Switching Costs and Information Technology: The Case of IT Outsourcing

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Abstract

While information technology (IT) has been playing an important role in the financial sector since the 1950s, a large panel of micro data from US credit unions for the years 1999 to 2009 reveals that with more than 98 percent, outsourcing has been by far the preferred mode of IT provision in the recent years. However, the average credit union only sticks with the same vendor for four years. The literature has identified complementary investment, network effects and compatibility issues to be crucial to a client's decision to switch the supplier of IT services. This paper extends the literature by investigating the existence and magnitude of switching costs when credit unions change their information processing vendor. Estimates suggest that switching costs account for three percent of annual expense.

Keywords: Outsourcing, ICT, IT, IS, switching costs, lock-in
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1 Introduction

Switching costs occur when changing the supplier means that investments specific to the current supplier have to be duplicated (Farrell and Klemperer, 2007, p. 1977). "As such, ex-ante homogeneous products become ex-post heterogeneous." (Kim et al., 2003, p. 25). The literature has studied switching costs from a broad theoretical perspective (see the surveys by Farrell and Klemperer (2007) and Chen and Hitt (2006) for the particular case of IT). Empirical studies provide evidence on switching costs in IT markets (Greenstein, 1993; Knittel, 1997; Chen and Hitt, 2002; Whitten and Wakefield, 2006; Krafft and Salies, 2008; Maicas et al., 2009), however the literature has not provided a direct estimate of switching costs so far. For the specific case of IT Outsourcing, empirical evidence on client-side innovation in Germany suggests that IT Outsourcing lowers the probability to introduce new products and services (Peukert, 2010). When this can be interpreted as a lack of quality in the supplied IT services, then switching costs that enable the vendor to exploit locked-in costumers are a possible explanation (Larkin, 2007; Farrell and Klemperer, 2007, p. 1983).

Put together this paper aims at two issues: Is there evidence for switching costs in IT Outsourcing, and if, what is their magnitude?

The paper is structured as follows: Section 2 briefly introduces credit unions and their role in the US financial system. The data is discussed in section 3 followed by the derivation of the empirical model in section 4. Results are presented in section 5, section 6 concludes.

2 Background discussion

Credit unions are non-profit member-owned financial cooperatives. Membership is based on a community, organizational, religious or employee affiliation (Branch and Grace, 2008). In 2008 US credit unions (CUs) had nearly 90 million members which accounts for roughly 44 percent of the economically active population. Approximately 8,000 CUs held some $692 billion in deposits which accounts for about 10 percent of total deposits in the US.[1]

IT has been playing an important role in the financial sector since the 1950s with applications such as check handling, bookkeeping, credit analysis, automated teller machine (ATM) and e-banking (Franke, 1987). In order to capitalize on economies of scale and gain access to technology and expertise, organizations do not operate own data centers but choose to resort to external suppliers of IT services (Loh and Venkatraman, 1992). CUs rely particularly on IT Outsourcing for essential technology services like processing of deposit and loan data, costumer information files, and general ledger processing (Robbins and Van Walleghem, 2004). Case study research in the US, Europe and Australia has shown that the majority of IT Outsourcing contracts has a duration of less than eight years (Lacity and Willcocks, 2001, p. 150). Hence organizations are regularly confronted with the decision to renew an existing contract or evaluate the market and switch vendors. However, the literature has shown that switching is associated with costs. Based on Klemperer's (1995) categorization of switching costs, Chen and Hitt (2006) point to the specifics of IT. Issues such as complementary investments (e.g. employees training), network effects and compatibility may specifically lead to switching costs in the case of IT Outsourcing. Empirical studies provide evidence that compatibility between the client's installed base and the new system

[1] Figures are calculated using data from World Council of Credit Unions (WCCU) and Federal Deposit Insurance Corporation (FDIC).

influences the vendor choice and having bought from one supplier increases the likelihood to buy from the same supplier again (Greenstein, 1993; Shapiro and Varian, 1999; Chen and Hitt, 2002).

3 Data

A panel on US CUs collected by and publicly available from National Credit Union Administration (NCUA) is used for the empirical analysis.[2] CUs are obligated to file quarterly Call Reports spanning a wide range of variables. Beside financial issues the data also provide information on the organization of information processing and the information processing vendor. The data has been used by other authors studying IT Outsourcing (Borzekowski and Cohen, 2005; Knittel and Stango, 2008; Weigelt and Sarkar, 2009), however this is the first paper to examine the effects of switching vendors.

Figure 1: Number of CUs

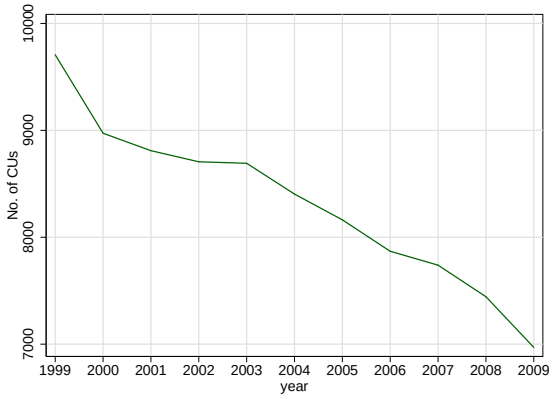
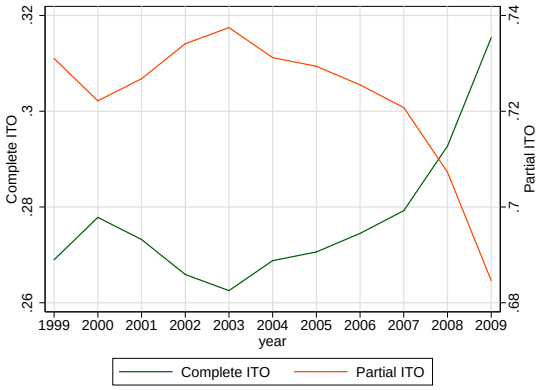


Figure 2: IT Outsourcing



Source: NCUA, own illustration.

The sample tracks 10439 CUs and 207 vendors in the period from December 1999 to December 2009 in a yearly frequency. Due to panel attrition the total number of observations is 71,994. Figure 1 shows that the number of CUs decreased by nearly 30 percent during the observed period.

[2]See Table 4 in the appendix for a population-sample comparison based on data provided by Credit Union National Association (CUNA).

3.1 IT Outsourcing

The literature on IT Outsourcing finds that outsourcing is no "simple dichotomous decision" (Grover et al., 1996, p. 95) and thus suggests to distinguish between different types of sourcing decisions. Lacity et al. (2009) distinguish between complete ('total') and partial ('selective') IT Outsourcing. In the data CUs can indicate their IT system as either (1) manual (no automation), (2) vendor supplied in-house system, (3) vendor on-line service bureau, (4) CU developed in-house system, or (5) other. At this I treat (2) as partial outsourcing and (3) as complete outsourcing and include only those CUs indicating (2) or (3) in the sample. Note that this accounts on average for more than 98 percent of the initial observations which illustrates that IT Outsourcing is very common in the CU industry. Figure 2 shows that while partial IT Outsourcing is done by more than two thirds of the CUs in the sample there is a negative time trend. Accordingly, roughly one third has sourced out completely with a positive time trend. Table 1 shows that the average CU sticks to the same vendor for four years.

Table 1: Vendor tenure

	mean	sd	min	p25	p50	p75	max
tenurem	4.223352	3.038692	0	2	4	7	10

Source: NCUA, own calculations.

3.2 Vendors

The data provide the name of the primary information processing vendor. The variable has been corrected for misspellings or abbreviations by manual inspection, consulting the internet and using the built-in *SOUNDEX* function of *STATA 11* (Knuth et al., 1977; StataCorp., 2009). Moreover, during the observed period the vendor market has been subject to mergers and acquisitions (M&A) (see Table 8).

Figure 3: Vendor switching (1)

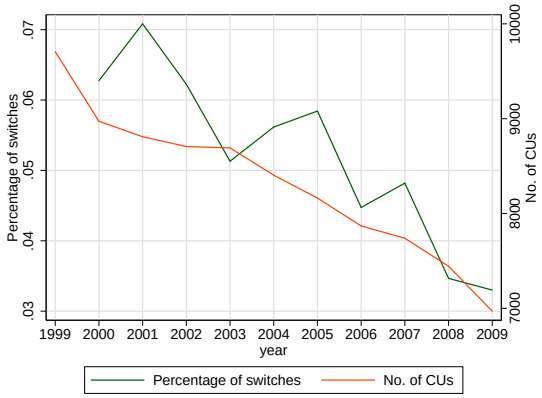
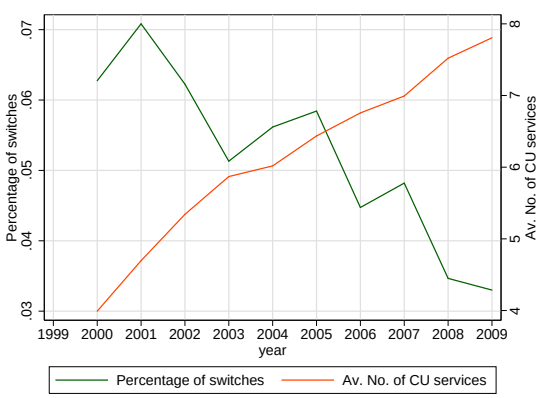


Figure 4: Vendor switching (2)



Source: NCUA, own illustration.

Considering M&A and aggregating subsidiaries I observe a total of 180 vendors in the sample (see Table 7). In most cases CUs continued to report the acquired vendor for a period of one or two years after the acquisition. However I treat a CU as client of the acquirer with the year of acquisition.

Moreover I treat the acquisition as irrelevant to the client as I assume that service quality is not affected by the change in ownership.[3] Therefore vendor switches due to acquisitions are not considered as a switch.[4]

Figure 3 indicates that the number of switches fell over time. Inspection of the plot for the number of CUs suggests however that this trend might be more due to a decrease of market size than due to systematically less switching. Nevertheless, Figure 4 indicates that while switching became more rare, the average number of services offered by a CU rose by roughly 60 percent.[5] A rising number of services might imply growing importance of complementary investments, network effects and compatibility and therefore an increase of switching costs.

[3] In some cases the acquired vendor continued to operate under its old name. This further strengthens the argument that the acquisition is irrelevant to the client.

[4] Figure 11 in the appendix shows the percentage of switches and the number of vendors when switches due to acquisitions are not considered as a switch. The percentage of switches is much higher compared to the plots when acquisitions are considered as switches. Moreover, the peak in 2004 might be explained by Fiserv Inc.'s $320 million acquisition of EDS' Consumer Network Services in late 2002 (Muckian, 2002).

[5] See Table 6 in the appendix for a description of CU services. Note that the data include variables on services starting from 2000.

Figure 5: Vendor switching (3)

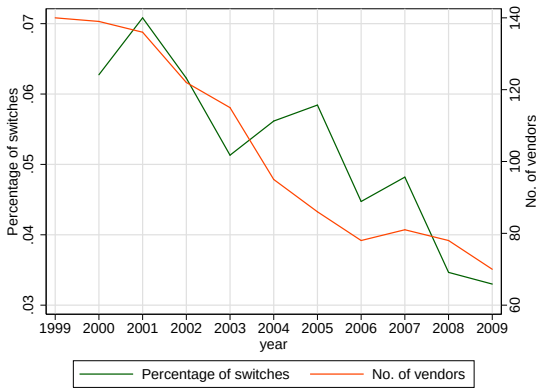


Figure 6: Vendor switching (4)

Source: NCUA, own illustration.

Moreover, Figure 5 shows that also the number of vendors decreased over time. This additionally suggests that a decrease of market size (however on the supply side) may explain the decrease in switching. The plot of the Herfindahl index indicating a decline in competitiveness in the vendor market in Figure 6 further strengthens this argument. It seems that less switching is accompanied by less competition in the vendor market.

3.3 Expenses

Figure 7: Expenses

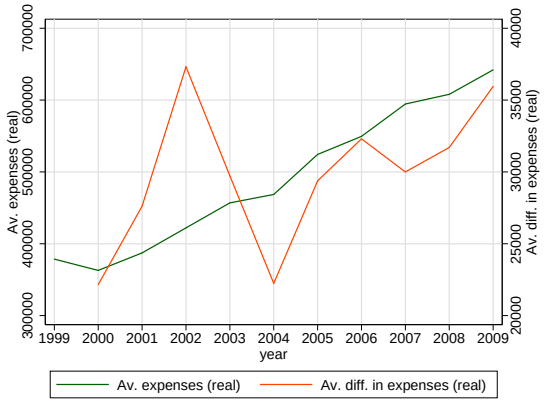
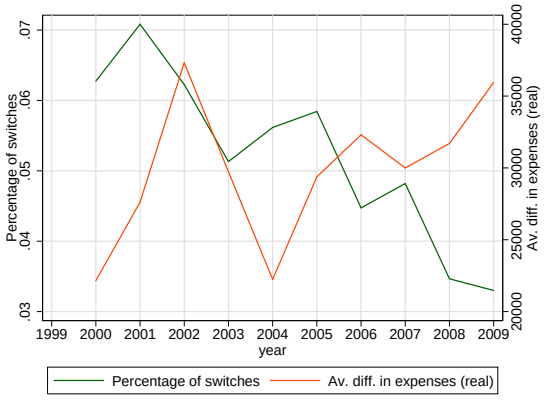


Figure 8: Vendor switching (5)



Source: NCUA, own illustration.

Different types of expenses relevant for the empirical analysis are observed in the data. Expenses for office operations include in-house IT cost beside expenses

for communications, stationery and supplies, liability insurance, bond insurance, furniture and equipment rental and/or maintenance and depreciation, and bank charges. Partial IT Outsourcing, defined as a vendor supplied in-house system, would hence be included in this variable.

Expenses for professional and outside services include outside IT servicing beside legal fees, audit fees, accounting services, and consulting fees. Expense for complete IT Outsourcing, defined as vendor on-line service bureau, is to be found in this variable.

Both are given in dollars units and have been inflation-adjusted using Producer Price Index (PPI) data provided by the US Bureau of Labor Statistics (BLS).[6] In the empirical analysis, I use the sum of office operations expense and professional and outside service expense. Data inspection reveals extreme outliers on both ends, therefore the 1st and 99th percentile are dropped. Figure 7 shows an increase in average expenses over time. Plotting the first difference however reveals fluctuations in the growth rate. Figure 8 indicates that switching occurs more frequently when the first difference in real expenses is relatively low. This suggests that CUs switch vendors when the new vendor offers a lower price than the old vendor.

4 Empirical analysis

4.1 Model derivation

I modify the approach of Elzinga and Mills (1998) to derive the empirical model. Assume an oligopolistic vendor market with two vendors k, j. In period t, CU i contracts vendor k at a price P_{ik}. In period $t+1$ CU i can either continue to contract vendor k or switch to vendor j. Let V_i^* denote the value to CU i in period $t+1$,

[6] PPI data for the sector *Professional and Technical Services* was used.

such that

$$V_i^* = \Delta P_i - s_i \tag{1}$$

where $\Delta P_i = P_{i,t+1} - P_{i,t}$ is the real difference between vendor j's and vendor k's price, and s_i is CU i's switching cost.[7] V_i^* is positive (negative) if the price vendor j offers is less (more) than vendor k's price, adjusting for switching cost. Because s_i is not observable, assume that switching costs are a linear function of observable CU characteristics, such that

$$s_i = \beta_0 + \beta x_i + e_i \tag{2}$$

where x_i is a vector of CU characteristics, β_0, β are coefficient vectors and e_i is an error term. The price a vendor offers is not observed, however, information on expenses C_i is available. Thus, I consider they are a linear function of IT Outsourcing vendor fees and other expenses, such that

$$\Delta C_i = \Delta P_i + \Delta O_i \tag{3}$$

where ΔO_i is itself a linear function of observable characteristics. Hence, it may be given by

$$\Delta O_i = \gamma_0 + \gamma o_i + u_i \tag{4}$$

where γ_0, γ are coefficient vectors, o_i is a vector of characteristics leading to other expenses and u_i is an error term. Rewriting (1) and substituting (3) for (4) and (2)

[7] Note that s_i occurs regardless of whether CU i switches or not. For the case that CU does not switch vendors, think of switching cost as the cost of being locked-in.

gives

$$\Delta C_i = V_i^* + \beta_0 + \beta x_i + e_i + \gamma_0 + \gamma o_i + u_i \tag{5}$$

which leads to the estimation equation

$$\Delta C_i = \alpha + \theta V_i^* + \beta x_i + \gamma o_i + \epsilon_i \tag{6}$$

when setting $\alpha = \beta_0 + \gamma_0$, $\epsilon_i = e_i + u_i$.

V_i^* is not directly observed, however the decision to switch vendors is obtained according to the rule

$$V_i = \begin{cases} 1, & \text{if } V_i^* > 0 \\ 0, & \text{otherwise.} \end{cases} \tag{7}$$

The interpretation is that CUs only switch vendors when they expect to benefit from the switch. Rewriting (6) gives a system of equations that can be estimated using the treatment effects model (Heckman, 1978; Maddala, 1983, p. 120–122), with

$$\Delta C_i = \alpha + \theta V_i + \beta x_i + \gamma o_i + \epsilon_i \tag{8}$$

$$V_i = a + dw_i + v_i \tag{9}$$

where ϵ and v are bivariate normal with mean zero and covariance matrix $\left(\begin{smallmatrix} \sigma & \rho \\ \rho & 1 \end{smallmatrix}\right)$, w_i is vector of exogenous covariates including x_i and z_i, where z_i is a vector of identifying variables. At this, the difference in expected inter-period savings between switchers and non-switchers is

$$E(C_i|V_i = 1) - E(C_i|V_i = 0) = \theta + \lambda \frac{\phi(dw_i)}{\Phi(dw_i)\{1 - \Phi(dw_i)\}} \tag{10}$$

where $\lambda = \rho\sigma$, ϕ is the standard normal density and Φ is the standard normal cumulative distribution function. Testing $\rho = 0$ hence allows to study if directly substituting V_i^* for V_i in (6) and estimating via OLS yields biased estimates (Greene, 2003, p. 788).

4.2 The size of switching costs

In order to calculate the size of switching costs, recall (2) and rewrite (8) as

$$s_i = \Delta C_i - (\alpha - \beta_0) - \theta V_i - \gamma o_i - (\epsilon_i - u_i) \tag{11}$$

in order to estimate the size of switching costs. Because β_0 can not be observed, an estimate of switching cost can not be calculated directly. However, if we assume $\gamma_0 = 0$, then $\alpha = \beta_0$ and $\hat{s_i}$ can be calculated as

$$\hat{s_i} = \widehat{\Delta C_i} - \hat{\theta} V_i - \hat{\gamma} o_i \tag{12}$$

conditional on the assumption $\gamma_0 = 0$.

4.3 Empirical specification

Equations (8) and (9) are estimated using the maximum likelihood estimator of *STATA 11*'s *TREATREG* command. The first difference of the sum of expenses for office operations, and professional and outside services is the dependent variable. The vector x_i includes the following control variables:

Number of employees: The size of a CU might influence the size of switching costs as the complexity of IT systems may rise with size. Size is measured by the number of employees were part-time employees are considered with a full-time equivalent of 0.5. I include dummies indicating the four size classes of below the 25th percentile, between the 25th percentile and the median, between the median

and the 75th percentile and above the 75th percentile. The first is the omitted category.

Vendor tenure: The number of years a CU is customer to a vendor may be correlated to the amount of asset specific investments which may lead to switching costs.

Vendor marketshare: To control for vendor market power, the vendor's marketshare – calculated as the ratio of number of clients to total number of CUs – is included.

Vendor marketshare in area: Because "credit unions are much more likely to exhibit geographic clustering in their outsourcing decisions than are commercial banks" (Borzekowski and Cohen, 2005, p. 7), the vendor's market share in the CU's standard metropolitan statistical area (SMSA) is included.

Herfindahl index: The intensity of competition in the vendor market may have an effect on the size of switching costs. Therefore a dummy variable coded one for the years after 2002, where the Herfindahl index has high values, zero before 2003 is included (see Figure 6).

Complete IT Outsourcing: To control for network and compatibility effects a dummy indicating the scale of outsourcing is included.[8]

CU services: The type of services a CU offers to its customers might influence the size of switching costs. Hence I include dummies for each service shown in Table 6 in the appendix.

The vector o_i includes dummy variables to control for sources of other expenses in the dependent variable:[9]

Type of audit: I argue that the type of audit the CU i has had in the previous

[8]Partial IT Outsourcing is the omitted category.

[9]Recall that these are communications, stationery and supplies, liability insurance, bond insurance, furniture and equipment rental and/or maintenance and depreciation, bank charges, legal fees, audit fees, accounting services, and consulting fees.

period[10] may be suitable to control for the effect of audit fees and accounting services on expenses.[11]

Other fixed assets: The amount of other fixed assets[12] may be correlated with expense for stationery, and furniture and equipment rental/maintenance/deprecitation.

Additional insurance: To control for expense for insurance, I include a dummy variable set to one if the CU maintains share/deposit insurance coverage in addition to the government backed insurance fund.

Percentage switching: The vector z_i includes the number of switches from a vendor relative to the total number of CUs. In other words and from the perspective of CU *i*, this variable is the percentage of CUs that also switched to the same new vendor in the same year CU *i* switched. This variable may indicate the quality of the new vendor.

Four specifications are estimated: (1) only CU specifics, (2) year dummies, (3) vendor dummies, and (4) year and vendor dummies.

[10] These are (1) Supervisory Committee , (2) CPA w/o Opinion , (3) CPA with Opinion , (4) League Audit and (5) Outside Accountant before 2002, and (6) Financial statement audit performed by state licensed persons, (7) Balance sheet audit performed by state licensed persons, (8) Examinations of internal controls over call reporting performed by state licensed persons, (9) Supervisory Committee audit performed by state licensed persons, (10) Supervisory Committee audit performed by other external auditors, (11) Supervisory Committee audit performed by the supervisory committee or designated staff after 2002 (due to Sarbanes-Oxley Act of 2002). The dummy *Audit group 1* is one if (2), (3) or (6)–(9), *Audit group 2* is one if (4), (5) or (10), *Audit group 3* is one if (1) or (11). *Audit group 3* is the omitted category.

[11] Note that it is unlawful for audit firms to provide audit services and non-audit services (including bookkeeping and consulting services) to the same customer at the same time since 2002 (Sarbanes-Oxley Act of 2002, Sec. 201). However I consider audit fees and accounting fees to be correlated: When accounting is more complex (and therefore costly), auditing should also be more complex (and therefore costly).

[12] I include dummies indicating size classes of below the 25th percentile, between the 25th percentile and the median, between the median and the 75th percentile and above the 75th percentile. The first is the omitted category.

5 Results

Estimation results for the four model specifications are given in Table 2.[13] The estimated coefficient of vendor switch is only significant if it is controlled for time and vendor-specific effects. In model (4), the coefficient is positively significant. This has two implications: First, switching vendors is costly. Second, switching vendors seems to be associated with lower inter-period savings in expenses. Complete IT Outsourcing has a significantly negative sign in all specifications; processing data at a vendor's on-line service bureau has a positive effect on inter-period savings. The significance and positive sign of the coefficient of the fourth size class implies that big CUs seem to have lower inter-period savings. The significantly positive coefficient of vendor tenure – except for model (2) – suggests that the first difference in expenses is higher the longer a CU sticks with a vendor. This may support the bargain-then-ripoffs-hypothesis (Farrell and Klemperer, 2007, p. 1981 sq.). Results for the vendor's marketshare are interesting. The marketshare in the overall market seems to negatively affect the difference in expenses (significant only when it is controlled for year and vendor-specific effects). However, when the marketshare in a geographical area is considered, the sign is reversed. This is consistent with the argument of geographical clustering in Borzekowski and Cohen (2005). High values of the Herfindahl index have a significantly negative effect on the difference of expenses only when it is not controlled for year effects. Hence a decrease in overall competitiveness of the vendor market seems to be associated with higher inter-period savings. This result is counter-intuitive in the light of the theoretical literature (Klemperer, 1987). Variables included to control for expenses not related to IT Outsourcing are significant in all models. Coefficients of CU service dummies, time dummies and vendor dummies are not

[13] In the maximum likelihood procedure, ρ and σ are not directly estimated. Therefore $atanh\ \rho = \frac{1}{2} ln(\frac{1+\rho}{1-\rho})$ and $ln\ \sigma$ are additionally given in Table 2. Results for an OLS benchmark can be found in the appendix.

reported. Comparison of Akaike's information criterion (AIC) reveals that model (4) is the preferred specification.

Inspection of the second part of Table 2 sheds some additional light on the determinants of vendor switching. Complete IT Outsourcing seems to increase the probability to switch (significant in all models). Client size seems to be influential only when it is controlled for time effects. For big CUs the probability to switch seems to increase with the number of employees. The coefficient of vendor tenure is negative and highly significant in all specifications. Hence the likelihood to switch seems to decrease with the number of years a CU sticks with a vendor. Same applies for the vendor's marketshare in a geographical area. The marketshare in the overall market however seems to have a negative effect on switching when it is not controlled for time and vendor-specific effects. In models (2)-(4) however, the coefficient is significantly positive. Results for high values of the Herfindahl index are interesting. Highly significant in all specifications, the sign of the coefficient is positive when it is not controlled for time effects, and negative otherwise. Hence, a less competitive vendor market lowers the probability to switch when year effects are included. The percentage of CUs having switched to a vendor positively affects the probability of an individual switch. Again, this implies some sort of clustering in the choice of vendors.

Figure 9: Estimated switching costs

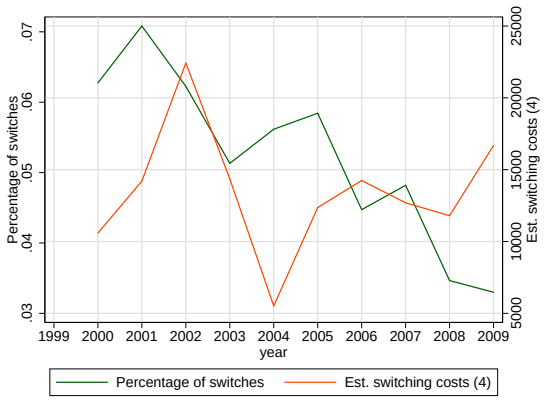
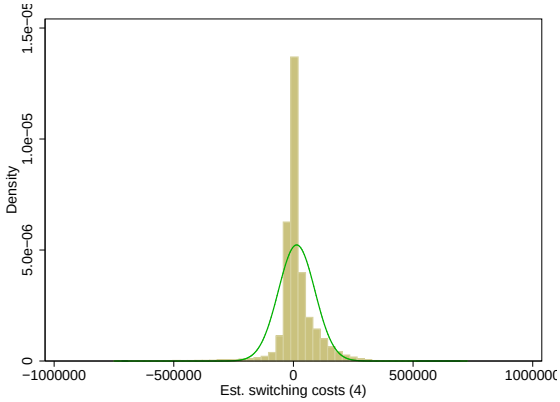


Figure 10: Histogram: switching costs



Note: Graphics refer to model (4) presented in Table 2.
Source: NCUA, BLS, own illustration.

Figure 9 depicts the estimated switching costs calculated according to equation (12) using estimates from model (4) and the percentage of switches. It illustrates that average switching costs are low when the percentage of CUs switching is low and high when relatively few switches occur, respectively.

Table 3 shows descriptive statistics for the estimated switching costs. The mean of $\hat{s_i}$ is 13,491 with a standard deviation of 76,264 and the median at 2178. This corresponds to nearly three percent of the average annual expense for office operations and professional and outside services (482,451). The histogram in Figure 10 illustrates the estimates.

Table 2: Estimation results

	(1)		(2)		(3)		(4)	
First difference in expenses								
Vendor switch	1198.9	(0.47)	2958.0	(1.11)	4803.2	(1.31)	8133.6**	(2.06)
Complete ITO	-5631.7***	(-9.03)	-5638.5***	(-9.04)	-7528.1***	(-10.26)	-7574.0***	(-10.33)
Size 2	977.7	(0.47)	1006.8	(0.49)	1144.1	(0.55)	1143.7	(0.55)
Size 3	2941.0	(0.81)	2993.4	(0.83)	3485.6	(0.96)	3564.8	(0.99)
Size 4	35831.0***	(34.63)	35899.8***	(34.68)	34078.4***	(32.67)	34112.5***	(32.68)
Vendor tenure	1468.1***	(6.33)	757.1	(1.27)	1505.8***	(5.93)	1322.3*	(1.83)
Vendor marketshare	-1411.5	(-0.54)	-462.9	(-0.18)	-21076.5***	(-2.92)	-20676.5***	(-2.84)
Vendor marketshare in area	6259.8***	(3.73)	6483.3***	(3.87)	6017.3***	(3.45)	6191.6***	(3.56)
Herfindahl index	-522602.4***	(-12.48)	-306616.1	(-0.92)	-506549.3***	(-11.12)	-136568.5	(-0.39)
Audit group 1	2171.7**	(2.41)	2142.9**	(2.38)	2758.1***	(3.03)	2720.0***	(2.99)
Audit group 2	670.3	(0.74)	506.8	(0.56)	1491.2	(1.62)	1312.4	(1.42)
Additional insurance	15975.2***	(13.35)	16005.0***	(13.37)	14972.2***	(12.36)	15008.0***	(12.40)
Other fixed assets 2	1085.3	(1.30)	1041.1	(1.25)	1588.5*	(1.85)	1567.5*	(1.83)
Other fixed assets 3	832.7	(0.83)	786.0	(0.78)	2360.0**	(2.26)	2357.3**	(2.26)
Other fixed assets 4	33906.9***	(25.05)	33836.2***	(24.99)	34838.3***	(25.06)	34817.2***	(25.04)
Constant	58576.3***	(12.99)	33881.6	(0.89)	54025.4**	(2.23)	10638.8	(0.23)
Vendor switch								
Complete ITO	0.136***	(6.45)	0.165***	(6.91)	0.211***	(7.94)	0.235***	(7.81)
Size 2	-0.00805	(-0.11)	0.0836	(1.05)	-0.0206	(-0.28)	0.0456	(0.56)
Size 3	-0.200	(-1.41)	-0.121	(-0.78)	-0.182	(-1.27)	-0.0667	(-0.42)
Size 4	0.0408	(1.40)	0.155***	(4.74)	0.0207	(0.68)	0.125***	(3.63)
Vendor tenure	-0.426***	(-49.32)	-0.983***	(-77.76)	-0.444***	(-50.16)	-1.006***	(-77.39)
Vendor marketshare	-0.322***	(-3.21)	0.264**	(2.27)	0.798***	(2.91)	2.393***	(6.88)
Vendor marketshare in area	-0.564***	(-8.92)	-0.547***	(-7.60)	-0.601***	(-9.04)	-0.588***	(-7.73)
Herfindahl index	61.31***	(41.69)	-250.1***	(-23.76)	61.14***	(40.00)	-254.0***	(-23.40)
Perc. switching	3.999***	(46.69)	3.867***	(41.93)	4.123***	(34.00)	4.356***	(32.95)
Constant	-7.904***	(-48.34)	27.55***	(23.16)	-8.293***	(-13.14)	27.25***	(18.58)
athrho								
Constant	0.0555***	(3.04)	0.0410**	(2.02)	0.0304	(1.12)	0.00195	(0.06)
lnsigma								
Constant	11.18***	(4233.11)	11.18***	(4237.56)	11.17***	(4234.73)	11.17***	(4239.31)
Year dummies	No		Yes		No		Yes	
Vendor dummies	No		No		Yes		Yes	
Service dummies	Yes		Yes		Yes		Yes	
AIC	1835710.1		1831166.4		1835486.3		1830998.5	
BIC	1836389.8		1831993.0		1839196.7		1834855.9	
Log likelihood	-917781.1		-915493.2		-917339.1		-915079.3	
χ^2	22397.4		22496.2		23043.6		23142.1	
p-value $\rho = 0$	0.00773		0.0640		0.262		0.951	
ρ	0.0554		0.0410		0.0304		0.00195	
σ	71459.5		71419.8		71207.7		71172.0	
λ	3959.6		2925.5		2163.8		138.8	
Observations	71984		71984		71984		71984	

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source: NCUA, BLS, own calculations.

Table 3: Size of switching cost

	mean	sd	min	p25	p50	p75	max
shat24	13490.91	76269.1	-750703.9	-12723.81	2178.223	30157.51	727923.1

Source: NCUA, BLS, own calculations.

6 Conclusions

While IT has been playing an important role in the financial sector since the 1950s, outsourcing has been by far the preferred mode of IT provision in the recent years. The literature has identified complementary investment, network effects and compatibility issues to be crucial to a client's decision to switch the supplier of IT services. Using a large panel of micro data from US CUs, the paper aims at two questions: Is there evidence for switching costs in IT Outsourcing, and if, what is their magnitude?

Estimation results drawn from a treatment effects model suggest that switching vendors has a significantly positive effect on the difference of expenses for professional and outside services in two consecutive periods when it is controlled for time and vendor-specific effects. Hence switching is costly. On average, per-period switching costs are about 13,500 dollars for a CU. This accounts for nearly three percent of the average annual expense for office operations and professional and outside services. Put differently, a vendor makes an average annual revenue of 13,500 dollars per customer due to client lock-in. Multiplied by the average number of customers (1063), the annual lock-in-revenue is roughly 14.3 million dollars.

Given that CUs serve about 44 percent of the economically active population and hold about 10 percent of all deposits in the US, these findings have significant policy implications. However, results are limited by an indirect measure of outsourcing fees.

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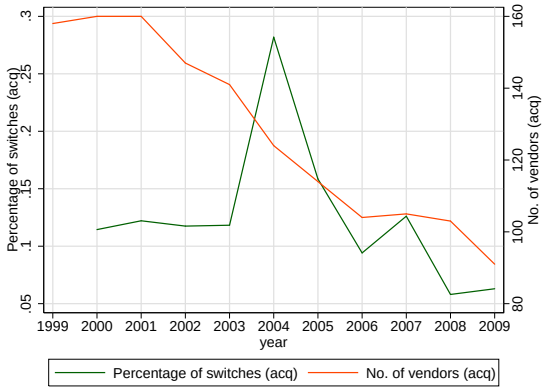
A Appendix

Table 4: Population-Sample-Comparison

Year	Pop	Sample	%
1999	11,016	9,718	88.22
2000	10,684	9,419	88.16
2001	10,355	9,232	89.16
2002	10,041	9,238	92.00
2003	9,710	9,012	92.81
2004	9,346	8,715	93.25
2005	9,011	8,444	93.71
2006	8,662	8,243	95.16
2007	8,396	7,997	95.25
2008	7,966	7,736	97.11
2009	NA	7,283	NA

Note: The number of CUs is given.
Source: NCUA, CUNA, own calculations.

Figure 11: Vendor switching (acq)



Source: NCUA, own illustration.

Table 5: Top 3 switches

Year	From	To	Number
2000	CompuSource	AFTECH	13
	EDS	AFTECH	12
	Fedcomp	AFTECH	9
2001	EDS	AFTECH	12
	AFTECH	CompuSource	9
	Computer Consultants	CMC	9
2002	EDS	Symitar	7
	AMI	Fedcomp	7
	Credit Union Online	Computer Consultants	7
2003	Western NY Computing	Connecticut Online	12
	AFTECH	Symitar	5
	Fedcomp	FITECH	5
2004	Fedcomp	Financial Data Corp	10
	AFTECH	Symitar	8
	Computer Consultants	Fedcomp	6
2005	Financial Software Group	Fedcomp	10
	Computer Consultants	Fedcomp	10
	CU Source	Harland	7
2006	Fedcomp	Fidelity	12
	Real Time Data Management	CU Nation	8
	CU Source	Harland	7
2007	Fidelity	Fedcomp	19
	One's Technology	Harland	11
	Hawaii Impulse Systems	EPL	11
2008	Open Solutions	Harland (Symitar)	9
	Fidelity	Fedcomp	9
	Open Solutions	CU Answers	6
2009	Open Solutions	Harland (Symitar)	11
	CU Nation	Real Time Data Management	5
	Open Solutions	Share One	4

Source: NCUA, own calculations.

Table 6: CU services

Service	Description
Account Aggregation	Service to present account information from may websites in a consolidated format
Account Balance Inquiry	
Bill Payment	Service to pay bills issued by third parties
Download account History	
Electronic Cash	Service to transfer monetary values that can be stored on a variety of media, including a PC, plastic card, or other device that has a computer chip or magnetic strip
Electronic Signature	Service to verify, and certify related electronic signature
E-Statements	Service where members can choose to receive their periodic statements electronically rather than receiving a paper statement in the mail.
Internet Access Services	Service to provide members with access to the internet
Loan Payments	
MA: ATM	Member access via ATMs
MA: Audio Response	Member access via phone-based audio response
MA: Home banking – Web	Member access via the Internet
MA: Kiosk	Member access via kiosks
MA: Wireless	Member access via cell phones, PDAs, etc.
MA: Home banking – PC	Member access via direct dial-up/PCs
Merchandise Purchase	
New Loan	Service that allows members to access and submit an application electronically via the internet
New Share Account	Service that allows members to access and submit an application electronically via the internet
Share Draft Orders	
Share Account Transfers	
View Account History	

Source: NCUA, Weigelt and Sarkar (2009).

Table 7: Vendors

Vendor name		
Advanced Management Info. Systems	Data Services, Inc.	Member Driven Technologies (Episys)
Alltel	Data Tech Services, Inc.	Mid Michigan Cuso
Amac	Datamatic	Midwest Marketing
American Business Computers	Datex	Mize Houser & Company
Ami, Inc.	Digital Processing Subsystems	Modern Data Management
Amis	Ebank Systems, Inc	Myrick Computer Services, Inc.
Apex Data Systems, Inc.	Ed Ouellette 240-832-0906	Ncr Corporation
Apple Federal Credit Union	Edcomp	Nilco, Inc
Area Financial Services	Efficiency Works, Inc.	North Carolina State Employeess Cre
Assoc. Of Community Cu'S	Eds	Northern Data Systems
Atcu	Electronic Recordkeeping Services	One'S Technologies
Automated Financial Technology Inc.	Emphysis Software Inc.	Open Solutions, Inc
Automated Systems Management, Inc.	Empire Corp	Pa Credit Union Association
Banctec, Inc.	Enhanced Software Products, Inc.	Pacific Business Services
Bcg,Inc.	Epl	Pacul
Beycaldwell Group	Evergent Solutions, Llp	Palos Community Hospital
Beysch Consulting Group	Fedcomp, Inc.	Paragon Services Inc
Bsa Turnkey Corp.	Fidelity Ifs-Mercury	Peerless Group
C T I	Fifs	Pennsylvania Credit Union League
C.U. Processing, Inc.	Financial Consultants International	Perform, Inc.
C.U. Services, Inc.	Financial Data Corporation	Premier Systems, Inc.
C.U. Solutions, Inc. (Sunbelt)	Financial Services Group	Prodata, Inc.
Cbs	Financial Software Group	Protestant Data
Charles Davis Cpa	Fincentric	Psa
Cherry Creek Technologies	First Ascent Investments, Inc.	R.C. Olmstead, Inc.
Computer Marketing Corp.	Cusa	Re:Member Data Services, Inc.
Commercial Business Systems, Inc.	Fitech Systems	Real Time Data Management Services
Community First Credit Union	Fsg	Risk Management
Compu Serv	Fsg Computer Software	Roop Services
Compuserve	Gds	Ryli Software Associates
Compusource Systems, Inc.	Gem Software	Share One, Inc
Computek	Gfc Data Systems	Sharetec Systems, Inc
Computer Business Systems	Gulf Data Systems	Smart Solution
Connecticut Online	Gunther Computer Systems, Inc.	Sos Computer Systems, Inc.
Cpi Proservices, Inc	Haggerty Associates	Southern Regional Data Corporation
Cred-U-Comp, Inc.	Harland Financial Solutions - Ultra	State Employees' Credit Union
Credimax	Hattan Enterprise Union 3	Stl Solutions, Ltd.
Credit Union Consultants, Inc.	Hawaii Impulse Systems, Inc.	Superior Services, Inc.
Credit Union Data Processing, Inc.	Helvetia Del Caribe, Inc.	Cu Solutions, Inc (Symitar Systems
Credit Union Management System	Heritage Credit Union	Syntropy, Inc.
Credit Union Online, Inc.	Houston Energy Credit Union	Systronics, Llc
Cu Accounting	Huron River Area Credit Union	T.S.I.
Cu Data	Icsi	Temenos
Cu Interface	Infoware	Terra Firma Software, Inc.
Cu Nation	Innovative Technology, Inc.	Total One Corporation
Cu Vision Technologies	Int'L Software Systems, Inc.	Tracking Services, Inc.
Cu*Answers	International Software Systems, Inc	Trinergy
Cu*Northwest	Ips, Inc.	United Solutions Company
Cu*South	Iss - Sdmi - Cuadvantage	Valtek Emp. Cu
Cu-Centric	Symitar Systems, Inc.	Vermont Heritage Financial Group
Cuc, Inc	Leber Services	Versyss
Cufas	Liberty	Vision
Cumas (John J. Shutt)	Link 21 Pc Cu Software	Vision Xxi
Cuna	Listerhill Credit Union	Wescom Resources Group
C.U.S	E.D.S	Lufthansa System House
West Shore Community College		
Cusoft	Maine Credit Union League	Western New York Computing Systems
Cusource, Inc.	Mcba	Williams & Associates
Custom/Data	Mecul	Worldwide Interactive Services, Inc
Data Basics	Meints Computing Services	Worthy Computers
Data Management Inc.	Member Computer Solutions	Young'S Software Systems

Source: NCUA, own calculations.

Table 8: M&A in the vendor market

Year	Vendor	Acquired by/Related to	Renamed to
?	CUSERVE	Harland Financial Solutions	
	CU Manager	Real Time Data Management	
	Aftech	Fiserv	
	Galaxy	Fiserv	
	Summit	Fiserv	
	Users	Fiserv	
	XP Systems	Fiserv	
	Synergent Corp.	Maine Credit Union League	
1994	Bradford-Scott Data Corporation	Sharetec Systems	
	Data Systems of Texas	Sharetec Systems	
	GBS Corp	Sharetec Systems	
1997	XP Systems	Users	UXP Corp.
1998	CUSA	Fiserv	
	Peerless	Jack Henry & Associates	
1999	Ultradata	Concentrex	
	Modern Computer Systems	Concentrex	
2000	CU Processing	CGI	
	Concentrex	Harland Financial Solutions	
	Symitar	Jack Henry & Associates	
2002	Aurum Technology	EDS	
	Prodata	Premier	
2003	EDS	Fiserv	Integrasys
	Computer Consultants	Aurum Technology	
	FiTech Liberty	Open Solutions	
	Wesco		CU*Answers
	Premier	Harland Financial Solutions	
	Alltel	Fidelity	
	Evergent	Fedcomp	
2004	Aurum Technology Inc	Fidelity	
	CU Solutions	Symitar	
	Re:Member Data Services	Open Solutions	
	Hawaii Impulse Systems	Open Solutions	
	Western New York Computing Systems	Synergy	
2005	SO Systems	Open Solutions	
	CGI	Open Solutions	
2006	Evergent Solutions		*Bankrupcty*
2007	ONE's Technology	Harland Financial Soultions	

Source: Robbins and Van Walleghem (2004), SEC filings, corporate annual reports and webpages.

Table 9: Estimation results: OLS

	(1)		(2)		(3)		(4)	
Vendor switch	7932.3***	(6.51)	7656.0***	(5.81)	8669.2***	(6.90)	8363.3***	(6.21)
Complete ITO	-5706.3***	(-9.15)	-5680.2***	(-9.11)	-7567.7***	(-10.31)	-7575.7***	(-10.33)
Size 2	1018.1	(0.49)	1020.6	(0.49)	1159.5	(0.56)	1143.9	(0.55)
Size 3	3048.7	(0.84)	3051.9	(0.84)	3556.1	(0.98)	3567.7	(0.99)
Size 4	35800.6***	(34.60)	35833.1***	(34.62)	34070.1***	(32.62)	34110.2***	(32.65)
Vendor tenure	1736.6***	(8.10)	1489.3***	(3.16)	1651.3***	(7.56)	1355.9***	(2.85)
Vendor marketshare	-793.4	(-0.30)	-502.7	(-0.19)	-21348.0***	(-2.95)	-20719.9***	(-2.86)
Vendor marketshare in area	6740.5***	(4.04)	6723.8***	(4.03)	6223.5***	(3.58)	6200.1***	(3.57)
Herfindahl index	-561957.4***	(-14.10)	-107803.6	(-0.34)	-526108.8***	(-12.49)	-127609.7	(-0.39)
Audit group 1	2164.7**	(2.40)	2121.8**	(2.35)	2757.5***	(3.03)	2719.1***	(2.99)
Audit group 2	682.5	(0.75)	497.7	(0.55)	1499.9	(1.63)	1311.9	(1.42)
Additional insurance	15953.4***	(13.32)	15985.8***	(13.35)	14976.5***	(12.35)	15007.9***	(12.38)
Other fixed assets 2	1099.9	(1.32)	1068.3	(1.28)	1595.9*	(1.86)	1568.3*	(1.83)
Other fixed assets 3	854.4	(0.85)	836.0	(0.83)	2370.4**	(2.27)	2358.8**	(2.25)
Other fixed assets 4	33982.3***	(25.10)	33937.9***	(25.07)	34863.7***	(25.05)	34820.2***	(25.02)
Constant	61777.8***	(14.09)	10071.6	(0.28)	50501.8	(0.71)	2246.4	(0.03)
Year dummies	No		Yes		No		Yes	
Vendor dummies	No		No		Yes		Yes	
Service dummies	Yes		Yes		Yes		Yes	
R^2	0.238		0.239		0.243		0.244	
Adjusted R^2	0.237		0.238		0.241		0.241	
AIC	1813443.0		1813396.9		1813285.9		1813239.3	
BIC	1813801.2		1813828.5		1815159.4		1815186.3	
Log likelihood	-906682.5		-906651.4		-906438.9		-906407.6	
Observations	71984		71984		71984		71984	

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source: NCUA, BLS, own calculations.