



## Measuring productivity growth, technical progress, and efficiency changes of CPA firms prior to, and following the Sarbanes–Oxley Act

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### ABSTRACT

This paper investigates productivity growth, technical progress, and efficiency change for a group of the 56 largest CPA firms in the US from the period 1996–1999 through the period 2003–2006, where the former preceded, and the latter followed, enactment of the Sarbanes–Oxley Act (SOX). Data envelopment analysis (DEA) is used to calculate Malmquist indices of three measures of interest: productivity growth, technical progress, and efficiency change. Results indicate that CPA firms, on average, experienced a productivity growth of approx. 17% from the pre- to post-SOX period. Consistent with the finding of Banker et al. [Banker RD, Chang H, Natarajan R. Productivity change, technical progress and relative efficiency change in the public accounting industry. *Management Science* 2005;51:291–304], this productivity gain can be attributed primarily to technical progress rather than a change in relative efficiency. In addition, results indicate that the “Big 4” firms underperformed their non-Big 4 counterparts in both productivity growth and technical progress.

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## 1. Introduction

### 1.1. Selected impacts of the Sarbanes–Oxley Act (SOX)

In response to a wave of fraudulent corporate reporting and accounting scandals, Congress passed the Sarbanes–Oxley Act of 2002 (SOX) which aims to enhance corporate governance, improve auditor independence, and increase

the transparency, as well as reliability, of financial reporting (see Chang et al. [1].) There are four main sections of SOX that affect accounting firms. Section 101 establishes a new private regulatory board, the Public Company Accounting Oversight Board (PCAOB), that sets the standards for auditing and related attestation services provided to public companies; Section 201 restricts auditors from providing certain consulting services to their audit clients; Section 203 deals with mandatory audit partner rotation; Section 404 requires corporate management to assess the effectiveness of its internal control system over financial reporting, as well as auditors to oversee this process and attest to managements' assessments.

Although these four sections are expected to change the landscape of the public accounting industry, Sections 201 and 404 have more direct and specific effects on accounting

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firms' services and, hence, on their productivity and efficiency. For example, the former Section 201 of SOX prohibits an auditor from providing the following services to its audit clients: bookkeeping, financial information systems design and implementation, appraisals or valuation, actuarial and internal audit outsourcing, management and human resources, broker/dealer and investment banking, and legal or expert services unrelated to the audit function (Chang et al. [1]).

Levitt [2] argues that non-audit activities, i.e., management advisory services (MAS), are lucrative and yield higher margins than do audit fees. Because these services are more productive in generating revenues for the same level of human resource (HR) inputs [3], such a restriction on MAS services can decrease the productivity and/or efficiency of CPA firms.

In contrast, Section 404 requires that auditors evaluate a company's internal control system, and report on management's assessment of the system as part of its overall audit engagement. These new requirements create opportunities for accounting firms to generate incremental revenues from additional audit procedures and consulting services. For example, auditors can charge more for additional stages in an analysis, resulting in increased revenues. Further, many companies hire CPA firms, other than their own auditors, as consultants to document or update and test their internal control systems, as required by Section 404.

Clearly, this, alone, could increase the consulting service revenues of accounting firms [1]. Indeed, a recent survey by Financial Executives International [4] of 217 firms with revenues of at least \$5 billion found that they spent an average of \$4.36 million (in 2004) to comply with Section 404. Additional audit fees paid for attestation of the system represented an average increase of 57% vs. "normal" levels over the regular financial statement audit fees in the period. With such incremental revenues, accounting firms are thus expected to improve their productivity and efficiency by offering Section 404 compliance services.

In a related development, as documented in Dopuch et al. [5], non-audit services appear to affect the efficiency and effectiveness of audit services. Since provision of the former offers auditors access to information they could not otherwise obtain the efficiency and effectiveness of audits could be improved through knowledge spillover [6]. However, according to Whisenant et al. [7], the pricing of audit and MAS services, at least for pre-SOX performances, were independent. Davis et al. [8] and Dopuch et al. [5], on the other hand, both found that audit fees charged by accounting firms are positively correlated with the joint provision of audit and non-audit services. Yet, others argue that, with knowledge spillover, audit firms are willing to share cost savings with their clients and charge a lower rate for their services [9,10]. With the elimination of selected complementary services, the pricing of remaining services likely changes. This, in turn, affects the overall productivity and efficiency of accounting firms.

## 1.2. Literature review

Although the new regulatory setting outlined above has significantly changed the playing field of accounting firms,

and affected their practices and service mixes, there is little empirical research on how such changes have impacted accounting firms' productivity. For example, many prior studies have focused on how SOX affects auditor independence and audit fees (e.g., Lai [11], Griffin and Lont [12]; Raghunandan and Rama [13]). A review of the relevant literatures suggests that only Chang et al. [1] has specifically examined the impact of SOX on the productivity of accounting firms. Using annual survey data for 57 large CPA firms in the US for the period from 2000 to 2005, these authors, Chang et al. [1], found that the fee productivity of CPA firms in transforming human resources into service revenues increased in the post-SOX period. However, they did not distinguish between changes in the frontier that determines what is possible, and the actual utilization of these possibilities in terms of efficiency.

Toward this end, the current paper follows Banker et al. [3] in using the Malmquist productivity index to estimate changes in productivity and efficiency of CPA firms under selected circumstances. Specifically, we analyze the extent to which a change in the productivity of accounting firms can be explained by a shift in their production technology (i.e., technical progress) and changes in their efficiency relative to peers (i.e., relative efficiency change).

Utilizing a group of 56 of the largest CPA firms in the US for the periods 1996–1999 (pre-SOX) and 2003–2006 (post-SOX), we found that US accounting firms, on average, experienced a productivity growth of approx. 17% from the pre-SOX to post-SOX period. This is consistent with the finding of Chang et al. [1] who observed a significant increase in the production efficiency of accounting firms following the passage of SOX. Further, consistent with the results of Banker et al. [3], we also found that the productivity gain of accounting firms may be attributed primarily to technical progress (19.9%). Finally, our results indicate that "Big 4" firms underperformed their non-Big 4 counterparts in both productivity growth and technical progress following passage of SOX. See also Fusco [14] who reported that 557 companies changed from use of Big 4 to mid-tier audit firms post-SOX, while only 55 changed in a reverse manner.

The remainder of this paper is organized as follows: Section 2 briefly describes data envelopment analysis (DEA) and the Malmquist productivity index. Section 3 contains our empirical estimations, including a description of the sample data and a discussion of the empirical results, while Section 4 concludes the paper.

## 2. Data envelopment analysis and the Malmquist productivity index

Productivity change for professional services firms is typically measured in terms of total revenue per employee. Nevertheless, this measure is not wholly appropriate for accounting firms because they employ three different categories of professional staff, partners, professionals, and other employees, to generate three types of outputs, accounting and auditing, taxation, and consulting services. To accommodate such a multiple outputs and inputs production scenario, we propose use of the Malmquist index to measure productivity change for firms of interest.

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