k$  and  $n_i$  is the number of firms in industry  $i$ . A firm's market share is

calculated as the ratio of its revenue to the sum of the revenue of all firms that belong to the same NAICS two-digit industry. The inverse of *HHI* is used to measure industry competitiveness. The higher an industry's *HHI*, the more concentrated and the less competitive the industry is. We calculated *HHI* for each NAICS two-digit industry and applied the same value of *HHI* to the firms that belong to the same industry. To control for time-invariant sector-specific effects and year-specific effects, we include sector (NAICS two-digit) and year dummies in our estimation. Table 1 presents definitions of the variables.

Table 2 shows the summary statistics. In our sample, on average, a firm's non-IT operating expenses account for 13.9 percent of the revenue. Also, an average firm in our sample spent 3.3 percent of revenue in total IT expenditures, with 2.8 percent of revenue in internal IT, and about 0.5 percent of revenue in IT outsourcing. In addition, the average ratio of IT outsourcing to total IT expenditures was about 14 percent, with the maximum being 83 percent.

Table 3 provides correlations among the variables. One interesting observation from Table 3 is that IT outsourcing spending and IT labor spending are positively correlated (0.54), which seems to be contrary to the widely held belief that outsourcing is associated with reduced IT labor. This seemingly counterintuitive positive relationship is consistent with arguments in prior studies that firms with higher total IT expenditures are likely to make greater use of IT outsourcing (e.g., Loh and Venkatraman 1992). Also, in general, the higher the total IT expenditures, the greater the likelihood of higher spending on IT labor. To gain additional insights, we examined how firms in our sample changed their spending on IT outsourcing and IT labor during our sample periods. In 169 out of 559 cases (30.2 percent) with consecutive yearly observations, IT outsourcing and IT labor spending (as a percentage of revenue) increased simultaneously. In 152 cases (27.2 percent), firms decreased spending on IT outsourcing and IT labor simultaneously. In 200 cases (35.8 percent), the changes in IT outsourcing and IT labor spending have opposite signs. Overall, the correlation between the changes in the two variables is 0.45 ( $p < 0.01$ ), which implies that the majority of the firms in our sample either increased or reduced spending on IT outsourcing and IT labor simultaneously. We discuss this issue in more detail later.

### **Empirical Models and Estimation Procedure**

To examine whether IT outsourcing is associated with lower non-IT operating costs, and whether IT outsourcing and internal IT investments are complements or substitutes in reducing non-IT operating costs, we use the following empirical specification:

<b>Variable</b>	<b>Definition/Operationalization</b>
<i>OPEXNIT (%)</i>	A firm's non-IT operating expenses as a percentage of its revenue (non-IT operating expenses = revenue – costs of goods sold – operating income – overall IT expenditures).
<i>ITIN (%)</i>	A firm's internal IT expenditure (excluding IT outsourcing) as a percentage of its revenue.
<i>ITOUT (%)</i>	A firm's spending on IT outsourcing as a percentage of its revenue.
<i>ITLAB (%)</i>	A firm's spending on IT labor as a percentage of its revenue.
<i>ITHW (%)</i>	A firm's spending on IT hardware as a percentage of its revenue.
<i>ITSW (%)</i>	A firm's spending on IT software as a percentage of its revenue.
<i>ITREM (%)</i>	A firm's other IT-related spending (excluding IT labor, hardware, software, and IT outsourcing) as a percentage of its revenue.
<i>HHI</i>	Herfindahl-Hirschman index that measures industry concentration. This is an inverse proxy for industry competitiveness.
<i>Sector dummy</i>	Dummies for sectors to control for time-invariant sector-specific effects. Sectors correspond to the NAICS two-digit level.
<i>Year dummy</i>	Dummies for sample years from 1999 to 2003 to control for year-specific effects.

<b>Variable</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min.</b>	<b>Max.</b>
<i>OPEXNIT</i>	13.93	14.56	.07	79.28
<i>ITIN</i>	2.77	2.57	.21	19.14
<i>ITOUT</i>	.49	.83	.00	9.68
<i>ITLAB</i>	1.03	1.13	.01	9.00
<i>ITHW</i>	.59	.67	.02	7.00
<i>ITSW</i>	.52	.61	.01	5.84
<i>ITREM</i>	.63	.58	.002	5.09
<i>HHI</i>	.05	.05	.01	.32

	<i>OPEXNIT</i>	<i>ITIN</i>	<i>ITOUT</i>	<i>ITLAB</i>	<i>ITHW</i>	<i>ITSW</i>	<i>ITREM</i>
<i>OPEXNIT</i>							
<i>ITIN</i>	-0.05						
<i>ITOUT</i>	-0.12*	0.52*					
<i>ITLAB</i>	-0.05	0.92*	0.54*				
<i>ITHW</i>	-0.04	0.84*	0.36*	0.70*			
<i>ITSW</i>	-0.10*	0.82*	0.40*	0.62*	0.61*		
<i>ITREM</i>	0.01	0.82*	0.41*	0.65*	0.58*	0.67*	
<i>HHI</i>	-0.06	-0.06	-0.03	-0.03	-0.05	-0.07	-0.06

Note: \*p < 0.05.

$$OPEX_{NIT} = \alpha_0 + \alpha_1 ITOUT + \alpha_2 ITIN + \alpha_3 ITOUT \times ITIN + \alpha_4 HHI + Y_{r_t} + D_i + \varepsilon$$

where  $Y_{r_t}$  denotes the year dummy for year  $t$  and  $D_i$  denotes the sector dummy (NAICS 2-digit). We first estimate the model without the interaction term to examine the unconditional effects of  $ITOUT$  and  $ITIN$ . Then, we re-estimate the model with the interaction term to examine the complementarity between  $ITOUT$  and  $ITIN$ .

To examine the relationship (complements or substitutes) between IT outsourcing and each component of internal IT investment, we disaggregate  $ITIN$  into  $ITLAB$ ,  $ITHW$ ,  $ITSW$ , and  $ITREM$  and estimate the interaction effect with  $ITOUT$ . Again, we estimate the model with and without the interaction terms to examine both the unconditional and the moderating effects. We center the variables comprising the interaction terms by calculating the deviations from their respective mean values to alleviate potential multicollinearity between the main terms and the interaction terms.

According to the Breusch-Pagan test for heteroskedasticity, we can reject the null hypothesis that the errors are homoskedastic ( $\chi^2 = 72.02, p < 0.01$ ). In addition, the Wooldridge (2002) test for autocorrelation indicates the presence of first-order autocorrelation (AR1) in our panel dataset ( $F = 52.58, p < 0.01$ ). In the presence of heteroskedasticity and autocorrelation, pooled ordinary least squares (OLS) regression may be problematic. Although the OLS estimators will still be unbiased and consistent, they will no longer be efficient, and the standard errors will not be correct. To deal with these issues, we use feasible generalized least squares (FGLS) procedures that effect the appropriate corrections (Wooldridge 2002).

## Results

### *IT Outsourcing and Non-IT Operating Costs*

The results shown in the Model 1 column of Table 4 suggest that IT outsourcing is negatively associated with non-IT operating costs. A one-unit increase in IT outsourcing as a percentage of revenue is associated with a 1.26-unit decrease in non-IT operating costs as a percentage of revenue. Because the mean revenue is \$9,614.36 million, a unit of IT outsourcing as a percentage of revenue is \$96.14 million ( $0.01 \times 9614.36$ ), and a 1.26-unit of non-IT operating costs as a percentage of revenue is \$121.14 million. Thus, our results indicate that on average, a \$96.14 million increase in IT outsourcing is associated with a \$121.14 million decrease in

non-IT operating costs. Our result is consistent with the substantial reduction in operating costs reported in Knittel and Stango (2007), who find that IT outsourcing reduced operating costs by approximately 30 percent in the U.S. credit union industry and saved over \$6 billion for the industry as a whole.

These high returns to IT outsourcing should be interpreted with care. First, IT outsourcing may be accompanied with substantial organizational changes and business process redesign in the client firm to facilitate outsourcing (Linder 2004). Because the costs associated with such complementary investments can be very high (e.g., Bresnahan et al. 2002), the true benefits from IT outsourcing would be smaller once these costs are taken into consideration. Furthermore, to the extent that these complementary investments reduce operating expenses and are correlated with IT outsourcing, the benefits from such investments are likely to be captured by the coefficient on IT outsourcing, thus somewhat inflating the impact of IT outsourcing. This may partially explain the large cost reduction associated with IT outsourcing. Finally, given the high risk associated with IT outsourcing, the high returns to IT outsourcing we report may include a substantial risk premium (Dewan et al. 2007). Once we take the risk premium into consideration, the benefits of IT outsourcing would be smaller.<sup>3</sup>

### *IT Outsourcing, Internal IT Investments, and Non-IT Operating Costs*

Before presenting our regression results, we first compare the non-IT operating costs based on the relative levels of IT outsourcing and internal IT investments. As shown in Table 5, on average, those firms that have above mean values for both IT outsourcing and internal IT investments incur lower non-IT operating costs, although the costs are slightly higher than those of firms with an above mean value of IT outsourcing and a below mean value of internal IT investment.

The results of estimating the interaction effects between IT outsourcing and internal IT investments are presented in the Model 2 column of Table 4. The coefficient on the interaction term between IT outsourcing and internal IT investment is negative and significant. This indicates that IT out-

<sup>3</sup>Another possible explanation of the high returns to IT outsourcing may be that this finding is more applicable to companies similar to the ones covered in "InformationWeek 500" surveys. While firms may sometimes try to replace their internal IT labor with IT outsourcing to reduce IT costs, many firms in our sample may strategically invest in both IT labor and IT outsourcing to create and capture greater value from their portfolio of IT investments. There is a need to test the generalizability of our findings in other settings.

**Table 4. Estimation Results Using FGLS (Dependent Variable: Non-IT Operating Costs)**

Variable	Model 1	Model 2	Model 3	Model 4
<i>IT outsourcing</i>	-1.26*** (.14)	-1.11*** (.11)	-1.28*** (.13)	-.65*** (.23)
<i>Internal IT investment</i>	-.73*** (.05)	-.72*** (.05)		
<i>IT outsourcing × Internal IT investment</i>		-.11*** (.03)		
<i>IT labor</i>			-.77*** (.94)	.68*** (.19)
<i>IT hardware</i>			-1.00*** (.18)	-.46* (.25)
<i>IT software</i>			-1.54*** (.18)	-3.38*** (.32)
<i>Other IT spending</i>			-.32* (.17)	1.29*** (.30)
<i>IT outsourcing × IT labor</i>				-.35*** (.12)
<i>IT outsourcing × IT hardware</i>				-.21 (.35)
<i>IT outsourcing × IT software</i>				.24 (.32)
<i>HHI</i>	-19.17*** (3.68)	-17.55*** (3.36)	-18.70*** (3.37)	-16.10*** (2.64)

**Note:** *N* = 900; Standard errors are in parentheses. Signif.: \*\*\**p* < 0.01, \*\**p* < 0.05, \**p* < 0.1. All variables except for HHI are measured as a percentage of revenue. Models include year and sector (NAICS 2-digit) dummies. All of the variables in the interaction terms have been centered.

**Table 5. Comparison of Non-IT Operating Costs Based on the Levels of IT Outsourcing and Internal IT Investments**

Non-IT Operating Costs		Internal IT Investments	
		High (Above mean)	Low (Below mean)
IT Outsourcing	High (Above mean)	12.09 (144)	11.76 (120)
	Low (Below mean)	16.47 (148)	14.24 (488)

**Note:** Non-IT operating costs as a percentage of revenue. Number of observations is in parentheses.

sourcing and internal IT investment are complements in reducing non-IT operating costs. Because both variables are continuous, the coefficient of the interaction term should be interpreted as the change in the slope of operating expenses on IT outsourcing, given a one-unit change in internal IT investments. The estimated coefficient of the interaction term is -0.11, which means that, on average, a one-unit increase in internal IT investments as a percentage of revenue is asso-

ciated with an additional 0.11-unit decrease in non-IT operating costs as a percentage of revenue.<sup>4</sup>

<sup>4</sup>In addition to these cost savings, IT investments can make significant contributions to other performance measures, including productivity (Brynjolfsson and Hitt 1996), customer satisfaction (Mithas et al. 2005), profitability (Mithas et al. 2012), and innovation (Kleis et al. 2012). Therefore, the total value created from an additional dollar of internal IT investment will be far greater than the cost savings we report here.

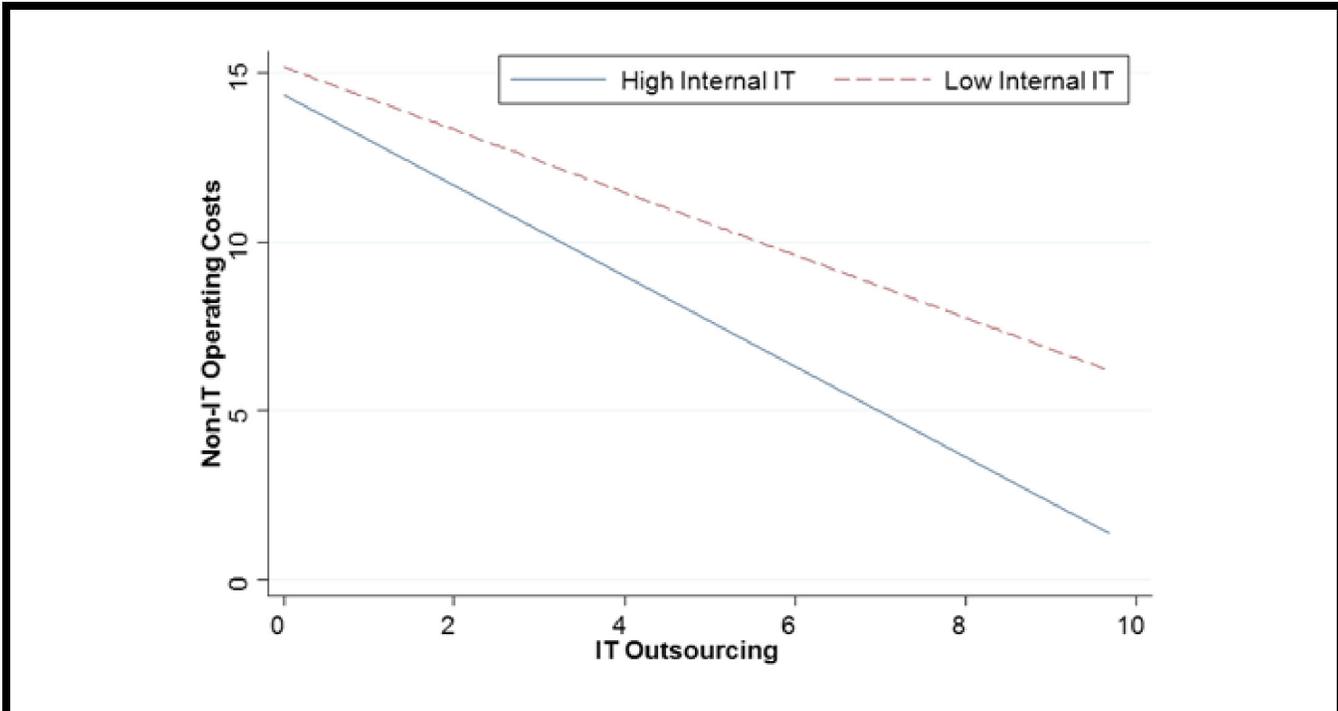


Figure 1. Complementarity Between IT Outsourcing and Internal IT Investments

To present the complementarity aspect more intuitively, we plot two regression lines (see Figure 1). The top (bottom) line in the figure shows the slope and intercept of regressing non-IT operating costs on IT outsourcing while fixing the internal IT investment at its mean minus (plus) one standard deviation. Consistent with our estimated coefficient on the interaction term, the regression line is steeper at the higher level of internal IT investment (-1.34 versus -0.93). Also, the intercept is smaller at the higher level of internal IT investment (14.34 versus 15.19). This indicates that greater IT investments are associated with lower non-IT operating costs at a given level of IT outsourcing.

### **IT Outsourcing, IT Labor and Non-IT Operating Costs**

We begin by comparing the non-IT operating costs based on the relative levels of IT outsourcing and IT labor investments. Table 6 shows that, on average, firms that have above mean values for both IT outsourcing and IT labor investments incur lower non-IT operating costs, although the costs are slightly higher than those firms whose IT outsourcing is greater than the mean level, but whose IT labor investments are lower than the mean level.

We first estimated the unconditional effects of IT outsourcing and each category of internal IT investment. As shown in the Model 3 column of Table 4, IT outsourcing, and all of the IT expenditure categories, including IT labor and IT software, have a negative and significant impact on non-IT operating costs. This suggests that not only the total internal IT investments, but also the investments in individual categories contribute to cost savings.

Next, we examine the interaction effects between IT outsourcing and each component of internal IT investment. As shown in the Model 4 column of Table 4, the interaction term between IT outsourcing and IT labor is negative and significant, whereas no significant interaction was found between IT outsourcing and IT hardware or between IT outsourcing and IT software. This finding suggests that the complementarity between IT outsourcing and internal IT investment mainly stems from IT labor, rather than from hardware or software. The coefficient estimate of -0.35 means that, at the mean value of IT outsourcing, a one-unit increase in spending on IT labor as a percentage of revenue is associated with an additional 0.35-unit decrease in non-IT operating costs as a percentage of revenue. Our result corroborates Hirschheim's (2009) observation:

**Table 6. Comparison of Non-IT Operating Costs Based on the Levels of IT Outsourcing and IT Labor Investments**

Non-IT Operating Costs		Investments in IT Labor	
		High (Above mean)	Low (Below mean)
IT Outsourcing	High (Above mean)	12.32 (129)	11.58 (135)
	Low (Below mean)	16.05 (150)	14.36 (486)

**Note:** Non-IT operating costs as a percentage of revenue. Number of observations is in parentheses.

Those who were successful were the ones who kept a number of IT staff internally who managed the arrangement and sought new IT opportunities. Those who turned all of IT over to outsourcing vendors typically failed (p. 134).

In Figure 2, we again plot two regression lines. The top (bottom) line in the figure shows the slope and intercept of regressing non-IT operating costs on IT outsourcing while fixing the IT labor spending at its mean minus (plus) one standard deviation. Consistent with our estimated interaction effect, the regression line is steeper at the higher level of IT labor spending (-1.40 versus -1.18). The intercept is smaller at the higher level of IT labor spending (22.77 versus 25.06). This indicates that higher IT labor spending is associated with lower non-IT operating costs at a given level of IT outsourcing.

**Robustness Checks**

To check the robustness of our results, we reestimated our models using the fixed effects specification, which accounts for unobserved heterogeneity by computing within-firm estimates of the coefficients. We estimated the fixed effects model, adjusting for the AR1 process using the *xtregar* procedure in STATA. As shown in Table 7, the overall results based on fixed effects are broadly similar to the FGLS results, with a few differences. One difference is that in Models 2 and 4, the unconditional effect of IT outsourcing is insignificant, due to large standard errors. Another difference is that IT hardware is insignificant in Models 3 and 4.

One potential issue associated with estimating the impact of IT outsourcing (and internal IT investments) on cost savings is that of endogeneity. In other words, if we find a significant association between IT outsourcing and cost savings, it may be the case that those firms that are good at saving costs tend to use more IT outsourcing, thereby making IT outsourcing

endogenous. We tested for endogeneity of IT outsourcing and internal IT investment variables. Using the one- and two-year lagged values (i.e.,  $ITOUT_{t-1}$ ,  $ITOUT_{t-2}$ ,  $ITIN_{t-1}$ , and  $ITIN_{t-2}$ ) as instruments, we checked for the endogeneity of IT outsourcing and internal IT investment variables, based on Hansen’s J and the C statistic tests for exogeneity (Baum et al. 2003).<sup>5</sup> We ran these tests for the two variables, both independently and jointly. All of the tests indicate that we cannot reject the null hypothesis that IT outsourcing and internal IT investments are exogenous. In addition, the results of instrumental variable estimation based on the two-stage least squares and two-step GMM procedures (Baum et al. 2003) are qualitatively similar to our FGLS and fixed effects results. Thus, we conclude that endogeneity is not a serious concern.

**Discussion**

**Key Findings**

Our goal in this research was to document the association between IT outsourcing and non-IT operating costs, while also considering the moderating effect of internal IT investments and internal IT labor. We find that spending on IT outsourcing is significantly associated with a reduction in non-IT operating costs for our sample firms. On average, a one-unit increase in IT outsourcing as a percentage of revenue was associated with a 1.26-unit decrease in non-IT operating costs as a percentage of revenue. Our results also suggest that firms making more intensive internal IT investments tend to benefit significantly more from IT outsourcing in terms of reduction in non-IT operating costs. By disaggregating the IT expenditures into several components, we find that firms

<sup>5</sup>Although the lagged values of independent variables are not perfect instruments, they are often used in the absence of better instruments (Kennedy 1994). Prior studies in the business value of IT literature have used the same approach (e.g., Brynjolfsson et al. 1994; Hitt and Brynjolfsson 1996).

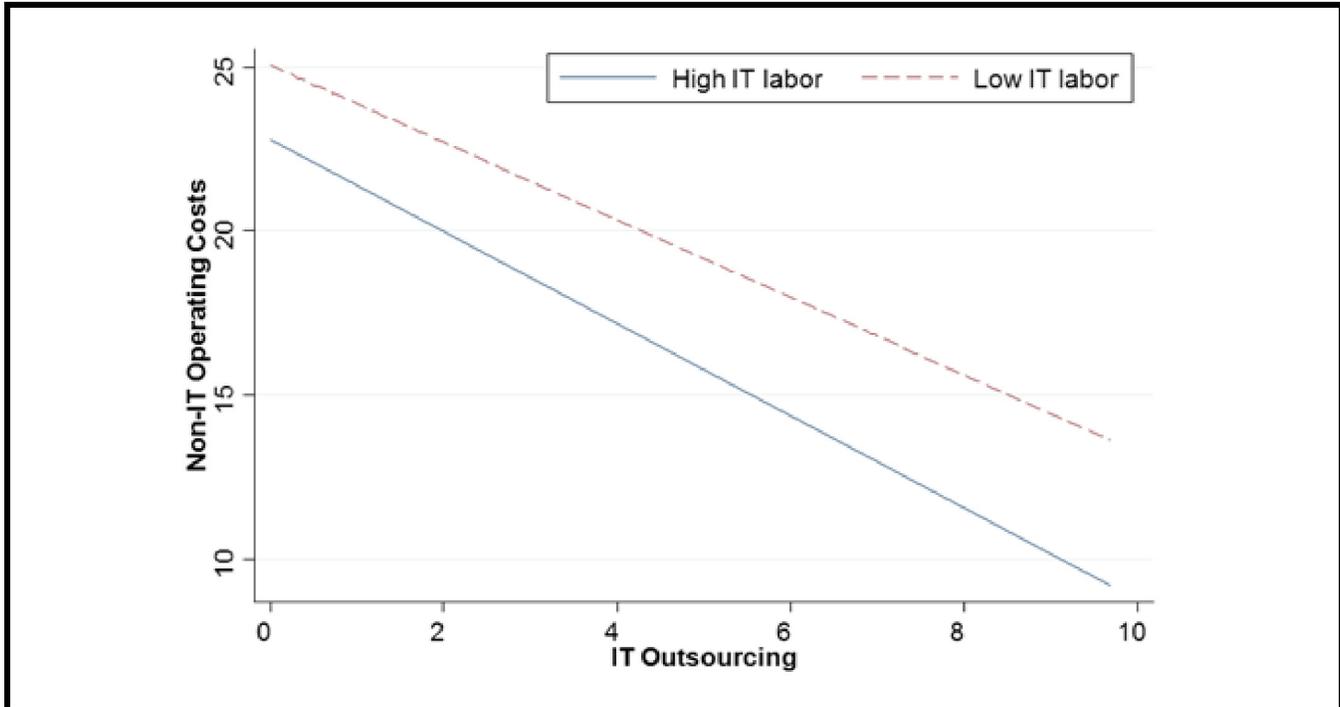


Figure 2. Complementarity Between IT Outsourcing and IT Labor

Table 7. Estimation Results Using Fixed Effects with AR1 Adjustment (Dependent Variable: Non-IT Operating Costs)

Variable	Model 1	Model 2	Model 3	Model 4
<i>IT outsourcing</i>	-1.54** (.66)	-.67 (.78)	-1.79*** (.67)	-1.15 (.80)
<i>Internal IT investment</i>	-.91*** (.20)	-.73*** (.21)		
<i>IT outsourcing × Internal IT investment</i>		-.20** (.10)		
<i>IT labor</i>			-.75* (.42)	-.31 (.46)
<i>IT hardware</i>			-.24 (.77)	-.19 (.79)
<i>IT software</i>			-2.87*** (.76)	-3.44*** (.90)
<i>Other IT spending</i>			-.44 (.60)	-.17 (.61)
<i>IT outsourcing × IT labor</i>				-.48* (.28)
<i>IT outsourcing × IT hardware</i>				-.21 (.64)
<i>IT outsourcing × IT software</i>				.53 (.46)
<i>HHI</i>	-14.96 (22.27)	-13.92 (22.16)	-17.86 (22.26)	-15.60 (22.12)
R-squared	0.14	0.17	0.18	0.20

Note: N = 619. Standard errors are in parentheses. Signif.: \*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.1. Models include year dummies. All of the variables in the interaction terms have been centered.

spending more on IT labor reap greater benefits from IT outsourcing in the form of reduction in non-IT operating costs; however, a complementary relationship was not found for spending on hardware and software.

### **Contributions and Implications**

This study makes important contributions. First, this is one of the first studies that provide empirical evidence for the association between IT outsourcing and non-IT operating costs, based on a large-scale dataset. Extant outsourcing studies that reported cost savings have focused on IT-related costs only, which are only a small part of operating costs, while non-IT costs account for a much greater portion of operating costs. Therefore, our paper broadens the scope of enquiry in the IT-outsourcing literature by validating the conjecture that IT outsourcing also reduces the non-IT component of operating costs, or “the costs of doing business.”<sup>6</sup> Our study also complements others that examine the outcomes of IT outsourcing by linking IT outsourcing with objective measures of value such as productivity (e.g., Chang and Gurbaxani 2012; Han, Kauffman and Nault 2011; Knittel and Stango 2007) or stock market returns (e.g., Agrawal et al. 2006; Gurbaxani and Jorion 2005). Our findings provide an explanation for why some studies report a favorable productivity impact and stock market reaction associated with IT outsourcing.

Second, our study provides new insights into the relationship between internal IT investments and IT outsourcing. Contrary to the conventional belief that IT outsourcing and internal IT investments are substitutes (based on the TCE-based “make-or-buy” logic), we find that IT outsourcing and internal IT investments are complements. This may be because firms can develop IT capabilities by investing heavily in internal IT (Bharadwaj 2000; El Sawy and Pavlou 2008; Mithas et al. 2011; Tafti et al. 2013), and these capabilities can, in turn, help them better manage outsourced IT projects and functions. In addition, IT capabilities can help firms better exploit and benefit from the IT-related knowledge spilled over from their vendors through outsourcing engagements (Chang and Gurbaxani 2012; Han, Chang and Hahn 2011). In this respect, our study makes a meaningful contribution to the IT capabilities literature. Prior studies have argued and found that IT capabilities help firms combine internal IT resources and utilize internal IT in ways that promote superior performance (Bharadwaj 2000). Our findings suggest that the role of IT capabilities may extend to outsourced IT, enabling

firms to better manage IT outsourcing, thereby increasing the value they can capture from IT outsourcing.

Finally, our finding that IT outsourcing and IT labor are complements provides new insights into the relationship between IT outsourcing and internal IT labor. To date, research on the relationship between IT outsourcing and IT labor has been scarce. A notable exception is Ang and Slaughter (1998), who compared the characteristics of outsourced IT workers and internal IT employees. Although several studies have examined the relationship between IT capital and non-IT capital inputs based on a production function framework, finding that IT capital and labor are substitutes (e.g., Chwelos et al. 2010; Dewan and Min 1997), they are silent about the relationship between IT outsourcing and IT labor. Our study makes a contribution by demonstrating that IT outsourcing and IT labor are complements—investing more in internal IT labor is associated with an increase in the benefits from IT outsourcing.

Our study also has some important managerial implications. First, our results can help managers gauge the impacts of IT outsourcing in terms of cost savings in non-IT related functions. In particular, the finding that IT outsourcing has a significant association with the non-IT portion of firms’ operating costs has an important implication: IT outsourcing, if done thoughtfully, can be an important lever to reduce overall costs. Our results provide an explanation for why many firms maintained or even increased their spending in IT outsourcing during the economic downturn after the global financial crisis in 2008 (Gartner 2009). In addition, while managers have mainly focused on the benefit of reducing IT costs when they consider IT outsourcing, our study calls for their attention to the impact of IT outsourcing on non-IT costs, which are much larger than IT costs. Firms should analyze the impact on non-IT costs and formulate strategies for maximizing the savings on non-IT costs in order to get the most out of their IT outsourcing spending. More broadly, to the extent that internal IT investments and IT outsourcing reduce non-IT costs, benchmarking with respect to competitors on IT budgets alone may be counterproductive because an overemphasis on reducing IT costs may deflect attention from potential opportunities for reducing costs in other areas such as R&D, marketing and sales, and other administrative costs where IT-enabled savings may significantly outweigh any increased spending on IT (Glazer 2012; Worthen 2012).

Second, our study findings can assist managers in formulating their IT strategies and allocating the IT budget. The complementarity between internal IT investments and IT outsourcing we find in this study highlights the importance of balancing internal IT investments and IT outsourcing. Firms need to make intensive investments in both internal IT and out-

<sup>6</sup>We thank an anonymous reviewer for suggesting this perspective.

sourcing in order to reap greater benefits in terms of cost savings; simply substituting IT outsourcing for internal IT investments will limit the value they can capture. Finally, IT outsourcing often involves transferring a large number of IT employees to the vendor, and our finding about the complementarity between internal IT labor and IT outsourcing suggests that firms should be judicious about this practice because internal IT staff can play a very important role in capturing greater value from IT outsourcing. Firms should continue to make investments in their IT human capital to get more out of increased IT outsourcing.<sup>7</sup>

### **Limitations and Suggestions for Further Research**

First, similar to other empirical studies based on secondary data, our study is associational, and we do not claim causality. Although we made reasonable efforts to address reverse causality and endogeneity by using lagged values of IT budget (including internal IT investment and IT outsourcing) as instrumental variables, as is commonly done, and by showing that the results based on instrumental variables (both two-stage least squares and GMM) are consistent with our FGLS- and OLS-based results, one can never prove causality in an observational study. There remains a need for further studies to establish causality (for a discussion of several approaches, see Gregor and Hovorka 2011; Mithas and Krishnan 2009). In a similar vein, our ability to uncover the exact mechanisms by which IT outsourcing influences non-IT operating costs is limited, due to the unavailability of such data as the types of IT services outsourced and the objectives of outsourcing. Hence, our results need to be interpreted as the *average effects* across different types of IT services outsourced and different objectives for outsourcing. Investigating whether and how such factors play a role in the way IT outsourcing impacts performance would be an exciting avenue for research. Of course, the challenge would be to collect such detailed information as firms are often not willing to disclose such details.

<sup>7</sup>Given that firms typically turn to IT outsourcing for cost savings, our recommendation that firms should make a *higher level of internal IT investment* (especially in IT labor) to receive greater benefits from IT outsourcing may sound counterintuitive. A firm can certainly reduce its *IT costs* by outsourcing the inefficient part of their IT operation. However, our results suggest that if the firm simply replaces its internal IT operation (especially IT staff) with IT outsourcing, the benefits in terms of reduction in *non-IT costs* would be limited. Given that on average, a firm's IT costs are about 3.2 percent of the revenue, while a firm's non-IT operating costs are 13.8 percent of the revenue in our sample, firms should make complementary internal IT investments. Although making complementary IT investments may reduce the savings on IT costs, it would result in greater benefits in the form of reduction in non-IT operating costs.

Second, the impact of outsourcing on firm performance may also depend on the firm's overall strategy (e.g., revenue growth versus cost reduction) and whether a firm chooses to emphasize revenue growth or cost reduction when it undertakes its IT investments. For example, Gilley and Rasheed (2000) find that firm-level strategy (e.g., differentiation or cost leadership) influences outsourcing performance. Similarly, in a more general context, Tallon et al. (2000) find that firms' goals for IT influence the payoffs from IT. Jacobides and Billinger (2006) argue that decisions about boundaries and vertical architecture can influence a firm's capabilities, which will, in turn, affect the benefits from outsourcing. A related question that remains unexamined is why firms outsource IT, even when there are IT capabilities in-house. Subsequent studies should examine what roles such firm-level or functional strategies and postures play in IT outsourcing in order to gain a more systemic understanding of IT outsourcing and its impact.

Finally, we observe that a majority of firms in our sample either increase or decrease IT outsourcing and IT labor spending together, which runs counter to the conventional substitution story of IT outsourcing and IT labor. Our result can be understood from the perspective of skill-biased technical change (SBTC), which refers to "technical progress that shifts demand toward more highly skilled workers relative to the less skilled" (Bresnahan et al. 2002, p. 340). In the SBTC literature, scholars have argued and found evidence that new information technologies are a complement to skilled labor, thereby contributing to the rise in the relative demand of skilled workers (Violante 2008). Our finding indicates that this complementarity may extend to the case of IT outsourcing. In other words, while IT outsourcing can replace low-skilled IT labor, it may increase the demand for high-skilled IT labor, which plays more strategic roles in managing IT outsourcing. Firms may have to hire more skilled IT professionals from outside, which may cost more, or they may have to pay more to the retained IT employees for taking on extra responsibilities in a leaner IT organization. When the increase in spending on high-skilled IT labor more than offsets the savings from reducing low-skilled IT labor, we would observe a net increase in overall IT labor spending. In labor economics, a number of studies have examined the impact of outsourcing (materials and services) on labor demand (see Crinò 2009). Most studies in this line of research have found that outsourcing of materials and services is associated with a decrease (increase) in the demand for unskilled (skilled) workers (e.g., Feenstra and Hanson 1996, 1999). Examining the relationship between IT outsourcing and IT labor with different skill levels will make meaningful contributions to the literature. To the extent that firms can

offshore IT (Rottman and Lacity 2006) and use IT labor across country boundaries (Oshri et al. 2007), understanding how IT professionals located across different countries influence firm performance is an interesting question in this context (Mithas and Han 2012; Tambe and Hitt 2012). Even within the United States, firms have a choice of using U.S. citizens or foreign-born IT professionals (see Mithas and Lucas 2010), and understanding how these workers substitute or complement each other in the production functions of firms remains to be explored. Further, it will be interesting to examine whether and how IT professionals' human capital (e.g., education, firm-specific and industry-specific experience) and various competencies (e.g., contract management, relationship management) affect IT outsourcing performance (Joseph et al. 2010; Slaughter et al. 2007).

To conclude, this study examined how IT outsourcing and internal IT investments influence non-IT operating costs. We found that IT outsourcing has a significant and negative association with firms' non-IT operating costs. Our results suggest that firms benefit more in terms of reduction in non-IT operating costs when they make complementary investments in internal IT, especially IT labor. This may be because investments in internal IT systems make business processes more amenable to outsourcing and complementary investments in internal IT staff can facilitate monitoring of vendor performance and coordination with vendors. Taken together, these findings suggest that firms should not focus narrowly on reducing their IT costs alone. Instead they should concentrate on reducing non-IT costs and overall costs by making appropriate allocations among internal IT investments, IT labor, and outsourced IT services.

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