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Accounting standards convergence dynamics

International evidence from club convergence and clustering

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Abstract

Purpose – This paper aims to explore convergence of accounting standards across worldwide adopted measures to investigate whether countries that have not completely adopted International Accounting Standards across the globe have displayed a tendency to act so.

Design/methodology/approach – The new panel convergence methodology, developed by Phillips and Sul (2007), is employed.

Findings – The empirical findings suggest that countries form distinct convergent clubs, albeit on a limited prevalence, yielding support to the notion that on a global basis firms and countries have initiated processes that will eventually lead them to a uniform pattern of employing common accounting standards.

Practical implications – These findings have substantial implications on a firm level, mainly for differences in accounting quality as well as for differences in their cost of capital, thus leading the regulatory authorities to opt for further improvements in financial reporting.

Originality/value – The novelties of this paper first, stem from the fact that it is the first time in the relevant literature that an empirical study attempts to formally measure whether the accounting world exhibits a tendency for accounting standards convergence or whether tactics and policies remain stagnant, acquiring drastic policy measures to speed up the convergence process. In addition, this study employs the implementation of the new methodology of panel convergence testing. This methodology has several appealing characteristics.

Keywords IFRS, Convergence, Club convergence methodology, Global firms

Paper type Research paper

JEL classification – M41, C33

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1. Introduction

As of January 1, 2005, all publicly listed firms in the European Union are required to prepare financial statements in accordance with International Financial Reporting Standards (IFRS)-although a number of firms were already preparing their financial statements even from 2000, while more and more firms in Asia are turning to the IFRS standards. USA firms are the only remaining entities in the world not yet adopting IFRS (Hail *et al.*, 2010). As more countries converge to IFRS, the accounting and financial community is getting increasingly interested in evaluating the benefits associated with IFRS adoption (Ball, 2006; Cynthia and Murphy, 2009). Nevertheless, even for those countries that have adopted IFRS directly, certain differences may exist during the implementation of the IFRS regime. Given these differences, it is essential to have reliable evidence of the progress in achieving worldwide convergence.

A primary objective of the International Accounting Standards Board (IASB) is to develop a high-quality system of accounting standards that will ensure transparent and comparable information regarding the quality of financial statements reporting. To this end, the IASB has adopted a number of steps to remove alternative accounting practices and, thus, to require accounting measurements that reflect a firm's economic position and performance (Ball *et al.*, 2003). The application of such international accounting practices is expected to lead to higher accounting information quality and, consequently, to a lower equity cost of capital (Ewert and Wagenhofer, 2005). They present a rational expectations model which provides empirical evidence that accounting earnings reflect better a firm's underlying economic position and, thus, are of higher quality.

The current worldwide evidence documents those firms which have not adopted international accounting practices, display less earnings management, more timely loss recognition and more value relevance of accounting amounts *vis-à-vis* those firms that have considered the IFRS regime. More specifically, the former firms display a higher variance of net income changes, a higher ratio of the variances relevant to net income and cash flows changes, a lower extent of correlation between accruals and cash flows and, finally, a lower frequency of small positive net income levels. Moreover, the IFRS regime is expected to facilitate growth, not only for the firms themselves, but also for bilateral activities involving international transactions (Daske *et al.*, 2008). A number of studies argue that the adoption of the IFRS regime is expected to reduce information costs in an economy, especially as trade and capital flows become more and more globalized: it is cheaper for capital market participants to become familiar with one set of international standards versus several local standards. (Leuz, 2003; Brath, 2008). Beneish and Yohn (2008) explored the effect of the adoption of IFRS on the tendency of investors to under-invest in foreign equities, given the pre-determined home bias effect considered in the relevant literature. Their empirical findings highlight that the quality of information that investors receive is higher, placing the home bias effect in dispute. Gaston *et al.* (2010) also examine the quantitative impact of the IFRS adoption on financial reporting by Spain and the UK, by comparing the information content disclosed under IFRS *vis-à-vis* the information content under local generally accepted accounting principles (GAAP) systems. Their empirical findings reveal that the quantitative impact is significant. Karampinis and Hevas (2013) investigate whether the adoption of IFRS in Greece tends to change tax-induced incentives for financial earnings

management. They document that although tax pressure is considered as a significant negative factor of discretionary accruals, this pressure dissipated in the IFRS era.

Overall, the benefits of a unified accounting standards system are related to the reduction of the information asymmetry associated with potential financial market investors and to the promotion of free flows of global investment; at the same time, it is related to the achievement of substantial benefits for all capital markets stakeholders, i.e. investors, firms and auditors (Dikova *et al.*, 2010).

The objective of this paper is to investigate convergence of accounting standards levels across 27 countries all over the globe and spanning the period 2000-2012. The findings will be the basis of more realistic policy recommendations that could be put forward, in an effort to eliminate such differences on a worldwide basis. The empirical findings could provide additional information to the users of financial reporting by helping them to assess the quality and comparability of the current convergence pattern. The convergence of accounting practices is a decisive strategic factor for global capital markets. The reason is simple: high-quality information is essential to high-quality markets.

The novelties of this paper stem from the fact that it is the first time in the relevant literature that an empirical study attempts to formally measure whether the accounting world exhibits a tendency for accounting standards convergence or whether tactics and policies remain stagnant, demanding for drastic policy measures to speed up the convergence process. In addition, this study makes use of the new methodology of panel convergence testing, recommended by Phillips and Sul (2007). The philosophy of the methodological approach is the club convergence hypothesis, suggested by Fischer and Stirbock (2004), which claims that certain countries or regions or firms which belong in a club move from a disequilibrium position to its club-specific steady-state position. This methodology has several appealing characteristics. To begin with, no specific assumptions concerning the stationarity of the variable of interest and/or the existence of common factors are necessary. Nevertheless, this convergence test could be interpreted as an asymptotic cointegration test without suffering from the small sample problems of unit root and cointegration testing. In addition, the methodology is based on a quite general form of a nonlinear time-varying factor model which takes into account that countries experience transitional dynamics. Finally, an additional novelty of the paper is that it tests for convergence by using a number of alternative methodologies that measure accounting standards to provide robust support to the studies' findings.

The rest of the paper is organized as follows. Section 2 reviews the recent empirical literature on international accounting standards. Section 3 presents the new methodology employed. Section 4 discusses the results of the empirical analysis, while Section 5 summarizes the paper, suggests possible venues for future research and offers some policy implications.

2. Literature review

The flexibility of IFRS principles-based standards allows firms to continue handling accounting information given to the public and to potential investors, thus reducing accounting quality. In this major strand of the literature on the effects of the IFRS regime, this type of flexibility has been a main concern of securities markets regulators (Breeden, 1994), while Street and Gray (2001) and Ball *et al.* (2003) argue that lax enforcement leads to limited compliance with the standards and, therefore, to their

limited effectiveness. With respect to the latter study, firms in Asian countries follow accounting standards largely derived from common law and thus are very close to IFRS. Empirical findings of their study show that in these Asian firms the quality level of timely loss recognition is no better *vis-à-vis* firms in other parts of the world that follow the code law system. Moreover, Bradshaw and Miller (2005) study non-USA firms that follow USA domestic accounting standards and yet the characteristics of their accounting practices are far from being similar to those by US firms. Peng *et al.* (2008) show that accounting standards convergence is documented across Chinese firms. Jeanjean and Stolowy (2008) find that the pervasiveness of earnings management increased in Australia, the UK and France, even after the adoption of IFRS, while Ahmed *et al.* (2010) find that mandatory adoption of IFRS leads to higher earnings smoothing, more aggressive reporting of accruals and, finally, to reduced levels in timeliness of loss recognition. Following the adoption of IFRS by Greek firms, Tsalavoutas *et al.* (2010) provide evidence against any significant changes in the value relevance of equity book values and earnings. Zeghal *et al.* (2011) examine whether the mandatory adoption of the IFRS regime in France is associated with lower earnings management. Based on a large sample of 353 firms, their results display that the new accounting regime is associated with a reduction in the level of earnings management, especially for firms with good corporate governance and for those that depend heavily on foreign financial markets. Clarkson *et al.* (2011) argue that there are no changes in price relevance for firms operating in countries under either the Code Law regime or the Common Law regime. Landsman *et al.* (2012) examine whether the information content of earnings announcements increases in countries that have adopted an IFRS regime. Their empirical findings suggest that that this information content strongly increases in IFRS regimes across a sample of 16 countries. They also identified three mechanisms through which this increase is attributed to: reduced reporting lags, increasing analysts following and increasing foreign investment. Finally, Dimitropoulos *et al.* (2013) examine the impact of the IFRS adoption on the quality of accounting information within the Greek manufacturing setting. They provide convincing evidence that the implementation of the IFRS regime contributes to less earnings management, to more timely loss recognition and to greater value relevance of accounting financial statements. By contrast, Misirlioglu *et al.* (2013) examine whether the mandatory adoption of the IFRS regime by Turkish listed firms played a significant role or not in the measurement of disclosures. They provide strong evidence that most of the items supposed to be disclosed in an IFRS regime were not disclosed.

A different strand of the literature investigates the potential association between accounting standards and informational asymmetries. Easley and O'Hara (2004) model the impact of information characteristics on the cost of capital. Their results confirm the direct impact of accounting information on the firm's cost of capital. Yip and Young (2009) and Horton *et al.* (2010) provide evidence that the adoption of IFRS reduces the asymmetry of information and has a positive effect on asset prices. Finally, Bruggenmann *et al.* (2009) and Yu (2009) show that the mandatory adoption of IFRS contributed to higher levels of trading activity across individual investors and higher volumes of investment in capital markets due to lower asymmetric information costs related to the cost of equity capital.

Studies comparing IFRS to domestic accounting standards report mixed results about their quality. In particular, Garrido *et al.* (2002) use a longitude study – that

employs Euclidian distances – to research formal convergence. Their methodology suffers from the drawback that such distances can show the difference between the items compared, but cannot reflect similarities or dissimilarities concerning the items under comparison. Ashbaugh and Pincus (2001) investigate whether convergence in international accounting standards is capable of forecasting analysts' attempts to forecast firms' earnings. Eccher and Healy (2003) find that accounting information based on IFRS is not more value-relevant than that based on Chinese accounting standards for firms that can be owned by foreign investors, attributing these differences to the lack of effective controls and infrastructure to monitor the application of IFRS. Tarca (2004) compares reporting practices between domestic and international settings for a sample of countries. Her empirical findings show that a growing number of firms, even in the US market, adopt the IFRS methodology. Van Tendeloo and Vanstraelen (2005) show that German firms applying IFRS do not exhibit differences in earnings management *vis-à-vis* firms that apply German accounting standards. Consistent with their findings, the study by Daske (2006) also finds the absence of evidence regarding cost capital reductions for the same German firms. Fontes *et al.* (2005) recommend the Spearman's coefficient approach to assess the process of convergence between any two sets of accounting standards. Their results document that their assessment methodology has comparative advantages over distance methodologies.

By contrast, a number of recent studies provide evidence that the quality of accounting information is not managed by the adoption of a specific accounting regime, but by market forces and institutional factors (Ball *et al.*, 2003; Ball and Shivakumar, 2005). Their main finding is that the adoption of a particular accounting system does not seem to enhance the quality of accounting information provided to potential investors and thus to reduce agency conflicts regarding groups of investors and/or shareholders. What really matters is the impact of legal institutions on auditors; performance.

3. Methodologies of accounting standards

A crucial concept for investigating convergence in accounting standards is the appropriate approach of accounting measurement, i.e. calculating accounting numbers through the measurement of stock values coming from the balance sheet. We follow the methodological approaches offered in the relevant literature on the employment of specific metrics that consider accounting standards convergence, i.e. the earnings management approach.

This approach measures accounting information quality using various earnings management metrics. The literature has used a formal approach of measuring earnings management, i.e. earnings smoothing. Regarding earnings smoothing, firms with less earnings smoothing exhibit higher earnings volatility (Leuz *et al.*, 2003; Lang *et al.*, 2005). Therefore, we make use of two measures of earnings volatility: volatility in net income changes scaled by total assets and the ratio of volatility in net income changes to volatility in cash flow changes. Moreover, the second ratio disaggregates across financing cash flows, investing cash flows and operating activities cash flows. We will examine whether firms in our sample display earnings smoothing metrics convergence, as IFRS firms have less discretion to smooth earnings.

4. Econometric methodology

In this section, we outline the methodology proposed by Phillips and Sul (2007) (henceforth PS) to test for convergence in a panel of countries. We also briefly discuss the clustering algorithm that allows us to classify countries into convergent clubs.

4.1 Testing for convergence

We make use of panel data for a variable X_{it}, where $i = 1,...N$ and $t = 1,...T$, with N, T the number of countries and the sample size, respectively. Often X_{it} is decomposed into two components, one systematic, g_{it}, and one transitory a_{it}

$$X_{it} = g_{it} + a_{it} \tag{1}$$

PS transform (1) in a way that common and idiosyncratic components in the panel are separated. Specifically:

$$X_{it} = \left(\frac{g_{it} + a_{it}}{\mu_t}\right)\mu_t = \delta_{it}\mu_t, \quad \text{for all } i,\ t \tag{2}$$

In this way, the variable of interest, X_{it}, is decomposed into two components, one common, μ_t, and one idiosyncratic, δ_{it}, both of which are time-varying components. δ_{it} is assumed to converge, for each country i, to some limiting value δ_i for that country. The average difference between δ_{it} and δ_i is assumed to decline over time at a rate proportional to $1/(t^{\alpha}\log(t+1))$ for some $\alpha \geq 0$. The convergence hypothesis is that every country converges to the same limit, $\delta_i = \delta$. This formulation enables testing for convergence by testing whether the factor loadings δ_{it} converge. To do so, PS define the relative transition parameter, h_{it}, as:

$$h_{it} = \frac{X_{it}}{\frac{1}{N}\sum_{i=1}^{N} X_{it}} = \frac{\delta_{it}}{\frac{1}{N}\sum_{i=1}^{N} \delta_{it}} \tag{3}$$

which measures the loading coefficient δ_{it} in relation to the panel and, as such, the transition path for the economy *i relative* to the panel average. The relative transition curves depict the relative transition coefficients h_{it}, calculated from Equation (3).

Having extracted the trend component from the series denoted as $\hat{X}_{it}$ (our data series are trending, therefore, we had to apply the PS methodology on the trend components of the series, which were extracted using the Hodrick – Prescott filter), we calculate the estimated transition paths as $\hat{h}_{it} = \dfrac{\hat{X}_{it}}{\frac{1}{N}\Sigma_{i=1}^{N}\hat{X}_{it}}$. Next, we construct the cross-sectional variation ratio H_1 / H_t, where:

$$H_t = \frac{1}{N}\sum_{i=1}^{N}(\hat{h}_{it} - 1)^2 \tag{4}$$

To define a formal econometric test, PS assume the following functional form for the transition distance H_t:

$$H_t \sim \frac{A}{L(t)^2 t^{2\alpha}} \text{ as } t \to \infty \tag{5}$$

where A is a positive constant, $L(t)$ is a slowly varying and increasing function diverging at infinity, such as $\log(t+1)$, and α denotes the speed of convergence. The null hypothesis of convergence for all i, takes the form:

$$H_0: \ \delta_i = \delta \ \ and \ \ \alpha \geq 0 \tag{6}$$

against the alternative:

$$H_A: \ \delta_i \neq \delta \ \ or \ \ \alpha < 0 \tag{7}$$

PS run the following log t regression:

$$\log\left(\frac{H_1}{H_t}\right) - 2\log L(t) = c + b\log t + u_t, \tag{8}$$

where L(t) = log(t + 1). The standard errors of the estimates are calculated using a heteroskedasticity and autocorrelation consistent estimator for the long-run variance of the residuals. We employ the quadratic spectral kernel and determine the bandwidth by means of the Andrews (1991) data-dependent procedure. By employing the conventional t-statistic t_b, the null hypothesis of convergence is rejected if $t_b < -1.65$. In practice, this regression is run after a fraction of the sample is removed. PS recommend starting the regression at some point $t = [rT]$, where $[rT]$ is the integer part of rT, and $r = 0.3$. [1]

Given that rejection of the null hypothesis for the panel as a whole does not imply the absence of club convergence, PS go one step beyond and develop an algorithm for club convergence. We next briefly outline the basic steps of the respective algorithm.

4.2 Club convergence algorithm

Step 1 (Ordering) Order the members of the panel according to the last observation.

Step 2 (*Core group formation*) Calculate the convergence t-statistic, t_k, for sequential log t regressions based on the k highest members (Step 1) with $2 \leq k \leq N$. The core group size is chosen on the basis of the maximum of t_k with $t_k > -1.65$.

Step 3 (Club membership) Select countries for membership in the core group (Step 2) by adding one at a time. Include the new country (member) if the associated t-statistic is greater than zero (conservative choice). Make sure that the club satisfies the criterion for convergence.

Step 4 (Recursion and stopping) The countries not selected in the club formed in step 3, form a complementary group. Run the *logt* regression for this set of countries. If it converges, then these countries form a second club. If not, Steps 1 to 3 are repeated, to reveal some sub-convergent clusters. If no core group is found (Step 2), then these countries display a divergent behavior.

5. Empirical analysis

5.1 Data description

We select both firms that have adopted the IFRS system (IFRS) and firms that have not adopted the IFRS system on a country basis, spanning the period 2000-2012. Many firms around the globe adopted IFRS accounting standards mostly within that period (either on a volunteer basis or on a mandatory basis). Firm-level data (on an annual basis) across countries are obtained from Datastream. The empirical analysis makes use of cash flows, total assets and net income data. To establish data on a comparable basis, these values are calculated as the sum (across firms) of the US dollar capitalization-weighted values for the relevant individual firms. The Data Table presents the country breakdown of our sample, indicating a wide range of countries. A final note is that although there are specific country blocks, i.e. the European countries, which adopted the IFRS around 2005, our analysis commences at 2000 for two reasons: because the methodological approach needs a time dimension, and, more importantly, these countries had already started making preparations for adopting the IFRS regime well before their formal introduction in 2005 (Table I).

Countries	No. of firms	IFRS	NIFRS
Australia	718	✓	
Austria	44	✓	
Belgium	67	✓	
Canada	583		✓
China	1,191		✓
Denmark	54	✓	
Finland	94	✓	
France	388	✓	
Germany	408	✓	
Greece	46	✓	
Hong Kong	790	✓	
Italy	132	✓	
Japan	2,738	✓	
Malaysia	568	✓	
The Netherlands	92	✓	
Philippines	163		✓
Portugal	38	✓	
Russia	27		✓
Singapore	373	✓	
South Africa	209	✓	
South Korea	665	✓	
Spain	11	✓	
Sweden	189	✓	
Switzerland	157	✓	
Turkey	28	✓	
United Kingdom	716	✓	
United States	3,585		✓

Notes: IFRS = firms adopted IFRS; NFRS = firms not adopted IFRS

Table I.
Data table

5.2 Club convergence and clustering: earnings management and volatility based on squared residuals from ARMA models

The analysis begins with an examination of panel tests for unit roots to determine the order of integration for the respective variables and to confirm the presence of trends in the variables under study. Levin *et al.* (2002) set forth a panel based Augmented Dickey-Fuller test (ADF) test that assumes homogeneity in the dynamics of the autoregressive coefficients for all panel units. On the other hand, Im *et al.* (2003) propose a panel unit root test that allows for heterogeneity in the dynamics of the autoregressive coefficients for all panel units. Alternatively, Maddala and Wu (1999) employ nonparametric panel unit root tests with the advantage of permitting as much heterogeneity across units as possible through the use of Fisher-ADF and Fisher-PP panel unit root tests. The Levin *et al.* (2002), Im *et al.* (2003), Fisher-ADF and Fisher-PP approaches test the null hypothesis of a unit root with the alternative hypothesis of the absence of a unit root. As displayed in Table II, the panel unit root tests show that each variable displays the presence of trend at the 1 per cent significance level.

5.2.1 Volatility in net income changes scaled by total assets. Table III reports results of the panel convergence methodology for volatility in net income changes scaled by total assets based on squared residuals. The first row shows the results of the full convergence *logt* test, i.e. convergence among all countries, and the club clustering algorithm. The null hypothesis of full convergence is rejected at the 5 per cent level for the time period under scrutiny. Specifically, the point estimate of b is -1.839 (t-statistic: -34.283). Rows 2 to 3 display the formation of two different convergence clubs. In other words, the empirical findings show that there exist two groups of countries, each with 14 and 8 countries, respectively, apparently characterized by different phases of international accounting convergence. Row 4 identifies a non-converging group of countries, i.e. Canada, China, Philippines, Russia, and the USA, which seem not to belong to any of the predetermined clubs, i.e. they are the countries that have not adopted the IFRS regime (Data Table), with b-coefficient -2.153 and t-static equal to -4.889. Once again, the empirical findings display that for all sub-clubs there is no evidence to support mergers of the original clubs.

Phillips and Sul (2009) argue that their convergence club methodology tends to overestimate the number of clubs than their true number. To avoid this overdetermination, they run the algorithm across the sub-clubs to assess whether any evidence exists in support of merging clubs into larger clubs. The results of the new converging tests are also reported in Table III. The empirical findings display that for all sub-clubs there is no evidence to support mergers of the original clubs.

5.2.2 Ratio of volatility in net income changes to volatility in cash flow changes. Tables IV to VII present clustering results in terms of the ratio of volatility in net income changes to volatility in cash flow changes, both on an aggregated basis (Table IV), and on a disaggregated basis, i.e. financing cash flows, investing cash flows and operating activities cash flows (Table V, Table VI and Table VII, respectively). Table IV documents that the null hypothesis of full convergence for the aggregated metric and for the full sample is rejected at the 5 per cent level. The point estimate of b (t-statistic in parenthesis) is -1.403 (-8.969). Once again, Canada, China, Philippines, Russia and the USA are the non-IFRS countries with b-coefficient equal to -1.517 and corresponding t-statistic -1.747. In this case, two clubs are formed, with their pattern very close to those clubs found in Table III. Their corresponding t-statistics are -0.822 and -1.351, respectively.

Variables	LLC	IPS	Fisher-ADF	Fisher-PP
Volatility in net income changes scaled by total assets	−2.14	−2.31	11.65	14.39
Ratio of volatility in net income changes to volatility in cash flow changes	−1.63	−2.15	7.19	12.64
Ratio of volatility in net income changes to volatility in cash flow changes-financing	−1.32	−2.14	1.25	2.11
Ratio of volatility in net income changes to volatility in cash flow changes-investing	−1.12	−1.24	3.20	5.32
Ratio of volatility in net income changes to volatility in cash flow changes-operating activities	−1.13	−1.27	3.23	5.56
Volatility in net income changes scaled by total assets – absolute value of residuals	−1.15	−1.22	3.08	5.17
Ratio of volatility in net income changes to volatility in cash flow changes – absolute value of residuals	−1.12	−1.26	3.09	5.11
Ratio of volatility in net income changes to volatility in cash flow changes-financing – absolute value of residuals	−1.16	−1.21	3.11	5.12
Ratio of volatility in net income changes to volatility in cash flow changes-investing – absolute value of residuals	−1.10	−1.29	3.21	4.53
Ratio of volatility in net income changes to volatility in cash flow changes-operating activities	−1.17	−1.35	3.86	4.18
Volatility in net income changes scaled by total assets – GARCH estimates	−1.24	−1.39	3.65	4.82
Ratio of volatility in net income changes to volatility in cash flow changes – GARCH estimates	−1.31	−1.44	4.52	4.25
Ratio of volatility in net income changes to volatility in cash flow changes-financing – GARCH estimates	−1.30	−1.48	4.58	4.85
Ratio of volatility in net income changes to volatility in cash flow changes-investing – GARCH estimates	−1.26	−1.46	4.71	4.64
Ratio of volatility in net income changes to volatility in cash flow changes-operating activities – GARCH estimates	−1.37	−1.62	4.83	4.92

Note: All unit root tests include an intercept and trend

Table II.
Panel unit root tests

Table V presents results for the disaggregated metric with reference to financing cash flows. Once again, the club algorithm recommends the rejection of full convergence with a value of t-statistic equal to −25.259. This time, however, three clubs are formed with each containing 3, 19 and 5 countries, respectively. The third club contains the non-IFRS countries with a corresponding t-statistic equal to −1.121.

	Countries	*t*-statistic	b coefficient
Full sample	Australia, Austria, Belgium, Canada, China, Denmark, Finland, France, Germany, Greece, Hong Kong, Italy, Japan, Malaysia, The Netherlands, Philippines, Portugal, Russia, Singapore, South Africa, South Korea, Spain, Sweden, Switzerland, Turkey, UK, US	−34.283	−1.839
1st club	Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, The Netherlands, Portugal, South Korea, Spain, Sweden, UK	0.916	0.390
2nd club	Australia, Hong Kong, Japan, Malaysia, Singapore, South Africa, Switzerland, Turkey	−0.227	−0.011
Non-converging	Canada, China, Philippines, Russia, US	−4.889	−2.153

Club	Tests of club merging
1	Club 1 + 2 = −0.057* (-6.41)

Table III.
Volatility in net income changes scaled by total assets – squared residuals approach

Note: *denotes statistical significant at the 5 per cent level, while it rejects the null hypothesis of convergence. Figures in parentheses denote *t*-statistics

	Countries	*t*-statistic	b coefficient
Full sample	Australia, Austria, Belgium, Canada, China, Denmark, Finland, France, Germany, Greece, Hong Kong, Italy, Japan, Malaysia, The Netherlands, Philippines, Portugal, Russia, Singapore, South Africa, South Korea, Spain, Sweden, Switzerland, Turkey, UK, US	−8.969	−1.403
1st club	Australia, Austria, Belgium, Denmark, Finland, France, Germany, Greece, Hong Kong, Italy, The Netherlands, Portugal, South Africa, Spain, Sweden, Switzerland, UK	−0.822	−0.098
2nd club	Japan, Malaysia, Singapore, South Korea, Turkey	−1.351	−0.301
Non-converging	Canada, China, Philippines, Russia, US	−1.747	−1.517

Club	Tests of club merging
1	Club 1 + 2 = −0.057* (−6.41)

Table IV.
Ratio of volatility in net income changes to volatility in cash flow changes – squared residuals approach

Note: Similar to Table III

	Countries	*t*-statistic	b coefficient
Full sample	Australia, Austria, Belgium, Canada, China, Denmark, Finland, France, Germany, Greece, Hong Kong, Italy, Japan, Malaysia, The Netherlands, Philippines, Portugal, Russia, Singapore, South Africa, South Korea, Spain, Sweden, Switzerland, Turkey, UK, US	−25.259	−2.059
1st club	Australia, South Korea, Switzerland	−1.569	−0.947
2nd club	Austria, Belgium, Denmark, Finland, France, Germany, Greece, Hong Kong, Italy, Japan, Malaysia, The Netherlands, Portugal, Singapore, South Africa, Spain, Sweden, Turkey, UK	−0.787	−0.084
3rd club	Canada, China, Philippines, Russia, US	−1.121	−0.311

Club	Tests of club merging
1	Club 1 + 2 = −0.057* (−6.41)
2	Club 2 + 3 = −0.073* (−5.95)

Note: Similar to Table III

Table V.
Ratio of volatility in net income changes to volatility in cash flow changes-financing – squared residuals approach

	Countries	*t*-statistic	b coefficient
Full sample	Australia, Austria, Belgium, Canada, China, Denmark, Finland, France, Germany, Greece, Hong Kong, Italy, Japan, Malaysia, The Netherlands, Philippines, Portugal, Russia, Singapore, South Africa, South Korea, Spain, Sweden, Switzerland, Turkey, UK, US	−2.329	−0.444
1st club	Australia, Austria, Belgium, Denmark, Finland, France, Germany, Greece, Hong Kong, Italy, Japan, The Netherlands, Portugal, South Africa, Spain, Switzerland, UK	1.290	1.071
2nd club	Malaysia, South Korea, Sweden, Turkey	0.282	0.116
3rd club	Canada, China, Philippines, Russia, US	−0.998	−1.128
4th club	Singapore	0.094	0.130

Club	Tests of club merging
1	Club 1 + 2 = −0.057* (−6.41)
2	Club 2 + 3 = −0.073* (−5.95)
3	Club 3 + 4 = −0.104* (−6.48)

Note: Similar to Table III

Table VI.
Ratio of volatility in net income changes to volatility in cash flow changes-investing – squared residuals approach

	Countries	*t*-statistic	b coefficient
Full sample	Australia, Austria, Belgium, Canada, China, Denmark, Finland, France, Germany, Greece, Hong Kong, Italy, Japan, Malaysia, The Netherlands, Philippines, Portugal, Russia, Singapore, South Africa, South Korea, Spain, Sweden, Switzerland, Turkey, UK, US	−3.835	−1.288
1st club	Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, The Netherlands, Portugal, Spain, Sweden	−1.455	−0.656
2nd club	South Africa, Turkey, UK	0.765	0.352
3rd club	Hong Kong, Japan, Malaysia, Singapore, South Korea	−1.204	−0.750
4th club	Australia, Switzerland	−0.871	−0.383
Non-converging	Canada, China, Philippines, Russia, US	−3.814	−2.453

Club	Tests of club merging
1	Club 1 + 2 = −0.036* (−5.18)
2	Club 2 + 3 = −0.048* (−5.53)
3	Club 3 + 4 = −0.064* (−6.81)

Note: Similar to Table III

Table VII.
Ratio of volatility in net income changes to volatility in cash flow changes-operating activities – squared residuals approach

Tables VI and VII report convergence results of the ratio of volatility in net income changes to volatility in cash flow changes, when they are proxied as investing and operating activities, respectively. Both tables reject the full sample convergence (with corresponding *t*-statistic values of −2.329 and −3.835, respectively), while they provide support to the formation of four converging clubs, although their structure is not similar. In Table VI and in terms of the non-converging group, the results display consistency for Canada, China, Philippines, Russia and the USA, signaling once again that these countries continue to follow their own domestic accounting standards. Across Tables IV to VII the empirical findings confirm the absence of merging across the original clubs.

6. Robustness tests: club convergence and clustering: earnings management and volatility based on the absolute value of the residuals from ARMA models

6.1. Volatility in net income changes scaled by total assets

Table VIII reports results for the new measure of volatility in net income changes scaled by total assets based on the absolute value of residuals. The first row shows that the null hypothesis of full convergence is rejected at the 5 per cent level for the time period under scrutiny. Specifically, the point estimate of *b* is −1.673 (*t*-statistic: −13.981). Rows 2 to 3 display the formation of two different convergence clubs, indicating that there exist two groups of countries, with 23 and 5 countries, respectively. These empirical findings clearly document the separation between IFRS-adopting and non-IFR-adopting countries.

	Countries	*t*-statistic	b coefficient
Full sample	Australia, Austria, Belgium, Canada, China, Denmark, Finland, France, Germany, Greece, Hong Kong, Italy, Japan, Malaysia, The Netherlands, Philippines, Portugal, Russia, Singapore, South Africa, South Korea, Spain, Sweden, Switzerland, Turkey, UK, US	−13.981	−1.673
1st club	Australia, Austria, Belgium, China, Denmark, Finland, France, Germany, Greece, Hong Kong, Italy, Japan, Malaysia, The Netherlands, Portugal, Singapore, South Africa, South Korea, Turkey, Spain, Sweden, Switzerland, UK	−10.025	−0.132
2nd club	Canada, China, Philippines, Russia, US	−1.136	−0.936

Club	Tests of club merging
1	Club 1 + 2 = −0.093* (−6.08)

Note: Similar to Table III

Table VIII.
Volatility in net income changes scaled by total assets – absolute value of residuals

Once again, the empirical findings display that for all sub-clubs there is no evidence to support mergers of the original clubs.

6.2. Ratio of volatility in net income changes to volatility in cash flow changes

Tables IX-XII present clustering results for the ratio of volatility in net income changes to volatility in cash flow changes, both on an aggregated (Table IX) and on a disaggregated basis (Tables X, XI, and XII, respectively). The picture remains similar to the previous case. More specifically, Table VIII documents that the null hypothesis of full convergence for the aggregated metric and for the full sample is rejected at the 5 per cent level. The point estimate of *b* (*t*-statistic in parenthesis) is −2.685 (−3.514). Canada, China, Philippines, Russia and the USA remain as the non-IFRS countries with b-coefficient equal to −0.391 and corresponding *t*-statistic −10.377. Two clubs are formed, with corresponding *t*-statistics −1.342 and 3.160, respectively, highlighting again the even countries that have adopted the IFRS regime are characterized by different stages of the adoption process.

Table X presents the results for the disaggregated metric with reference to the financing cash flows. The club algorithm recommends rejection of full convergence with a value of *t*-statistic equal to −17.646, while only one club is formed with 23 countries, while a non-converging group is present, with Canada, China, Philippines, Russia and the USA, with a corresponding *t*-statistic equal to −13.761.

Tables XI and XII report convergence results of the ratio of volatility in net income changes to volatility in cash flow changes, with cash flows being measured as investing and operating activities, respectively. Both tables reject full sample convergence (with corresponding *t*-statistic values of −5.274 and −6.824, respectively). The first table provides support to the formation of two converging clubs and a non-converging club

	Countries	*t*-statistic	b coefficient
Full sample	Australia, Austria, Belgium, Canada, China, Denmark, Finland, France, Germany, Greece, Hong Kong, Italy, Japan, Malaysia, The Netherlands, Philippines, Portugal, Russia, Singapore, South Africa, South Korea, Spain, Sweden, Switzerland, Turkey, UK, US	−3.514	−2.685
1st club	Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, The Netherlands, Portugal, Singapore, South Africa, South Korea, Spain, UK	−1.342	−0.971
2nd club	Australia, Hong Kong, Japan, Malaysia, Sweden, Switzerland, Turkey	3.160	1.207
Non-converging	Canada, China, Philippines, Russia, US	−10.377	−0.391

Club	Tests of club merging
1	Club 1 + 2 = −0.069* (−5.42)

Table IX.
Ratio of volatility in net income changes to volatility in cash flow changes – absolute value of residuals

Note: Similar to Table III

	Countries	*t*-statistic	b coefficient
Full sample	Australia, Austria, Belgium, Canada, China, Denmark, Finland, France, Germany, Greece, Hong Kong, Italy, Japan, Malaysia, The Netherlands, Philippines, Portugal, Russia, Singapore, South Africa, South Korea, Spain, Sweden, Switzerland, Turkey, UK, US	−17.646	−1.712
1st club	Australia, Austria, Belgium, Denmark, Finland, France, Germany, Greece, Hong, Kong, Italy, Japan, Malaysia, Netherlands, Portugal, Singapore, South Africa, South Korea, Spain, Sweden, Switzerland, Turkey, UK	2.848	0.707
Non-converging	Canada, China, Philippines, Russia, US	−13.761	−0.401

Table X.
Ratio of volatility in net income changes to volatility in cash flow changes-financing – absolute value of residuals

(the regular non-IFRS countries), while Table XII displays the formation of three clubs, still denoting consistency for both the European country club and the non-IFRS club.

The results across Tables IX to XII display that for all sub-clubs there is no evidence to support mergers of the original clubs.

7. Robustness tests: club convergence and clustering: earnings management and volatility based on Generalized Autoregressive Conditional Heteroscedasticity (GARCH) estimates

7.1. Volatility in net income changes scaled by total assets

Table XIII reports results for the new measure of volatility in net income changes scaled by total assets. This time we employ the GARCH methodology to account for a

	Countries	*t*-statistic	b coefficient
Full sample	Australia, Austria, Belgium, Canada, China, Denmark, Finland, France, Germany, Greece, Hong Kong, Italy, Japan, Malaysia, The Netherlands, Philippines, Portugal, Russia, Singapore, South Africa, South Korea, Spain, Sweden, Switzerland, Turkey, UK, US	−5.274	−0.749
1st club	Australia, Austria, Belgium, Denmark, Finland, France, Germany, Greece, Hong Kong, Italy, Japan, The Netherlands, Portugal, Singapore, South Africa, Spain, Sweden, Switzerland, Turkey, UK	−1.366	−0.186
2nd club	Malaysia, South Korea	−1.012	−2.421
Non-converging	Canada, China, Philippines, Russia, US	−12.972	−2.652

Club	Tests of club merging
1	Club 1 + 2 = −0.119* (−7.35)

Note: Similar to Table III

Table XI.
Ratio of volatility in net income changes to volatility in cash flow changes-investing – absolute value of residuals

	Countries	*t*-statistic	b coefficient
Full sample	Australia, Austria, Belgium, Canada, China, Denmark, Finland, France, Germany, Greece, Hong Kong, Italy, Japan, Malaysia, The Netherlands, Philippines, Portugal, Russia, Singapore, South Africa, South Korea, Spain, Sweden, Switzerland, Turkey, UK, US	−6.824	−2.935
1st club	Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, The Netherlands, Portugal, South Africa, Spain	0.758	0.306
2nd club	Australia, Hong Kong, Japan, Malaysia, Singapore, South Korea, Sweden, Switzerland, Turkey, UK	1.514	0.360
3rd club	Canada, China, Philippines, Russia, US	−1.465	−2.507

Club	Tests of club merging
1	Club 1 + 2 = −0.064* (−5.89)
2	Club 2 + 3 = −0.075* (−5.31)

Note: Similar to Table III

Table XII.
Ratio of volatility in net income changes to volatility in cash flow changes-operating activities – absolute value of residuals

time-varying ratio of net income changes scaled by total assets. The GARCH methodological approach is highly popular in empirical investigations of financial and accounting relationships given that the estimated conditional volatility can serve as a proxy for uncertainty. In addition, this particular uncertainty measure generates superior estimates, especially at longer horizons. The first row shows that the null

	Countries	*t*-statistic	b coefficient
Full sample	Australia, Austria, Belgium, Canada, China, Denmark, Finland, France, Germany, Greece, Hong Kong, Italy, Japan, Malaysia, The Netherlands, Philippines, Portugal, Russia, Singapore, South Africa, South Korea, Spain, Sweden, Switzerland, Turkey, UK, US	−42.481	−0.593
1st club	Australia, Austria, Belgium, Denmark, Finland, France, Germany, Greece, Hong Kong, Italy, Japan, Malaysia, The Netherlands, Portugal, Singapore, South Africa, South Korea, Spain, Sweden, Switzerland, Turkey, UK	−1.181	−0.617
Non-converging	Canada, China, Philippines, Russia, US	−32.709	−1.266

Table XIII.
Volatility in net income changes scaled by total assets–GARCH estimates

hypothesis of full convergence which is rejected at the 5 per cent level. Specifically, the point estimate of b is −0.593 (t-statistic: −42.481), while row 2 identifies the standard IFRS group of countries (which convergence) with b-coefficient −0.617 and t-statistic −1.181. Finally, row 3 identifies the non-IFRS group of countries, i.e. Canada, China, Philippines, Russia and the USA, with b-coefficient −1.266 and t-statistic equal to −32.709. Once again, the empirical findings reject any support for mergers of the original clubs.

7.2. Ratio of volatility in net income changes to volatility in cash flow changes

Tables XIV-XVII report clustering results in terms of the ratio of volatility in net income changes to volatility in cash flow changes, both on an aggregated basis (Table XIV), and on a disaggregated basis, i.e. financing cash flows, investing cash flows and operating activities cash flows (Tables XV, XVI, and XVII, respectively). Once again, the picture remains consistent and very similar to the previous case. More specifically, Table XIV documents that the null hypothesis of full convergence for the aggregated metric and for the full sample is rejected at the 5 per cent level. The point estimate of b (t-statistic in parenthesis) is −0.619 (−46.787). Canada, China, Philippines, Russia and the USA are the non-converging countries with b-coefficient equal to −0.619 and corresponding t-statistic −46.787. Two clubs are formed, with corresponding t-statistics −0.071 and 5.954, respectively. These empirical findings display again a strong picture of convergence, yielding support to the convergence hypothesis, especially, for the European group of countries.

Table XV presents results for the disaggregated metric with reference to the financing cash flows. The club algorithm recommends rejection of full convergence with a value of t-statistic equal to −36.898, while two clubs are formed with 7 and 15 countries, respectively. Our regular non-IFRS group is still present with a corresponding t-statistic equal to −33.849.

Tables XVI and XVII report convergence results of the ratio of volatility in net income changes to volatility in cash flow changes when cash flows are proxied by investing and operating activities, respectively. Both tables reject full sample convergence (with corresponding t-statistic values of −28.164 and −38.782,

	Countries	*t*-statistic	b coefficient
Full sample	Australia, Austria, Belgium, Canada, China, Denmark, Finland, France, Germany, Greece, Hong Kong, Italy, Japan, Malaysia, Netherlands, Philippines, Portugal, Russia, Singapore, South Africa, South Korea, Spain, Sweden, Switzerland, Turkey, UK, US	−46.787	−0.619
1st club	Austria, Belgium, Denmark, Finland, France, Germany, Greece, Hong Kong, Italy, Japan, Netherlands, Portugal, South Africa, Spain, Sweden, Switzerland, UK	−0.071	−0.007
2nd club	Australia, Malaysia, Singapore, South Korea, Turkey	5.954	0.757
Non-converging	Canada, China, Philippines, Russia, US	−46.787	−0.619
Club	Tests of club merging		
1	Club 1 + 2 = −0.119* (−5.97)		

Note: Similar to Table III

Table XIV. Ratio of volatility in net income changes to volatility in cash flow changes – GARCH estimates

	Countries	*t*-statistic	b coefficient
Full sample	Australia, Austria, Belgium, Canada, China, Denmark, Finland, France, Germany, Greece, Hong Kong, Italy, Japan, Malaysia, The Netherlands, Philippines, Portugal, Russia, Singapore, South Africa, South Korea, Spain, Sweden, Switzerland, Turkey, UK, US	−36.898	−0.921
1st club	Australia, Japan, Malaysia, Singapore, South Africa, South Korea, Turkey	3.362	0.380
2nd club	Austria, Belgium, Denmark, Finland, France, Germany, Greece, Hong Kong, Italy, The Netherlands, Portugal, Spain, Sweden, Switzerland, UK	3.913	0.267
Non-converging	Canada, China, Philippines, Russia, US	−33.849	−1.142
Club	Tests of club merging		
1	Club 1 + 2 = −0.098* (−7.73)		

Note: Similar to Table III

Table XV. Ratio of volatility in net income changes to volatility in cash flow changes-financing – GARCH estimates

respectively). Both tables provide support to the presence of two converging clubs, although their content does not look quite similar. In terms of the non-converging group (Table XVI), the results display consistency for Canada, China, Philippines, Russia and the USA, with a *t*-statistic value equal to −41.864.

Finally, the empirical findings across Tables XIV to XV display that for all sub-clubs there is no evidence to support mergers of the original clubs.

	Countries	*t*-statistic	b coefficient
Full sample	Australia, Austria, Belgium, Canada, China, Denmark, Finland, France, Germany, Greece, Hong Kong, Italy, Japan, Malaysia, The Netherlands, Philippines, Portugal, Russia, Singapore, South Africa, South Korea, Spain, Sweden, Switzerland, Turkey, UK, US	−28.164	−0.714
1st club	Hong Kong, Japan, Malaysia, Singapore, South Korea, Turkey	−0.795	−0.505
2nd club	Australia, Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, The Netherlands, Portugal, South Africa, Spain, Sweden, Switzerland, UK	−0.780	−0.105
Non-converging	Canada, China, Philippines, Russia, US	−41.864	−0.627

Club	Tests of club merging
1	Club 1 + 2 = −0.71* (−5.08)

Note: Similar to Table III

Table XVI.
Ratio of volatility in net income changes to volatility in cash flow changes-investing – GARCH estimates

	Countries	*t*-statistic	b coefficient
Full sample	Australia, Austria, Belgium, Canada, China, Denmark, Finland, France, Germany, Greece, Hong Kong, Italy, Japan, Malaysia, The Netherlands, Philippines, Portugal, Russia, Singapore, South Africa, South Korea, Spain, Sweden, Switzerland, Turkey, UK, US	−38.782	−0.603
1st club	Australia, Austria, Belgium, Denmark, Finland, France, Germany, Greece, Hong Kong, Italy, Japan, Malaysia, The Netherlands, Portugal, Singapore, South Africa, South Korea, Spain, Sweden, Switzerland, Turkey, UK	0.822	0.089
2nd club	Canada, China, Philippines, Russia, US	−0.310	−0.532

Club	Tests of club merging
1	Club 1 + 2 = −0.63* (−5.62)

Note: Similar to Table III

Table XVII.
Ratio of volatility in net income changes to volatility in cash flow changes-operating activities – GARCH estimates

8. Conclusions and policy implications

Motivated by the lack of literature analyzing convergence issues in terms of various accounting systems, this paper tested for accounting standards convergence across 27 countries. To this objective, the novel methodology of Phillips and Sul (2007) was employed. The advantages of this methodological approach enabled us to provide more

convincing results about the convergence or divergence pattern stemming from the speed of adopting IFRS.

The empirical findings suggest that although the countries under consideration do not form a homogeneous convergence club and are characterized by different idiosyncratic accounting conditions that are responsible for their convergence behavior, the number of distinct convergence groups that are formed is limited, yielding support to the process of convergence on a globalized basis. These empirical findings receive robust statistical support from a number of alternative measures of accounting standards convergence. In addition, there exist a specific group of countries, i.e. Canada, China, Philippines, Russia and the USA, characterized consistently as the non-IFRS group across all tests.

The empirical findings provide some useful implications for practitioners. In particular, by showing convergence patterns of accounting standards worldwide, it launched a call for policymakers and auditors in non-adopting countries to join the IFRS regime; such adoption fosters lower transaction costs, lower costs of capital market participation in the adopting country for international investors, ensuring better transparency in financial market investments.

Future research attempts could extend our results to a sample that involves industry breakdowns. Alternatively, the analysis could provide and explain specific factors responsible for the presence of such divergent patterns.

Note

1. Extensive Monte Carlo simulations conducted by Phillips and Sul (2007) show that $r = 0.3$ is satisfactory in terms of both size and power.

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