

Do Accounting Standards Matter for Productivity?

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In this study, we examine whether productivity shifts when accounting standards change. Using mandatory International Financial Reporting Standards (IFRS) as a shock to the accounting regime, we examine the changes in country-level productivity. We find that mandatory IFRS-adopting countries experience significant increases in total factor productivity (TFP) and labor productivity. The post-adoption productivity improvements are greater for countries without IFRS convergence. Further, TFP increases more for countries that experience a larger increase in industry comparability. Taken together, the evidence suggests that the new IFRS accounting regime increases economic productivity via improving information environments and facilitating internal firm decisions.

Key words: productivity; accounting standards; IFRS; information environments

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1. Introduction

Productivity, or efficiency in production, refers to how much output is obtained from a given set of inputs. Productivity growth is an important indicator for overall economic growth and growth in real per capita incomes.¹ Prior studies attribute productivity to various internal and external factors including managerial talent, quality of labor and capital inputs, technology spillovers, and competition (e.g., Syverson 2011, Iyer et al. 2013, Narayanan et al. 2014, Chang et al. 2015, Karmarkar et al. 2015, Jacobs et al. 2016, Chang et al. 2018). However, little evidence exists on how changes in financial reporting regimes and accounting standards may affect productivity.

In this study, we examine the association between productivity and accounting standards' quality in the context of mandatory adoption of International Financial Reporting Standards (IFRS). We argue that mandatory IFRS adoption may improve productivity by: (1) providing information to capital market participants, and (2) facilitating firm growth and internal

decision-making. Higher quality accounting information helps reduce information asymmetry between managers and investors as well as between uninformed and informed investors (Bushman and Smith 2001). This will enable firms to raise more capital from the equity market and allow investors to allocate capital more efficiently among firms in an industry (Diamond and Verrecchia 1991, Baiman and Verrecchia 1996, Leuz and Verrecchia 2000, Verrecchia 2001). Additionally, higher quality financial accounting systems can affect a firm's productivity indirectly by supporting an active stock market (Bushman and Smith 2001) and facilitating investments in new technologies (Boot and Thakor 1997).

In addition, higher quality accounting information may improve productivity by expediting both organic and non-organic growth of the firms (Bushman and Smith 2001, McNichols and Stubben 2008). Better accounting information can improve the intensity and efficiency of M&A transactions by reducing information costs of investing in foreign markets and improving the comparability of financial information

between acquiring firms and targets (Marquardt and Zur 2015, Francis et al. 2016). It may also assist investments in new projects and improve operating efficiency of existing assets-in-place by enabling managers to evaluate competitors' financial information such as sales growth and profit margins (Bushman and Smith 2001). Finally, firms with a sound and reliable financial information system can more easily attract and retain high-value customers and suppliers (Raman and Shahrur 2008).

Given that a higher quality accounting regime provides better information to both capital market participants and internal decision-makers, we expect mandatory adopters to experience a significant increase in productivity following IFRS adoption. We further predict that the increase in productivity after mandatory IFRS adoption is stronger for countries: (1) with larger differences between local GAAP and IFRS, and (2) exhibiting a larger increase in industry comparability after the adoption.

We use total factor productivity and labor productivity per employee to measure country-level productivity. In our sample with available data on at least one of the productivity measures, mandatory IFRS adopters includes 79 countries as opposed to 62 countries in the group of non-IFRS adopters. We then collect a large array of common determinants of productivity as controls. Our empirical results indicate that both total factor productivity and labor productivity of mandatory IFRS adopters increase significantly after the adoption. Consistent with our hypothesis, we find that after the IFRS adoption total factor productivity and labor productivity improve more for countries in which local GAAP does not converge with IFRS before mandatory IFRS adoption. We further document that total factor productivity increases more for countries experiencing a larger increase in the number of comparable industry peers. Taken together, the evidence suggests that countries with significant improvements in information environments are able to increase productivity more substantially after mandatory IFRS adoption.

We also perform a few additional analyses to substantiate our findings. We find that: (1) the effect of IFRS adoption on productivity persists for five years after adoption; (2) mandatory IFRS adopters experience higher productivity improvement than non-IFRS adopters only in the period after IFRS adoption, but not before; (3) total factor productivity improves for OECD countries while labor productivity increases for both OECD and non-OECD countries after mandatory IFRS adoption; (4) the improvement in productivity exists in adopters without significant improvement in legal enforcement; and (5) the improvement in productivity continues to exist when we control for voluntary IFRS adoption and

institutional effects, and conduct an analysis based on a firm-level measure of productivity.

Our study contributes to the operation, economics, and accounting literatures in the following ways. First, we contribute to the vast operation and economics research on productivity determinants by documenting that accounting standards aimed to enhance financial reporting transparency and comparability also help improve country-level productivity. Although many prior studies have investigated the internal and external drivers of productivity, very few have examined the role of accounting standards (an important component of financial market infrastructures) in this regard. Second, we provide cross-sectional evidence on the channels through which mandatory IFRS adoption affects productivity. We show that productivity increases more after mandatory IFRS adoption for those countries that exhibit greater improvements in information environment. Third, we contribute to the accounting literature on the economic consequences of mandatory IFRS adoption. Our evidence that productivity improves after mandatory IFRS adoption is consistent with the notion that high-quality accounting standards facilitate external financing and managerial decision-making. Fourth, our study complements prior research that examines the relation between accounting information quality and firm-level investment efficiency in the US setting (Biddle and Hilary 2006, McNichols and Stubben 2008, Biddle et al. 2009, Chen et al. 2011, Jung et al. 2014). The results presented in our study suggest that the positive impact of accounting information quality on the level and profitability of real decisions documented in these prior studies can be generalized to a much wider international context.

We caution the readers about the following caveats of this study. First, we acknowledge that the economic magnitude of the impact of mandatory IFRS adoption on country-level productivity seems relatively large. Although we have controlled for a large set of productivity determinants documented in prior studies, it is still possible that some correlated variables are omitted, whose effects confound our empirical estimates.

Second, we acknowledge that the arguments with regard to the capital market improvements are more likely to hold for countries in which public firms play a significant role in the economy. In some mandatory IFRS-adopting countries such as Germany and France, the majority of firms are private, which are permitted but not required to adopt IFRS. Therefore, the impact of mandatory IFRS adoption on productivity should be smaller in these countries. Since we do not have access to detailed data on private firms, we cannot examine the effect of IFRS adoption on

productivity in countries dominated by private firms. We leave this issue for future research.

The remainder of this study is organized as follows. In section 2, we discuss prior literature and develop our hypotheses. We describe our sample selection in section 3 and present our empirical tests in section 4. In section 5, we discuss additional analysis, and section 6 concludes.

2. Literature Review and Hypotheses

Over the past few decades, researchers in various fields have examined how firms convert inputs into outputs. Productivity measures the efficiency of this conversion process. It is usually defined as how much output can be obtained from a given set of inputs. Many studies have documented significant productivity variations across firms in different industries and within the same industry as well as across different economies. Factors that directly impact productivity at the plant or firm level include managerial practices or talent, quality of general labor workers, quality of capital inputs, investments in intangible assets such as information technology and R&D, innovation, corporate governance, and capital structure decisions (e.g., Bloom and Van Reenen 2007, Iyer et al. 2013, Narayanan et al. 2014). Productivity can also be influenced by producers' operating environments, including elements such as technological advancement, product market competition, capital market development, access to equity financing, deregulation, and flexibility of input markets (e.g., Syverson 2011, Chang et al. 2015, Karmarkar et al. 2015, Jacobs et al. 2016, Chang et al. 2018). However, there is scarce evidence on how financial reporting regimes and accounting standards may impact productivity.

In this study, we investigate the association between productivity improvements and changes in financial reporting regimes. We adopt a cross-country design to investigate whether a shift to higher quality accounting standards is associated with improvements in productivity. Existing research suggests that there are considerable, quantifiable cross-country differences in financial accounting regimes and in economic efficiency. These differences make it feasible to test predictions concerning the association between financial accounting regimes and productivity. To mitigate the concern that productivity and accounting information quality are endogenously determined, we study the association between the two upon a shock to the accounting system, namely, the mandatory adoption of International Financial Reporting Standards (IFRS). A large number of countries have mandated IFRS adoption since 2005. IFRS adoption provides substantial

benefits to equity investors by reducing information processing cost through enhanced accuracy, comparability, comprehensiveness, and timeliness of financial information (Ball 2006).

However, existing research on the benefits of mandatory IFRS adoption does not examine how the improvement in accounting standard quality can affect firm productivity. Theoretical research in economics and finance has developed convincing links between the information available to outside suppliers of capital and economic performance (Hirshleifer 1971, Spence 1973, Marshall 1974, Holmstrom and Milgrom 1987, Levine 1997). This literature provides a powerful motivation for testing the relation between properties of financial accounting regimes and direct measures of economic performance, such as productivity. In a similar vein, we argue that the mandatory adoption of IFRS can increase productivity in the following ways.

To begin with, the mandatory adoption of IFRS may improve productivity by providing information to capital market participants, thereby lowering information asymmetry between managers and investors as well as between uninformed and informed investors (Bushman and Smith 2001). As a result, better quality accounting information may attract more capital into the firm, lower individual investors' liquidity risk and facilitate long-term investments in high return technologies (Diamond and Verrecchia 1991, Baiman and Verrecchia 1996, Leuz and Verrecchia 2000, Verrecchia 2001). Investors can also make capital allocation decisions among firms in an industry based on the financial information reported by all firms in that industry. In addition to providing information directly to investors, financial accounting systems can also indirectly affect a firm's productivity by supporting an active stock market (Bushman and Smith 2001).²

Moreover, the mandatory adoption of IFRS can improve productivity by enhancing the role of accounting information in internal decision-making (Bushman and Smith 2001, McNichols and Stubben 2008), enabling firms to achieve both organic and non-organic growth. On the one hand, managers can rely on the financial information reported by potential acquisition targets to identify suitable targets and estimate acquisition premiums accordingly, thereby achieving non-organic growth through mergers and acquisitions (Marquardt and Zur 2015). That is, IFRS adoption could improve firm productivity by increasing both the intensity and the efficiency of M&A transactions. Consistent with this idea, Francis et al. (2016) find that mandatory IFRS adoption significantly increases the cross-border M&A transactions in the IFRS-adopting countries by reducing information costs of investing in another country and improving

the comparability of financial information between acquiring firms and foreign targets.

On the other hand, better quality financial information may also help firms achieve organic growth due to the following reasons. First, financial reporting can facilitate investments in new projects and improve operating efficiency of existing assets-in-place by increasing opportunities of learning from other sources (Ferracuti and Stubben 2019, Roychowdhury et al. 2019). Managers may use competitors' financial information such as sales growth, profit margins, R&D expenses, SG&A expenses, and capital expenditures to evaluate the market conditions, the industry environment, and the competitors' product development plans as well as their cost management strategies (Bushman and Smith 2001, Chen et al. 2012, Badertscher et al. 2013). For example, an improved revenue recognition principle implemented at the industry level enables managers to estimate the market demand of products provided by competitors, which in turn helps managers decide whether to expand current production capacity or discontinue certain product lines. Similarly, an enhanced R&D capitalization rule allows managers to infer the investment strategies implemented by competitors, leading to more efficient managerial decisions on intangible assets. In addition to peer firms' disclosures, managers could also learn from financial information reported by joint-venture partners, suppliers, and customers. Information from these different sources will enable managers to reduce investment uncertainty, identify new investment opportunities, predict possible responses of competitors and partners, and enhance the operational efficiency of existing assets (Ferracuti and Stubben 2019). Furthermore, a firm's financial information can also serve a role of market coordination by reducing competitors' and partners' uncertainty about its actions (e.g., Palepu et al. 2000). Finally, higher quality financial information increases investors' ability to monitor managerial decisions, thus constraining managers' value destroying activities such as empire building (Bushman and Indjejikian 1993, Holmström and Tirole 1993, Kanodia and Lee 1998, Bushman and Smith 2001, Lambert 2001). For example, investors may use higher quality financial information reported by competitors to benchmark against managers' performance and better evaluate managers' contribution to firm value, thus motivating managers to utilize existing resources more efficiently to deliver higher outputs.

In addition, there are often significant overlaps between financial and managerial accounting systems, resulting in high correlations between qualities of the two systems. Many of the same policies, procedures, and controls related to financial reporting of economic transactions also affect internal

operating decisions. Feng et al. (2015) discuss and empirically test this idea in the context of inventory accounting and management, and find supportive evidence. Theoretically, Hemmer and Labro (2008) show that the changes in the financial accounting regime influence managerial accounting systems. Several studies also document a significant positive association between financial reporting quality and investment efficiencies (Biddle and Hilary 2006, McNichols and Stubben 2008, Biddle et al. 2009, Chen et al. 2011, Jung et al. 2014), providing further support for the importance of accounting information to internal decisions.

Another way for better quality financial information to expedite firms' organic growth is through attracting and retaining high-value customers and suppliers. This is because a firm can use reliable financial accounting information to signal to its customers and suppliers the soundness of its financial conditions and the sustainability of its business operations. Customers and suppliers are then more willing to maintain long-term contracts, provide upstream and downstream financing, and engage in relationship-specific investment with the firm (Raman and Shahrur 2008).

In summary, the mandatory adoption of IFRS can improve productivity by attracting more capital investment from investors and supporting better-functioning stock markets. It can also enhance productivity by improving internal decision-making and contributing to organic and non-organic growth of the firm. This can be achieved through facilitating M&A and internal project selection, improving management of assets-in-place, and attracting and retaining better customers and suppliers. Therefore, we expect a higher country-level productivity after the mandatory IFRS adoption. We present the following hypothesis:

H1. *Country-level productivity increases after mandatory adoption of IFRS.*

We also investigate the cross-sectional variations in the association between productivity and mandatory IFRS adoption. The economic costs and benefits of mandatory IFRS adoption could vary based on the difference between local GAAP and IFRS, which in turn may affect the extent to which IFRS adoption affects productivity. Following Daske et al. (2008), we identify whether a country adopts a strategy to let its domestic accounting standard converge with IFRS before the mandatory IFRS adoption. If a country adopts a convergence strategy, its local GAAP and IFRS are fairly similar before the mandatory IFRS adoption. As a result, this country may benefit less from IFRS adoption in terms of information

environment improvements, leading to a smaller productivity increase. In contrast, if a country does not adopt a convergence strategy before IFRS adoption, it may benefit more from IFRS adoption and experience a higher productivity increase. Therefore, we present the following hypothesis:

H2. The increase in productivity after mandatory IFRS adoption is higher for countries without a convergence strategy before mandatory IFRS adoption.

Mandatory IFRS adoption could also improve financial transparency and induce productivity changes by increasing the comparability of financial reports. By mandating a uniform set of accounting standards and enhancing financial statement comparability, IFRS may help firms attract greater cross-border investments, which could fund more projects with a positive NPV and improve firm productivity. DeFond et al. (2011) investigate changes in foreign mutual fund investment for mandatory IFRS adopters in the EU. They find that foreign mutual fund ownership increases more when mandatory IFRS adoption creates larger improvements in comparability, where comparability is measured as the number of industry peers using the same accounting standards. In addition, Francis et al. (2016) argue that mandatory IFRS adoption lowers the costs of investing in foreign markets and increases the comparability between acquiring firms and foreign targets. They find a significant increase in the cross-border M&A transactions among adopting countries. Based on these ideas, we expect the IFRS effect on productivity to be stronger when mandatory IFRS adoption leads to a larger increase in industry comparability.

H3. The increase in productivity after mandatory IFRS adoption is greater for countries with a larger improvement in industry comparability.

3. Sample and Measures

Our sample period covers years from 1996 to 2013.³ Our treatment sample of IFRS adopters includes countries that mandated adoption of IFRS in the sample period. The benchmark group of non-IFRS adopters includes countries that required their firms to prepare financial statements based on local standards throughout the sample period. For the treatment sample, we identify the IFRS adoption year of each country and define the country-specific pre- and post-IFRS adoption periods. To construct the benchmark sample, we identify for each IFRS adoption year in the treatment sample a group of countries that did not adopt IFRS during the sample period.⁴ To construct

the final sample, we require countries in both treatment and benchmark groups to have non-missing data on productivity measures and all control variables for at least one year in both pre- and post-IFRS adoption periods.

We employ two country-level measures of productivity commonly used in the economics literature: total factor productivity (TFP) and labor productivity (e.g., Bekaert et al. 2007, Bekaert et al. 2011, Syverson 2011). The country-level TFP captures the variation in output that cannot be explained based on the intensity of the use of observable inputs such as capital and labor (Syverson 2011).⁵ We obtain the country-level TFP (available for 116 countries) from the Penn World Table version 9.0, which provides the estimates of TFP based on the translog production function after incorporating measures of physical and human capital (Feenstra et al. 2015). Labor productivity is defined as GDP per person employed (scaled by 100,000). We obtain GDP per person employed from the Total Economy Database™, which is a comprehensive database with annual data covering GDP, population, employment, hours, labor quality, and labor productivity for 123 countries in the world.

Table 1 presents the country names and adoption years of mandatory IFRS adopters as well as the country names of non-IFRS adopters. Mandatory IFRS adopters includes 79 countries, while non-IFRS adopters includes 62 countries. Both of these two groups widely spread across the world.

4. Estimation and Results

4.1. Descriptive Statistics

Table 2 presents the descriptive statistics on productivity measures and control variables for both mandatory IFRS adopters and non-IFRS adopters. TFP and labor productivity of IFRS adopters are higher than those of non-adopters. The mean (median) TFP for IFRS adopters is 0.782 (0.765) while the mean (median) of TFP for non-adopters is 0.651 (0.678). The mean (median) labor productivity for IFRS adopters is 0.648 (0.634) while the mean (median) of labor productivity for non-adopters is 0.476 (0.369). In addition, compared with non-adopters, IFRS adopters tend to provide better education and better health care. The mean (median) ratio of secondary school enrollment over total population for that age group is 0.964 (0.971) for IFRS adopters, while it is 0.825 (0.843) for non-adopters. The mean (median) value of logarithm of life expectancy is slightly larger for IFRS adopters than for non-adopters. This evidence suggests that IFRS adopters tend to have higher quality human capital than non-adopters. IFRS adopters also exhibit

Table 1 Sample Distribution

IFRS adopters (N = 79)								Non-IFRS adopters (N = 62)		
Country (jurisdiction)	Year of adoption	Country (jurisdiction)	Year of adoption	Country (jurisdiction)	Year of adoption	Country (jurisdiction)	Year of adoption			
Jordan	1997	Bosnia and Herzegovina	2005	Latvia	2005	Croatia	2007	Albania	Fiji	Niger
Georgia	1999	Switzerland	2005	Malta	2005	New Zealand	2007	Algeria	Guatemala	Paraguay
Trinidad and Tobago	1999	Cyprus	2005	Mauritius	2005	Pakistan	2007	Angola	Honduras	Rwanda
Bahrain	2001	Czech Republic	2005	Namibia	2005	Israel	2008	Armenia	India	Saint Lucia
Malawi	2001	Germany	2005	Netherlands	2005	Morocco	2008	Azerbaijan	Indonesia	Senegal
Costa Rica	2002	Denmark	2005	Norway	2005	Saudi Arabia	2008	Barbados	Iran	Sierra Leone
Jamaica	2002	Spain	2005	Panama	2005	Chile	2009	Belarus	Iraq	Sri Lanka
Kenya	2002	Estonia	2005	Philippines	2005	Gabon	2009	Benin	Japan	Syria
United Arab Emirates	2003	Finland	2005	Poland	2005	Brazil	2010	Bolivia	Kyrgyz Republic	Taiwan
Singapore	2003	France	2005	Portugal	2005	Ecuador	2010	Burkina Faso	Lao People's DR	Tajikistan
Uganda	2003	United Kingdom	2005	Romania	2005	Canada	2011	Burundi	Lesotho	Thailand
Macedonia	2004	Greece	2005	Slovak Republic	2005	South Korea	2011	Cambodia	Madagascar	Togo
Russia	2004	China, Hong Kong SAR	2005	Slovenia	2005	Peru	2011	Cameroon	Malaysia	Tunisia
Serbia	2004	Hungary	2005	Sweden	2005	Sudan (Former)	2011	Central African Republic	Mali	Turkmenistan
Tanzania	2004	Ireland	2005	Venezuela	2005	Swaziland	2011	China	Mauritania	United States
Australia	2005	Iceland	2005	South Africa	2005	Ukraine	2011	China, Macao SAR	Mexico	Uruguay
Austria	2005	Italy	2005	Egypt	2006	Zambia	2011	Colombia	Moldova	Uzbekistan
Belgium	2005	Kazakhstan	2005	Turkey	2006	Argentina	2012	Congo, DR	Mongolia	Vietnam
Bangladesh	2005	Lithuania	2005	Botswana	2007	Nigeria	2012	Côte d'Ivoire	Mozambique	Yemen
Bulgaria	2005	Luxembourg	2005	Ghana	2007			Dominican Republic	Myanmar	Zimbabwe
								Ethiopia	Nicaragua	

This table presents 141 countries (jurisdictions) that have non-missing data on at least one of the productivity measures (*TFP* and *Labor Productivity*), of which there are 79 mandatory IFRS adopters and 62 non-IFRS adopters. IFRS adopters include countries (jurisdictions) that mandated adoption of IFRS during our sample period 1996–2013. Non-IFRS adopters include countries (jurisdictions) that required their firms to prepare financial statements based on local standards throughout the sample period.

higher trade openness, greater financial development, larger equity market size, stronger legal enforcement, and better governance. The mean (median) Trade/GDP and equity market size/GDP ratios of IFRS adopters are 0.937 (0.722) and 0.735 (0.424), while they are 0.594 (0.502) and 0.578 (0.526) for non-adopters. The mean (median) financial market and overall openness indices of IFRS adopters are 0.733 (0.850) and 0.755 (0.840), while they are 0.344 (0.200) and 0.451 (0.390) of non-adopters. In addition, mean (median) of the four legal enforcement and governance indices (i.e., control of corruption, government effectiveness, rule of law, and political stability) are all higher for IFRS adopters than for non-adopters.

4.2. Main Effect of Mandatory IFRS Adoption on Productivity

We first examine whether on average firm productivity increases after mandatory adoption of IFRS using the following equation::

$$\begin{aligned}
 & TFP_{it} \text{ (or Labor Productivity}_{it}) \\
 &= \alpha_0 + \alpha_1 \text{IFRS Adopter}_{it} + \alpha_2 \text{POST}_{it} \\
 &+ \alpha_3 \text{IFRS Adopter}_{it} \times \text{POST}_{it} \\
 &+ \alpha_4 \text{Second School Enrollment}_{it} \\
 &+ \alpha_5 \text{Log}(\text{life expectancy})_{it} + \alpha_6 \text{Trade/GDP}_{it} \\
 &+ \alpha_7 \text{Private credit/GDP}_{it} \\
 &+ \alpha_8 \text{GDP Growth}_{it} \\
 &+ \alpha_{11} \text{Financial Market Openness}_{it} \\
 &+ \alpha_{12} \text{Overall Openness}_{it} \\
 &+ \alpha_{13} \text{Control of Corruption}_{it} \\
 &+ \alpha_{14} \text{Government Effectiveness}_{it} + \alpha_{15} \text{Rule of Law}_{it} \\
 &+ \alpha_{16} \text{Political Stability}_{it} + \text{Year Fixed Effects} + \varepsilon_{it},
 \end{aligned} \tag{1}$$

where the dependent variable is the country-level TFP or labor productivity. *IFRS Adopter_{it}* is an indicator variable that equals to 1 if a country mandates adoption of IFRS in the sample period (1996–2013),

Table 2 Descriptive Statistics

Variable	N	Mean	SD	25%	Median	75%
IFRS adopters						
TFP	489	0.782	0.225	0.636	0.765	0.924
Labor Productivity	477	0.648	0.339	0.407	0.634	0.922
Secondary School Enrollment	489	0.964	0.188	0.894	0.971	1.038
Log(life expectancy)	489	4.317	0.109	4.296	4.356	4.383
Trade/GDP	489	0.937	0.641	0.555	0.722	1.139
Private Credit/GDP	489	0.801	0.445	0.438	0.763	1.116
GDP Growth	489	0.022	0.034	0.004	0.021	0.041
Investment Growth	489	0.036	0.102	−0.013	0.032	0.085
Equity Market Size	489	0.735	1.150	0.256	0.424	0.801
Financial Market Openness	489	0.733	0.293	0.550	0.850	1.000
Overall Openness	489	0.755	0.247	0.680	0.840	0.950
Control of Corruption	489	0.777	0.979	0.008	0.663	1.693
Government Effectiveness	489	0.864	0.817	0.256	0.920	1.638
Rule of Law	489	0.783	0.896	0.075	0.928	1.596
Political Stability	489	0.376	0.870	−0.085	0.577	1.017
Non-IFRS adopters						
TFP	988	0.651	0.212	0.445	0.678	0.787
Labor Productivity	988	0.476	0.315	0.244	0.369	0.718
Secondary School Enrollment	988	0.825	0.146	0.721	0.843	0.945
Log(life expectancy)	988	4.308	0.064	4.281	4.310	4.344
Trade/GDP	988	0.594	0.347	0.304	0.502	0.843
Private Credit/GDP	988	0.942	0.649	0.376	0.622	1.617
GDP Growth	988	0.023	0.033	0.008	0.026	0.043
Investment Growth	988	0.039	0.093	0.001	0.049	0.089
Equity Market Size	988	0.578	0.391	0.242	0.526	0.814
Financial Market Openness	988	0.344	0.342	0.050	0.200	0.700
Overall Openness	988	0.451	0.315	0.140	0.390	0.820
Control of Corruption	988	0.195	0.848	−0.385	−0.245	1.219
Government Effectiveness	988	0.548	0.675	0.071	0.315	1.218
Rule of Law	988	0.293	0.822	−0.383	−0.056	1.316
Political Stability	988	−0.194	0.900	−1.013	−0.117	0.509

This table presents the descriptive statistics on productivity measures and control variables for both IFRS adopters and non-IFRS adopters from 1996 to 2013. IFRS adopters are countries that mandated adoption of IFRS in the sample period (1996–2013). Non-IFRS adopters are countries that required their firms to prepare financial statements based on local standards throughout the sample period. For conciseness, we report summary statistics of all variables (except for labor productivity) for the TFP sample, which includes countries that have non-missing data on TFP and all control variables for at least one year in both pre- and post-IFRS adoption periods. Summary statistics of the labor productivity variable are based on the sample of countries that have non-missing data on labor productivity and all control variables for at least one year in both pre- and post-IFRS adoption periods.

and 0 otherwise. $POST_{it}$ is an indicator variable that equals to 1 if a calendar year is in or after the first year when a country adopts IFRS, and 0 otherwise. Our main variable of interest is the interaction term, $IFRS Adopter_{it} \times POST_{it}$. A positive coefficient on this variable indicates that the change in productivity is larger, on average, for adopters after mandatory IFRS adoption, compared with the change in productivity for the control group of non-IFRS adopters.

We include thirteen standard country-level control variables that have been found to impact country-level productivity (Bekaert et al. 2007, Bekaert et al. 2011). $Secondary\ School\ Enrollment_{it}$ is a human capital measure, defined as the ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the secondary level of education. $Log(Life\ expectancy)_{it}$ captures the quality of health care. It is measured as the logarithm of life expectancy at birth, where life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life. $Trade/GDP_{it}$ is the trade dependency ratio, defined as the sum of exports and imports of goods and services measured as a share of gross domestic product. It measures the trade openness of a country. $Private\ credit/GDP_{it}$ captures the financial development of a country. It is defined as credit to private sector divided by gross domestic product, where credit to private sector refers to financial resources provided to the private sector, such as through loans, purchases of non-equity securities, and trade credits and other accounts receivable that establish a claim for repayment. $GDP\ Growth_{it}$ is the GDP per capita growth (annual %) divided by 100. $Investment\ Growth_{it}$ is the growth of gross fixed capital formation (annual %) divided by 100. $Equity\ Market\ Size_{it}$ is the market capitalization of listed domestic companies (% of GDP) divided by 100. Data for these seven control variables come from the World Bank Development Indicators Database. $Financial\ Market\ Openness_{it}$ is the financial market liberalization measured as the unweighted average of the openness of seven types of asset categories. $Overall\ Openness_{it}$ is the overall liberalization index of all asset categories. These two country-level indices are collected from the International Monetary Fund (Wang-Jahan Index) database and range between 0 and 1, where 1 indicates a country being fully liberalized. We also include four country-level estimates of governance that range from approximately −2.5 (weak) to 2.5 (strong) governance performance: $Control\ of\ Corruption_{it}$, $Government\ Effectiveness_{it}$, $Rule\ of\ Law_{it}$, and $Political\ Stability_{it}$. Data for these control variables are collected from the World Bank Worldwide Governance Indicators (2018 Update). We expect positive signs on these control variables, predicting that a higher country-level productivity is associated with larger human capital, better health care, higher openness, greater financial development, higher GDP and investment growth, larger equity market size, and better governance.

Table 3 presents the results of estimating equation (1). We find that the improvement in TFP after the adoption is significantly higher for IFRS adopters as compared with non-adopters. The first column shows that the coefficient on $IFRS\ Adopter \times POST$ is

Table 3 Regression Analyses of Changes in Productivity around Mandatory IFRS Adoption

	Dependent variables:			
	TFP		Labor productivity	
	(1)	(2)	(3)	(4)
IFRS Adopter	0.073*** (4.22)	−0.003 (−0.21)	0.064*** (2.58)	−0.053*** (−3.37)
POST	0.016 (0.84)	−0.001 (−0.11)	0.033 (1.14)	−0.006 (−0.51)
IFRS Adopter × POST	0.097*** (3.99)	0.044** (2.39)	0.174*** (4.65)	0.078*** (4.18)
Secondary School Enrollment		0.171*** (4.96)		0.106*** (3.33)
Log(life expectancy)		−0.124 (−1.38)		0.068 (0.84)
Trade/GDP		−0.026** (−2.56)		−0.023 (−1.51)
Private Credit/GDP		−0.006 (−0.54)		−0.057*** (−4.94)
GDP Growth		−1.110*** (−2.80)		−1.692*** (−3.49)
Investment Growth		0.334*** (2.68)		0.318** (2.14)
Equity Market Size		−0.006 (−0.91)		0.022*** (2.98)
Financial Market Openness		0.368*** (11.25)		0.145*** (4.77)
Overall Openness		−0.319*** (−9.44)		0.066** (2.14)
Control of Corruption		0.025 (1.23)		−0.017 (−0.73)
Government Effectiveness		0.293*** (16.42)		0.300*** (15.44)
Rule of Law		−0.154*** (−7.62)		0.040** (2.00)
Political Stability		0.037*** (5.54)		−0.005 (−0.73)
No. of observations	1477	1477	1465	1465
Adjusted R ²	12.49%	68.37%	8.86%	84.65%

This table presents the results on the regressions analyses of total factor productivity (TFP) and labor productivity for both the treatment sample of IFRS adopters and the benchmark group of non-IFRS adopters. IFRS adopters include countries that mandated adoption of IFRS in the sample period (1996–2013). Non-IFRS adopters include countries that required their firms to prepare financial statements based on local standards throughout the sample period. The sample in columns (1) and (2) includes countries that have non-missing data on total factor productivity and control variables for at least one year in both pre- and post-IFRS adoption periods. The sample in columns (3) and (4) includes countries that have non-missing data on labor productivity and control variables for at least one year in both pre- and post-IFRS adoption periods. Intercepts and year fixed effects are included but not reported. *T*-statistics reported in parentheses are based on heteroscedasticity robust standard errors. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Appendix A contains the variable definitions.

0.097 with a *t*-stat. of 3.99 (*p*-value < 0.01). After including control variables, we continue to find that the coefficient on *IFRS Adopter* × *POST* is positive and significant (coefficient = 0.044; *t*-stat. = 2.39). This is consistent with *H1* that mandatory IFRS adoption improves productivity. The magnitudes of the IFRS

effect are also economically large, relative to the mean TFP levels (0.651 for non-adopters and 0.782 for adopters).

Columns (3) and (4) of Table 3 report results of the baseline regressions for labor productivity as an alternative productivity measure. We find similar results when we use GDP per person employed (scaled by 100,000) as the dependent variable. The coefficient on *IFRS Adopter* × *POST* is positive and significant in both columns [coefficient = 0.174, *t*-stat.=4.65 in column (3); coefficient = 0.078, *t*-stat.=4.18 in column (4)].⁶

In addition, we find that control variables *Secondary School Enrollment*, *Investment Growth*, *Financial Market Openness*, and *Government Effectiveness* are positively and significantly associated with both *TFP* and labor productivity as predicted, suggesting that the amount of human capital, the degree of financial market openness, and the country governance contribute to a country's productivity. The 13 control variables altogether explain an incremental 55.9% variation in *TFP* and 75.8% variation in labor productivity.⁷

4.3. Cross-Sectional Variation: Post-Adoption Productivity Changes Conditional On Changes In Information Environment

To examine the cross-sectional variation in the association between mandatory IFRS adoption and productivity, we use the following set of equations to investigate whether the relation between country-level productivity and IFRS adoption varies with changes in information environments, proxied by country-level IFRS convergence and the change in financial statement comparability.

$$\begin{aligned}
 & TFP_{it} \text{ (or Labor Productivity}_{it}) \\
 &= \alpha_0 + \alpha_1 IFRS\text{ Adopter}_{it} + \alpha_2 POST_{it} \\
 &+ \alpha_3 IFRS\text{ Adopter}_{it} \times POST_{it} \\
 &+ \alpha_4 NonIFRS\text{ Convergence}_{it} \times POST_{it} \\
 &+ \alpha_5 NonIFRS\text{ Convergence}_{it} \times IFRS\text{ Adopter}_{it} \\
 &+ \alpha_6 NonIFRS\text{ Convergence}_{it} \times IFRS\text{ Adopter}_{it} \times POST_{it} \\
 &+ \alpha_7 NonIFRS\text{ Convergence}_{it} \\
 &+ Controls + Year\text{ Fixed Effects} + \varepsilon_{it}.
 \end{aligned} \tag{2}$$

$$\begin{aligned}
 & TFP_{it} \text{ (or Labor Productivity}_{it}) \\
 &= \alpha_0 + \alpha_1 IFRS\text{ Adopter}_{it} + \alpha_2 POST_{it} \\
 &+ \alpha_3 IFRS\text{ Adopter}_{it} \times POST_{it} \\
 &+ \alpha_4 Change\text{ in comparability}_{it} \times POST_{it} \\
 &+ \alpha_5 Change\text{ in comparability}_{it} \times IFRS\text{ Adopter}_{it} \\
 &+ \alpha_6 Change\text{ in comparability}_{it} \times IFRS\text{ Adopter}_{it} \times POST_{it} \\
 &+ \alpha_7 Change\text{ in comparability}_{it} + Controls \\
 &+ Year\text{ Fixed Effects} + \varepsilon_{it},
 \end{aligned} \tag{3}$$

In equation (2), we use *Non-IFRS Convergence* to capture the degree to which accounting rules change after mandatory IFRS adoption. Following Daske et al. (2008), we identify whether a country adopts a strategy to let its domestic accounting standard converge with IFRS. Specifically, IFRS-convergence countries are identified as: (1) countries with a formal plan of convergence according to the “GAAP Convergence 2002” (International Forum for Accountancy Development (IFAD), 2002), or (2) countries that are reported of convergence by “Use of IFRS by Jurisdiction.”⁸ *Non-IFRS Convergence* is an indicator variable that equals 1 if a country (either an IFRS adopter or a non-IFRS adopter) does not have a plan for IFRS convergence, and 0 otherwise. If a country does not adopt a convergence strategy, this country may benefit more from IFRS adoption, leading to a greater productivity increase. Therefore, we expect to find a positive coefficient on our main variable of interest, *Non-IFRS Convergence* \times *IFRS Adopter* \times *POST*, indicating that countries without IFRS convergence before the adoption experience greater productivity improvements after mandatory IFRS adoption.

Finally, in equation (3) we use *Change in comparability* to capture the extent of changes in financial statement comparability. Following DeFond et al. (2011), we first calculate an industry–country-level measure of the change in the number of firms using the same GAAP in an industry that a firm can be compared to after the mandatory IFRS adoption. We then average the industry–country-level changes in comparability at the country level. We expect a positive coefficient on *Change in comparability* \times *IFRS Adopter* \times *POST*, predicting that productivity improves more when mandatory IFRS adoption leads to a greater improvement in comparability with industry peers.

Table 4 presents the results of estimating equations (2) and (3). Columns (1) and (3) show that TFP and labor productivity improve more after the adoption for those countries without IFRS convergence. The coefficients on *Non-IFRS Convergence* \times *IFRS Adopter* \times *POST* are positive and significant [coefficient = 0.187, *t*-stat. = 3.70 in column (1); coefficient = 0.111, *t*-stat. = 2.37 in column (3)]. This is consistent with *H2* that the improvement in productivity after mandatory IFRS adoption is higher for countries without a convergence strategy before mandatory IFRS adoption.

Columns (2) and (4) present the analyses conditional on the change in comparability. Consistent with *H3*, We find that countries with a larger increase in comparability exhibit significantly greater improvement in TFP in the post-adoption period (coefficient on *Change in comparability* \times *IFRS Adopter* \times *POST* =

0.018, *t*-stat. = 2.33). However, the coefficient on *Change in comparability* \times *IFRS Adopter* \times *POST* is insignificant in column (4).⁹

Taken together, the evidence in Tables 4 suggests that countries with greater improvements in information environments after mandatory IFRS adoption are able to increase productivity more substantially.

5. Supplementary Analysis

5.1. Persistence of Productivity Improvement

Table 5 examines whether the improvement in mandatory adopters’ productivity persists beyond five years. We include both the IFRS adopters and the non-IFRS adopters in our sample. We require all countries to have non-missing data on productivity measures and control variables for at least one year in both pre- and post-IFRS adoption periods. We include two variables, *POSTST* and *POSTLT*, in our analysis of the persistence of productivity improvement. *POSTST* is an indicator variable that equals 1 for the event window [0, +5] and 0 otherwise. In contrast, *POSTLT* is an indicator variable that equals 1 for the event years in or after year + 6, and 0 otherwise. Therefore, *POSTST* captures the relative short-term effect and *POSTLT* captures the relative long-term effect of IFRS adoption on productivity. After controlling for various factors, we find that the IFRS effects on TFP and labor productivity are strong and significant in the [0, +5] window. The second column using TFP as the dependent variable shows that the coefficient on *IFRS Adopter* \times *POSTST* is 0.049 (*t*-stat. = 2.53). The positive effect on TFP does not remain in the long term. The coefficient on *IFRS Adopter* \times *POSTLT* is 0.033 (*t*-stat. = 1.17). The fourth column using labor productivity as the dependent variable shows that the coefficients on *IFRS Adopter* \times *POSTST* and *IFRS Adopter* \times *POSTLT* are both positive and significant. This evidence suggests that improvement in total factor productivity is mainly concentrated in the five years after the adoption. However, labor productivity improvement is a relatively longer term effect, which persists beyond five years after mandatory IFRS adoption.

5.2. Parallel Trend Analysis

One might be concerned that our main findings are driven by other institutional changes or events that are not related to IFRS adoption. In particular, mandatory IFRS adopters might be experiencing greater productivity improvements than non-IFRS adopters even before IFRS adoption. To rule out this concern, we conduct a parallel trend analysis using the following model:

Table 4 Analyses Conditional on Country-level IFRS Convergence and Change in Comparability

	Dependent variables:			
	TFP		Labor Productivity	
	(1)	(2)	(3)	(4)
IFRS Adopter	0.002 (0.05)	0.041* (1.91)	−0.133*** (−3.80)	−0.043** (−2.35)
POST	0.033** (2.50)	0.017 (1.35)	0.010 (0.61)	−0.001 (−0.13)
IFRS Adopter × POST	−0.094** (−2.06)	0.088*** (3.23)	−0.014 (−0.35)	0.124*** (5.35)
Non-IFRS Convergence × POST	−0.072*** (−5.14)		−0.032* (−1.92)	
Non-IFRS Convergence × IFRS Adopter	−0.054 (−1.24)		0.092** (2.08)	
Non-IFRS Convergence × IFRS Adopter × POST	0.187*** (3.70)		0.111** (2.37)	
Non-IFRS Convergence	0.092*** (5.58)		0.000 (0.02)	
Change in comparability × POST		−0.019** (−2.41)		0.004 (0.66)
Change in comparability × IFRS Adopter		−0.028*** (−4.69)		0.013*** (2.81)
Change in comparability × IFRS Adopter × POST		0.018** (2.33)		−0.005 (−0.69)
Change in comparability		0.028*** (4.65)		−0.013*** (−2.79)
Control Variables	Yes	Yes	Yes	Yes
No. of observations	1477	1282	1465	1284
Adjusted R ²	69.42%	72.92%	85.05%	89.14%

This table presents the results on the analyses of total factor productivity (TFP) and labor productivity conditional on country-level IFRS convergence and change in comparability. IFRS adopters include countries that mandated adoption of IFRS in the sample period (1996–2013). Non-IFRS adopters include countries that required their firms to prepare financial statements based on local standards throughout the sample period. The sample includes countries that have non-missing data on the productivity measure (TFP or Labor Productivity) and control variables for at least one year in both pre- and post-IFRS adoption periods. Intercepts, all control variables, and year fixed effects are included but not reported. *T*-statistics reported in parentheses are based on heteroscedasticity robust standard errors. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Appendix A contains the variable definitions.

$$\begin{aligned}
 & TFP_{it} \text{ (or Labor Productivity)}_{it} \\
 &= \alpha_0 + \alpha_1 IFRS Adopter_{it} \\
 &\times Year_{-2} + \alpha_2 IFRS Adopter_{it} \\
 &\times Year_{-1} + \alpha_3 IFRS Adopter_{it} \\
 &\times Year_0 + \alpha_4 IFRS Adopter_{it} \\
 &\times Year_{+1} + \alpha_5 IFRS Adopter_{it} \\
 &\times Year_{+2} + \alpha_6 IFRS Adopter_{it} \\
 &\times Year_{\geq+3} + \alpha_7 Year_{-2} + \alpha_8 \\
 &+ \alpha_9 Year_0 + \alpha_{10} Year_{+1} \\
 &+ \alpha_{11} Year_{+2} + \alpha_{12} Year_{\geq+3} \\
 &+ Controls + Year Fixed Effects + \varepsilon_{it},
 \end{aligned} \tag{4}$$

where $Year_{-2}$ is an indicator variable equals 1 for two years before a country adopts IFRS, and 0 otherwise. $Year_{-1}$ is an indicator variable that equals 1 for one year before a country adopts IFRS, and 0 otherwise. $Year_0$ is an indicator variable that equals 1 for the first year when a country adopts IFRS, and 0 otherwise. $Year_{+1}$ is an indicator variable that equals 1 for one year after a country adopts IFRS, and 0 otherwise. $Year_{+2}$ is an indicator variable that equals 1 for two years after a country adopts IFRS, and 0 otherwise. $Year_{\geq+3}$ is an indicator variable that equals 1 for event years in or more than three years after a country adopts IFRS, and 0 otherwise.

Table 6 presents the results from estimation of equation (4), using TFP and labor productivity as dependent variables, respectively. None of the coefficients on $IFRS Adopter_{it} \times Year_{-2}$ and $IFRS Adopter_{it} \times Year_{-1}$ is significant, suggesting that mandatory IFRS adopters exhibit similar trends of productivity as non-IFRS adopters before IFRS adoption. Overall, the evidence presented in Table 6 suggests that the mandatory IFRS adopters experience greater productivity improvements than non-IFRS adopters only in the period after IFRS adoption, but not before. These results suggest a causal effect of IFRS adoption on productivity.

5.3. Comparison of OECD and Non-OECD Countries

To address the concern that the improvement in productivity of IFRS adopters captures country-level heterogeneity (such as difference in economic development) rather than IFRS effects, we perform the analysis for OECD and non-OECD countries separately.¹⁰ On the one hand, we may expect that productivity improves more for OECD countries than for non-OECD countries because OECD countries represent more developed economies with stronger legal enforcements than non-OECD countries. On the other hand, some prior studies find greater increases in financial transparency in firms with poorer information environments (e.g., DeFond et al. 2015). Consistent with this finding, non-OECD countries might glean more information benefits from the IFRS adoption, which lead to larger increases in productivity. In addition, countries with lower prior levels of productivity might have greater potential to achieve larger productivity improvements. Thus, we may expect larger productivity gains for non-OECD countries than for OECD countries. We empirically examine which of these effects prevails in the data.

Results are reported in Table 7. The coefficient on $IFRS Adopter \times POST$ is positive and significant for OECD countries when we use TFP and labor productivity as the dependent variable [coefficient = 0.069, *t*-stat. = 3.04 in column (1); coefficient = 0.097, *t*-stat. =

Table 5 Persistency of Productivity Improvement

	Dependent variables:			
	TFP		Labor Productivity	
	(1)	(2)	(3)	(4)
IFRS Adopter	0.073*** (4.22)	−0.004 (−0.23)	0.064*** (2.59)	−0.053*** (−3.34)
POSTST	0.016 (0.82)	−0.003 (−0.31)	0.042 (1.38)	−0.004 (−0.38)
IFRS Adopter × POSTST	0.094*** (3.49)	0.049** (2.53)	0.144*** (3.48)	0.074*** (3.66)
POSTLT	0.041 (1.31)	−0.005 (−0.30)	0.097* (1.92)	0.005 (0.27)
IFRS Adopter × POSTLT	0.092** (2.40)	0.033 (1.17)	0.214*** (3.45)	0.084*** (2.86)
Secondary School Enrollment		0.172*** (4.98)		0.106*** (3.34)
Log(life expectancy)		−0.124 (−1.38)		0.068 (0.84)
Trade/GDP		−0.025** (−2.51)		−0.024 (−1.55)
Private Credit/GDP		−0.006 (−0.56)		−0.057*** (−4.88)
GDP Growth		−1.121*** (−2.78)		−1.678*** (−3.46)
Investment Growth		0.336*** (2.67)		0.316** (2.13)
Equity Market Size		−0.006 (−0.93)		0.022*** (2.99)
Financial Market Openness		0.368*** (11.24)		0.145*** (4.77)
Overall Openness		−0.320*** (−9.42)		0.067** (2.15)
Control of Corruption		0.025 (1.20)		−0.016 (−0.72)
Government Effectiveness		0.293*** (16.41)		0.300*** (15.42)
Rule of Law		−0.153*** (−7.52)		0.040** (1.97)
Political Stability		0.037*** (5.54)		−0.006 (−0.79)
No. of observations	1477	1477	1465	1465
Adjusted R ²	12.44%	68.34%	9.19%	84.64%

This table examines whether the improvement in IFRS adopters' productivity persists beyond five years. IFRS adopters include countries that mandated adoption of IFRS in the sample period (1996–2013). Non-IFRS adopters include countries that required their firms to prepare financial statements based on local standards throughout the sample period. The sample includes countries that have non-missing data on the productivity measure (*TFP* or *Labor Productivity*) and control variables for at least one year in both pre- and post-IFRS adoption periods. Year 0 is the IFRS adoption year. POSTST is an indicator variables that equals 1 for the event window [0, +5], and 0 otherwise. POSTLT is an indicator variables that equals 1 for event years in or after Year + 6, and 0 otherwise. Intercepts and year fixed effects are included but not reported. *T*-statistics reported in parentheses are based on heteroscedasticity robust standard errors. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Appendix A contains the variable definitions.

4.10 in column (3)]. On the other hand, we do not find any significant effect of IFRS adoption on *TFP* for non-OECD countries (coefficient = 0.032, *t*-stat. =

Table 6 Parallel Trend Analysis

	Dependent variables:	
	(1) TFP	(2) Labor Productivity
IFRS Adopter × Year _{−2}	0.016 (0.40)	−0.040 (−1.09)
IFRS Adopter × Year _{−1}	0.041 (1.07)	0.001 (0.02)
IFRS Adopter × Year ₀	0.058 (1.58)	0.021 (0.59)
IFRS Adopter × Year ₊₁	0.075** (2.14)	0.053 (1.44)
IFRS Adopter × Year ₊₂	0.057 (1.61)	0.042 (1.09)
IFRS Adopter × Year _{≥+3}	0.036* (1.80)	0.044** (2.33)
Year _{−2}	−0.004 (−0.29)	0.005 (0.28)
Year _{−1}	−0.009 (−0.60)	0.000 (0.03)
Year ₀	−0.007 (−0.43)	0.002 (0.12)
Year ₊₁	−0.006 (−0.35)	0.002 (0.13)
Year ₊₂	−0.005 (−0.27)	0.001 (0.05)
Year _{≥+3}	−0.005 (−0.30)	0.002 (0.13)
Control Variables	Yes	Yes
No. of observations	1,477	1,465
Adjusted R ²	68.28%	84.44%

This table presents the results of the parallel trend analysis for both the treatment sample of IFRS adopters and the benchmark group of non-IFRS adopters. IFRS adopters include countries that mandated adoption of IFRS in the sample period (1996–2013). Non-IFRS adopters include countries that required their firms to prepare financial statements based on local standards throughout the sample period. The sample includes countries that have non-missing data on the productivity measure (*TFP* or *Labor Productivity*) and control variables for at least one year in both pre- and post-IFRS adoption periods. Year 0 is the IFRS adoption year. Intercepts, all control variables, and year fixed effects are included but not reported. *T*-statistics reported in parentheses are based on heteroscedasticity robust standard errors. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Appendix A contains the variable definitions.

1.19). The effect of IFRS adoption on labor productivity for non-OECD countries is marginally significant (coefficient = 0.034, *t*-stat. = 1.95), and is significantly lower than that for OECD countries (*p*-value of the difference test = 0.028). The results suggest that *TFP* improves for OECD countries while labor productivity increases for both OECD and non-OECD countries after mandatory IFRS adoption. Overall, OECD countries experience larger improvements in productivity than non-OECD countries after mandatory IFRS adoption.

5.4. Robustness Checks

We also perform several robustness checks. To alleviate the concern that the improvement in productivity may be driven by the change in legal enforcement, we

Table 7 OECD vs. Non-OECD Countries

	Dependent variables:			
	TFP		Labor productivity	
	(1) OECD Countries	(2) Non-OECD Countries	(3) OECD Countries	(4) Non-OECD Countries
IFRS Adopter	−0.104*** (−4.64)	−0.008 (−0.30)	−0.218*** (−10.22)	0.029** (1.96)
POST	0.015* (1.69)	−0.024** (−2.36)	0.024** (2.15)	−0.017*** (−2.96)
IFRS Adopter × POST	0.069*** (3.04)	0.032 (1.19)	0.097*** (4.10)	0.034* (1.95)
Secondary School Enrollment	0.278*** (5.93)	0.415*** (5.76)	0.099** (2.41)	0.187*** (4.87)
Log(life expectancy)	−1.740*** (−5.69)	−0.383*** (−2.85)	−1.061*** (−3.44)	−0.008 (−0.11)
Trade/GDP	−0.034 (−1.51)	0.123*** (4.10)	0.106*** (4.65)	0.095*** (5.16)
Private Credit/GDP	−0.053* (−1.89)	−0.055** (−2.12)	−0.085*** (−3.12)	−0.044** (−2.45)
GDP Growth	−2.398*** (−4.73)	−0.333 (−1.08)	−2.694*** (−5.63)	−0.451* (−1.82)
Investment Growth	0.743*** (4.33)	0.202** (2.28)	0.646*** (4.07)	0.057 (0.80)
Equity Market Size	0.025 (1.32)	−0.031*** (−2.71)	0.076*** (3.64)	0.019*** (2.89)
Financial Market Openness	0.220*** (3.80)	0.474*** (8.22)	0.070 (1.21)	−0.003 (−0.10)
Overall Openness	−0.248*** (−3.17)	−0.452*** (−10.28)	0.000 (0.00)	−0.019 (−0.77)
Control of Corruption	−0.023 (−0.76)	0.062** (2.21)	−0.222*** (−7.75)	0.149*** (7.49)
Government Effectiveness	0.132*** (3.69)	0.231*** (6.23)	0.164*** (4.19)	0.064*** (3.52)
Rule of Law	0.143*** (3.96)	−0.234*** (−9.58)	0.468*** (13.57)	−0.127*** (−7.73)
Political Stability	−0.039*** (−3.05)	0.070*** (6.39)	−0.090*** (−5.78)	0.045*** (6.98)
No. of observations	778	699	778	687
Adjusted R ²	58.40%	68.10%	80.15%	83.69%

This table presents the results of subsample analyses by splitting the full sample into OECD countries and non-OECD countries. IFRS adopters include countries that mandated adoption of IFRS in the sample period (1996–2013). Non-IFRS adopters include countries that required their firms to prepare financial statements based on local standards throughout the sample period. The sample includes countries that have non-missing data on the productivity measure (*TFP* or *Labor Productivity*) and control variables for at least one year in both pre- and post-IFRS adoption periods. Intercepts and year fixed effects are included but not reported. *T*-statistics reported in parentheses are based on heteroscedasticity robust standard errors. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Appendix A contains the variable definitions.

remove the five countries that experienced significant improvement in legal enforcement (Finland, Germany, the Netherlands, Norway, and the United Kingdom) during our sample period (Christensen et al. 2013). Results reported in Column (1) of Table 8 are similar as those in Table 3, which should mitigate the concern about the possible confounding effects of changes in legal enforcement.

Column (2) of Table 8 shows the results after controlling for the effect of voluntary (early) adoption before the mandatory IFRS adoption. *Voluntary Adoption Ratio_{−1}* is the number of public firms adopting IFRS (Compustat Global annual item *ACCTSTD*) in one year before the mandatory adoption year of the country, divided by the total number of public firms in the country in the same year. This ratio equals 0 for non-IFRS adopters. The coefficient on *IFRS Adopter* × *POST* remains positive and significant (coefficient = 0.050, *t*-stat. = 2.03 in Panel A; coefficient = 0.084, *t*-stat. = 3.32 in Panel B). The coefficient on *Voluntary Adoption Ratio_{−1}* × *IFRS Adopter* × *POST* is negative and insignificant in Panels A and B. The evidence suggests that increase in the country-level *TFP* and labor productivity still exists after we control for the voluntary adoption before the mandatory adoption year.

Overall, we find that our main results are robust to an alternative subsample of IFRS and non-IFRS adopters, and controlling for the effect of voluntary adoption.

5.5. Cross-Sectional Analyses Conditional on Equity Market Size and Legal Enforcement

Prior literature (e.g., Daske et al. 2008) finds that IFRS adoption does not lead to significant improvements in reporting unless properly enforced. Table 9 presents results of cross-sectional analyses conditional on institutional variables such as the size of the stock market (*Large Equity Market Size_{−1}*) and legal enforcement (*High Rule of Law_{−1}*). *Large Equity Market Size_{−1}* is an indicator variable that equals 1 if the market capitalization of listed domestic companies is above median in the year immediately before the IFRS adoption year, and 0 otherwise. *High Rule of Law_{−1}* is an indicator variable that equals 1 if the legal enforcement measure *Rule of Law* is above median one year before the IFRS adoption year, and 0 otherwise. Table 9 shows that the coefficients on *IFRS Adopter* × *POST* are all positive and significant except in column (4). The aggregate effect of IFRS adoption in column (4) (*IFRS Adopter* × *POST* + *High Rule of Law_{−1}* × *IFRS Adopter* × *POST*) is still positive and significant (*p*-value = 0.0003), suggesting that productivity improves after mandatory IFRS adoption, thus supporting H1. The coefficients on the interaction terms with the size of the stock market (*Large Equity Market Size_{−1}* × *IFRS Adopter* × *POST*) and legal enforcement (*High Rule of Law_{−1}* × *IFRS Adopter* × *POST*) are both insignificant. This evidence suggests that the effect of mandatory IFRS adoption on productivity improvement is not significantly driven by equity market development and legal enforcement.

5.6. Firm-Level Measure of Productivity

In our main analyses and robustness checks, we use country-level *TFP* and labor productivity to capture

Table 8 Robustness Checks**Panel A: Robustness checks based on total factor productivity**

	Dependent variable: TFP	
	(1) Removing the five countries in Christensen et al. (2013)	(2) Control for voluntary adoption
IFRS Adopter	−0.004 (−0.25)	−0.002 (−0.09)
POST	−0.003 (−0.27)	0.000 (0.01)
IFRS Adopter × POST	0.040** (2.09)	0.050** (2.03)
Voluntary Adoption Ratio _{−1} × IFRS Adopter × POST		−0.007 (−0.13)
Voluntary Adoption Ratio _{−1}		−0.013 (−0.30)
Control Variables	Yes	Yes
No. of observations	1420	1468
Adjusted R ²	66.66%	68.65%

Panel B: Robustness checks based on labor productivity

	Dependent variable: labor productivity	
IFRS Adopter	−0.051*** (−3.19)	−0.050*** (−2.70)
POST	−0.005 (−0.48)	−0.003 (−0.31)
IFRS Adopter × POST	0.079*** (4.06)	0.084*** (3.32)
Voluntary Adoption Ratio _{−1} × IFRS Adopter × POST		−0.014 (−0.24)
Voluntary Adoption Ratio _{−1}		−0.018 (−0.42)
Control Variables	Yes	Yes
No. of observations	1408	1456
Adjusted R ²	84.20%	84.95%

This table presents the results on a few robustness checks for the regression analyses of changes in productivity. Panel A presents robustness check results based on total factor productivity. IFRS adopters include countries that mandated adoption of IFRS in the sample period (1996–2013). Non-IFRS adopters include countries that required their firms to prepare financial statements based on local standards throughout the sample period. The sample includes countries that have non-missing data on total factor productivity and control variables for at least one year in both pre- and post-IFRS adoption periods. Year 0 is the IFRS adoption year. In column (1) of Panel A, we remove the five countries that experienced significant improvement in legal enforcement. In column (2) of Panel A, we control for the effect of voluntary (early) adoption. Panel B presents robustness check results based on labor productivity per employee (scaled by 100,000). Intercepts, all control variables, and year fixed effects are included but not reported. *T*-statistics reported in parentheses are based on heteroscedasticity robust standard errors. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Appendix A contains the variable definitions.

productivity. Prior literature also uses accounting data to estimate firm-level productivity using data envelopment analysis (DEA) (Charnes et al. 1978, Banker et al. 2005, Banker and Natarajan 2008, Iyer

Table 9 Analysis Conditional on Equity Market Size and Legal Enforcement

	Dependent variables:			
	TFP		Labor productivity	
	(1)	(2)	(3)	(4)
IFRS Adopter	−0.025 (−1.08)	0.024 (1.03)	−0.055*** (−2.58)	0.012 (0.60)
POST	−0.062*** (−5.04)	−0.008 (−0.79)	−0.045*** (−4.29)	−0.017* (−1.73)
IFRS Adopter × POST	0.061** (2.30)	0.073** (2.14)	0.076*** (2.97)	0.044 (1.59)
Large Equity Market Size _{−1} × POST	0.091*** (7.06)		0.063*** (4.16)	
Large Equity Market Size _{−1} × IFRS Adopter	0.036 (1.32)		0.002 (0.07)	
Large Equity Market Size _{−1} × IFRS Adopter × POST	−0.040 (−1.14)		−0.001 (−0.03)	
Large Equity Market Size _{−1}	−0.126*** (−9.72)		−0.077*** (−5.70)	
High Rule of Law _{−1} × POST		0.018 (1.19)		0.031* (1.72)
High Rule of Law _{−1} × IFRS Adopter		−0.055** (−2.00)		−0.122*** (−4.31)
High Rule of Law _{−1} × IFRS Adopter × POST		−0.036 (−0.89)		0.048 (1.28)
High Rule of Law _{−1}		0.000 (0.01)		0.009 (0.64)
Control Variables	Yes	Yes	Yes	Yes
No. of observations	1477	1477	1465	1465
Adjusted R ²	70.29%	68.64%	85.03%	84.99%

This table presents the results on the analyses of total factor productivity and labor productivity conditional on indicators for large size of equity market (*Large Equity Market Size_{−1}*) and higher level of legal enforcement (*High Rule of Law_{−1}*) measured at one year before the IFRS adoption year. IFRS adopters include countries that mandated adoption of IFRS in the sample period (1996–2013). Non-IFRS adopters include countries that required their firms to prepare financial statements based on local standards throughout the sample period. The sample includes countries that have non-missing data on the productivity measure (*TFP* or *Labor Productivity*) and control variables for at least one year in both pre- and post-IFRS adoption periods. Year 0 is the IFRS adoption year. Intercepts, all control variables, and year fixed effects are included but not reported. *T*-statistics reported in parentheses are based on heteroscedasticity robust standard errors. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Appendix A contains the variable definitions.

et al. 2013, Narayanan et al. 2014, Chang et al. 2015, Karmarkar et al. 2015, Jacobs et al. 2016, Chang et al. 2018). Using the DEA approach, we estimate firm productivity for each year, country, and industry (based on the Fama–French 48 industry classification scheme), with a minimum of 10 observations for each group. We use sales revenue (deflated by price index, with year 1991 as the base year) as the output measure and the following flow measures as inputs (deflated by price index): cost of goods sold, selling and

administrative expenses, and depreciation and amortization expenses. This DEA-based productivity measure is defined as the ratio of output over inputs.

In untabulated analysis, we find that our main results are robust to the use of firm-level productivity measures. However, since these firm-level productivity measures are constructed based on accounting variables, these results should be interpreted with caution as they can be mechanically driven by changes in accounting regulations.

6. Conclusion

In this study, we examine whether productivity improves after mandatory IFRS adoption. We conjecture that mandatory IFRS adoption increases productivity via improving information transparency and information comparability. Our main measures of productivity are country-level *TFP* and labor productivity.

Empirical results indicate that both country-level *TFP* and labor productivity of mandatory IFRS adopters increase significantly after the adoption. We further document that after the IFRS adoption *TFP* and labor productivity improve more for countries without IFRS convergence. In addition, we find that *TFP* increases more for countries exhibiting a larger increase in the number of comparable industry peers. Taken together, the evidence suggests that countries with significant improvements in information environments are able to increase productivity more substantially after mandatory IFRS adoption.

We also perform a few additional analyses to substantiate our findings. We find that the improvement in productivity for mandatory adopters: (1) persists for five years after adoption, (2) does not exist in years before IFRS adoption, (3) is robust to controlling for

voluntary adoptions, and (4) is not caused by changes in legal enforcement. Our study provides insights into whether high-quality accounting standards help improve economic productivity. The evidence is consistent with the notion that better quality accounting information facilitates the functioning of capital markets and internal decision-making.

We conclude our study by suggesting several avenues for future research. First, more microscopic analysis at the firm level likely provide deeper insights on the determinants of productivity. However, there are very few firm-level productivity measures readily available. A measure recently developed by Demerjian et al. (2013) is based on accounting variables, which are subject to accounting measurement rules and often incomparable across different accounting regimes. Therefore, more research efforts can be devoted to identifying alternative ways of measuring firm-level productivity. Second, the factors that drive the productivity improvement can be further investigated. For instance, can technology spillovers partially explain the increase in productivity? Third, future research can examine changes in specific financing and production activities after mandatory IFRS adoption and evaluate their contributions to the improvements in productivity.

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Appendix Variable Definitions

Variable name	Definition
TFP	Country-level total factor productivity. For details of calculation, see Feenstra et al. (2015). Available for 116 countries. Source: <i>Penn World Table version 9.0</i>
Labor Productivity	GDP per person employed (scaled by 100,000), available for 123 countries. Source: <i>Total Economy Database</i> TM at: https://www.conference-board.org/data/economydatabase/index.cfm?id=27762
Secondary School Enrollment	Secondary School Enrollment ratio is the ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the secondary level of education. Accordingly, the reported value can exceed (or average) more than 100%. Source: <i>World Bank Development Indicators</i>
Life Expectancy	Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life. Source: <i>World Bank Development Indicators</i>
Trade/GDP	The trade dependency ratio is the sum of exports and imports of goods and services measured as a share of gross domestic product. Source: <i>World Bank Development Indicators</i>
Private Credit/GDP	Private credit divided by gross domestic product. Credit to private sector refers to financial resources provided to the private sector, such as through loans, purchases of non-equity securities, and trade credits and other accounts receivable that establish a claim for repayment. Source: <i>World Bank Development Indicators</i>

(continued)

Appendix (continued)

Variable name	Definition
GDP Growth	GDP per capita growth (annual %) divided by 100. Source: <i>World Bank Development Indicators</i>
Investment Growth	Annual percentage growth of gross fixed capital formation divided by 100. Source: <i>World Bank Development Indicators</i>
Equity Market Size	Market capitalization of listed domestic companies (% of GDP) divided by 100. Source: <i>World Bank Development Indicators</i>
Financial Market Openness	Financial Market Openness Index is the unweighted average of the openness of five types of asset categories: equity, bond, money market, collective investment, derivatives and other instruments. This country-level index ranges between 0 and 1 (1 indicates a country being fully liberalized). Source: <i>International Monetary Fund (Wang-Jahan Index)</i>
Overall Openness	Overall Openness Index is the unweighted average of the openness of 12 types of asset categories: equity, bond, money market, collective investment, derivatives and other instruments, commercial credit, financial credit, direct investment, direct investment liquidation, guarantees, real estate, and personal capital transaction. This country-level index ranges between 0 and 1 (1 indicates a country being fully liberalized). Source: <i>International Monetary Fund (Wang-Jahan Index)</i>
Control of Corruption	A country-level estimate of governance that ranges from approximately –2.5 (weak) to 2.5 (strong) governance performance regarding control of corruption. This measure reflects the perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as “capture” of the state by elites and private interests. Source: <i>World Bank Worldwide Governance Indicators (WGI), 2018 Update</i>
Government Effectiveness	A country-level estimate of governance that ranges from approximately –2.5 (weak) to 2.5 (strong) governance performance regarding government effectiveness. This measure reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government’s commitment to such policies. Source: <i>World Bank Worldwide Governance Indicators (WGI), 2018 Update</i>
Rule of Law	A country-level estimate of governance that ranges from approximately –2.5 (weak) to 2.5 (strong) governance performance regarding rule of law. This measure reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. Source: <i>World Bank Worldwide Governance Indicators (WGI), 2018 Update</i>
Political Stability	A country-level estimate of governance that ranges from approximately –2.5 (weak) to 2.5 (strong) governance performance regarding political stability. This measure reflects perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism. Source: <i>World Bank Worldwide Governance Indicators (WGI), 2018 Update</i>
IFRS Adopter	An indicator variable that equals to 1 if a country mandates adoption of IFRS in the sample period (1996–2013), and 0 otherwise.
POST	An indicator variable that equals to 1 if a calendar year is in or after the first year when a country adopts IFRS, and 0 otherwise.
Change in Comparability	Country-level measure of changes in comparability. We first calculate the industry–country-level measure of changes in comparability, computed as the number of firms using the same accounting standards in an industry that a firm can be compared to after the mandatory IFRS adoption divided by the number of firms in an industry that a firm can be compared to before the mandatory adoption (DeFond et al. 2011). We then aggregate the industry–country-level measure at the country level to calculate the country-level measure of changes in comparability.
Non-IFRS Convergence	An indicator variable that equals to 1 if a country (either an IFRS adopter or a non-IFRS adopter) does not have a plan for IFRS convergence during the sample period (1996–2013), and 0 otherwise. IFRS-convergence countries are identified as: (1) countries with a formal plan of convergence according to the “GAAP Convergence 2002” (IFAD 2002), or (2) countries that are reported of convergence by “Use of IFRS by Jurisdiction” (https://www.iasplus.com/en/resources/ifrs-topics/use-of-ifrs).
Year ₋₂	An indicator variable that equals 1 for two years before a country adopts IFRS, and 0 otherwise.
Year ₋₁	An indicator variable that equals 1 for one year before a country adopts IFRS, and 0 otherwise.
Year ₀	An indicator variable that equals 1 for the first year when a country adopts IFRS, and 0 otherwise.
Year ₊₁	An indicator variable that equals 1 for one year after a country adopts IFRS, and 0 otherwise.
Year ₊₂	An indicator variable that equals 1 for two years after a country adopts IFRS, and 0 otherwise.
Year _{≥+3}	An indicator variable that equals 1 for event years in or more than three years after a country adopts IFRS, and 0 otherwise.
POSTST	An indicator variables that equals 1 for the event window [0, +5], and 0 otherwise.
POSTLT	An indicator variables that equals 1 for event years in or after Year + 6, and 0 otherwise.
Voluntary Adoption Ratio ₋₁	The number of public firms adopting IFRS in one year before the mandatory adoption year of the country, divided by the total number of public firms in the country in the same year. This ratio equals 0 for non-IFRS adopters. Source: <i>Compustat Global</i> (annual item ACCTSTD)
Large Equity Market Size ₋₁	An indicator variables that equals 1 if <i>Equity Market Size</i> is above median measured at one year before the IFRS adoption year (Year ₋₁), and 0 otherwise.
High Rule of Law ₋₁	An indicator variables that equals 1 if <i>Rule of Law</i> is above median measured at one year before the IFRS adoption year (Year ₋₁), and 0 otherwise.

Notes

¹In addressing why productivity measurement is important, Bureau of Labor Economics states on its website: “Advances in productivity, that is the ability to produce more with the same or less input, are a significant source of increased potential national income. The US economy has been able to produce more goods and services over time, not by requiring a proportional increase of labor time, but by making production more efficient.” (See: <http://www.bls.gov/lpc/faqs.htm#P02>.)

²We acknowledge that the arguments with regard to the capital market improvements are more likely to hold for countries in which public firms play a significant role in the economy. In the meantime, some mandatory IFRS-adopting countries such as Germany and France permit private firms to adopt IFRS, while others such as Chile and Cyprus require these firms to adopt IFRS. In addition, even if private firms do not adopt IFRS, they may be benchmarked against public firms that adopted IFRS, and they can also learn about market conditions and investment opportunities from the improved financial information reported by their public peers. As a result, private firms may also experience the effect of mandatory IFRS adoption spilled over from public firms (). However, since we do not have access to detailed data on accounting variables for private firms across countries, we are not able to examine the effect of IFRS adoption on these firms.

³The sample period starts one year before the first IFRS adoption event and ends one year after the last adoption event in Table 1.

⁴For the benchmark sample, the adoption years are assumed to be adoption years in the matched treatment sample.

⁵On the one hand, TFP measures the efficiency of producing outputs using a fixed set of capital and labor factors. On the other hand, labor productivity focuses narrowly on productivity of a single factor (labor).

⁶Note that the coefficient on *POST* is not interpretable in Table 3 because of the inclusion of year fixed effects. To examine whether productivity for non-IFRS adopters changes significantly, we re-estimate equation (1) after excluding year fixed effects. Untabulated results show that after we include all control variables, the coefficient on *POST* is significantly negative when we use TFP as the dependent variable, but significantly positive when we use labor productivity as the dependent variable. It appears that non-IFRS adopters on average have experienced a decrease in total factor productivity and an increase in labor productivity around IFRS adoption. The combined coefficients on *POST* and *IFRS Adopter* × *POST* are positive and significant when we use TFP and labor productivity as dependent variables, suggesting that IFRS adopters experience increases in productivity.

⁷We calculate the Variance Inflation Factors (VIFs) for all variables in all regressions. The mean VIFs of all regressions are well-below 10, which is the standard cutoff of multicollinearity. This evidence suggests that there is no indication of potential multicollinearity. We have also checked the results based on clustering by year and find qualitatively similar results.

⁸<https://www.iasplus.com/en/resources/ifrs-topics/use-of-ifrs> (retrieved July 2019).

⁹The findings for TFP and labor productivity are different, possibly because the two measures are conceptually distinct and computed differently.

¹⁰As of year 2018, the OECD includes 36 member countries. See <http://www.oecd.org/about/members-and-partners/> for a complete list of OECD countries. The accession years of two member countries are beyond our sample period. Specifically, Latvia joined OECD in 2016 and Lithuania joined OECD in 2018. We thus classify these two countries as non-OECD countries in the sample period.

References

- Badertscher, B., N. Shroff, H. D. White. 2013. Externalities of public firm presence: Evidence from private firms' investment decisions. *J. Financ. Econ.* **109**(3): 682–706.
- Baiman, S., R. E. Verrecchia. 1996. The relation among capital markets, financial disclosure, production efficiency, and insider trading. *J. Account. Res.* **34**(1): 1–22.
- Ball, R. 2006. International Financial Reporting Standards (IFRS): Pros and cons for investors. *Account. Bus. Res.* **36** (sup1): 5–27.
- Banker, R., H. Chang, R. Natarajan. 2005. Productivity change, technical progress and relative efficiency change in the public accounting industry. *Management Sci.* **51**(2): 291–304.
- Banker, R., R. Natarajan. 2008. Evaluating contextual variables affecting productivity using data envelopment analysis. *Oper. Res.* **56**(1): 48–58.
- Bekaert, G., C. R. Harvey, C. Lundblad. 2011. Financial openness and productivity. *World Dev.* **39**(1): 1–19.
- Bekaert, G., C. R. Harvey, C. Lundblad, S. Siegel. 2007. Global growth opportunities and market integration. *J. Finan.* **62**(3): 1081–1137.
- Biddle, G., G. Hilary. 2006. Accounting quality and firm-level capital investment. *Account. Rev.* **81**(5): 963–982.
- Biddle, G., G. Hilary, R. S. Verdi. 2009. How does financial reporting quality relate to investments efficiency? *J. Account. Econ.* **48** (2–3): 112–131.
- Bloom, N., J. Van Reenen. 2007. Measuring and explaining management practices across firms and countries. *Q. J. Econ.* **122** (4): 1351–1408.
- Boot, A., A. Thakor. 1997. Financial system architecture. *Rev. Finan. Stud.* **10**(3): 693–733.
- Bushman, R., A. Smith. 2001. Financial accounting information and corporate governance. *J. Account. Econ.* **32**(1–3): 237–333.
- Bushman, R., R. Indjejikian. 1993. Shareholder demand for “distorted” accounting disclosures. *Account. Rev.* **68**(4): 765–782.
- Chang, H., H. L. Choy, I. Hwang. 2015. An empirical study of returns to scale of CPA firms in the post SOX era. *Ann. Oper. Res.* **229**(1): 253–264.
- Chang, H., Y. Kao, R. Mashruwala, S. Sorensen. 2018. Technical inefficiency, allocative inefficiency, and audit pricing. *J. Account. Audit. Finan.* **33**(4): 580–600.
- Charnes, A., W. Cooper, E. Rhodes. 1978. Measuring the efficiency of decision-making units. *Eur. J. Oper. Res.* **2**(6): 429–444.
- Chen, F., O. Hope, Q. Li, X. Wang. 2011. Financial reporting quality and investment efficiency of private firms in emerging markets. *Account. Rev.* **86**(4): 1255–1288.
- Chen, C., D. Young, Z. Zhuang. 2012. Externalities of mandatory IFRS adoption: Evidence from cross-border spillover effects of

- financial information on investment efficiency. *Account. Rev.* **88**(3): 881–914.
- Christensen, H., L. Hail, C. Leuz. 2013. Mandatory IFRS reporting and changes in enforcement. *J. Account. Econ.* **56**(2–3): 147–177.
- Daske, H., L. Hail, C. Leuz, R. Verdi. 2008. Mandatory IFRS reporting around the world: Early evidence on the economic consequences. *J. Account. Res.* **46**(5): 1085–1142.
- DeFond, M., M. Hung, S. Li, Y. Li. 2015. Does mandatory IFRS adoption affect crash risk? *Account. Rev.* **90**(1): 265–299.
- DeFond, M., X. Hu, M. Hung, S. Li. 2011. The impact of IFRS adoption on foreign mutual fund ownership: The role of comparability. *J. Account. Econ.* **51**(3): 240–258.
- Demerjian, P., B. Lev, M. Lewis, S. McVay. 2013. Managerial ability and earnings quality. *Account. Rev.* **88**(2): 463–498.
- Diamond, D. W., R. E. Verrecchia. 1991. Disclosure, liquidity, and the cost of capital. *J. Finan.* **46**(4): 1325–1359.
- Feenstra, R. C., R. Inklaar, M. P. Timmer. 2015. The next generation of the Penn World Table. *Am. Econ. Rev.* **105**(10): 3150–3182.
- Ferracuti, E., S. R. Stubben. 2019. The role of financial reporting in resolving uncertainty about corporate investment opportunities. *J. Account. Econ.* **68**(2–3). <https://doi.org/10.1016/j.jacc.2019.101248>
- Feng, M., C. Li, S. McVay, H. Skaife. 2015. Does ineffective internal control over financial reporting affect a firm's operations? Evidence from firms' inventory management. *Account. Rev.* **90**(2): 529–557.
- Francis, J., S. X. Huang, I. Khurana. 2016. The role of similar accounting standards in cross-border mergers and acquisitions. *Contemp. Account. Res.* **33**(3): 1298–1330.
- Hemmer, T., E. Labro. 2008. On the optimal relation between the properties of managerial and financial reporting systems. *J. Account. Res.* **46**(5): 1209–1240.
- Hirshleifer, J. 1971. The private and social value of information and the reward to inventive activity. *Am. Econ. Rev.* **61**(4): 561–574.
- Holmstrom, B., P. Milgrom. 1987. Aggregation and linearity in the provision of intertemporal incentives. *Econometrica* **55**(2): 303–328.
- Holmström, B., J. Tirole. 1993. Market liquidity and performance monitoring. *J. Polit. Econ.* **101**(4): 678–709.
- International Forum for Accountancy Development (IFAD). 2002. *GAAP Convergence 2002: a survey of national efforts to promote and achieve convergence with International Financial Reporting Standards*, by BDO, Deloitte Touche Tohmatsu, Ernst & Young, Grant Thornton, KPMG, and PricewaterhouseCoopers. Available at <https://www.iasplus.com/en/binary/resource/gaap2002.pdf> (accessed date July 6, 2019).
- Iyer, A., H. Saranga, S. Seshadri. 2013. Effect of quality management systems and total quality management on productivity before and after: Empirical evidence from the Indian auto component industry. *Prod. Oper. Manag.* **22**(2): 283–301.
- Jacobs, B. M., R. Kraude, S. Narayanan. 2016. Operational productivity, corporate social performance, financial performance, and risk in manufacturing firms. *Prod. Oper. Manag.* **25**(12): 2065–2085.
- Jung, B. C., W. Lee, D. P. Weber. 2014. Financial reporting quality and labor investment efficiency. *Contemp. Account. Res.* **31**(4): 1047–1076.
- Kanodia, C., D. Lee. 1998. Investment and disclosure: The disciplinary role of periodic performance reports. *J. Account. Res.* **36**(1): 33–55.
- Karmarkar, U. S., K. Kim, H. Rhim. 2015. Industrialization, productivity and the shift to services and information. *Prod. Oper. Manag.* **24**(11): 1675–1695.
- Lambert, R. A. 2001. Contracting theory and accounting. *J. Account. Econ.* **32**(1–3): 3–87.
- Leuz, C., R. E. Verrecchia. 2000. The economic consequences of increased disclosure. *J. Account. Res.* **38**(Supplement): 91–124.
- Levine, R. 1997. Financial development and economic growth: views and agenda. *J. Econ. Lit.* **35**(2): 688–726.
- Marquardt, C., E. Zur. 2015. The role of accounting quality in the M&A market. *Management Sci.* **61**(3): 604–623.
- Marshall, J. 1974. Private incentives and public information. *Am. Econ. Rev.* **64**(3): 373–390.
- McNichols, M. F., S. R. Stubben. 2008. Does earnings management affect firms' investment decisions? *Account. Rev.* **83**(6): 1571–1603.
- Narayanan, S., J. M. Swaminathan, S. Talluri. 2014. Knowledge diversity, turnover, and organizational-unit productivity: An empirical analysis in a knowledge-intensive context. *Prod. Oper. Manag.* **23**(8): 1332–1351.
- Palepu, K. G., P. M. Healy, V. L. Bernard. 2000. *Business analysis and valuation: Using financial statements, text and cases*. 3rd ed, South-Western Educational Publishing.
- Raman, K., H. Shahrur. 2008. Relationship-specific investments and earnings management: Evidence on corporate suppliers and customers. *Account. Rev.* **83**(4): 1041–1081.
- Roychowdhury, S., N. Shroff, R. S. Verdi. 2019. The effects of financial reporting and disclosure on corporate investment: A review. *J. Account. Econ.* **68**(2–3). <https://doi.org/10.1016/j.jacc.2019.101246>.
- Spence, M. 1973. Job market signaling. *Q. J. Econ.* **87**(3): 355–374.
- Syverson, C. 2011. What determines productivity? *J. Econ. Lit.* **49**(2): 326–365.
- Verrecchia, R. E. 2001. Essays on disclosure. *J. Account. Econ.* **32**(1–3): 97–180.