International Journal of u- and e- Service, Science and Technology
Vol.8, No. 10 (2015), pp.41-52
http://dx.doi.org/10.14257/ijunesst.2015.8.10.05

The Impact of Non-Audit Services on Accounting Firm Productivity[1]

Seok-Young Lee

Department of Business Administration, Sungshin Women's University
34 Bomoon-ro Seongbuk-gu Seoul 136-742, Korea
sylee@sungshin.ac.kr

Abstract

Based on a two-stage analysis of a panel of data for 25 Korean accounting firm for 16 years from 1997 to 2012, the researcher investigates how non-audit services affect accounting firm productivity. In the first stage, the researchers employ Data Envelopment Analysis (DEA) to compute the relative productivity of accounting firms in using their human resources to generate firm revenues. In the second stage, the researcher estimate regression models that relate the logarithm of DEA productivity scores to the mix of services provided and control variables. Empirical results support my research hypotheses that accounting firm productivity, in terms of revenue generation based on human resources utilized, decreases with greater provision of taxation services and increases with greater provision of management advisory services.

Keywords: *Accounting Firm, Productivity, Human Resources, Data Envelopment Analysis*

1. Introduction

The setting for this study is the market for accounting services in Korea during the period of 1997 to 2012. This market setting is interesting because regulatory intervention associated with the financial crisis and International Monetary Fund (IMF) bailout in 1997 caused a restructuring of the market for assurance services. To meet minimum size requirement constraints for performing statutory audits, smaller accounting firms coagulated into larger accounting firms. An important part of firms' strategies for competing in the newly-shaped market was selection of the mix of services provided. In addition to that, new rules issued to improve the transparency of the market for auditing services required an unprecedented amount of public disclosure of accounting firm financial information and non-financial information including human resources. This combination of accounting market restructuring and availability of firm-level data enables me to evaluate the effects of different mixes of services on accounting firm productivity.

In the interest of auditor independence, public pressure and policy is forcing accounting firms to exit from the business of providing management advisory services to audit clients and other companies [1]. At the turn of this century, a series of audit failures at large companies such as Enron, Tyco International, HealthSouth, Adelphia Communications, WorldCom, Global Crossing, and Rite Aid has turned up the heat on the public accounting profession in the Unites States [2]. There is a perception that audits have been "loss-leaders" in bringing in more lucrative management advisory service business [3]. To signal their commitment to audit quality, some of the largest accounting firms have spun off or sold their management advisory service practices. New legislation,

[1] The paper is an extended version of *The Role of Management Advisory Services in Accounting Firms: A Preliminary Study* which was presented at the 7th International Workshop on Business 2015 (Paper ID: BUS7003) on August 19, 2015.

ISSN: 2005-4246 IJUNESST

the Sarbanes-Oxley Act of 2002 (SOX), prohibits accounting firms from designing financial information systems for audit clients.

While public debate has focused on the auditor independence issue [4, 5], little attention has been paid to the potential effects of divesting management advisory services on the productivity of accounting firms and on their ability to provide information assurance services. During the period from 1995 to 1999, management advisory service revenues increased from 20.7% to 28.3% of total firm revenues for a large sample of U.S. public accounting firms, accounting and auditing revenues decreased from 49.5% to 42.2%, but taxation service revenues did not change substantially [6]. During the period from 1999 to 2013, the percentage of revenues from taxation services for the Big N U.S. public accounting firms remained between 20 to 30%, and the trends for auditing services and management accounting services show more fluctuation and shift in an inverse way [7]. In addition to that, the majority of Big N U.S. public accounting firm revenues were generated from management advisory services in 1999 and 2000 [7]. However, as Big N U.S. public accounting firms divested their consulting practices due to the SOX restrictions placed on non-audit services from 2004 through 2006, revenues from management advisory services dropped to less than 16% of total revenues [7]. Over the same period, Big N U.S. public accounting firm revenues from accounting and auditing were on the increase, reaching a peak of almost 60% of total revenues by 2006 [7]. However, since 2006, the percentage of revenues from management advisory services has increased dramatically and the percentage of revenues from accounting and auditing services has decreased. As of 2013, management advisory services have again become the largest source of revenues for the U.S. Big N accounting firms, slightly outperforming accounting and auditing services [7].

While the explosion of information technology contributed to the demand for management advisory services, the fact that accounting firms became major players in management advisory services leads to questions about the business role of management advisory services in accounting firms and the potential business effects of restricting firms from offering management advisory services [8]. By evaluating the business role of management advisory services in accounting firms, the researcher establishes a basis for considering how required divestment or restriction of management advisory services would affect the operation of accounting firms and their provision of information assurance services.

Unlike traditional auditing and taxation services, provision of management advisory services is an entrepreneurial endeavor because it involves new combinations of technology and production [3, 7]. Firms can differentiate their management advisory services by admitting partners or hiring professionals who blend technical abilities with entrepreneurial drive [6]. This makes it possible to sell management advisory services at a premium to the more commodity-like accounting and auditing services. Taxation services, on the other hand, are not likely to sell at a premium because they share the commodity-like attributes of financial statement assurance services and accounting firms must compete with non-licensed providers (non-CPAs) of tax services.

In this study, extending Lee [9], the researcher examines the impact of non-audit services on accounting firm productivity. Specifically, the researcher investigated whether accounting firm productivity, in terms of revenue generation based on human resource utilized, decreases with greater provision of taxation services and increases with greater provision of management advisory services. Therefore, the researcher states the hypotheses formally as follows:

Hypothesis 1: The impact of taxation services on accounting firm productivity is negative.

Hypothesis 2: The impact of management advisory services on accounting firm productivity is positive.

The remainder of this paper is organized as follows. Section 2 discusses the data and the estimation model employed for the empirical analysis, Section 3 contains the empirical results, Section 4 summarizes and concludes.

2. Data Description and Estimation Model

2.1 Data and Variables

In Korea, the Act on External Audit for Stock-Listed Companies amended on December 30, 1996 required accounting firms to submit their annual business reports beginning with the fiscal year 1997 to the Securities and Futures Commission and the Korean Institute of Certified Public Accountants (KICPA) within three months after the end of each fiscal year. As this new disclosure requirement for accounting firms was imposed, annual business reports of Korean accounting firms became public information from the fiscal year 1997. The balanced data used in this study were obtained from the annual business reports of 25 Korean accounting firms that have existed during the whole sample period: 1997-2012. The final sample consists of 400 (=25×16) firm-year observations.

Each individual firm-year observation in the sample represents a decision-making unit (DMU). The researcher modeled the production function relating the output of each DMU as a function of its inputs and contextual variables. In researcher's empirical setting, the researcher measures output as annual total firm revenues (REVENUE) in deflated millions (M) of Korean won (KRW).

Human resources are the partners, professionals and other staff that make up accounting firms. The researcher considered three human input variables: the number of partners (PARTNER), the number of certified public accountants who are not partners (CPA), and the number of all other employees (EMP) [6, 10]. The researcher does not include capital inputs in this analysis as they are not considered to be of primary importance [11].

Accounting firm revenues are from three sources: auditing services, taxation services, and management advisory services. The mix of services for a period is determined by the proportions of total revenues generated from provision of auditing services, taxation services, and management advisory services. The percentage of revenues derived from auditing services is represented as AUD%, the percentage of revenues derived from taxation services is represented as TAX%, and the percentage of management advisory services is represented as MAS%. The contextual variables included to evaluate my research hypothesis are TAX% and MAS% constructed to represent the service mix.

The Korean accounting service market setting is interesting as regulatory intervention associated with the financial crisis and International Monetary Fund (IMF) bailout in 1997 led to a restructuring of the market for auditing services. To meet minimum size requirement constraints for performing statutory audits, smaller accounting firms coagulated into larger accounting firms. In addition to that, the Korean Certified Public Accountant Act amended in 2001 facilitated new entry of accounting firms. This accounting market restructuring resulted in three different groups of accounting firms: established big firms (BIG) with Big N affiliation, established local firms (LOCAL) without Big N affiliation, and non-established small firms (OTHER) that resulted from the coagulation of smaller firms or were newly started. Many prior studies document that Big N accounting firms charge a premium for their auditing services [12, 13]. The Big N firms are also likely to charge a premium for other services provided. Clients are willing to pay the premium for the Big N's reputation. To control for any potential effect of the Big N price premium on firm productivity, the researcher included a dummy variable BIG that equals one if the firm is one of the established big firms with Big N affiliation. Further, to control the impact of established local firms without Big N affiliation on firm productivity, the researcher also included the researcher also included an indicator

variable LOCAL that equals one if the firm is one of the established local firms without Big N affiliation.

Service diversity is measured by the Herfindahl index (HERF), which is calculated as [(AUD%/100)2 + (TAX%/100)2 + (MAS%/100)2]. The Herfindahl index has been widely used as a measure of concentration of products or services at the level of the firm [14]. The researcher included the variable HERF to control for the effect of service diversity on firm productivity. Following Banker, Chang and Cunningham [6], the researcher included the number of offices (OFFICE) of the accounting firm as a control variable.

The researcher also included several other contextual variables. To capture how ownership of the firm affects the productivity [15, 16], the researcher also included POWN constructed as the percentage of certified public accountants who are not partners. To account for different financial strength among accounting firms [17], the researcher included two measures of financial strength to represent the availability of capital within the partnership: the ratio of equity to debt (EQUITY) and the quick ratio (QUICK). New entry of accounting firms in the Korean accounting market was facilitated by the Korean Certified Public Accountant Act amended in 2001. To control for this effect of regulatory intervention on firm productivity, the researcher included an indicator variable POST whose value is 1 if the fiscal year belongs to the 2002-2012 period and 0 otherwise.

2.2 Estimation Models

Following Banker and Natarajan [18], the researcher used the DEA model of Banker, Charnes and Cooper (BCC) [19] in the first stage of the empirical analysis to evaluate the productivity scores of the different observations represented as DMUjt for firm j = 1,…..25, and year t = 1,……16. There are 400 (=25×16) observations. The researcher used the output-oriented BCC [19] model to evaluate the productivity scores using a set of three inputs to produce one output. Recall that the single output is total firm revenues in deflated millions of Korean won (REVENUE), and the three inputs are the number of partners (PARTNER), the number of certified public accountants who are not partners (CPA), and the number of all other employees (EMP) [6, 10]. The formulation of this output-oriented BCC model for estimating the productivity $\hat{\theta}_{j*t*} = 1/\hat{\rho}_{j*t*}$ of an observation (j*, t*) is given by the following linear program:

$$\hat{\rho}_{j*t*} = \max \rho_{j*t*} \tag{1}$$

subject to

$$\sum_{t=1}^{16}\sum_{j=1}^{25} \lambda_{jt} x_{ijt} \le x_{ij*t*} \quad \text{i=1, 2, 3}$$

$$-\sum_{t=1}^{16}\sum_{j=1}^{25} \lambda_{jt} y_{jt} + \rho_{j*t*} y_{j*t*} \le 0$$

$$\sum_{t=1}^{16}\sum_{j=1}^{25} \lambda_{jt} = 1$$

$$\lambda_{jt}, \rho_{j*t*} \ge 0$$

where x_{ijt} is the quantity of input i consumed by DMUjt , y_{jt} is the quantity of output produced by DMUjt, λ_{jt} is the weight placed on inputs/output of DMUjt, xijt are the quantities of inputs for DMUjt being evaluated, yjt is the quantity of output for DMUjt being evaluated. The linear program is solved for each observation (j*, t*) for j*=1,….,25 and t*=1,…..,16.

To evaluate the researcher's research hypotheses about the impact of non-audit services on firm productivity, the researcher regresses the logarithm of the productivity estimator $\hat{\theta}_{jt}$ (reciprocal of the estimated inefficiency ρ_{jt} **)** on the contextual variables in the second stage, using the full panel of pooled data. Banker and Natarajan [18] show that this two-stage procedure involving nonparametric estimation of productivity in the first stage followed by OLS regression provides statistically consistent estimators. Specifically the regression I estimate is represented as:

$$\ln \hat{\theta}_{jt} = \beta_0 + \beta_1*TAX\%_{jt} + \beta_2*MAS\%_{jt} + \beta_3*BIG_j + \beta_4*LOCAL_j + \beta_5*HERF_{jt} + \beta_6*LNOFF_{jt} + \beta_7*POWN_{jt} + \beta_8*EQUITY_{jt} + \beta_9*QUICK_{jt} + \beta_{10}*POST_t + \varepsilon_{jt} \quad (2)$$

where $\ln \hat{\theta}_{jt}$ is the logarithm of productivity score for firm j in year t, $TAX\%_{jt}$ is the percentage of total revenues generated from taxation services for firm j in year t, $MAS\%_{jt}$ is the percentage of total revenues generated from management advisory services for firm j in year t, BIG_j is 1 if firm j is one of the established big firms with Big N affiliation, otherwise 0, $LOCAL_j$ is 1 if firm j is one of the established local firms without Big N affiliation, otherwise 0, $HERF_{jt}$ is the Herfindahl index for firm j in year t, $LNOFF_{jt}$ is the logarithm of the number of offices firm j has in year t, $POWN_{jt}$ is the percentage of certified public accountants who are partners for firm j in year t, $EQUITY_{jt}$ is the equity-to-debt ratio for firm j in year t, $QUICK_{jt}$ = the quick ratio for firm j in year t, $POST_t$ is 1 if fiscal year t belongs to the 2002-2012 period, otherwise 0, ε_{jt} are random errors, j = 1….. 25, and t = 1 ……16.

3. Empirical Results

3.1 Descriptive Statistics

Table 1 provides descriptive statistics of output, inputs and contextual variables. The median values of the output variable (REVENUE) and the three input variables (PARTNER, CPA, EMP) are all smaller than their mean values, indicating that the data are skewed to the right. The contextual variables representing my research hypotheses are TAX% and MAS%, their means are 17.6% and 37.7%, respectively for the pooled data, and their medians are 16.7% and 37.3%, respectively for the pooled data. The mean (median) values of the Herfindahl index (HERF), the number of offices (OFFICE), the percentage of certified public accountants who are partners (POWN), the equity-to-debt ratio (EQUITY) and the quick ratio (QUICK) are 0.430 (0.397), 3.0 (2.0), 50.6% (50.0%), 84.5% (61.4%), and 173.1% (147.3%), respectively for the pooled data.

Table 1. Descriptive Statistics on Output, Inputs and Contextual Variables

Panel A: 1997 (N=25)					
	Mean	SD	Q1	Median	Q3
Output					
REVENUE	103.1M	176.4M	30.7M	45.6M	75.5M
Inputs					
PARTNER	16.5	9.1	10.0	16.0	20.0
CPA	55.0	118.7	4.0	15.0	50.0
EMP	63.5	64.3	23.0	54.0	80.0
Contextual Variables					
AUD%	47.2%	20.2%	33.7%	49.7%	60.5%
TAX%	14.4%	7.0%	8.3%	14.5%	20.4%
MAS%	38.4%	19.9%	25.6%	38.1%	50.1%

HERF	0.473	0.118	0.388	0.445	0.466
OFFICE	2.2	1.2	1.0	2.0	3.0
POWN	50.6%	32.4%	23.1%	40.0%	86.7%
EQUITY	101.9%	83.2%	48.3%	80.9%	122.9%
QUICK	162.9%	100.3%	108.4%	137.4%	177.8%
Panel B: 2002 (N=25)					
	Mean	SD	Q1	Median	Q3
Output					
REVENUE	312.4M	655.3M	60.1M	82.4M	200.9M
Inputs					
PARTNER	24.6	17.2	16.0	19.0	24.0
CPA	116.6	280.6	5.0	12.0	94.0
EMP	105.8	134.2	34.0	61.0	151.0
Contextual Variables					
AUD%	46.0%	15.8%	35.7%	47.1%	55.8%
TAX%	16.0%	6.1%	13.1%	16.4%	20.2%
MAS%	38.0%	13.3%	29.1%	37.0%	45.7%
HERF	0.426	0.076	0.375	0.393	0.430
OFFICE	3.0	2.1	2.0	2.0	4.0
POWN	52.3%	31.0%	26.6%	58.2%	78.9%
EQUITY	54.0%	23.9%	36.5%	49.2%	68.6%
QUICK	144.0%	44.0%	114.6%	136.2%	152.9%
Panel C: 2007 (N=25)					
	Mean	SD	Q1	Median	Q3
Output					
REVENUE	465.2M	898.2M	63.0M	106.0M	292.7M
Inputs					
PARTNER	33.7	31.3	17.0	20.0	45.0
CPA	210.0	458.2	6.0	20.0	130.0
EMP	131.8	169.8	26.0	65.0	170.0
Contextual Variables					
AUD%	45.9%	14.5%	35.7%	46.4%	55.4%
TAX%	17.7%	8.1%	12.7%	15.9%	20.8%
MAS%	36.3%	13.0%	28.2%	35.8%	41.9%
HERF	0.418	0.078	0.364	0.391	0.422
OFFICE	3.4	2.4	2.0	3.0	4.0
POWN	49.9%	29.8%	25.7%	51.1%	76.0%
EQUITY	87.0%	74.4%	45.7%	51.6%	105.7%
QUICK	208.8%	230.6%	119.7%	156.7%	176.7%
Panel D: 2012 (N=25)					
	Mean	SD	Q1	Median	Q3
Output					
REVENUE	527.3M	1041.7M	59.0M	108.1M	261.9M
Inputs					
PARTNER	43.1	46.8	15.0	23.0	43.0
CPA	256.0	585.2	4.0	18.0	66.0
EMP	166.5	261.	30.0	68.0	142.0
Contextual Variables					
AUD%	40.9%	13.3%	30.2%	41.9%	48.3%
TAX%	22.4%	9.9%	14.5%	20.6%	27.4%
MAS%	36.7%	13.8%	28.3%	36.0%	44.6%
HERF	0.397	0.060	0.361	0.373	0.407
OFFICE	3.0	1.9	1.0	3.0	4.0
POWN	51.7%	29.4%	22.9%	57.1%	73.7%
EQUITY	115.0%	95.8%	54.4%	85.5%	124.3%
QUICK	198.4%	130.2%	136.9%	165.0%	192.2%

Panel E: pooled data (N=400)					
	Mean	SD	Q1	Median	Q3
Output					
REVENUE	359.7M	770.7M	50.2M	80.8M	218.8M
Inputs					
PARTNER	29.5	29.9	15.0	20.0	36.0
CPA	160.4	392.6	4.0	16.0	80.0
EMP	113.0	160.3	28.0	61.0	115.5
Contextual Variables					
AUD%	44.6%	15.9%	32.4%	45.4%	55.8%
TAX%	17.6%	8.9%	12.5%	16.7%	21.4%
MAS%	37.7%	15.5%	26.7%	37.3%	46.8%
HERF	0.430	0.088	0.375	0.397	0.447
OFFICE	3.0	2.1	1.0	2.0	4.0
POWN	50.6%	29.6%	24.3%	50.0%	77.5%
EQUITY	84.5%	68.5%	43.8%	61.4%	101.5%
QUICK	173.1%	105.4%	119.3%	147.3%	185.9%

N = number of accounting firms in the sample, REVENUE = total firm revenues expressed in millions (M) of Korean won whose values are inflation adjusted to 2010 Korean won, PARTNER = number of partners, CPA = number of certified public accountants who are not partners, EMP = number of other employees, AUD% = proportion of auditing service revenues, TAX% = proportion of taxation service revenues, MAS% = proportion of management advisory service revenues, HERF = Herfindahl index, OFFICE = number of offices a firm has, POWN = percentage of certified public accountants who are partners, EQUITY = equity-to-debt ratio, QUICK = quick ratio.

Table 2 provides distribution of DEA productive scores for the pooled sample of 400 observations computed using the BCC models in (1). The interquartile range for the productivity scores is from 0.6185 to 0.8657 for the entire sample period. The mean of the DEA productivity scores is 0.7272 and the median is 0.7221 for the entire sample period.

Table 2. Distribution of Productivity Scores by Year and for the Sample Period

Year	No. of obs.	Mean	SD	Q1	Median	Q3
1997	25	0.5265	0.1684	0.4370	0.5047	0.6210
1998	25	0.5879	0.2175	0.4724	0.5159	0.6611
1999	25	0.6227	0.1544	0.5219	0.6227	0.7206
2000	25	0.7076	0.1375	0.6171	0.6906	0.8030
2001	25	0.7248	0.1528	0.6271	0.7171	0.8071
2002	25	0.7667	0.1547	0.6639	0.7687	0.8422
2003	25	0.7209	0.1755	0.6173	0.7121	0.8063
2004	25	0.7187	0.1342	0.6449	0.7200	0.7767
2005	25	0.7729	0.1408	0.6666	0.7702	0.8684
2006	25	0.7842	0.1456	0.6502	0.7815	0.8809
2007	25	0.8277	0.1236	0.7139	0.8369	0.9248
2008	25	0.8048	0.1302	0.6946	0.7978	0.9157
2009	25	0.7864	0.1520	0.6267	0.7995	0.9311
2010	25	0.7719	0.1467	0.6737	0.7691	0.8727
2011	25	0.7415	0.1592	0.6209	0.7237	0.8370
2012	25	0.7705	0.1723	0.6262	0.7810	0.9433
Pooling	400	0.7272	0.1723	0.6185	0.7221	0.8657

Figure 1 presents the average DEA productivity score for each of 16 years from 1997 to 2012. The average DEA productivity score for each year showed the lowest 0.5265 in

1997, and since then indicated an upward trend and recorded the highest 0.8277 in 2007. This trend analysis reveals that since the worldwide economic crisis of 2007, the average DEA productivity score for each year has declined steadily until 2011.

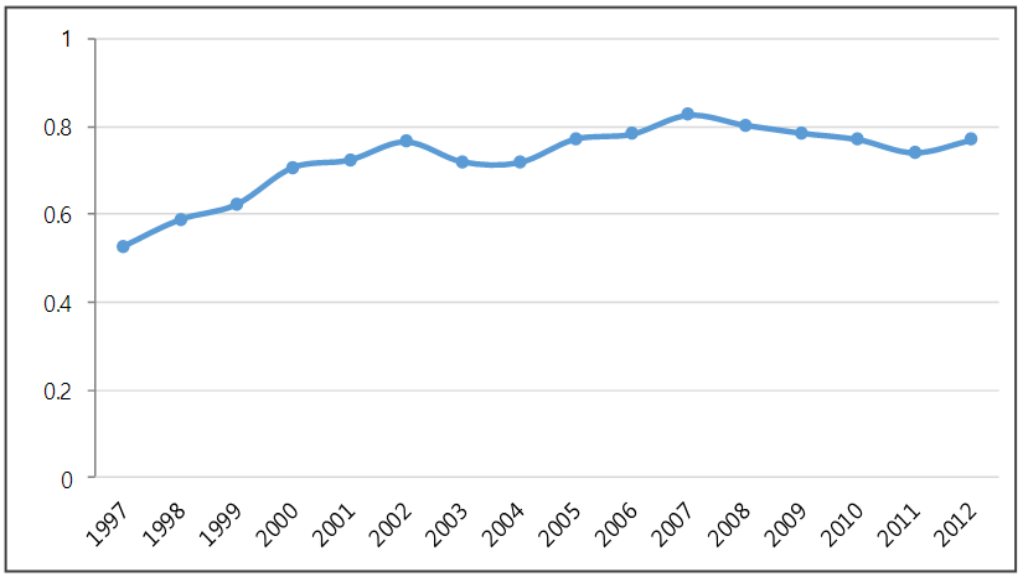

Figure 1. Mean DEA Productivity Score by Year

Figure 2 presents the average proportions of revenues from auditing services, taxation services, and management advisory services for the 25 accounting firms for each of 16 years from 1997 through 2012 [9]. For the pooled data, the means of AUD%, TAX%, and MAS% are 44.6%, 17.6%, and 37.7%, respectively. For the entire sample period, AUD% has fluctuated, but has stayed between 40 to 48%. However, MAS% peaked in 1999, but since then has shown a downward trend. In contrast, since 1997, TAX% has indicated an upward trend until 2012.

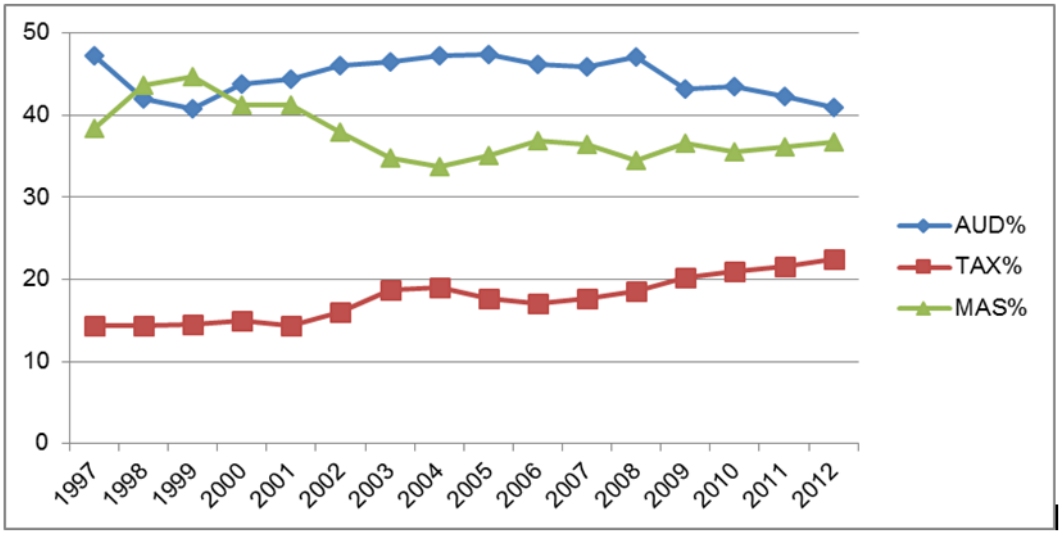

Figure 2. Trend of Average Service Mix by Year [9]

Table 3 presents Pearson and Spearman correlations between DEA productivity score and contextual variables used in estimation model (2). There is a statistically insignificant negative correlation between $\ln \hat{\theta}_{jt}$ and $TAX\%_{jt}$, before controlling for the impact of the

other contextual variables. However, there is a statistically significant positive correlation between $\ln \hat{\theta}_{jt}$ and MAS%$_{jt}$, before controlling for the impact of the other contextual variables.

Pearson and Spearman correlations between the indicator variable for established big firms with Big N affiliation (BIG) and the percentage of certified public accountants who are partners (POWN) are -0.613 ($p < 0.0001$) and -0.616 ($p < 0.0001$), respectively. Pearson and Spearman correlations between the percentage of certified public accountants who are partners (POWN) and the proportion of taxation service revenues (TAX%) are 0.500 ($p < 0.0001$) and 0.555 ($p < 0.0001$), respectively. Pearson and Spearman correlations between the equity-to-debt ratio (EQUITY) and the quick ratio (QUICK) are 0.597 ($p < 0.0001$) and 0.690 ($p < 0.0001$), respectively.

Table 3. Correlation Matrix (P-values in Parentheses)

	$\ln\hat{\theta}$	TAX%	MAS%	BIG	LOCAL	HERF	OFFICE	POWN	EQUITY	QUICK	POST
$\ln\hat{\theta}$	--	-0.080 (0.110)	0.159 (0.001)	0.352 (0.000)	-0.051 (0.308)	-0.014 (0.778)	0.240 (0.000)	-0.165 (0.001)	-0.053 (0.293)	0.110 (0.027)	0.350 (0.000)
TAX%	-0.081 (0.104)	--	-0.045 (0.389)	-0.121 (0.015)	-0.227 (0.000)	-0.777 (0.000)	-0.064 (0.202)	0.555 (0.000)	0.283 (0.000)	0.313 (0.000)	0.200 (0.000)
MAS%	0.202 (0.000)	-0.241 (0.000)	--	0.068 (0.172)	-0.277 (0.000)	-0.195 (0.000)	0.141 (0.005)	0.093 (0.063)	0.185 (0.001)	0.160 (0.001)	-0.210 (0.000)
BIG	0.352 (0.000)	-0.160 (0.001)	0.038 (0.448)	--	-0.162 (0.001)	-0.036 (0.474)	0.292 (0.000)	-0.616 (0.000)	-0.181 (0.000)	-0.080 (0.109)	0.031 (0.537)
LOCAL	-0.038 (0.449)	-0.200 (0.000)	-0.247 (0.000)	-0.162 (0.001)	--	0.307 (0.000)	0.406 (0.000)	-0.264 (0.000)	-0.334 (0.000)	-0.355 (0.000)	-0.033 (0.506)
HERF	0.072 (0.147)	-0.552 (0.000)	0.020 (0.684)	-0.029 (0.566)	0.335 (0.000)	--	-0.012 (0.815)	-0.325 (0.000)	-0.239 (0.000)	-0.245 (0.000)	-0.232 (0.000)
OFFICE	0.181 (0.000)	-0.115 (0.022)	-0.026 (0.603)	0.214 (0.000)	0.561 (0.000)	0.007 (0.886)	--	-0.414 (0.000)	-0.209 (0.000)	-0.117 (0.020)	0.078 (0.117)
POWN	-0.157 (0.002)	0.500 (0.000)	0.073 (0.144)	-0.613 (0.000)	-0.029 (0.000)	-0.317 (0.000)	-0.411 (0.000)	--	0.399 (0.000)	0.384 (0.000)	-0.033 (0.506)
EQUITY	0.046 (0.353)	0.208 (0.000)	0.129 (0.010)	-0.181 (0.000)	-0.189 (0.000)	-0.110 (0.028)	-0.209 (0.000)	0.345 (0.000)	--	0.690 (0.000)	0.031 (0.541)
QUICK	0.137 (0.006)	0.281 (0.000)	0.094 (0.082)	-0.117 (0.020)	-0.190 (0.000)	-0.156 (0.0018)	-0.091 (0.069)	0.297 (0.000)	0.597 (0.000)	--	0.083 (0.098)
POST	0.386 (0.000)	0.237 (0.000)	-0.180 (0.000)	0.031 (0.537)	-0.033 (0.506)	-0.234 (0.000)	0.111 (0.027)	-0.028 (0.570)	0.078 (0.117)	0.098 (0.051)	--

Pearson correlations are below the diagonal and Spearman correlations are above the diagonal.

$\ln \hat{\theta}_{jt}$ = the logarithm of productivity score

BIG = 1 if the firm is one of the established big firms with Big N affiliation, otherwise 0.

LOCAL = 1 if the firm is one of the established local firms without Big N affiliation, otherwise 0.

POST = 1 if the fiscal year belongs to the 2002-2012 period, otherwise 0.

Other variable definitions appear in Table 1.

3.2 Regression Results

In the second stage of the researcher's empirical analysis, the researcher regresses the logarithm of DEA productivity scores on the contextual variables. Specifically, the researcher I estimate a regression model (2) that relates the efficiency parameters for firms to the mix of services provided and control variables. Because pooled cross-sectional and time-series information is used to estimate the impact of contextual variables on firm productivity, there is the potential for serial correlation biasing the standard errors of the coefficients. Therefore, the researcher performed specification tests for residuals to check serial correlations and found that there exists substantial positive serial correlation (parameter estimate = 0.213, t = 3.214) for the full model (2). The researcher addressed this problem by using a variant of the Prais-Winston [20] estimator proposed by Park and Mitchell [21] to make first-order autocorrelation adjustments to the variables. This estimator is consistent and performs especially well for short time series and trended data in relation to several other estimates [22]. It also reduces the extent to which the serial correlation coefficient tends to be underestimated by simpler methods [23].

I conducted several econometric tests of my model specification. I used Belsley, Kuh and Welsch's [24] diagnostics to evaluate the effects of multicollinearity. These diagnostics indicated collinearity between just two variables, EQUITY and QUICK. This collinearity may inflate the standard errors for these two variables but would not impair the overall results. White's [25] test did not indicate heteroskedasticity for any of the models estimated. I employed the criteria proposed by Belsley, Kuh and Welsch [24] to identify influential observations. No observation was identified as an outlier in any of the models. I test my hypotheses using the parameter estimates from the regression using the transformed variables.

Results of estimating full model (2), model (2) excluding HERF, and model (2) excluding HERF and LNOFF are presented in Table 3. Results of estimating full model (2) show that the coefficients on all the control variables except LOCAL and EQUITY are statistically significant. The estimated coefficient on TAX% is negative and significant (t = -1.73) at the 10% level, and the estimated coefficient on MAS% is positive and significant (t = 4.39) at the 1% level. Thus, after controlling for the differences of reputation capital, service diversity, size, ownership structure, and financial strength across firms, and the impact of regulatory changes over time, the results provide strong support for the researcher's research hypotheses that taxation services have a negative impact on accounting firm productivity and management advisory services have a positive impact on accounting firm productivity.

Results of estimating model (2) excluding HERF and model (2) excluding HERF and LNOFF demonstrate that the coefficients on all the control variables except EQUITY are statistically significant. The estimated coefficient on TAX% is negative and significant at the 1% level, and the estimated coefficient on MAS% is positive and significant at the 1% level. Thus, after controlling for firm differences in terms of reputation, service diversity, size, ownership structure, and financial strength and the impact of regulatory changes over time, the results also provide strong support for my research hypotheses that the productivity of Korean accounting firms decreased with the proportion of taxation services in the revenue mix and increased with the proportion of management advisory services in the revenue mix.

Table 3. Results of OLS Estimation

Variables	Parameter	Predicted Sign	Full Model (2)	Model (2) excluding HERF	Model (2) excluding HERF & LNOFF
Intercept	α_0	-	-1.2086*** (-12.07)	-0.8150*** (-15.43)	-0.8082*** (-15.31)
TAX%	α_1	-	-0.0017* (-1.73)	-0.0055*** (-3.51)	-0.0051*** (-3.29)
MAS%	α_2	+	0.0007*** (4.39)	0.0033*** (4.21)	0.0037*** (4.86)
BIG	α_3	+	0.3413*** (8.02)	0.3237*** (7.45)	0.3383*** (7.91)
LOCAL	α_4	+	0.0565 (1.29)	0.1077** (2.48)	0.1439*** (3.77)
HERF	α_5	+	0.6988*** (4.58)	-	-
LNOFF	α_6	+	0.0557*** (2.73)	0.0205* (1.74)	-
POWN	α_7	+	0.0028*** (4.60)	0.0024*** (3.87)	0.0022*** (3.62)

EQUITY	α_8	+	-0.0278 (-1.43)	-0.0260 (-1.30)	-0.0302 (-1.52)
QUICK	α_9	+	0.0004*** (2.80)	0.0004*** (3.02)	0.0004*** (3.35)
POST	α_{12}	+	0.2682*** (11.24)	0.2529*** (10.44)	0.2575*** (10.67)
F-value			25.70	24.95	27.55
Adjusted R^2			0.3824	0.3507	0.3474

*, ** and *** indicate statistical significance at 10%, 5% and 1% levels respectively.
LNOFF is the logarithm of the number of offices a firm has.
Other variable definitions appear in Table 1 and Table 2.

5. Conclusion

In this study, the researcher examined how non-audit services influence accounting firm productivity using a panel of data for 25 Korean accounting firms for 16 years from 1997 to 2012. First, using Data Envelopment Analysis (DEA), the researcher computed the relative productivity of accounting firms in using their human resources (represented by the number of partners, the number of certified public accountants who are not partners, and the number of all other employees) in order to generate (deflated) firm revenues. The researcher then regressed the logarithm of DEA productivity scores on contextual variables (represented by the mix of services provided and control variables) to consistently estimate the impact of the contextual factors on productivity and evaluate their statistical significance [18].

After controlling for the differences of reputation capital, service diversity, size, ownership structure, and financial strength across firms, and the impact of regulatory changes over time, empirical results provide strong support for my research hypotheses that taxation services have a negative impact on accounting firm productivity and management advisory services have a positive impact on accounting firm productivity. Therefore, the researcher found that, in the context of Korean accounting service market, accounting firm productivity, in terms of revenue generation based on human resources utilized, decreased with greater provision of taxation services and increased with greater provision of management advisory services.

References

[1] M. E. McHugh III and P. W. Polinski, "Audit Firm Changes Post-Sarbanes Oxley: Impact on the Market for Public Company Audits", CPA Journal, vol. 82, no. 5, **(2012)**, pp. 24-31.
[2] C. Linthicum, A. L. Reitenga and J. M. Sanchez, "Social Responsibility and Corporate Reputation: The Case of the Arthur Andersen Enron Audit Failure", Journal of Accounting & Public Policy, vol. 29, no. 2, **(2010)**, pp. 160-176.
[3] D. Simunic, "Auditing, Consulting, and Auditor Independence", Journal of Accounting Research, vol. 22, **(1984)**, pp. 679-702.
[4] M. Defond and J. Zhang, "A Review of Archival Auditing Research", Journal of Accounting and Economics Research, vol. 58, **(2014)**, pp. 275-326.
[5] N. Tepalagul and L. Lin, "Auditor Independence and Audit Quality: A Literature Review", Journal of Accounting, Auditing & Finance, vol. 30, no. 1, **(2015)**, pp. 101-121.
[6] R. D. Banker, H. Chang and R. Cunningham, "The Public Accounting Industry Production Function", Journal of Accounting and Economics, vol. 35, **(2003)**, pp. 255-281.
[7] L. L. Lisic, L. A. Myers, R. Rawlewicz and T. A. Seidel, "Do Accounting Firm Consulting Revenues Affect Audit Quality? Evidence from the Post-SOX", Working Paper, **(2015)**.
[8] R. D. Banker, H. Chang and Y.-C. Kao, "Impact of Information Technology on Public Accounting Firm Productivity", Journal of Information Systems, vol. 16, no. 2, **(2002)**, pp. 209-222.
[9] S.-Y. Lee, "The Role of Management Advisory Services in Accounting Firm: A Preliminary Study", H. J. Hwang, Editor. Advanced Science and Technology Letters Vol.102. Proceedings of the 7th International Workshop on Business, **(2015)** August 19-22, pp. 10-14, Jeju Island, Korea.

[10] R. D. Banker, H. Chang and R. Natarajan, "Productivity Change, Technical Progress, and Relative Efficiency Change in the Public Accounting Industry", Management Science, vol. 51, no. 2, **(2005)**, pp. 291-304.
[11] T. B. O'Keefe, D. A. Simunic and M. T. Stein, "The Production of Audit Services: Evidence from a Major Public Accounting Firm", Journal of Accounting Research, vol. 32, no. 1, **(1994)**, pp. 241-261.
[12] J. Francis, "The Effect of Audit Firm Size on Audit Prices", Journal of Accounting and Economics, vol. 6, **(1984)**, pp. 133-151.
[13] A. Craswell, J. Francis and L. Taylor, "Auditor Brand Name Reputations and Industry Specializations', Journal of Accounting and Economics, vol. 20, **(1995)**, pp. 297-322.
[14] F. Schere and D. Ross, "Industrial Market Structure and Economic Performance", 3rd Edition, Houghton Mifflin, Boston, **(1990)**.
[15] M. Jensen and W. Meckling, "The Theory of Firm: Managerial Behavior, Agency Costs and Ownership Structure", Journal of Financial Economics, vol. 3, **(1976)**, pp. 305-360.
[16] H. Demsetz and K. Lehn, "The Structure of Corporate Ownership: Cases and Consequences", Journal of Political Economy, vol. 93, **(1985)**, pp. 1155-1177.
[17] C. Lennox, "Audit Quality and Auditor Size: An Evaluation of Reputation and Deep Pockets Hypotheses", Journal of Business Finance & Accounting, vol. 26, **(1999)**, pp. 779-805.
[18] R. D. Banker and R. Natarajan, "Evaluating Contextual Variables Affecting Productivity Using Data Envelopment Analysis", Operations Research, vol. 56, no. 1, **(2008)**, pp. 48-58.
[19] R. D. Banker, A. Charnes and W. W. Cooper, "Some Models for Estimating Technical and Scale Inefficiencies in Data Envelopment Analysis", Management Science, vol. 30, no. 9, **(1984)**, pp. 1078-1092.
[20] S. J. Paris and C. B. Winsten, "Trend Estimators and Serial Correlation", Cowles Commission Discussion Paper, **(1954)**, no. 383, Chicago.
[21] R. E. Park and B. M. Mitchell, "Estimating the Autocorrelated Error Model with Trended Data", Journal of Econometrics, vol. 13, **(1980)**, pp. 185-201.
[22] H. E. Doran and W. E. Griffiths, "On the Relative Efficiency of Estimators Which Include the Initial Observations in the Estimation of Seemingly Unrelated Regressions with First-Order Autoregressive Disturbances", Journal of Econometrics, vol. 23, **(1983)**, pp. 165-191.
[23] J. Kmenta and R. F. Gilbert, "Estimation of Seemingly Unrelated Regressions with Autoregressive Disturbances", Journal of the American Statistical Association, vol. 65, **(1970)**, pp. 186-197.
[24] D. Belsley, E. Kuh and R. Welsch, Regression Diagnostics, John Wiley & Sons, New York, **(1980)**.
[25] H. White, "A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity", Econometrica, vol. 48, **(1980)**, pp. 817-838.

Author

Seok-Young Lee, is a professor of accounting at Sungshin Women's University, Seoul, Korea. He received his Ph.D. degree from the University of Minnesota, USA. His primary research interest is in economic modeling and empirical analysis to understand the implications of changing competitive environments for performance evaluation.

