The Influence of International Financial Reporting Standards Adoption on Economies of Scale in Accounting Firms: Korean Evidence

Sang-Lyul Ryu
College of Business, Konkuk University

Jayoun Won*
Division of Economics and International Trade, Sunchon National University

ABSTRACT

This paper examines how the mandatory transition to International Financial Reporting Standards (IFRS) affected economies of scale in accounting firms. Following the global harmonisation of accounting standards, Korea has required all listed companies to prepare financial statements using IFRS since 2011. The mandatory transition in accounting standards may influence the size and mix of outputs in accounting firms. We adopt a translog cost function to evaluate economies of scale in accounting firms. Our sample consists of 1,429 firm-year observations from 2005 to 2017. We found that, on average, economies of scale existed in accounting firms over the sample period. In addition, during the post-IFRS period (2012–2017) compared to the pre-IFRS period (2005–2010), overall scale economies and the scale economies of Audit and Accounting (A&A) and Tax services (TAX) decreased, whereas economies of scale specific to Management Advisory Services (MAS) improved. This indicates that overall scale economies deteriorated due to the rise of operating costs in A&A and TAX rather than MAS. Our findings suggest that accounting firms should increase revenues from MAS to improve economies of scale in countries that have adopted global accounting standards.

Keywords: International Financial Reporting Standards; economies of scale; translog cost function; accounting firms

1. INTRODUCTION

An accounting standard is a common set of principles that defines the basis of accounting policies and practices. A company uses an accounting standard to prepare financial statements, including the financial position, earnings, cash flow and changes in equity. Those who use accounting information, such as managers, creditors and equity holders, analyse the financial statements to obtain information for making economic decisions about the company, such as profitability, financial stability and solvency.

As world economic integration has progressed, the EU announced that all EU-listed companies should prepare their financial statements in compliance with International Financial Reporting Standards (IFRS) for fiscal years starting after January 1, 2005. IFRS is considered a globally accepted accounting standard. It is expected that the accounting convergence can be a means of improving the quality of financial reporting and increasing investor confidence in the stock market.

Following the trends in accounting harmonisation, Korea has required all companies listed on the Korea Exchange (KRX) to report financial statements under IFRS since 2011. Korea expected that adopting IFRS would make the listed companies more appealing to overseas investors and facilitate the globalisation of the Korean capital market. Before adopting the IFRS, Korean listed companies used the Korean generally accepted accounting principles (local GAAP), which involved rules-based accounting standards. Under the local GAAP, companies were required to follow a list of detailed rules to ensure accurate financial information. With these rigid rules in place, there was little room for discretionary judgement, and accounting practices were highly uniform. However, IFRS consist of principles-based standards that provide broad guidelines that can be applied in a variety of circumstances. Consequently, IFRS leaves more leeway for interpretation and allows managerial discretion in accounting choices.

Accounting firms hire professionals including certified public accountants, chartered accountants, tax and business consulting experts to provide services for their clients. Accounting firms are the only authorised external auditors who conduct audits of and provide attestations to a company's financial statements. They present an opinion on whether the financial statements are fairly stated in accordance with the accounting standard, thereby enhancing the degree of confidence that the information users have for the financial statements. The outputs of accounting firms can be divided into three categories: A&A, Tax and MAS. A&A includes statutory or voluntary audits, a compilation of financial statements, attestations and other accounting services. TAX encompasses tax returns and tax dispute resolutions. Along with attorneys and enrolled agents, accounting firms may represent their clients on any matters including tax payment or collection issues before the Internal Revenue Service. MAS includes business innovation, implementation and evaluation of internal controls, performance evaluations and other advisory services.

Researchers have argued that the accounting industry is competitive (e.g., Simunic 1980). This competitive market pressure causes the firms to improve their productivity over time. The IFRS adoption provided mandated shifts in accounting standards, which influence the size or composition of revenues generated from A&A, TAX and MAS in accounting firms. It is intriguing to consider whether the mandatory IFRS adoption affected economies of scale in accounting firms. Understanding economies of scale in an industry is crucial for evaluating changing business environments and developing appropriate regulatory policies (Goldberg et al. 1991). This is purely an empirical question because there is little theory or evidence to guide the direction of the answer.

This study aimed to investigate the changes in scale economies before and after the mandatory transition to IFRS in Korea. Under IFRS, companies should prepare consolidated financial statements as well as individual ones. Auditors should consider which company reports consolidated financial statements with subsidiaries. IFRS requires companies to measure all assets and liabilities at their fair value, and auditors should understand and document underlying assumptions in arriving at the fair value. Moreover, IFRS requires an increased volume of disclosures in footnotes to the financial statements. IFRS adoption may result in more efforts and operating costs for auditors. In most jurisdictions, accounting earnings provide a starting point for determining taxable income for tax filing. Because there are many differences in accounting methods between IFRS and tax laws, accounting firms might spend more time in providing TAX, resulting in additional costs. However, because the competition in the market has been growing, it is hard for accounting firms to raise fees for audit or tax services. Consequently, scale

economies in producing A&A or TAX are likely to deteriorate after the IFRS adoption. Accounting firms can provide advisory services for their clients during the IFRS transition. These services include the installation of the new accounting system and reconciliation between the two accounting regimes. The impact of the IFRS on consulting fees may depend on the extent of the difference between local GAAP and the IFRS. Thus, adopting the IFRS can create new consulting services for accounting firms and may improve economies of scale in providing MAS.

Korea provides a good research setting, not only because of the data available on accounting firms' annual reports but also because its accounting market trends are analogous to other countries: accounting firms have been required to file annual reports to the Korean Institute of Certified Public Accountants and Securities and Futures Commission since 1981. We can obtain the revenues and costs of accounting firms from their annual reports.

It is interesting to investigate the impact of IFRS on the scale economies in Korean accounting firms. Korea is a member of the Asian-Oceanian Standard-Setters Group, which was formed to share experiences on IFRS adoption in the Asian-Oceanian region. The Korean accounting service market exceeded US$2.8 billion in 2017. In an international study of 31 countries, Leuz et al. (2003) ranked Korea as the third among countries that earnings management is widespread. Since 2011, Korea has adopted IFRS to increase transparency in accounting information. Across the world, the accounting industry has been facing a similar market trend; Like other countries, a few of the largest firms (Big4) dominate the market. Specifically, from 2005 to 2017, the Big4 have maintained more than 50% of the market share, which is measured by total revenues. Thus, our findings can provide insight into how accounting firms in other countries can improve economies of scale after IFRS adoption.

We found that the scale efficiencies of A&A and TAX deteriorated, whereas the scale efficiency of MAS improved in accounting firms during the post-IFRS period. This signifies that accounting firms attained cost advantages by increasing revenues from MAS rather than A&A and TAX after the IFRS adoption. We also documented that cost complementarities existed between A&A and MAS or TAX and MAS, and accounting firms could thus achieve cost advantages by providing these two services in pairs.

Our findings also contribute to the related literature. This study extends previous research on the accounting industry by considering economies of scale in accounting services. So far, the literature has paid little attention to economies of scale in the industry, partially due to data availability. MAS has become a crucial business area for determining overall economies of scale within accounting firms since IFRS adoption. Thus, managers of accounting firms should strive to boost revenues generated from MAS to enhance scale economies. Our results have implications for other countries that have adopted or are considering adopting global accounting standards.

The remainder of this study is organised as follows. Section 2 outlines the accounting service industry and IFRS adoption in Korea. In Section 3, we review studies related to economies of scale in the accounting industry and develop a research hypothesis. Section 4 describes our research methodology including the data sample and the cost function used to estimate scale economies. In Section 5, we discuss the empirical findings. Finally, Section 6 presents conclusions and implications of our findings and offers future research directions.

2. ACCOUNTING INDUSTRY AND IFRS ADOPTION IN KOREA

2.1 Overview of the Korean accounting industry

As mentioned in Section 1, accounting firms provide A&A, TAX and MAS to their clients. Based on A&A, accounting firms have expanded their lines of business to TAX and MAS. Recently, accounting firms also offer new services, including continuous monitoring, evaluation of internal controls and strategic tax planning, which performed based on the client's accounting policies, internal controls, tax laws and auditing rules.

   Table 1 shows the number of accounting firms by year, from 2005 to 2017. In 2000, Korea amended its regulations to ease the requirements needed to establish an accounting firm, resulting in a significant increase in the number of small and medium-sized firms newly entering the industry. The number of accounting firms increased from 34 in 2000 to 79 in 2004 (not reported here). The number of firms was 86 in 2005 and remained above 120 from 2010 to 2016. Korean accounting service market has been dominated by Big4, which consists of PricewaterhouseCoopers-Samil, KPMG-Samjong, Ernst & Young-Hanyoung and Deloitte-Anjin. Each one of the Big4 has an international network, sets quality standards and provides a wide range of accounting services. In Indonesia, one of the Asian countries, companies use big accounting firms to enhance audit quality and public trust (Alexander 2021).

Table 1. The number of accounting firms and the market share of Big4

Description	2005	2006	2007	2008	2009	2010	2011
Number of firms	86	91	103	104	115	123	125
Market share of Big4 (%)	61.6	58.9	57.1	57.8	57.5	57.7	55.3
Description	2012	2013	2014	2015	2016	2017	Total
Number of firms	127	125	122	121	121	118	1,481
Market share of Big4 (%)	55.5	55.6	54.7	53.7	53.6	55.3	56.5

Note: The Big 4 are PricewaterhouseCoopers-Samil, KPMG-Samjong, Ernst & Young-Hanyoung and Deloitte-Anjin. The market share of Big 4 in Total column is the average value during the period.

As shown in Table 1, the Big4 controlled 61.6% of the market in 2005, which declined steadily to 53.6% in 2016. The market share of the Big4 was between 50% and 65% during the period, which indicates a medium market concentration (Bigus and Zimmerman 2008). Because the Big4's market share has decreased and more firms have entered the industry, the market competition has become fierce over the period.

2.2 IFRS adoption

In 2005, the European Union (EU) announced that all listed companies must apply the IFRS to eliminate any confusion caused by differences in the accounting standards between jurisdictions. The IFRS have replaced many different local accounting standards and have been adopted by more than 140 countries around the world.

   Korea is one of the countries that was hit by the Asian financial crisis, which was triggered by a devaluation of the Thai baht in 1997. The Korean government requested a

bailout from the International Monetary Fund (IMF), which, in return, signed an agreement that required the government to establish accounting standards at a global level. Financial authorities in Korea endeavoured to improve accounting standards in the years following the financial crisis of 1997. However, financial statements prepared under local GAAP did not appeal to domestic and foreign investors because the accounting standards were not consistent with those globally (Kwon et al. 2019). As a result, the prices of stocks issued by Korean companies have been undervalued by investors.

In 2007, the National Assembly of Korea passed a regulation that requires all listed companies to report financial statements using IFRS by 2011 (allowing voluntary adoption from 2009). Instead of 'phase-in' or 'convergence' approaches, Korea employed a big bang approach in adopting IFRS. The IFRS is designed to enhance the comparability of financial information, strengthen accountability and contribute to economic efficiency in the capital market worldwide. The purpose of adopting IFRS is to have a unified set of globally accepted accounting standards and improve the reliability and transparency of financial reporting.

Pros and cons of adopting IFRS have been in many countries around the world. Supporters of the IFRS argued that the use of common accounting standards improves transparency and comparability of financial reporting, which leads to more efficient investment decisions (Choi and Meek 2005; Daske et al. 2008). Opponents argued that it is appropriate and necessary for countries to have different accounting standards because a single accounting standard is not suitable for all economic settings (Jermakowicz and Gornik-Tomaszewski 2006; Soderstrom and Sun 2007). From an economic standpoint, to achieve greater productivity gains in the service sector, it is crucial to establish a set of policies based on regulatory gaps that exist across other countries' service industries (Kim and Wood 2020). In this respect, the international unification of accounting standards will contribute to the development of the accounting services industry.

Figure 1 shows the transition from local GAAP to IFRS if a company's fiscal year begins on the 1st of January. When the company reports 2011 financial statements under IFRS, it should also apply IFRS to prepare 2010 financial statements to compare the two fiscal years. Thus, the transition date for the comparative disclosure is 1 January 2010.

Figure 1. Transition from local GAAP to IFRS
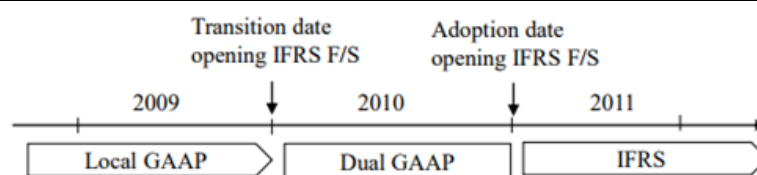
Note: F/S, IFRS and GAAP indicate Financial Statements, International Financial Reporting Standards and Generally Accepted Accounting Principles, respectively.

Korea amended related laws and regulations to ensure the validation of IFRS principles. Moreover, the Korea Accounting Standards Board (2016) reported that adopting the IFRS positively impacted international financing for Korean companies. Indeed, the Korean stock market ranking among stock exchanges worldwide improved from 16th in 2010 to 13th in 2017, and foreign investors held close to one-third of the stocks listed on the KRX in 2017.

3. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

We examine how the scale economies in accounting firms have changed since the adoption of global accounting standards. Economies of scale pertain to the cost advantage that firms attain due to their scale of operation, with the unit cost of output decreasing with increasing output size. The mandatory IFRS adoption might change the scale and mix of outputs and thus the scale economies of accounting services.

It has been several years since the IFRS was adopted worldwide. Researchers in many countries have investigated the consequences of implementing the IFRS. One strand of research has explored the effects of IFRS adoption on earnings quality, earnings management practices and the value relevance of earnings. However, the studies revealed mixed findings. Some studies claimed that financial statements prepared using IFRS could provide higher quality information than those prepared using local GAAP (e.g., Barth et al. 2008; 2014). Recently, Lee and Azis (2023) found that adopting IFRS can enhance audit quality and significantly reduce corruption perceived by foreign investors. Others suggested that IFRS could decrease reporting quality because the principles-based standards allowed for managerial discretion in accounting choices, which could reduce the opportunity to better reflect the economic substance of a company (e.g., Ahmed et al. 2013). The other strand has focused on whether the IFRS adoption increases audit fees or audit efforts. So far, the empirical evidence seems to be inconclusive. Some research found evidence of increased audit fees after IFRS adoption (e.g., De George at al. 2013). Others argued that there was no significant difference in audit fees before and after the IFRS adoption (e.g., Vieru and Schadewitz 2010).

A few studies to date have examined the productive efficiency of accounting firms. The paucity of the evidence on productive efficiency is attributable to a lack of accounting firm-level data. For instance, Banker et al. (2003) estimated a translog production function using annual survey data for 64 accounting firms in the U.S. from 1995 to 1999. They claimed that their study was the first to estimate an accounting industry production function and suggested that increasing returns-to-scale prevailed in the accounting industry, justifying mergers and acquisitions among accounting firms. Chang et al. (2009) investigated the effect of the Sarbanes-Oxley Act of 2002 (SOX) on the Malmquist productivity for 62 of the largest US accounting firms. They showed that accounting firms had exhibited significant growth in productive efficiency after the SOX. They also found that accounting firms with a positive change in revenues from A&A and MAS had greater improvements in productive efficiency after the SOX. Ryu and Won (2022) estimated a multi-product translog cost function using a panel of 43 Korean accounting firms from 2002 to 2008. In contrast to Chang et al. (2009), they reported that accounting firms had been less able to exploit scale efficiency after SOX regulations, and the reduced scale efficiency was possibly due to A&A rather than TAX or MAS. This paper differs from previous studies because it estimates economies of scale in each output of accounting firms and explores business areas in which scale economies are most affected by the mandatory IFRS adoption.

After the introduction of IFRS, the main financial statement was changed from individual to consolidated financial statements. Thus, auditors need to consider the scope and conditions of affiliated firms, which affects the audit workload. The new standards also require that financial statements include lengthy disclosures in footnotes. Webb (2006) found that financial statements prepared in the first fiscal year that the IFRS was adopted are about 60% longer than those prepared pre-adoption. Nam (2018) quoted a survey that was conducted by the financial authority in Korea, indicating that the number of footnote pages significantly increased (from 21 to 61) in the first IFRS adoption. This

implies that the content of the footnotes also increased, which requires auditors to put in more audit hours. The IFRS require fair value measurements, which allow discretionary judgement in estimating the value of assets and liabilities. To determine whether an asset or a liability is measured at its fair value, auditors should estimate the price at which the asset can be sold, or the liability can be settled with a third party. This increases the potential occurrence of misstatements in financial statements. Thus, auditors need to increase their efforts to identify the possible reporting errors of the financial statements. Because there is much difference between the accounting methods of the IFRS and tax laws, it is expected that audit work and tax adjustments increase in the post-IFRS period. Using Korean audit data, Lee et al. (2012) suggested that auditors put in more work hours but did not demand adequate remuneration for their work during the post-IFRS period. If audit or tax fees did not increase in proportion to the increase in workload, the scale efficiency in accounting firms would worsen after IFRS adoption.

The mandatory shift from local GAAP to IFRS can bring about new business opportunities for accounting firms. For instance, accounting firms can analyse the impact of convergence to IFRS, design solutions for implementing a new accounting system and help clients educate their staff on the IFRS. Some researchers have argued that providing non-audit services such as TAX and MAS to audit clients impairs auditor independence (Hay et al. 2006). Accounting firms prefer MAS, which is more profitable than A&A and TAX (Choi and Yoon 2014). Furthermore, IFRS adoption creates new consulting services for accounting firms. Thus, they are likely to offer MAS unless their independence is not compromised at the auditing level, which may lead to the improvement of scale economies specific to MAS. Based on the above discussion, we posit the following hypothesis.

Hypothesis: After IFRS adoption, economies of scale in A&A and TAX deteriorate, whereas the scale economies in MAS improve.

The cost structure of a firm affects the firm's pricing policy. Higgins et al. (2016) found that PwC and Deloitte have employed lower marginal pricing after IFRS adoption and had relatively higher fixed costs and lower variable costs. If economies of scale had prevailed in the accounting industry, accounting firms could have been able to keep prices above total costs and lower prices when expanding production scale.

4. EMPIRICAL MODEL AND DATA

4.1 Translog cost function

This study's purpose was to examine whether the mandatory IFRS adoption affects economies of scale within accounting firms. Economies of scale can be assessed by exploring a firm's production structure. According to duality theory, cost and production functions are dual to each other under certain regularity conditions, such as non-negativity, non-decreasing in prices and outputs and linear homogeneity (Shephard 1970). Therefore, the structure of production technology can be equivalently analysed using a cost or production function: the choice between the two should be based on economic and statistical grounds. A production function is appropriate if we assume that a firm maximises its profit and output levels are endogenous. If a firm is an input-price taker and tries to minimise total costs, then the cost function contains enough information to describe the firm's production structure (Shephard 1953; McFadden 1978). Cheng et al.

(2000) suggested that a cost function is more suitable than a production function when investigating the issues related to economies of scale.

Economic literature provides various functional forms, such as Leontief, linear, quadratic, constant elasticity of substitution and Cobb-Douglas models. However, these functional forms impose a-priori restrictions on either the substitution possibilities among production factors or on scale economies. A common approach to estimate the cost function of a firm producing multi-outputs using multi-inputs is to specify a translog cost model (e.g., Ryu and Won 2022; Banker et al. 2003; Cheng et al. 2000; Muldur and Sassenou 1993; Goldberg et al. 1991). We utilised the translog cost function, known for its flexibility and practicality, as it can approximate any twice-differentiable function without placing a priori restrictions on the production technology. The degree of scale economies is determined using the estimated coefficients of the translog cost function. The translog cost form can be expressed as Eq. (1).

$$\ln C(w, q) = a_0 + \sum a_p (\ln w_p) + \sum b_i (\ln q_i) + 1/2 \sum \sum c_{pq} (\ln w_p)(\ln w_q)$$
$$+ 1/2 \sum \sum d_{ij} (\ln q_i)(\ln q_j) + \sum \sum f_{pi} (\ln w_p)(\ln q_i) \quad (1)$$

where $\ln C(\cdot)$ is the natural log of total costs (TC), $\ln w_p$ is the log of input price (w_p), p = 1, …,P and $\ln q_i$ is the log of output (q_i), i = 1, …, I. The symmetry condition requires that $c_{pq} = c_{qp}$ and $d_{ij} = d_{ji}$. For the linear homogeneity in all input prices, the following restrictions on parameters are required:

$$\sum a_p = 1, \sum c_{pq} = 0 \text{ for } p, q = 1, …,P \text{ and } \sum f_{pi} = 0 \text{ for } i = 1, …,I. \quad (2)$$

To estimate parameters more accurately, we add cost share equations that represent the accounting firm's input choices. By partially differentiating Eq. (1) and using Shephard's (1970) lemma, we obtain the cost share of p input (S_p) as follows.

$$S_p = w_p x_p / C(\cdot) = w_p[\partial C(\cdot)/\partial w_p]/C(\cdot) = \partial \ln C(\cdot)/\partial \ln w_p$$
$$= a_p + \sum c_{pq}(\ln w_q) + \sum f_{pi}(\ln q_i) \text{ for } p, q = 1, … ,P. \quad (3)$$

where x_p is the level of usage of input p. Eq. (1) and Eq. (3) are related through the correlation in the error terms. Thus, we estimate the parameters of Eq. (1) and Eq. (3) simultaneously, so that the parameters of each equation are generated by taking the information provided by the other equations into account.

Economies of scale, also called returns-to-scale (RTS), pertain to whether firms can save their average production costs by increasing their output levels. Because average costs cannot be defined in firms that produce multi-outputs, ray scale economies (RSCE) can be applied to multi-product firms. RSCE is a concept in which economies of scale at a single product are extended into a multi-product context. It indicates the change in total cost resulting from an equally proportional change in all output levels while maintaining the product mix. (Baumol et al. 1982). The degree of RSCE is measured as Eq. (4).

$$RSCE \equiv [\sum q_i \, \partial C(\cdot)/\partial q_i]/C(\cdot) = \{\sum q_i[C(\cdot)/q_i][\partial \ln C(\cdot)/\partial \ln q_i]\}/C(\cdot)$$
$$= \sum \partial \ln C(\cdot)/\partial \ln q_i \quad (4)$$

$SCE_i = \partial \ln C(\cdot)/\partial \ln q_i$ is the measure of scale economies specific to an output i (Panzar and Willig 1977). SCE_i indicates how much the total cost changes as the level of an output i changes while all other outputs remain at a constant level. A value of SCE_i is less than,

equal to or greater than one as there are increasing, constant or decreasing RTS about the output i. Likewise, the value of RSCE that is less (or greater) than one means that the total cost increases less (or more) than proportionately with the level of outputs, signifying that firms operate in the production area of increasing (or decreasing) RTS. It is interpreted that the closer the value of RSCE is to one, the more the scale economies are exhausted.

4.2   Model specification

We specify the translog cost function (TCM) to investigate economies of scale in accounting firms during the pre- and post-IFRS periods. The TCM for accounting firms with two inputs and three outputs can be expressed as follows:

$$\ln(TC/w_K) = \alpha_0 + \alpha_L*\ln(w_L/w_K) + \sum \beta_i *(\ln q_i) + 1/2*\gamma_L*[\ln(w_L/w_K)]^2$$
$$+ 1/2*\sum \sum \theta_{ij}*(\ln q_i)(\ln q_j)+ \sum \delta_{Li}*\ln(w_L/w_K)*(\ln q_i) + YEAR + \varepsilon \quad (5)$$
$$S_L = \alpha_L + \gamma_L*\ln(w_L/w_K) + \sum \delta_{Li}*(\ln q_i) + YEAR + \upsilon \quad (6)$$

The outputs of accounting firms are measured as revenues from each line of business: A&A, TAX and MAS. The price of labour (w_L) is calculated by dividing total amounts paid to employees, including salaries, insurance premiums, retirement benefits and training expenses, by the total number of employees. We approximated the price of capital (w_K) by dividing capital expenses, including rent, depreciation and interest expenses, by the net tangible assets (Muldur and Sassenou 1993). TC includes both capital and labour costs. The labour cost share (S_L) is defined as the proportion of labour costs among the total costs. The capital cost share (S_K) can be defined in the same way as the labour cost share. YEAR is a dummy variable that equals one for each year and 0 otherwise, which captures time-specific fixed effects.

Eq. (5) and (6) are specified with error terms that are assumed to be correlated across equations. Thus, we estimate the equation system using Zellner's (1962) seemingly unrelated regression model (SUR). Because the cost shares sum to one, we divide TC and w_L with w_K chosen arbitrarily as a numeraire to avoid the singularity problem. SUR is iteratively performed until convergence is achieved to yield maximum-likelihood estimates (Kmenta and Gilbert 1968). Because the TCM is estimated using the maximum likelihood method, the hypothesis based on restrictions imposed on the parameters of the TCM can be evaluated by a likelihood-ratio (LR) test (Greene 2003). The translog model is a generalised version of the Cobb–Douglas function. Thus, we conduct the LR test to confirm whether the TCM more accurately represents accounting firms' cost function compared to the Cobb-Douglas function. SCE_i is computed as Eq. (7) for the TCM specified in Eq. (5).

$$SCE_i = \partial \ln(TC/w_K)/\partial \ln q_i = \beta_i + \theta_{ii}*\ln q_i + 1/2*\sum \theta_{i,j}*(\ln q_j) + \delta_{Li}*\ln(w_L/w_K) \quad (7)$$

In Eq. (7), if the value of SCE_i is less than one, then scale economies exist in accounting firms during the full sample period. It is interpreted that the closer SCE_i approaches zero the more economies of scale exist. Therefore, we can suggest that the IFRS adoption has reduced economies of scale in accounting firms if SCE_i and RSCE show upward trends in the post-IFRS period.

4.3 Data

This paper examines how the mandatory transition from local GAAP to IFRS has affected economies of scale in the accounting service sector. We obtain data from the annual reports of accounting firms in Korea for each of the 13 years from 2005 to 2017 and divide the sample period into pre-IFRS (2005–2010) and post-IFRS (2012–2017) periods. As shown in Table 1 of Section 2.1, the number of accounting firms during the full sample period is 1,481. We excluded firms from the sample that had not run their business for a whole year to ensure the completeness and consistency of data. After removing the unqualified observations, the final sample size was 1,429.

Table 2 presents descriptive statistics for the pooled data on revenues, total costs, input prices and cost shares. We adjusted all monetary data to the 2010 Korean won using the consumer price index released by the Bank of Korea. MAS makes up the largest portion of total revenues, followed by A&A and TAX. The labour costs and capital costs account for 92.25% and 7.75% of total costs, respectively. The high standard deviation implies that accounting firms vary in their sizes of revenues, total costs and input prices. Though the distributions of output and input variables are skewed to the right, the skewness disappears when transforming the data logarithmically to estimate the TCM. As for the prices and compositions of inputs, the mean values are the same as the median values, indicating that the data appear symmetric distribution.

Table 2. Descriptive statistics (Unit: Korean won in millions)

Variable	Mean	Std. dev.	Q1	Median	Q3
Total Revenues	18,133	57,124	3,963	6,336	9,184
A&A (q_A)	6,687	21,322	929	1,811	3,144
TAX (q_T)	4,327	12,298	760	1,508	3,425
MAS (q_M)	7,119	24,497	1,172	2,428	3,938
Total costs (TC)	13,242	43,401	2,724	4,435	6,575
Capital costs	867	2,703	194	313	508
Labour costs	12,374	40,796	2,490	4,115	6,081
Capital price (w_K)	0.384	0.234	0.235	0.347	0.475
Labour price (w_L)	98	63	64	80	109
Share of capital costs (S_K)	7.75%	3.26%	5.71%	7.25%	9.07%
Share of labour costs (S_L)	92.25%	3.26%	90.93%	92.75%	94.29%

Note: A&A, TAX and MAS indicate accounting and assurance, tax and management advisory service, respectively.

5. EMPIRICAL RESULTS AND DISCUSSION

5.1 Estimation of the TCM and scale economies

We estimated the cost function cross-sectionally using the pooled data and evaluates the scale economies of individual firms with the parameters of the cost function. We applied Zellner's SUR to estimate a simultaneous equation system of the TCM specified in Eq. (5) and its cost-share in Eq. (6). The maximum likelihood estimator (MLE) is obtained after the five iterations of Zellner's procedure.

Table 3 reports the estimated results of the TCM. The McElroy R^2 is 82.61%, suggesting that the explanatory power of the whole system is high. The result of the LR test shows that the TCM represents more accurately the accounting firms' cost function than the Cobb-Douglas function.

Table 3. The estimated results of the TCM

Parameter	Estimate	Std. error	Parameter	Estimate	Std. error
α_0	2.5430***	0.0418	θ_{AM}	-0.1001**	0.0447
α_K	0.1795***	0.0239	θ_{TT}	0.0279	0.0186
α_L	0.8205***	0.0239	θ_{TM}	-0.1011***	0.0273
β_A	0.2499***	0.0253	θ_{MM}	0.1129***	0.0229
β_T	0.3785***	0.0227	δ_{KA}	-0.1127***	0.0228
β_M	0.1772***	0.0227	δ_{KT}	-0.0061	0.0158
γ_{KK}	0.0027	0.0255	δ_{KM}	0.0741***	0.0184
γ_{KL}	-0.0027	0.0255	δ_{LA}	0.1127***	0.0228
γ_{LL}	0.0027	0.0255	δ_{LT}	0.0061	0.0158
θ_{AA}	0.0137	0.0306	δ_{LM}	-0.0741***	0.0181
θ_{AT}	0.0941**	0.0391	YEAR	Included	
McElroy R^2	0.8261	LR test (H$_0$: γ_{pq}, θ_{ij}, $\delta_{pi} = 0$): Chi-square	175.05***		

Note: Iterated 5 times until convergence. **: $p < 0.05$; ***: $p < 0.01$.

As reported in Table 3, the first-order parameters that measure the effects of individual output and input prices on total costs are all significant. Particularly, the estimates of θ_{AM} and θ_{TM} are significantly negative, implying that cost complementarities exist between A&A and MAS and between TAX and MAS. That is, cost advantages can be realised while accounting firms jointly produce A&A and MAS or TAX and MAS. This may result for two reasons: (1) there are common inputs, such as personnel and office, between the two service departments; or (2) the common inputs are not easily separated and are all important to produce the two services. It applies to accounting firms where accounting or tax professionals can be transferred to management advisory departments without further expert knowledge. In contrast, the positive θ_{AT} shows that cost complementarities do not exist in providing A&A and TAX together. Thus, accounting firms could be more cost-effective by separating A&A and TAX into two entities. This result is consistent with that of Cheng et al. (2000) who examine economies of in the Taiwanese accounting industry. In estimating Eq. (5), we divided all output and input price variables by their average values. Thus, SCE$_i$ and RSCE measured at the average level of outputs and input prices degenerate into $\sum \beta_i$ and $\sum$ SCE$_i$, i= 1, ..., I, respectively. Table 4 presents the computed measures of SCE$_i$ and RSCE from the parameter estimates. In Table 4, the values of SCE$_A$, SCE$_T$ and SCE$_M$ are all less than one and significant at the 1% level, meaning that, on average, economies of scale exist in providing each service of accounting firms. RSCE, which measures the overall scale economies of the individual accounting firm, is less than one and significant at the 1% level. These results signify that increasing RTS prevails in accounting firms during the analysis period. In other words, an equal proportional change in the levels of all outputs results in the proportional change in total costs, holding the output mix unchanged (Bailey and Friedlander 1982).

In Table 4, the values of SCE$_A$, SCE$_T$ and SCE$_M$ are all less than one and significant at the 1% level, meaning that, on average, economies of scale exist in providing each service of accounting firms. RSCE, which measures the overall scale economies of the individual

accounting firm, is less than one and significant at the 1% level. These results signify that increasing RTS prevails in accounting firms during the analysis period. In other words, an equal proportional change in the levels of all outputs results in the proportional change in total costs, holding the output mix unchanged.

Table 4. Economies of scale

SCE	Estimate	Std. error	SCE	Estimate	Std. error
SCE_A	0.2499^{***}	0.0253	SCE_T	0.3785^{***}	0.0227
SCE_M	0.1772^{***}	0.0227	RSCE	0.8056^{***}	0.0663

Note: SCE_A, SCE_T and SCE_M represent economies of scale specific to A&A, TAX and MAS, respectively. RSCE is ray scale economies. ***: $p < 0.01$.

5.2 Empirical results

5.2.1 Correlations between scale economies

We report Pearson and Spearman correlations between scale economies and POST in Table 5. POST takes a value of 1 for the post-IFRS period and 0 otherwise. SCE_A, SCE_T and RSCE are all positively correlated with POST whereas SCE_M is negatively correlated with POST. This implies that since the IFRS adoption, scale economies specific to MAS have improved but those specific to other services have deteriorated. Overall scale economies in accounting firms have also worsened since the IFRS adoption. The correlation coefficient between SCE_A and SCE_T is significantly positive, whereas the correlations between SCE_A and SCE_M and between SCE_T and SCE_M are significantly negative. This is consistent with the result of the estimated cost function in the sense that cost complementarities exist between A&A and MAS or TAX and MAS.

Table 5. Correlations between SCEi, RSCE and POST

Variable	POST	SCE_A	SCE_T	SCE_M	RSCE
POST	1	0.311^{***}	0.345^{***}	-0.360^{***}	0.182^{***}
SCE_A	0.300^{***}	1	0.686^{***}	-0.883^{***}	0.658^{***}
SCE_T	0.328^{***}	0.674^{***}	1	-0.783^{***}	0.629^{***}
SCE_M	-0.351^{***}	-0.881^{***}	-0.780^{***}	1	-0.417^{***}
RSCE	0.156^{***}	0.618^{***}	0.649^{***}	-0.359^{***}	1

Note: Pearson correlations are at the bottom left of the diagonal and Spearman rho values are at the top right of the diagonal. ***: $p < 0.01$.

5.2.2 Difference in scale economies between the pre- and post- IFRS periods

We conducted three conventional tests, including the t-test, Wilcoxon test and Kolmogorov-Smirnov test, to evaluate the differences in economies of scale between the pre- and post-IFRS periods. Table 6 shows the results of the tests. We find that the mean difference in the measures of scale economies between the two periods is significant at the 1% level from the t-test, signifying that SCE_A, SCE_T and RSCE were higher whereas SCE_M was lower during the post-IFRS period. This suggests that overall and product-specific economies of scale in providing A&A and TAX lessened, whereas economies of scale specific to MAS improved in the post-IFRS period.

Table 6. Test of difference in scale economies

SCE	Mean		t-test (t-value)	Median		Wilcoxon test (Z-value)	Kolmogorov-Smirnov test (Z-value)
	pre-IFRS (2005 −2010)	post-IFRS (2012 −2017)		pre-IFRS (2005 −2010)	post-IFRS (2012 −2017)		
SCE_A	0.221	0.279	11.158***	0.217	0.274	11.009***	4.862***
SCE_T	0.358	0.399	12.362***	0.359	0.405	12.238***	6.384***
SCE_M	0.218	0.137	13.484***	0.232	0.142	12.927***	5.984***
RSCE	0.797	0.815	5.534***	0.791	0.811	6.387***	3.469***

Note: ***: $p < 0.01$.

5.2.3 Regression analysis

We posit that IFRS adoption will affect economies of scale in accounting firms. Thus, we model this potential impact as an interrupted time series and assess it employing an intervention analysis. As described in Eq. (7), SCE_i is determined by revenues from each line of business (q_i) and the input prices (w_L and w_K). We include the input prices (w_L and w_K) and revenues (q_A, q_T and q_M) in our regression model. A dummy variable, POST, is treated as an intervention variable to differentiate between the pre- and post-IFRS periods and to reflect the difference in economies of scale between the two periods. The estimation model is specified as follows:

$$\ln(SCE_i) = \eta_{0i} + \eta_{1i}*\ln w_L + \eta_{2i}*\ln w_K + \eta_{3i}*\ln q_i + \eta_{4i}*POST + \varepsilon, \; i = A, T \text{ and } M. \quad (8a)$$
$$\ln(RSCE) = \eta_0 + \eta_1*\ln w_L + \eta_2*\ln w_K + \eta_3*\textstyle\sum \ln q_i + \eta_4*POST + \varepsilon, \; i = A, T \text{ and } M. \quad (8b)$$

where $\ln(SCE_i)$, $\ln(RSCE)$, $\ln w_L$, $\ln w_K$ and $\ln q_i$ are the natural log of scale economies specific to an output i, ray scale economies, labour price, capital price and an output i, respectively; POST is a variable that indicates whether IFRS is adopted, and ε is the disturbance term.

   We can predict the signs of parameters included in Eq. (8a) and (8b) based on the estimation result of the TCM. For example, when the output is A&A, η_{1A} is expected to be positive because η_{1A} corresponds to δ_{LA} in Eq. (7), and it was estimated to be the positive value of 0.1127 (See Table 3). When the output is A&A, η_{2A} and η_{3A} are equivalent to δ_{KA} and θ_{AA} in Eq. (7), which are expected to have negative and positive values, respectively. Similarly, we can predict η_{1T}, η_{2T} and η_{3T} by using δ_{LT}, δ_{KT} and θ_{TT} when the output is TAX and η_{1M}, η_{2M} and η_{3M} using δ_{LM}, δ_{KM} and θ_{MM} when the output is MAS. η_1, η_2 and η_3 are the parameters of Eq. (8b) where the output is total revenue, and they can be predicted as joint effects of the three outputs:

$$\eta_1 \sim \delta_{LA} + \delta_{LT} + \delta_{LM}; \quad \eta_2 \sim \delta_{KA} + \delta_{KT} + \delta_{KM}; \quad \eta_3 \sim \theta_{AA} + \theta_{TT} + \theta_{MM}.$$

For instance, η_3 is the effect of total revenues on RSCE and expected to have a positive value because θ_{AA}, θ_{TT} and θ_{MM} are all estimated to be positive. The parameters η_{4i} and η_4 enable us to evaluate whether there is a significant shift in the scale economies of accounting firms after IFRS adoption.

   In Table 6, we discover that in accounting firms after IFRS adoption, scale economies specific to A&A and TAX worsen, whereas scale efficiency specific to MAS improves.

Thus, the expected signs of η_{4A} and η_{4T} are positive when the efficiency measures are SCE_A and SCE_T, but η_{4M} is negative when the measure is SCE_M. Table 7 summarises the predicted signs of the parameters in Eq. (8a) and (8b).

Table 7. Predicted sign of parameter in Eq. (8a) and (8b)

Parameter in Eq. (8a) and (8b)	SCE_A		SCE_T	
	Corresponding parameter in Eq. (5)	Pred. sign	Corresponding parameter in Eq. (5)	Pred. sign
η_{1i}/η_1	δ_{LA}	+	δ_{LT}	+
η_{2i}/η_2	δ_{KA}	-	δ_{KT}	-
η_{3i}/η_3	θ_{AA}	+	θ_{TT}	+
η_{4i}/η_4	n/a	+	n/a	+
Parameter in Eq. (8a) and (8b)	SCE_M		RSCE	
	Corresponding parameter in Eq. (5)	Pred. sign	Corresponding parameter in Eq. (5)	Pred. sign
η_{1i}/η_1	δ_{LM}	-	$\delta_{LA} + \delta_{LT} + \delta_{LM}$	+/-
η_{2i}/η_2	δ_{KM}	+	$\delta_{KA} + \delta_{KT} + \delta_{KM}$	+/-
η_{3i}/η_3	θ_{MM}	+	$\theta_{AA} + \theta_{TT} + \theta_{MM}$	+
η_{4i}/η_4	n/a	-	n/a	+/-

We constructed a panel of cross-sectional and time-series data, thus employing a fixed effects model for estimation. Table 8 presents the regression results.

Table 8. The effect of IFRS adoption on scale economies

Parameter	SCE_A		SCE_T	
	Estimate	Std. error	Estimate	Std. error
η_{1i}/η_1	0.4199^{***}	0.0237	0.0105	0.0074
η_{2i}/η_2	-0.5807^{***}	0.0166	-0.0341^{***}	0.0055
η_{3i}/η_3	0.2065^{***}	0.0144	0.1417^{***}	0.0038
η_{4i}/η_4	0.2242^{***}	0.0125	0.0128^{**}	0.0052
Adj. R^2	0.6167		0.6509	
Max. VIF	1.2723		1.1991	
F-statistic	603.006^{***}		697.878^{***}	
Parameter	SCE_M		RSCE	
	Estimate	Std. error	Estimate	Std. error
η_{1i}/η_1	-2.0308^{***}	0.1255	0.0533^{***}	0.0012
η_{2i}/η_2	1.0005^{***}	0.0947	-0.0549^{***}	0.0008
η_{3i}/η_3	1.9065^{***}	0.0664	0.0682^{***}	0.0009
η_{4i}/η_4	-0.5768^{***}	0.0706	0.0103^{***}	0.0006
Adj. R^2	0.477		0.9254	
Max. VIF	1.3315		1.2873	
F-statistic	358.142^{***}		4457.05^{***}	

Note: A, T and M respectively denote A&A, TAX and MAS. q_i is total revenue when the dependent variable is RSCE. VIF is the variance inflation factor. **: $p < 0.05$; ***: $p < 0.01$.

From Table 8, we observe that the estimates of η_{1i}, η_{2i} and η_{3i} have the same signs as predicted in Table 7. The estimate of η_{1A} (0.4199) is positive, whereas that of η_{2A} (-0.5807) is negative, indicating that scale economies specific to A&A improve as labour price decreases and capital price increases. We find the same results when the output is TAX

or total revenue: the scale efficiency becomes better as labour price declines and capital price increases. However, scale economies specific to MAS improve as labour price increases and capital price decreases. This implies that, compared to other services, hiring highly paid employees is important for the scale efficiency of MAS department. The estimates of η_{4A}, η_{4T} and η_4 are all positive, whereas η_{4T} is estimated to be negative, meaning that the scale efficiencies specific to A&A, TAX and total service revenues worsen, whereas the scale efficiency specific to MAS improves in accounting firms after the IFRS adoption.

6. SUMMARY AND CONCLUSION

We investigated the effect of mandatory IFRS adoption on the scale economies of accounting firms in Korea from 2005 to 2017. Using data gathered over 13 years, including the six years before and after the IFRS adoption of 2011, the results show that ray and product-specific economies of scale exist in accounting firms during the overall period. Specifically, compared to pre-IFRS period (2005–2010), overall scale economies and scale economies specific to A&A and TAX diminished, whereas scale economies specific to MAS improved during the post-IFRS period (2012–2017). This indicates that the mandatory IFRS adoption leads to deteriorated overall scale economies in accounting firms, possibly due to the rise of operating costs in A&A and TAX rather than MAS.

The estimated cost function and correlations between scale economies suggest that accounting firms can attain cost advantages by producing A&A and MAS or TAX and MAS in pairs. Thus, accounting firms can be more cost-effective by providing A&A and TAX as two separate entities. We also found that accounting firms with higher labour prices and lower capital prices had lower scale efficiency in providing their total services. In the accounting industry, labour costs comprise the bulk of total costs, and the labour price has increased while the capital price has decreased since the IFRS adoption. These seem to cause overall scale economies to worsen in the industry.

After global accounting standards adoption, the empirical evidence implies that economies of scale offer incentives for expanding MAS rather than A&A and TAX to achieve cost advantages. Accounting firms provide highly standardised services using expert knowledge in accounting, taxation and business practices. Thus, the cost advantage can help accounting firms increase their market share by delivering services at a lower cost than their competitors. Moreover, it would be better for these firms to specialise in A&A and MAS or TAX and MAS, which are cost complementary to each other. These results suggest how economies of scale in accounting firms have changed since the global accounting standards adoption. Because our study analysed the Korean case, it would be interesting to compare the relationships found in this study in other countries that have adopted IFRS.

ACKNOWLEDGEMENT

REFERENCES

[1]   Ahmed, A. S., Neel, M., Wang, D. (2013), "Does mandatory adoption of IFRS improve accounting quality? Preliminary evidence", *Contemporary Accounting Research*, 30(4), 1344– 1372.

[2]   Alexander, N. (2021), "Effect of corporate governance on earnings management: Study on manufacturing companies listed in the Indonesia stock exchange", *Review of Integrative Business & Economics Research*, 10(s1), 55-61.

[3]   Bailey, E., Friedlaender, A. F. (1982), "Market structure and multiproduct industries", *Journal of Economic Literature*, 20(3), 1024-1048.

[4]   Banker, R. D., Chang, H., Cunningham, R. (2003), "The public accounting industry production function", *Journal of Accounting and Economics*, 35(2), 255-281.

[5]   Barth, M. E., Landsman, W. R., Lang, M. (2008), "International accounting standards and accounting quality", *Journal of Accounting Research*, 46(3), 467–498.

[6]   Barth, M. E., Landsman, W. R., Zhang, Z. (2014), "Relevance of differences between net income based on IFRS and domestic standards for European firms", *Journal of Business Finance & Accounting*, 41(3–4), 297–327.

[7]   Baumol, W. J., Panzar, J. C., Willig, R. D. (1982), *Contestable Markets and the Theory of Industry Structure*, Harcourt Brace Jovanovich, New York.

[8]   Bigus, J., Zimmerman, R-C. (2008), "Non-audit fees, market leaders and concentration in the German audit market: A descriptive analysis", *International Journal of Auditing*, 12(3), 159-179.

[9]   Caves, D. W., Christensen, L. R., Tretheway, M. W. (1980), "Flexible cost functions for multiproduct firms", *Review of Economics and Statistics*, 62(3), 477-481.

[10] Chang, H., Choy, H. L., Cooper, W. W., Ruefli, T. W. (2009), "Using Malmquist indexes to measure changes in the productivity and efficiency of US accounting firms before and after the Sarbanes-Oxley", *Omega*, 37(5), 951-960.

[11] Cheng, T-W., Wang, K-L., Weng, C-C. (2000), "Economies of scale and scope in Taiwan's CPA service industry", *Applied Economics Letters*, 7(6), 409-414.

[12] Choi, F. D. S., Meek, G. K. (2005), *International Accounting* (5th ed.). Upper Saddle River, NJ: Prentice Hall.

[13] Choi, W., Yoon, S. (2014), "Effects of IFRS adoption, Big N factor, and the IFRS-related consulting services of auditors on audit fees: The case of Korea", *Asian Journal of Business and Accounting*, 7(1), 55-80.

[14] Daske, H., Hail, L., Leuz, C., Verdi, R. (2008), "Mandatory IFRS reporting around the world: Early evidence on the economic consequences", *Journal of Accounting Research*, 46(5), 1085–1142.

[15] De George, E. T., Ferguson, C. B., Spear, N. A. (2013), "How much does IFRS cost? IFRS adoption and audit fees", *The Accounting Review*, 88(2), 429-462.

[16] Goldberg, L. G., Hanweck, G. A., Keenan, M., Young, A. (1991), "Economies of scale and scope in the securities industry", *Journal of Banking and Finance*, 15(1), 91-107.

[17] Greene, W. H. (2003), *Econometric Analysis*, 5th ed., Prentice Hall, New Jersey.

[18] Hay, D. C., Knechel, W. R., Wong, N. (2006), "Audit fees: A meta-analysis of the effect of supply and demand attributes", *Contemporary Accounting Research*, 23(1), 141-191.

[19] Higgins, S., Lont, D., Scott, T. (2016), "Longer term audit costs of IFRS and the differential impact of implied auditor cost structures", *Accounting and Finance*, 56(1), 165-203.

[20] Jermakowicz, E. K., Gornik-Tomaszewski, S. (2006), "Implementing IFRS from the perspective of EU publicly traded companies", *Journal of International Accounting, Auditing and Taxation*, 15(2), 170-196.

[21] Kim, J., Wood, J. (2020), "Service sector development in Asia: an important instrument of growth", *Asian-Pacific Economic Literature*, 34(1), 12-25.

[22] Kmenta, J., Gilbert, R. F. (1968), "Small sample properties of alternative estimators of seemingly unrelated regressions", *Journal of the American Statistical Association*, 63(324), 1180-1200.

[23] Korea Accounting Standards Board (2016), "IFRS adoption and capital globalisation in Korea", *Research Report*, 38, 1-46.

[24] Kwon, S. Y., Na, K., Park, J. (2019), "The economic effects of IFRS adoption in Korea", *Asia-Pacific Journal of Accounting & Economics*, 26(4), 321-361.

[25] Lee, C-W., Azis, M. I. (2023), "The effect of adopting international accounting standards on corruption under financial reporting basis", *Review of Integrative Business & Economics Research*, 12(1), 40-55.

[26] Lee, M. G., Chang, S. J., Cho, S. M. (2012), "The adoption of International Financial Reporting Standards (IFRS), audit hours and audit fees", *Accounting and Auditing Research*, 54(2), 473–503. [Printed in Korea]

[27] Leuz, C., Nanda, D., Wysocki, P. D. (2003), "Earnings management and investor protection: an international comparison", *Journal of Financial Economics*, 69(3), 505-527.

[28] McFadden, D. (1978), "Cost, revenue and profit functions", in Fuss, M. and McFadden, D. (ed.), *Production Economics: A Dual Approach to Theory and Applications I*, North-Holland, Amsterdam.

[29] Muldur, U., Sassenou, M. (1993), "Economies of scale and scope in French banking and savings institutions", *The Journal of Productivity Analysis*, 4(1-2), 51-72.

[30] Nam, H-J. (2018), "The impact of mandatory IFRS transition on audit effort and audit fees: Evidence from Korea", *Australian Accounting Review*, 28(4), 512-524.

[31] Panzar, J. C., Willig, R. D. (1977), "Economies of scale in multi-product production", *The Quarterly Journal of Economics*, 91(3), 481-493.

[32] Ryu, S.-L., Won, J. (2022), "Scale and scope economies in Korean accounting firms around Sarbanes-Oxley regulations", *Journal of Asian Economics*, 78, 101427.

[33] Shephard, R. W. (1953), *Cost and Production Functions*, Princeton University Press, New Jersey.

[34] Shephard, R. W. (1970), *Theory of Cost and Production Functions*, Princeton University Press, New Jersey.

[35] Simunic, D. A. (1980), "The pricing of audit services: Theory and evidence", *Journal of Accounting Research*, 18(1), 161–90.

[36] Soderstrom, N., Sun, K. (2007), "IFRS adoption and accounting quality: A review", *European Accounting Review*, 16(4), 675–702.

[37] Vieru, M., Schadewitz, H. (2010), "Impact of IFRS transition on audit and non-audit fees: Evidence from small and medium-sized listed companies in Finland", *Working Paper*.

[38] Webb, R. (2006), "Brace yourselves: IFRS will be bumpy", *Financial Review*, 25(1), 26–34.

[39] Zellner, A. (1962), "An efficient method of estimating seemingly unrelated regressions and tests for aggregation bias", *Journal of the American Statistical Association*, 57(298), 348–368.