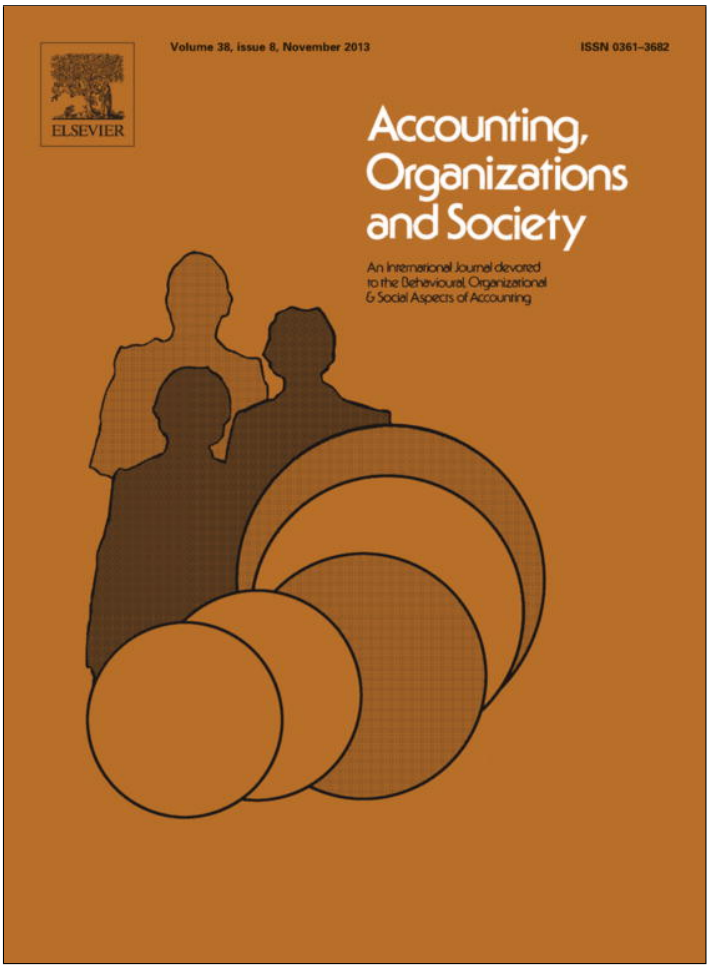

Accounting, Organizations and Society 38 (2013) 573–595

Contents lists available at ScienceDirect

Accounting, Organizations and Society

journal homepage: www.elsevier.com/locate/aos

How arbitrary are international accounting classifications? Lessons from centuries of classifying in many disciplines, and experiments with IFRS data

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A B S T R A C T

The process of classification is central to the daily task of doctors and librarians; and it is the foundation of study and research in chemistry and biology. Double-entry bookkeeping and the preparation of financial statements are classification activities of accounting *practice*. Classifying national accounting systems has long been an aspect of accounting *research*. This paper seeks to extract lessons for accounting researchers from anthropology, biology, chemistry, cosmology and medicine. In particular, we examine how the classifiers themselves and the characteristics that they choose can affect classification. We observe that objectivity is neither possible nor desirable in classification. Despite the arbitrariness, some classifications can be more reasonable or more useful than others. For previous accounting classifications, we analyze the classifiers, the scope, the characteristics used, the data and the classification techniques. We report various problems. We then empirically investigate the sensitivity of classifications to such issues as the characteristics chosen, and the countries and sectors included. For this, we hand pick data on the practices of large listed companies from 12 jurisdictions relating to 14 accounting topics under International Financial Reporting Standards. We show how different researchers could produce different classifications, particularly depending on which accounting topics are used to represent the countries.

Introduction

Classification is a fundamental part of many disciplines. The classifications of diseases and books are vital in the daily tasks of medical practitioners and librarians, respectively. The Linnaean and Mendeleev classifications are central to learning and research in biology and chemistry. Classifications have also been made in many other fields; for example, languages (Ruhlen, 1991), economies (Neuberger & Duffy, 1976), political systems (Shils, 1966), and legal systems (David & Brierley, 1985). Members of society are also put into classes, e.g. recently in the UK (Savage et al., 2013). In all cases, the fundamental purpose of the classification is to simplify (Rudner, 1966).

The everyday work of accountants involves recording transactions in the classification system that is double-entry bookkeeping. The financial statements which result are also classifications: for example, assets are classed as non-current or current; the former are then sub-classed as tangible, intangible or financial (Gröjer, 2001). The classifications are debatable: in the income statement, should expenses be classified by nature or by function?

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http://dx.doi.org/10.1016/j.aos.2013.10.001

Some classifications are metaphysical: the split of equity financial assets into trading or available-for-sale rests[2] not on any observable characteristic, nor even on the real intentions of managers, but on the *declared* intentions of managers.

Classification has also been applied in the field of international accounting. Just as in other fields, classification has been used to assist understanding of how the many different objects (in this case, accounting systems) are related. We explain in more detail below how classification of accounting systems can be relevant to accounting practice and research. We use the term 'accounting system' to refer to a set of accounting practices, i.e. policies on recognition, measurement and presentation as used in a company's published financial statements. For example, each individual listed company in the USA has its own accounting practices. However, the accounting of all the companies has many shared characteristics, imposed and enforced by the Securities and Exchange Commission. The individual examples of US accounting share so much in common that they could be said to comprise a 'system': the US GAAP accounting system. Another precise, but quite different, system is French GAAP as used for unconsolidated financial statements in France. A country can exhibit more than one system. For example, although a national GAAP (such as French GAAP) is still used for unconsolidated financial statements in most EU countries, the consolidated statements of listed companies are now prepared using International Financial Reporting Standards (IFRS).

The US and French 'systems' contain few overt[3] options. However, partly because of international political negotiations (Camfferman & Zeff, 2007, chap. 5), many options were included in IFRS; although these are gradually being removed. Therefore, transition from French (or German etc.) GAAP to IFRS has *increased* the variation in accounting practices within a country. Even so, when considering the options, national factors (including such matters as tax and legal systems) can still affect a company's choice. Ball (2006, p. 15) explains how, even if all entities are complying with IFRS, the incentives of preparers and enforcers remain 'primarily local'. As a result, one can discern national patterns of IFRS practice (Kvaal & Nobes, 2010). These could be seen as different 'systems' of generic IFRS. We classify such systems in the empirical part of this paper.

Many international classifications of accounting systems have been proposed, beginning more than a century ago. An examination of other fields (see below) suggests that a classification might reflect its classifier, and that the process of classification is awash with judgements of various kinds. Few accounting classifiers have even *discussed*, let alone investigated, the sensitivity of classifications to changes in the nature of the classifiers, the number of objects being classified (countries or accounting systems), the nature and number of characteristics used to measure the objects, or the type of companies (e.g. corporate sectors) included. This paper discusses and empirically investigates these issues.

Our first objective is to investigate the ways in which classifications in fields other than accounting (i.e. anthropology, biology, chemistry, cosmology and medicine) have been affected by issues analogous to those in the previous paragraph and how classifications have changed dramatically over time. We seek lessons for assessing the robustness of accounting classifications.

Our second objective is to apply these lessons. We examine previous accounting classifications, especially to record the number of countries classified, the number and type of characteristics used to classify them, and whether industry sectors were discussed or excluded. We find that the early classifications reflect the classifiers; in particular, they vary by the national backgrounds of the classifiers. We then find that some classifiers apparently used no data, and most of the rest used data collected by others for other purposes. Few classifiers specified the date or the scope of their classifications (e.g. was it limited to listed companies or to non-financial companies?), and few specified a clear purpose.

Our final objective is to investigate empirically whether accounting classifications are anything other than arbitrary; whether they can easily be manipulated to back up particular arguments. To do this, we hand pick data on the practices in 2011, under International Financial Reporting Standards (IFRS), of a large sample of listed companies from 12 jurisdictions. For these companies, we examine the observable accounting policy choices on 14 topics, including presentation issues (e.g. choice of format for the income statement) and measurement issues (e.g. use of cost or fair value for investment property). Our analyses are based on a total of 5689 choices of 514 companies. We find that our classifications are highly sensitive to changes in the set of characteristics measured (i.e. the IFRS policy topics, in our case), and this is a feature common to classifications in other fields such as biology. However, certain aspects of the classifications are remarkably stable, e.g. Italy and Spain are always in the same group, and never with the UK. Furthermore, with minor exceptions, the classifications are much more robust to the exclusion of individual countries or sectors. We therefore conclude that our classifications based on IFRS choices are not essentially arbitrary. Nevertheless, our classifications could be used to support or refute the influence on accounting of the code/common legal dichotomy.

The advantage of using the above policy topics is that IFRS specifically allows management to choose among the options.[4] There is therefore scope for country and industry influences to lead to varied practice, unlike the setting of previous studies of pre-IFRS accounting where management is constrained by national rules, which can also vary by industry. Our experiments deal with the accounting policy choices of actual companies but, for the purposes of other accounting research, different objects should be classified. For example, in an analysis of corporate reporting regulation, Leuz (2010) classifies countries on the basis of facts and impressions about legal systems and securities laws.

[2] As under IAS 39, para. 9.

[3] As explained later, we use this term to describe policy options that have been deliberately inserted into accounting rules.

[4] Some caveats will be entered later, but our policy topics are presented in the IFRS documents as free choices.

The purpose of a study should guide the choice of characteristics measured (Roberts, 1995); different accounting classifications are suitable for different purposes.

The paper contributes by drawing together relevant lessons on classification from fields other than accounting; by conducting the first meta-analysis of accounting classifications; by applying the lessons from other fields when analyzing the accounting classification literature with a new focus on the nature of the classifiers and of the characteristics, sectors and countries included; and by assessing the reliability of previous classifications through empirical investigation of the sensitivity of classification to variations in such factors, thereby revealing the dramatic effect of inclusions/exclusions on classifications. Our purpose is not to present a classification but, as a by-product of our work, we provide data on IFRS practices for the first time for several jurisdictions (i.e. China, Hong Kong, South Africa, South Korea and Switzerland), and we provide classifications which include these countries (and Canada) for the first time.

Our findings on the reliability of classifications are important because hundreds[5] of academic papers refer to the classifications as part of motivating research (Ball, Kothari, & Robin, 2000; Gray, 1988; O'Donnell & Prather-Kinsey, 2010; Saudagaran & Biddle, 1995) or to justify an independent variable (type of accounting system) which is expected to influence issues such as value relevance (e.g. Ali & Hwang, 2000). Then, there are new uses for classifications, as explanations of which companies volunteer to adopt IFRS (Tarca, Morris, & Moy, 2013), how jurisdictions respond to IFRS (Sellhorn & Gornik-Tomaszewski, 2006; Tyrrall, Woodward, & Rakhimbekova, 2007), how countries change from one class to another (Xiao, Weetman, & Sun, 2004), how practices on major topics vary over time (Ding, Richard, & Stolowy, 2008), how companies respond to the choices available in IFRS (Nobes, 2011), why the amount of lobbying on IFRS varies by country (Orens, Jorissen, Lybaert, & van der Tas, 2011), by how much various countries' domestic accounting requirements vary from IFRS (Ding, Hope, Jeanjean, & Stolowy, 2007), or how to identify countries with similar backgrounds when selecting countries for study (Delvaille, Ebbers, & Saccon, 2005). If the classifications are inappropriate, the research setting or the variables will be questionable.

For financial analysts, students and policy makers, the classifications are a convenient way of simplifying and summarizing. So, again, inappropriate classifications are likely to be misleading. For instance, much of the argumentation on the development of new standards is political (Harrison & McKinnon, 1986), and is now often expressed in terms of resisting 'Anglo-American' accounting. As an example, German writers have seen the international standard-setters as a Trojan horse which conceals Anglo-American accounting (Kleekämper, 2000) or as 'the unknown enemy from London'[6] (Hennes & Metzger, 2010). Botzem and Quack (2009) believe that the history of the International Accounting Standards Committee has been wrongly reported as 'an Anglo-American success story' (p. 991). However, as will be shown, some classifiers deny the existence of Anglo-American accounting.

Power (2009) warns researchers not to exaggerate the international differences (p. 325) and to be wary of resorting to cultural variables to explain them (p. 331). On the first point, Power notes that we can only talk of different arrangements of balance sheets because all companies present balance sheets and show very similar things in them. This paper reinforces those warnings by showing that some findings about international differences are unreliable and that classification could be used to prove or disprove the importance of one commonly used cultural variable: the legal system. Further, although classifications do identify countries which are different, their main purpose is to group together countries on the basis of their similarities.

The paper proceeds as follows. The next section shows how classification in various fields can depend on who is doing the classifying. Then we examine the degree to which classification depends upon the characteristics chosen to measure the objects being classified, and upon the definition of the characteristics. After that, we perform a meta-analysis of previous accounting classifications, and we analyze them in order to reveal the apparent effects on classifications of the classifiers and the potential effects of various other factors, such as the countries/systems included and the characteristics chosen to represent them. The next four sections report on our empirical investigations: the data, the findings on policy choice, the analysis of sensitivity of classification to the manipulation of various factors, and the presentation of some new classifications. Then, there are conclusions.

Goldilocks and the forebears

This section examines the degree to which classification is determined by who is classifying. Bloor (1982, p. 268) found new support for the claim of Durkheim and Mauss (1903) that the classification of things reproduces a pattern of social arrangements more than a pattern of the things. He argued that even such renowned scientists as Newton and Boyle were affected by their religious and political ideals and 'were arranging the fundamental laws and classifications of their natural knowledge in a way that artfully aligned them with their social goals' (p. 290). The fields of cosmology and anthropology are used as examples below.

Cosmology

Throughout most of recorded history, man[7] saw himself as the unique peak of creation (see below). He lived in a world which was also in a class of its own, being fixed and at the center of the universe. The Copernican revolution, set in motion in 1543 by the publication of the book commonly known as the '*Revolutions*',[8] spread slowly. For

[5] As examples from Table 1, Nair and Frank (1980) has 228 citations and Nobes (1983) has 390 (according to Google Scholar, accessed on 15.4.2013).

[6] 'Der unbekannte Feind aus London'.

[7] We use the term 'man' when discussing authors who did so (i.e. those until the late twentieth century).

[8] *De revolutionibus orbium coelestium* (On the revolutions of the heavenly spheres).

espousing it, Galileo was held under house arrest from 1633 to his death in 1642. Even in unorthodox Amsterdam, Joan Blaeu's '*New and very accurate map of the whole world*' of 1662 still gave equal status to Ptolemy's geocentric beliefs and heliocentrism (Brotton, 2012, p. 288). However, enlightenment eventually reduced anthropocentrism: the earth is now classified as a planet (i.e. something that moves) orbiting a star which is rather far from the middle of one of many galaxies. The planet is fairly small, but happens to be in the Goldilocks zone: at the right distance from its star to be at a congenial temperature for water-based life forms.

Anthropology

The 'great chain of being', derived from Aristotle and conventional for millennia, is a six-group classification[9] (Lovejoy, 1964). Man is not classified as an animal at all but as a special creation which is a little lower than the angels. They had spirit only, animals had body only, but man had both. Man saw himself as unique: not just *sui generis* but *hors de catégorie*. In the eighteenth century, Linnaeus took *homo sapiens* down a rung by placing him in the animal kingdom, though he remained *sui generis*. The descent of man continued in the nineteenth century when Darwin outrageously suggested evolution from more 'primitive' primates, presumably without spirits; and other types of humans joined his genus, such as *homo neanderthalensis*. In the twentieth century, the genus got more crowded, for example with the arrival of *homo floresiensis*. In the twenty-first century, Wildman, Uddin, Liu, Grossman, and Goodman (2003) went yet further by proposing[10] that, since modern humans share 99.4% of non-synonymous DNA with chimpanzees, *homo sapiens* is a parvenu member of their genus.

Classification and standards

The previous section showed how classification can depend on the mindsets of those doing the classifying, and how classification can therefore change dramatically over time without the objects changing. This section examines the degree to which classification depends upon the characteristics chosen to measure the objects being classified, and on the definition of the characteristics. Foucault (1970, p. 125) suggested that modernity in science begins with privileging observation, starting with Roger Bacon. Sight must replace reliance on 'self-evident' axioms. It also replaces hearsay evidence about sightings, and it is given greater weight than the less reliable senses of taste, smell and touch (p. 132). The invention of the telescope and the microscope helped greatly. It is observation which guided Copernicus and Galileo, and Linnaeus and Darwin. However, not even everything visible is relevant and reliable: color is not (p. 133). When Linnaeus classified plants, he used only four observable features: the shape of elements, the quantity of the elements, their arrangement related to each other, and their relative magnitudes. However, there was still much scope in deciding which elements to observe, as will be explained below. In a book whose title could be translated[11] as '*To Think, to Classify*', Perec (1985) discusses how books can be classified by, *inter alia*, alphabetical order of author or title, country of author or publication, color, date of publication or acquisition, language, priority for reading, and so on (p. 39). The fields of cosmology, chemistry, biology and medicine are now used as examples.

Cosmology

Whether or not a celestial body is classed as a planet depends, like any classification, on definitions (Gröjer, 2001) or standards.[12] The 'standard' for a planet was revised by the International Astronomical Union in 2006 (IAU, 2006), with the result that Pluto (which had only become a planet, as far as we were concerned, on its discovery in 1930) ceased to be one. The revision was caused by the discovery of bodies larger than Pluto with orbits further from the sun. The re-definition of a planet and the re-classification of Pluto has both scientific and cultural implications (Basri & Brown, 2006), though not as large as those that led to the arrest of Galileo for professing the planetary status of the earth. An important implication for other classifications (e.g. in accounting) is that an object's place in a classification can depend on the range of objects being classified.

Chemistry

Some alchemists had classified elements into solids, liquids and gases, but this is now seen to produce an unhelpful classification of such liquids as mercury, molten lead and liquid nitrogen. So, chemists moved onto observing various behaviors of elements (e.g. reaction to oxygen), leading to Mendeleev's periodic table (Aldersley-Williams, 2011). This approach was later confirmed by a more fundamental one (called 'natural' in the next paragraph) when it became possible to count protons, neutrons and electrons.

Biology

Linnaeus started his classifying with plants, perhaps because their characteristics are more easily observable than such things as the structure of the inner ear of animals (Foucault, 1970, p. 137). However, he chose to ignore differences in leaves, stems and roots, such that the 'primary arrangement of the vegetables[13] is to be taken from the

[9] God, angels, man, animals, plants and minerals.

[10] This proposal has not been generally accepted. For example, Steiper and Young (2006, p.385) still treat *homo* and *pan* as different genera.

[11] A translation of '*Penser/Classer*' was published in 2009 by Godine Press of Boston under the less literal title of '*Thoughts of Sorts*'.

[12] At first sight, the word 'standard' has a different meaning in financial reporting from that used here. It appears to refer to a type of regulation. Elsewhere in accounting, a 'standard cost' fits more obviously into the normal scientific meaning. However, the documents issued by the International Accounting Standards Board (IASB), for example, are not in themselves requirements. The IASB is a private sector standard setter. A regulator such as the European Union can choose to require certain companies to comply with a standard.

[13] That is, plants; Linnaeus classified all things on earth as animal, vegetable or mineral.

fruit-body[14] alone' (Linnaeus, 1751, section 164). In other words, his system was essentially arbitrary. Whereas the features of living plants were easy to observe, plants lacked a fossil record on which to base the evolutionary approach that was adopted fairly early on for animal classification. However, analysis of plant DNA has recently solved this problem and led to a transformation of the botanical classification to something 'natural', i.e. related to the thing causing the variation (e.g. Duff & Nickrent, 1999).

Classification of animals has a long history. Socrates classified man as a 'featherless biped', but his pupil Plato was mocked by Diogenes for repeating it. Ironically, biologists still include humans and birds in a super-class of tetrapoda. However, at a more detailed level, humans are not now classed with birds but with dogs and dolphins (which ostensibly have four feet and no feet, respectively). Looking more deeply, one can observe five fingers not only on a human hand but also on a dog's front paw and inside a dolphin's flipper. Several other mammalian shared characteristics can be identified, such as giving birth to live young.

As with plants, Linnaeus classified animals by observing shared characteristics, but the result again depends upon which characteristics are chosen. As a result, many of Linnaeus' animal classifications have also been overturned. Classification now rests on a search for homologs, which are shared characteristics inherited from a common ancestor, such as seen in the hand, paw and flipper. In effect, zoological classification is now entirely about descent. For this purpose, the analysis of DNA became a powerful tool as a supplement to, and sometimes as a contradiction of, the received fossil record (Stringer, 2011, chap. 1). Again, the zoological classification is now regarded as 'natural' (i.e. less arbitrary, being based on evolutionary relationships as evidenced by DNA).

However, a caveat should be entered. The biologists' classifications take no account of different possible purposes. For example, if the purpose were to help in planning the habitats or menus for a new zoological park, it might be more useful to classify a dolphin with a shark even though the dolphin is much more closely related to a dog, a human or even a pterodactyl.[15]

Diseases

Medicine is a practical activity, which relies heavily on the International Classification of Diseases (ICD). This has been in operation for a century but is revised approximately every decade (Bowker & Star, 2000, p. 136). The ICD is a pragmatic tool with a clear purpose: it helps doctors to identify diseases and then to record information about patients. Whereas biologists now classify in a monothetic way, using binary characteristics (e.g. backbone or not), the ICD looks for a number of shared characteristics (a polythetic system). Further, whereas chemical elements do not change,[16] and animal species change very slowly, diseases change rapidly. Lastly, the ICD sometimes needs to be dramatically expanded. It began among six European countries, but had to be adjusted when African and Asian diseases were included (Bowker & Star, 2000, p. 151). Many of these features remind one of classifications of accounting systems: they are polythetic, the systems change rapidly, and the classifications started with Europe and North America only.

What's in a name?

A more alarming point must also be made: no classifications are 'real'. As Buffon pointed out in 1749:

> The more we increase the number of divisions in the production of nature, the closer we shall approach to the true, since nothing really exists in nature except individuals, and since genera, orders and classes exist only in our imagination [as cited in Foucault, 1970, p. 146].

We noted earlier that the definition of a planet is a matter of opinion. In biology, it is notable that neither Darwin nor any follower has set out a definition of 'species' which has gained general acceptance. Linnaeus thought that species were fixed in number, immutable in nature and divinely created. Darwin showed that the first two points were errors, and drew a polite veil over the third. However, we can now put another interpretation on the origin of species: they evolved in the brain of *homo sapiens*. The lack of definitions explains why there is debate about whether Neanderthals and modern humans are part of the same species (given that they have successfully interbred),[17] and whether humans are part of the chimpanzee genus. Buffon's insight has not yet been taken to its logical conclusion, but the complete abandonment of the apparatus of species, genera, etc. is being contemplated by biologists (Mishler, 2009, p. 65).

Nevertheless, it seems unlikely that biologists or any other humans will be able to give up classifying: 'to classify is human' (Bowker & Star, 2000, p. 1). Lévi-Strauss (1958) suggests that we inevitably perceive the world in terms of binary opposites, and he encourages a search for underlying structures. For example, when discussing the content of myths, Lévi-Strauss notes that 'this apparent arbitrariness is belied by the astounding similarity between myths collected from widely different regions' (p. 208). Furthermore, the fact that no classifications are real does not mean that classification cannot be useful. For librarians or doctors, various competing classification systems could be almost as useful as each other. For example, the Dewey Decimal system and the Library of Congress system both work satisfactorily in libraries. Linnaeus' initial botanical classification was also of practical use in organizing information, even though it was arbitrary. However, some classifications might be more useful than others. For example, Mendeleev's classification in chemistry was much more useful than some earlier classifications because it identified 'missing' elements and predicted what they would be like.

[14] That is, the reproductive system.

[15] The four types of animal in this sentence other than the shark are all in the tetrapod clade.

[16] Elements cannot be changed by chemical reactions. They can be changed by (and indeed were formed by) nuclear reactions. Thus, gold is created from other elements such as base metals (ultimately from hydrogen) and it could be used to create even heavier elements, but this does not change the nature, definition or 'standard' of gold.

[17] Modern humans, except for sub-Saharan Africans, contain traces of Neanderthal DNA; up to 4% in some cases (Green et al., 2010).

Accounting classifiers can learn from these fields. One relevant lesson from above is the need for detailed personal observation. Another is that the purposes of a classification should be considered. Further, classifiers should be deliberate about the characteristics measured; Roberts (1995, p. 641) shows 'the incoherence of taxonomies which rely upon appeals to objectivity'. We apply these lessons below, while analyzing past accounting classifications.

Analysis of previous accounting classifications

There have been many international classifications of accounting, as summarized in Table 1.[18] Several (i.e. items 2, 3, 4, 10, 14 and 15 of Table 1) relate to influences on accounting rather than to accounting itself. Roberts (1995) calls the former 'extrinsic' and the latter 'intrinsic'; or they could be called deductive and inductive. This section first performs a meta-analysis on these classifications and then examines the apparent effects on classification of the classifiers, and the potential effects of various other factors, such as the countries/systems included and the characteristics chosen to represent them.

A meta-analysis

Meta-analysis is a procedure which mathematically integrates the results of previous independent studies. It can reduce the importance of unbiased errors in the data or the procedures of particular individual studies. Meta-analysis is frequently used in medical research, in which context Egger, Smith, and Phillips (1997) note that attention must be paid to the selection and weighting of previous studies. For our meta-analysis of accounting classifications, we include all the studies of Table 1 with equal weights, in the absence of any objective alternative. Our analysis covers the 15 countries which host the world's largest economies and which have been included in previous classifications. The countries included are those for which we collect IFRS data for our experiments below (except China), plus the largest remaining countries: Brazil, India, Japan and the United States. Russia is excluded because it was only found in two previous classifications, and not in terms of published financial reporting. China is excluded because it was not in any of the former classifications. As will be explained in the next paragraph, ours is not a traditional meta-analysis which combines studies by significance levels (see e.g. Christie, 1990), because the results of classification studies are the groupings of countries and not significance levels.

Table 2 shows the meta-analysis: the bottom-left triangle relates to all the classifications, the top-right triangle to the intrinsic ones only. For each pair of countries, the figure shown is the percentage of the classifications which placed that pair in the same group. The bracketed number shows how many classifications included the pair. For example, the bottom-left pairing of Japan and the US shows that those countries were together for 40% of the ten classifications which included them both. Scores of 0% or 100% reveal consensus among the classifications. The table also shows which percentages for country-pairs are significantly different from 50%, based on a test of proportion (two-sided). A significant result indicates a high degree of confidence that the relationship of the countries in the pair (either being or not being grouped together) is not arbitrary. Although the various classifications consider different numbers of countries and result in different numbers of groups,[19] our method of analyzing country-pairs allows the combination of these different classifications into a meta-analysis.

The meta-analysis can be summarized as showing two main features. First, most of the percentages for the country-pairs are not significantly different from 50%,[20] which suggests a high degree of arbitrariness in the classifications; however, many relationships are not arbitrary. Similar conclusions can be drawn from observing that there are many scores from 33% to 67%. For example, the results for Italy in the bottom-left triangle reveal that there is little consensus concerning which countries it should be classified with (because there are no percentages above 50% which are statistically significant). On the other hand, there is strong consensus that Italy should *not* be classified with 'Anglo' countries (see the six percentages below 50% which are statistically significant). Similar remarks apply to France, Spain and Germany. Secondly, a British group can be identified, which includes Australia and Hong Kong (see the UK column and row in the bottom-left triangle). However, North America is not included in that group: the first column of Table 2 shows that only Canada has usually been classified with the United States. The first row (intrinsic classifications only) shows an even lower tendency for there to be an 'Anglo-American' group.

Several caveats must be entered about this meta-analysis. First, it uses data (i.e. the classifications) spanning several decades, during which countries might have changed their relationships. This and other reasons might mean that the various results should not have been combined. Nevertheless, to the extent that certain pairs of countries retain their relative positions over many decades (even surviving a move to IFRS) suggests that the classifications are picking

[18] d'Arcy (2001) lists some further papers, which we exclude on the grounds that they replicate or overlap previous papers (e.g. Mueller (1968) overlaps Mueller (1967), Nair (1982) replicates Nair and Frank (1980), and Salter and Doupnik (1992) overlaps Doupnik and Salter (1993)); or they are about the style of rule-making (e.g. Daley and Mueller (1982, for which d'Arcy references its 1989 re-printing) and AlNajjar (1986)); or their purpose is not to present a classification (e.g. Previts (1975) provides criteria, Gray (1988) builds a theory, and Cooke and Wallace (1990) test a developed/developing country hypothesis).

[19] In two of the classifications (Nobes (1983) and Doupnik and Salter (1993)), countries were first divided into two groups, and those were subdivided further. For the meta-analysis, we used the two-group classifications (see the footnote of Table 2), which stress similarities rather than differences. Compared to using the multi-group classifications, this increases the scores in Table 2 for several country-pairs.

[20] 61% of the scores in the bottom-left triangle and 75% in the top-right triangle (64 out of 105 country-pairs and 76 out of 101 country-pairs, respectively; only 101 country-pairs are considered for the top-right triangle because there are four cases where the country-pair is only included in one classification but the test requires at least two observations). The main reason for the lower frequency of significant scores in the top-right triangle is the reduced power of the tests due to considering fewer classifications.

Table 1
Features of some classifications.

	1. Researchers	2. No. of countries	3. Range of companies (e.g. sectors, large, listed)	4. Date of data	5. No. of topics	6. Type of data	7.Classification method	8. Classification type
1.	Hatfield (1911)	4	Unspecified	Unspecified, c. 1910	0	Impressions of practices	Judgement	3 Groups
2.	Mueller (1967)	5	Unspecified	Unspecified, c. 1965	1	Impressions of purposes	Judgement	4 Unconnected groups
3.	Seidler (1967)	13	Unspecified	Unspecified, c. 1965	1	Impressions of influences	Judgement	4 Unconnected groups plus other mentioned countries
4.	AAA (1977)	6	Unspecified	Unspecified, c. 1975	1	Impressions of influences	Judgement	5 Unconnected groups
5.	da Costa et al. (1978)	38	Unspecified	Unspecified, c. 1973	100	Mixture of rules and impressions of practices (by Price Waterhouse partners)	PCA	2 Unconnected groups
6.	Frank (1979)	38	Unspecified	Unspecified, c. 1973	233	As above	PCA, MDS	4 Unconnected groups
7.	Nair and Frank (1980)	38, 46	Unspecified	Unspecified, c. 1973 and c. 1975	233, 264	As above	PCA, SSA	4/5 Unconnected groups for measurement; 7 for disclosure
8.	Goodrich (1982)	64	Unspecified	Unspecified, c. 1979	26	Impressions of concepts (by Price Waterhouse partners)	PCA	5 Unconnected groups
9.	Nobes (1983)	14	Listed	1980	9	Impressions of practices	PCA	Hierarchy of 2 groups, leading to 6 groups
10.	Puxty, Willmott, Cooper, and Lowe (1987)	4	Unspecified	Unspecified, c. 1985	3	Impressions of regulatory style	Judgement	Positions of the countries with respect to three regulatory ideals
11.	Shoenthal (1989)	2	Unspecified	Unspecified, c. 1987	1	Impressions of competencies of auditors	Judgement	2 Unconnected groups
12.	Doupnik and Salter (1993)	50	Economically significant entities	1990	114	Impressions of practices (by academics and auditors)	Average-linkage clustering	Hierarchy of 2 groups, leading to 9 groups
13.	d'Arcy (2001)	14 + IASC	Listed; consolidated and unconsolidated	Unspecified, based on Ordelheide and Semler (1995)	129	Rules	Clustering, MDS	4 Groups with MDS
14.	Leuz et al. (2003)	31	Listed	Based on La Porta et al. (1998)	9	Facts and impressions relating to stock markets and investor protection	Clustering by k-means	3 Groups in order
15.	Leuz (2010)	37, 49	Listed	'2000s'	13	Facts and impressions on legal system, securities regulation	Clustering by k-means	3 Groups, then 5 groups
16.	Nobes (2011)	8	Large, listed, consolidated, excluding financials for some topics	2008/9	13	Practices	PCA, MDS, clustering	3 Groups by PCA; hierarchy starting with 2 groups

Key: PCA = principal component analysis. MDS = multi-dimensional scaling. SSA = smallest space analysis.

Table 2
Meta-analysis of classifications: percentages with which pairs of countries are grouped together.

	US % (N)	AU % (N)	UK % (N)	CA % (N)	HK % (N)	FR % (N)	ES % (N)	IT % (N)	DE % (N)	CH % (N)	ZA % (N)	SK % (N)	BR % (N)	IN % (N)	JP % (N)
US		29 (7)	22 (9)	83 (6)	50 (2)	13* (8)	14 (7)	17 (6)	25 (8)	20 (5)	20 (5)	50 (2)	20 (5)	25 (4)	43 (7)
AU	40 (10)		75 (8)	33 (6)	50 (2)	0* (8)	0* (8)	0* (7)	0* (8)	0* (5)	80 (5)	0 (2)	20 (5)	25 (4)	14 (7)
UK	33 (15)	82* (11)		50 (6)	100 (2)	22 (9)	0* (8)	0* (7)	11* (9)	20 (5)	100* (5)	0 (2)	0* (5)	0* (4)	0* (7)
CA	88* (8)	50 (8)	63 (8)		100 (2)	17 (6)	0* (6)	0* (5)	17 (6)	0* (4)	50 (4)	0 (2)	0* (4)	0 (3)	33 (6)
HK	75 (4)	75 (4)	100* (4)	100* (4)		50 (2)	0 (2)	0 (2)	0 (2)	0 (1)	100 (2)	0 (2)	0 (2)	0 (1)	0 (2)
FR	8* (13)	0* (11)	14* (14)	13* (8)	25 (4)		63 (8)	71 (7)	78 (9)	80 (5)	20 (5)	50 (2)	40 (5)	25 (4)	43 (7)
ES	10* (10)	0* (10)	0* (11)	0* (8)	0* (4)	64 (11)		86 (7)	50 (8)	60 (5)	0* (5)	50 (2)	60 (5)	50 (4)	57 (7)
IT	13* (8)	0* (9)	0* (9)	0* (7)	0* (4)	56 (9)	78 (9)		71 (7)	50 (4)	0* (5)	50 (2)	60 (5)	50 (4)	50 (6)
DE	15* (13)	0* (10)	7* (14)	13* (8)	0* (4)	69 (13)	45 (11)	56 (9)		60 (5)	0* (5)	50 (2)	40 (5)	25 (4)	57 (7)
CH	14 (7)	0* (7)	14 (7)	0* (6)	0 (3)	86 (7)	57 (7)	33 (6)	71 (7)		0* (4)	0 (1)	25 (4)	25 (4)	20 (5)
ZA	29 (7)	71 (7)	86 (7)	50 (6)	75 (4)	29 (7)	0* (7)	0* (7)	14 (7)	17 (6)		0 (2)	0* (5)	0* (4)	0* (5)
SK	25 (4)	0* (4)	0* (4)	0* (4)	0* (4)	50 (4)	75 (4)	50 (4)	50 (4)	33 (3)	0* (4)		50 (2)	0 (1)	50 (2)
BR	17 (6)	17 (6)	0* (6)	0* (5)	0 (3)	33 (6)	50 (6)	67 (6)	33 (6)	20 (5)	0* (6)	33 (3)		100* (4)	60 (5)
IN	14 (7)	29 (7)	14 (7)	0* (5)	0 (3)	14 (7)	50 (6)	67 (6)	17 (6)	17 (6)	0* (6)	33 (3)	100* (5)		50 (4)
JP	40 (10)	10* (10)	0* (10)	25 (8)	0* (4)	50 (10)	56 (9)	38 (8)	67 (9)	43 (7)	14 (7)	50 (4)	50 (6)	29 (7)	

This table reports the results of a meta-analysis of the classification studies of Table 1. The bottom-left triangle considers all 16 classifications, and the top-right triangle considers only the intrinsic classifications (i.e. excluding studies 2, 3, 4, 10, 14 and 15). For each country-pair, the table shows the frequency (in %) with which the country-pair is classified in the same group. The number in brackets (N) indicates in how many classifications both countries of the country-pair were included. * indicates that the percentage for the country-pair is significantly different from 50% at the 5% level (two-sided, based on a test of proportion); the test requires at least two observations, i.e. the country-pair needs to be included in at least two classifications; a significant result indicates a high degree of confidence that the relationship of the countries in the pair (either being or not being grouped together) is not arbitrary. The countries are: US (United States), Australia (AU), United Kingdom (UK), Canada (CA), Hong Kong (HK), France (FR), Spain (ES), Italy (IT), Germany (DE), Switzerland (CH), South Africa (ZA), South Korea (SK), Brazil (BR), India (IN) and Japan (JP). For those classification studies of Table 1 which provide more than one classification, we only use one/the main classification, as follows: for classification study 7, p. 433 (1975 analysis, measurement practices); for 9, Table 8 (we use the two-group classification, not the more detailed one); for 12, Table 1 (again we use the two-group classification not the more detailed one of Table 2); for 13, Fig. 2 (multi-dimensional scaling); for 15, Table 3 Panel C; for 16, Table 4 (principal component analysis).

up something fundamental. However, whether the insights from this analysis can be relied upon at all depends greatly on whether there are biased errors in the data or the methods used by the previous classifiers. This is a central issue of this paper, so we return to the worth of Table 2 after we have examined that issue.

The classifiers

The above discussions of cosmology and anthropology showed how susceptible classification can be to the nature of the classifiers. For accounting classifications, most of the early writers had US or UK origins, so they were most familiar with US and UK accounting, and had noticed the differences. They then fitted the rest of the world around that starting point, often leading to a three-way classification: US, UK and other. This explanation is consistent with classifications 1, 3 and 4 of Table 1: Hatfield (1911) and the similar[21] ones of Seidler (1967) and of the American Accounting Association (AAA, 1977, p. 105). These classifications were all drawn up by Americans. However, classification 2 was produced by Gerhard Mueller, whose initial education[22] was in Germany. Thus, Mueller had a different *Weltanschauung*, in which the US and the UK are together in one class, and the other three classes are each typified by a different continental European country. This suggests that the nature of the classifiers affected the classifications.

An extreme version of the above approach, of starting with the US and the UK, can be found in paper 11 of Table 1 and in Alexander and Archer (2000). In these, the writers (all from North America or the UK) identify some differences between the US and the UK (though these relate to the context of accounting rather than to accounting practices) and then conclude that the US and the UK cannot be classified together. This would be like observing that two cousins exhibit many differences, and therefore cannot be closely related.

The range of countries

The objects being classified (i.e. 'accounting systems' or countries that use particular accounting systems) vary in number from two to 50 (column 2 of Table 1). Communist countries were generally excluded, because they had no published financial reporting. Later in this paper, we include Chinese companies using IFRS. Roberts (1995) points out that it should be accounting systems rather than countries that are classified. This became particularly relevant when the widespread use of IFRS began in 2005 because, in many countries, IFRS is only used for certain types of reporting, such that one country now uses two or more systems. This point was not adopted by any of the classifications in Table 1, though it was discussed at length in Nobes (1998). The last classification of Table 1 still appears to classify countries, but it is the set of IFRS practices used by companies in a country (i.e. the accounting system) that is the object of classification. The same applies later in this paper.

The range of companies

The scope of the data (e.g. restrictions by sector or listing status) is recorded in column (3). As may be seen, most classifications did not specify a scope. This reduces their usefulness, because the practices of listed companies vary from those of unlisted companies; and, even among listed companies, size has a major effect.[23] The last classification in Table 1 was the only one to mention sectors. It included companies in all sectors, but displayed the sectoral mix and excluded data on financial companies for topics for which sector-specific practices were anticipated. On such grounds, the exclusion of financial companies is common in much research involving accounting data. However, this creates a different problem: in all countries, the financial sector is significant and, in some (e.g. Australia, Italy, Spain and the UK), it is the most important sector among large listed companies, as shown later. Therefore, exclusion of the sector presents a misleading picture of a whole accounting system.

The importance of sector in influencing accounting policy was first systematically investigated by Jaafar and McLeay (2007), who examined three policy issues for companies from 13 EU countries using national accounting rules, in a pre-IFRS world. Consequently, Jaafar and McLeay were not investigating policy *choices* only but a mixture of different requirements and different choices. They found that country was a much stronger explanatory variable than sector, but that sector had some influence. Apart from the financial sector, which is excluded from many studies on policy choice, a sector which might make idiosyncratic choices is extractives, given the degree to which US practices dominate.[24] Jaafar and McLeay found some evidence of this; and it might be important for countries in which extractive companies constitute a large industry sector (e.g. Canada).

The period measured

The users of classifications should also be aware that countries can change their positions over time.[25] Table 1 (column 3) gives information on the dates of the data used for the classifications, noting that most classifiers have not specified a date.

The characteristics chosen

The discussions about chemistry, biology and cosmology above showed that the nature and definitions of the characteristics chosen as the basis for classification is vital. It is therefore inevitable that classifiers must use judgement in selecting and defining the characteristics used to

[21] Seidler discusses the US and UK groups in some detail, suggests a French group without naming any members of it, and proposes a Communist group, mentioning only the Soviet Union. The AAA has British and US groups, plus two continental European groups and 'Communistic'.

[22] Until moving to California at age 22, and then taking various degrees.

[23] For example, see Nobes and Perramon (2013).

[24] For example, under IFRS, there are no detailed rules on accounting issues associated with extraction.

[25] For example, see Nobes (1998).

Table 3
IFRS policy topics.

Topic	IFRS policy options		Standard[b]
1.[a]	– Income statement by nature	– By function or neither	IAS 1.99
2.[a]	– No inclusion of a line for EBIT or operating profit	– Line included	IAS 1.82
3.	– Equity accounting results included in 'operating'	– Immediately after, or after 'finance'	IAS 1.82[c]
4.	– Balance sheet showing net assets	– Showing assets = credits	IAS 1.54[c]
5.	– Balance sheet with liquidity decreasing (cash at top)	– Liquidity increasing	IAS 1.54[c]
6.	– Indirect operating cash flows	– Direct	IAS 7.18
7.	– Dividends received shown as operating cash flow	– Not	IAS 7.31
8.[a]	– Interest paid shown as operating cash flow	– Not	IAS 7.31
9.	– Some property at fair value	– Only cost	IAS 16.29
10.	– Investment property at fair value	– At cost	IAS 40.30
11.[a]	– Some designation of financial instruments at fair value	– None	IAS 39.9
12.[a]	– FIFO only for inventory cost	– Weighted average used	IAS 2.25
13.	– Actuarial gains and losses to OCI	– Corridor method or to income in full	IAS 19.92/3
14.	– Proportionate consolidation of joint ventures	– Equity method	IAS 31.30

This table shows 14 IFRS policy topics on which choices were observable in 2011. Topics 1–8 are presentation issues and topics 9–14 are measurement issues. The topics are as in Kvaal and Nobes (2010). Most topics are binary choices but topics 1, 3 and 13 allow a choice between three options. For these, we define binary choices: for topic 1, we distinguish whether or not the income statement is by nature because the 'neither' cases are usually more similar to 'by function' than 'by nature'; for topic 3, we consider the key issue to be whether or not the item is included in operating profit; for topic 13, we combine the options 'corridor method' and 'to income in full' because we consider the key issue to be whether or not actuarial gains and losses are ever charged in the income statement, which is not the case under 'actuarial gains and losses to OCI'.

[a] Not appropriate, and therefore not collected for financial companies.

[b] Versions of the standards ruling in 2011.

[c] IAS 1 specifies lists of items to be shown in financial statements, but does not specify their order.

represent the objects to be classified. We now examine this aspect for the 'intrinsic' classifications of Table 1, i.e. those that classify countries by their accounting rules/practices rather than by influences on the accounting.

The number of specified characteristics per system/country (column 5 of Table 1) varies from zero to 264. Classifications 5 to 8 were all[26] based on the surveys of Price Waterhouse (PW) (1973, 1976, 1979) which had begun as a list of detailed differences between US and UK accounting. They therefore did not ask (about a country) such important questions as: (i) are depreciation expenses determined by tax rules? or (ii) is deferred tax accounted for? They asked instead such peripheral questions as whether or not self-insurance provisions were maintained in an internal account by systematic charges to income (PW, 1973, Question 124), which was known to be a topic of US/UK difference.

Not surprisingly, the PW data showed that the US and the UK were the most different[27] of any pairing of the 36 countries examined for 1973. Consequently, by using these data, da Costa, Bourgeois and Lawson (1978) found again that the world had three types of country: US-led (containing most of continental Europe), UK-led, and unclassifiable (i.e. Canada and the Netherlands). Frank (1979) and Nair and Frank (1980) identified four groups from the same data, two of which were those dominated by the US and UK, respectively. Goodrich (1982) used the 1979 PW data and identified five groups, two of which were headed by the US and the UK, though there is another headed by Jersey which (remarkably) also contains Guatemala, Germany, Italy, the Netherlands and Zaire.

Doupnik and Salter (1993) started with PW's list of characteristics but report an attempt to eliminate those not representative of the fundamental features of the accounting systems being classified. d'Arcy (2001) used a large number of characteristics from a KPMG database which was not specifically prepared for her purpose. In Nobes (2011), the characteristics measured are the policy choices made by companies on topics such as those listed in Table 3. The issue of which characteristics to measure was discussed, and certain presentation topics were deleted on the grounds of less importance.

It was noted above that the purposes of a classification can be relevant for choosing the characteristics to be measured. Some accounting researchers have outlined the various possible purposes of classifying, including those of classifying accounting systems, but few[28] have specified the purpose of their own attempts, apart from organizing knowledge.

The type of data used to measure the characteristics

As may be seen from Table 1 (column 6), the type of data used to measure the characteristics also varies. Only the last classification was based on the collection of data relating to the accounting practices of actual companies. Clearly, the early classifications, which either used no data (classifications 1–4) or relied upon *impressions* of practices or of influences on practices (classifications 8–11), are less satisfactory than detailed observation of practices. In the non-accounting fields reviewed earlier, the quality of data for classification improved over time in various ways. For accounting research, the annual reports of hundreds of listed companies can now be collected quickly, and many are available in English.[29] By contrast, in the 1960s and 1970s, if the US researchers had wanted to collect the finan-

[26] Classification 8 (Goodrich, 1982) is based on the concepts part of the survey, but still excludes the two examples of important questions given later in this paragraph.

[27] See Exhibit 1 of da Costa, Bourgeois, and Lawson (1978).

[28] An exception is that Leuz, Nanda, and Wysocki (2003) make a classification in order to better understand international variations in earnings management.

[29] Nobes and Perramon (2013) find that English language reports contain the same information as the originals.

cial statements of all the members of the main French stock market index (for example), that would have proved very difficult, and many of the reports would not have been in English. This might be what held back researchers from detailed observation, but a more likely explanation is that accounting researchers were not yet accustomed to an empirical approach (Watts & Zimmerman, 1979).

Data which mix rules and impressions of practices (classifications 5–7 and 12) are incoherent. The usefulness of data relating to rules alone (e.g. classification 13) can also be questioned. For example, IFRS (IAS 38, para. 72) allows certain intangible assets to be measured at fair value rather than on a cost basis, whereas German and US GAAPs require a cost basis. However, this difference in rules is of doubtful significance if no IFRS companies choose fair value to measure intangibles, which is the case in the sample of German and UK companies of Christensen and Nikolaev (2013). It is surely more significant, for example, that the majority of IFRS-using UK companies choose fair value for investment properties whereas it is very rare for IFRS-using German companies to do so,[30] even though all the companies from both countries are using identical rules.

The quality of data

Any of the methods of measuring the characteristics chosen for classification can involve error. The PW data used for classifications 5 to 7 of Table 1 certainly contain errors. Simple examples[31] are that the UK is scored as not allowing weighted average cost for inventory valuation which was not (and never has been) the case; and that, on several topics, the UK has different scores from Ireland, even though they shared the same accounting rules. The data based on KPMG information (used for classification 13) also produces erroneous scores. For example,[32] the KPMG topics related to 'provisions' were interpreted for most countries as referring to provisions as defined in IAS 37 (i.e. liabilities of uncertain timing or amount), but the scoring for Australia was based on the rules for items such as 'bad debt provisions' (i.e. impairments, in current IFRS terminology). The last classification (Nobes, 2011), in common with most others, did not provide specific information about how the data were collected and coded. This makes it difficult to replicate the studies.

The techniques of classification

Table 1 (column 7) also shows the techniques used for classification. These range from qualitative assessments to several different statistical methods. The resulting classifications range (see column 8) from apparently unrelated groups of countries to hierarchies (family trees or dendrograms) of related countries. Roberts (1995, p. 649) warns against pushing the evolutionary analogies of the family trees too far, and points out that dendrograms can summarize similarities and differences without invoking evolution. Following from this, Roberts (1995, p. 656) also criticizes the use of the term 'species' in an accounting classification, as in Nobes (1983). We use 'system' for a set of objects with important characteristics in common, although the apparently scientific word 'species' might not be entirely out of place, given the discussion above about the vagueness of the term in biology.

Roberts (p. 652) convincingly suggests that analogies with the classification of languages might be more appropriate, given that languages both converge (they interbreed) and diverge, whereas species only diverge. Even so, as discussed earlier, the Linnaean system did not begin as evolutionary but was based on assessing shared characteristics. When evolution was added in (greatly aided later by the analysis of DNA), the broad outline of the animal classification survived although many details were revised. The same might apply to the hierarchical accounting classifications. That is, although they were prepared by assessing common characteristics, the inclusion of evolution might not upset the results. For example, the common ancestor of UK and US accounting could perhaps be traced to nineteenth century UK practice. By contrast, the common ancestor of French and UK accounting lies much further in the past, perhaps in the middle of the 16th century.[33]

The statistical methods of classification employed in our subsequent empirical analyses are outlined in Appendix A. In principle, they are sensitive to which countries are included. For example, a clustering program starts by finding the two nearest countries, showing them together and then treating the average of them as a 'country' for the next stage of clustering. So, exclusion of one country can affect the 'seeding' of the first cluster, which can then affect the position of many other countries.

Summary of factors affecting classification

In sum, early accounting classifications seem to have been affected by the national backgrounds of the classifiers or of the data gatherers. We have suggested, above, ways in which classification has also been affected by the data used. First, the choice of which characteristics to measure has a profound effect on the results. Once chosen, the way of measuring the characteristics has varied: several classifiers apparently used no data, some used incoherent data (mixtures of rules and impressions of practices); and others used data which are arguably of limited practical relevance (differences in rules). Many classifiers did not specify the scope of the objects being classified (e.g. large or listed companies) or the date.

However, some classifiers have entered caveats. Frank (1979, p. 596) notes that the topics included in his PW data vary in importance. Frank does not make a selection or comment on the mixture of rules and impressions of practices in the data, but warns that the coding scheme which turns that mixture into data for classification might introduce errors. Nair and Frank (1980) note that the clas-

[30] In the companies comprising the main German and UK stock market indices (Kvaal & Nobes, 2010).

[31] Several examples are given in Nobes (1981).

[32] These examples are discussed in Nobes (2004).

[33] The earliest double-entry bookkeeping records in France and England date from 1299 and 1305, respectively. However, both were isolated examples kept by Italian firms of merchants in versions of Italian. Domestic practice might instead be traced to translations of Pacioli's tractatus on bookkeeping, which were produced in France and England in the middle of the 16th century (Coomber, 1956; Yamey, 1997).

sifications differ if based on presentation topics rather than on measurement topics. d'Arcy (2001, p. 333) points out that different topics would lead to different classifications, and notes the inherent problem of using data on rules instead of practices. Nobes (2011) mentions the need for judgement in identifying important characteristics, and excludes some characteristics on these grounds.

We can now return to the meta-analysis of Table 2. We have noted above that the early classifiers might have been particularly aware of US and UK differences, and that many subsequent classifications were based on PW data which had been originally designed to reveal such differences. This could explain why no 'Anglo-American' group was generally found.

The lessons of this section for accounting researchers are that (i) a classification should be based on detailed observation of characteristics, (ii) the characteristics chosen should ideally be informed by the purpose of the classification, and at least be deliberately chosen and overt, (iii) related to this, any claims of objectivity are incoherent, (iv) accounting practices are a better representation of an 'accounting system' than rules are, and (v) the set of companies included in the accounting 'system' and the period of the data should be specified. It is further clear from this survey that the effect of inclusions or exclusions of countries, sectors (especially financial and extractive) and characteristics needs to be empirically investigated in order to see whether classification is robust to manipulation of these issues or whether it is instead essentially arbitrary. We now proceed with that.

Data

Our sample[34] includes companies from the world's largest economies which use IFRS, as follows: (i) the countries with the six largest stock markets where IFRS was required from 2005 (i.e. Australia, France, Germany, Italy, Spain and the UK), (ii) the two other countries with large stock markets with a longer history of IFRS usage: South Africa and Switzerland, (iii) Canada and South Korea, where IFRS has been recently adopted, and (iv) Hong Kong and companies from China which use IFRS.[35] In order to include Canada and South Korea, we use financial statements from 2011 onwards. In particular, we use company reports for years ended 31 December 2011 (or latest before) for 12 countries.[36] Our sample includes the largest[37] listed companies in each of these jurisdictions, which comprise 65%[38] of the total market capitalization of these countries. Companies with foreign influence or which are subsidiaries are excluded. In total, we examine the IFRS practices of 514 companies. Details of the sample are provided in Appendix B.

Table 4 shows the sample by country and sector. As explained, we wish to investigate whether exclusion of certain sectors might affect classification. Prior literature indicates that the financial and extractive sectors have idiosyncratic policies.[39] Given the topic of this paper, we should admit that the classification of companies by sector exhibits the difficulties typical of classification. There are several accepted versions. We have chosen the 'Industry Classification Benchmark' (ICB) of the index company FTSE. The corresponding data are from Worldscope (data code WC07040). Consistently with our recommended approach, we have used judgement to adjust it for our purposes, in particular to calculate country totals for extractive companies.[40]

We concluded above that practices are the best representation of an accounting system. We record the IFRS practices of companies and use them as the characteristics to be measured in order to classify a country. Even for companies which are fully complying with IFRS, there is considerable scope for varied practice because, for example: (i) the recognition of expenses (e.g. impairments) or assets (e.g. development projects) relies on the exercise of judgement against somewhat vague criteria, (ii) the measurement of liabilities (e.g. provisions) or assets (e.g. the fair value of investment properties) involves estimation, and (iii) many standards offer choices to companies. The first two of these are hard to assess (although, see an attempt by Wehrfritz, Haller, & Walton, 2012), but data on the third can be hand-picked from the annual reports of companies. These data provide a good indication of the influence of factors such as country and sector because the differences in practices are caused by management choices and not by regulations. There is some constraint

[34] Our results show that the inclusion or exclusion of particular countries generally does not affect how the remaining countries are classified.

[35] Although China has not fully adopted IFRS, the majority of the largest listed Chinese companies prepares IFRS financial statements, because they are listed on the Hong Kong Stock Exchange (HKEx), which required IFRS from 2005. Consequently, Chinese companies with a listing in Hong Kong and Mainland China prepared two sets of financial statements (IFRS and Chinese GAAP). However, from 2010, HKEx accepts Chinese GAAP financial statements, and six companies in our sample have stopped preparing IFRS financial statements.

[36] The one exception to this is that we include the first available IFRS financial statements for ten Canadian and four South Korean companies which have year-ends other than 31 December 2011. This enables the inclusion of six Canadian and four South Korean financial companies; in particular, our Canadian sample would otherwise not include any *bank* because all Canadian banks in our sample have 31 October year-ends.

[37] Findings of country influence would probably be even stronger for smaller companies because of less international influence (Nobes & Perramon, 2013).

[38] According to Worldscope data for 2011 (Worldscope code: WC07210).

[39] Christensen and Nikolaev (2013) show that real-estate firms (which are part of the financial sector) choose to use fair value for investment property more frequently than other firms. Jaafar and McLeay (2007, p. 180) refer to special practices in the extractive industries.

[40] We define extractive companies as those in sector 0530 (oil and gas producers), sector 1770 (mining), sub-sector 1753 (aluminum) and sub-sector 1755 (non-ferrous metals); additionally, we classify Fortescue Metals Group of sub-sector 1757 (iron and steel) as an extractive company. We believe that using ICB codes results in a better industry classification than using primary SIC codes (Worldscope data code WC07021). If using SIC codes, we would identify extractive companies as 'mining' (SIC codes starting with the digits 10, 12, 13 or 14) and financial companies as 'finance, insurance and real estate' (SIC codes starting with the digit 6). Using ICB codes, we classify 57 (129) companies as extractive (financial), and using SIC codes we would have classified 79% (94%) in the same way. The main difference is that many integrated oil and gas companies (e.g. BP) are not classified as extractive but as 'manufacturing' using SIC codes due to their petroleum refining businesses. Additionally, the classification of some companies using SIC codes is unsuitable for our purposes: e.g. China Oilfield Services is classified as an extractive company even though it does no extraction.

Table 4
Sample by country and sector.

Sector	AU	UK	CA	CN	HK	FR	ES	IT	DE	CH	ZA	SK	∑
0/1 Extractives	6	9	21	7	0	2	1	1	0	0	7	3	57
0/1 Other oil and gas, basic materials	4	3	2	3	0	2	3	0	7	3	1	4	32
2 Industrials	7	15	2	12	4	9	8	7	6	2	6	13	91
3 Consumer goods	2	10	2	3	3	7	1	5	7	3	2	5	50
4 Health care	2	3	0	1	0	2	1	1	2	4	2	0	18
5 Consumer services	8	20	8	4	3	7	3	8	6	0	6	4	77
6 Telecommunications	1	4	3	1	1	1	1	1	1	1	2	3	20
7 Utilities	1	5	1	3	3	2	4	3	2	0	0	2	26
8 Financials	20	22	10	13	8	6	9	12	6	6	6	11	129
9 Technology	0	2	0	2	0	2	1	0	2	1	0	4	14
∑	**51**	**93**	**49**	**49**	**22**	**40**	**32**	**38**	**39**	**20**	**32**	**49**	**514**

This table reports descriptive statistics of the sample companies. The countries are Australia (AU), United Kingdom (UK), Canada (CA), China (CN), Hong Kong (HK), France (FR), Spain (ES), Italy (IT), Germany (DE), Switzerland (CH), South Africa (ZA) and South Korea (SK). Sector is according to the first digit of the Industry Classification Benchmark (ICB), except that we show all the extractive companies (sectors 0530 and 1770; sub-sectors 1753 and 1755; and Fortescue Metals Group) together in the first row, and all the remaining companies of sector 0 (oil and gas) and sector 1 (basic materials) together in the second row.

on *changing* policy,[41] but IFRS specifically removes restraints on choices made on first-time use of IFRS (IFRS 1, para. 11). As explained below, there are some rare examples of national regulators, in the financial sector, adding to IFRS requirements.

The list of policy topics used by Kvaal and Nobes (2010) is shown here as Table 3, after deleting the topics on which choice was removed from IFRS by 2011. There are eight presentation topics and six measurement topics. For the last two topics in the table, changes to IFRS had already been made by 2011 but were not compulsory for any of our companies.[42] Kvaal and Nobes (2012) found that there was little early adoption of IFRS changes, but we report on this below. For financial companies, Kvaal and Nobes (2010) omitted topics on which there were sector-specific presentation practices influenced by pre-IFRS laws. We do not do that, because part of our purpose is to investigate the effects of including or excluding certain sectors. Still, we omit five topics for financial companies because they are not appropriate for the sector, as explained in Appendix C.

When the purpose of research is to investigate whether IFRS policy choices are associated with country, then it is appropriate to examine as many policy topics as are observable. However, as discussed earlier, for assessing a country's accounting 'system' or a country's profile of IFRS practices, judgement is needed to exclude (or give lower weight to) topics likely to be of little importance to users of financial statements (e.g. the liquidity order of assets in a balance sheet). We investigate the sensitivity of classifications to such exclusion of topics.

Appendix C provides details about our data collection and our coding procedures used to generate binary choice data from the 14 IFRS policy topics. Our empirical analyses below are based on a total of 5,689 hand-picked IFRS policy choices of the 514 companies from 12 countries.

Findings on policy choice

Policy choices

Table 5 reports, by country, the percentages of companies in our sample which chose particular options. For several topics, the policy choice was observable for all 514 companies. However, we only count companies for which the policy is observable, which explains why the '*N*' in Table 5 is smaller for certain topics, notably investment property measurement (topic 10).

Table 5 includes several countries for which data on IFRS practices have not previously[43] been presented: China, Hong Kong, South Africa, South Korea and Switzerland. Some features of these countries stand out. First, the practices in South Korea are unusually uniform: for most topics, over 90% of companies make the same choice, and for no topic do fewer than 80% of companies make the same choice. Secondly, the majority of companies in China, Hong Kong, South Africa and Switzerland chose to take actuarial gains/losses to income, even though that practice was to be outlawed by a change to IFRS which had already been issued. Similarly, a majority of companies in South Africa and a large minority in Switzerland chose proportional consolidation, even though that practice was to be outlawed. This is further evidence of no widespread early adoption of changes to IFRS, and of the strong influence of pre-IFRS practices and therefore national patterns of IFRS practice, as documented in the papers mentioned in the previous section.

Examples of sectoral effect

As explained earlier, some previous researchers observed an association between pre-IFRS practices and sec-

[41] IAS 8 imposes certain conditions and disclosure requirements (paras. 14 and 29).

[42] IAS 19 was amended in 2011 to remove the option on the treatment of actuarial gains and losses. IAS 31 was replaced in 2011, thus removing the option of proportional consolidation. Both changes were only compulsory for 2013 onwards.

[43] Data on the other countries is included elsewhere; for example in Nobes (2011).

Table 5
Percentages of policy choice by country and topic.

IFRS policy choice	*N*	AU	UK	CA	CN	HK	FR	ES	IT	DE	CH	ZA	SK
1. Income statement by nature	385	35	11	5	44	36	29	96	81	24	29	15	3
2. Operating profit not shown	385	42	1	31	31	29	3	0	0	12	0	0	0
3. Equity profits in operating	423	59	35	48	4	0	8	23	14	35	39	7	4
4. Balance sheet showing net assets	514	100	76	0	39	82	0	0	0	0	5	0	0
5. Balance sheet with liquidity decreasing	514	100	10	100	24	14	10	22	29	26	50	9	98
6. Indirect cash flows	514	4	98	100	98	100	100	91	95	100	95	66	100
7. Dividends received as operating	348	87	37	85	5	30	79	39	20	71	43	86	91
8. Interest paid as operating	381	86	61	74	44	43	79	52	69	61	64	96	89
9. Some property at fair value	504	10	10	2	0	5	0	0	0	0	0	0	0
10. Investment property at fair value	216	93	68	36	21	94	20	5	0	5	80	40	3
11. Some fair value designation	383	10	3	13	0	7	24	4	4	6	7	23	19
12. FIFO only	329	21	42	23	6	15	11	22	19	0	36	23	6
13. Actuarial gains/losses to OCI	414	85	89	72	8	36	60	68	30	59	35	28	83
14. Proportionate consolidation of JVs	379	6	25	55	9	0	71	70	38	17	43	59	17

This table reports the percentages of companies per country and topic which make the respective IFRS policy choice in 2011. The countries are as in Table 4. *N* is the number of observations/companies. See Table 3 and Appendix C for details of the topics.

Table 6
Examples of sectoral differences in policy choice.

Country	IFRS policy choice	*N*	% Financials	% Extractives	% Others	*p*-value
All	10. Investment property at fair value	216	61	0	9	<0.01
All	13. Actuarial gains/losses to OCI	414	39	58	73	<0.01
All	14. Proportionate consolidation of JVs	379	27	56	35	<0.01
AU	10. Investment property at fair value	15	100	–	50	<0.01
CA	13. Actuarial gains/losses to OCI	39	10	82	100	<0.01
CA	14. Proportionate consolidation of JVs	38	30	82	36	0.01
UK	4. Balance sheet showing net assets	93	45	67	89	<0.01
UK	5. Balance sheet with liquidity decreasing	93	32	0	3	<0.01

This table reports the percentages of financial, extractive and other companies which make the respective IFRS policy choice in 2011. *N* is the number of observations/companies. The column '*p*-value' reports the *p*-values for χ^2 tests of independence. See Table 4 for the definition and frequencies of financial and extractive companies. See Table 3 and Appendix C for details of the topics.

tor. In some cases, this was driven by sectors having different accounting rules.[44] By contrast, apart from a few isolated examples of additional jurisdiction-based rules,[45] there are no sector-specific accounting requirements in IFRS. Even so, significant differences in IFRS choices between sectors are evident when we split our entire sample into three sectors: financial, extractive and other. Table 6 shows particularly clear examples from our data. More importantly for this paper, there are also significant differences between the sectors within countries. As may be seen, compared to other companies in their countries, Australian financial companies prefer fair value for investment properties, Canadian financial companies prefer not to recognize actuarial gains/losses as OCI (they prefer the corridor method), Canadian extractive companies prefer to proportionally consolidate joint ventures, and British financial companies are less likely to show net assets but more likely to start the balance sheet with cash. In all these cases, a χ^2 test of independence shows that a null hypothesis of no association with sector can be rejected at the 1% level. These are examples of how a country's sectoral mix might affect its mean scores on topics, which might then affect classification, as examined in the next section.

Sensitivity of classifications

Introduction

We have suggested above how the accounting classifications, particularly the early ones, appear to have been sensitive to the nature of the classifiers. In this section, we empirically investigate how sensitive classifications can be to various aspects of the data used.

As recorded in Table 1, several different statistical methods of classification have been employed by previous researchers. We begin with principal component analysis. Table 7 shows the principal components for one version of the data: all 14 topics for all sectors of all 12 countries. This analysis leads to a three-group initial classification, summarized as 'run' 1 in Table 8. In this table, we report the results for 11 different versions of the data. For ease of comparison, Germany is always shown in Group 1.

The Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy should be higher than 0.6 (or possibly 0.5) for the data to be considered suitable for factor analysis (Kai-

[44] For example, EU banks have different company law from other companies on such issues as the format of the balance sheet.

[45] Such as requirements from the Bank of Spain relating to the IFRS balance sheets of Spanish banks. For example, Caixabank states in its '2011 Management report and annual financial statements' (p. 23) that it changed the format of its balance sheet to conform to legislation for credit institutions (Bank of Spain Circular 4/2004).

Table 7
Principal component analysis using all available data.

Country	Component 1	Component 2	Component 3
AU	**0.1764**	0.1520	−0.6277
UK	0.0978	**0.4717**	−0.1518
CA	**0.4662**	−0.1047	−0.1532
CN	−0.0320	**0.4829**	0.2698
HK	−0.0829	**0.6540**	−0.0987
FR	**0.3580**	−0.0139	0.1950
ES	0.1798	0.0360	**0.4511**
IT	0.1531	0.1304	**0.4571**
DE	**0.3719**	0.0456	0.0757
CH	**0.2574**	0.2319	−0.0023
ZA	**0.3714**	−0.0467	0.0344
SK	**0.4557**	−0.0774	−0.1399

This table reports the results of principal component analysis using data on the IFRS policy choices made on 14 topics by companies of all sectors from 12 countries in 2011. The data used are the percentages shown in Table 5. Specifically, the countries constitute the variables (i.e. the objects of study) and the IFRS policy choices constitute the observations. The numbers shown are the principal component loadings after varimax rotation. Principal components are those with eigenvalues greater than one. Bold numbers indicate the component on which the respective country loads the most. The countries are as in Table 4.

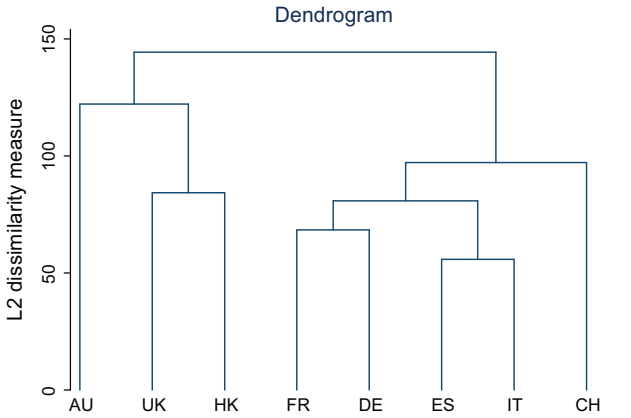

Fig. 1. Dendrogram for run 5. This figure shows the dendrogram of hierarchical clustering using the average linkage method for run 5. See Table 8 for details of the specification of run 5.

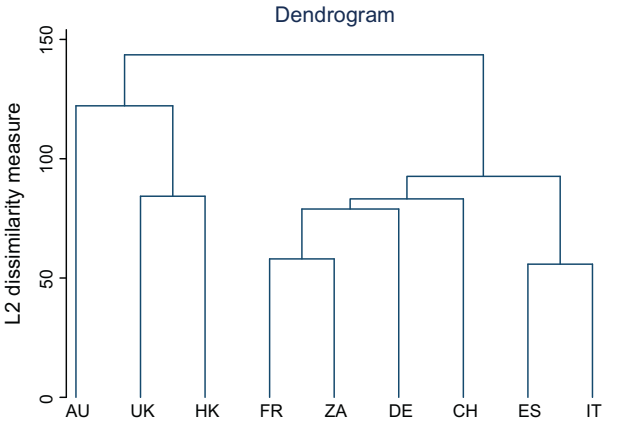

Fig. 2. Dendrogram for run 6. This figure shows the dendrogram of hierarchical clustering using the average linkage method for run 6. See Table 8 for details of the specification of run 6.

ser, 1970, 1974). Run 1 has a low KMO. However, by excluding China, Switzerland and South Korea (for reasons explained below), the KMO improves greatly (see run 2). However, although the KMO can change substantially due to the exclusion of countries, the classifications are generally not affected (see below). We therefore conclude that, for our purposes, there is no need to be concerned about analyses which show a low KMO. Nevertheless, the majority of our runs has a KMO of above 0.6.

Excluding countries

Before our analysis (below) of the effects of excluding topics and sectors, we experiment by excluding various

Table 8
Grouping of countries based on principal component analysis, varying the countries, topics and sectors included.

Run #	Topics	Sectors	AU	UK	CA	CN	HK	FR	ES	IT	DE	CH	ZA	SK	KMO
1	All	All	1 (2)	2	1	2	2	1	3	3	1	1 (2)	1	1	0.3400
2	All	All	1	2	1		2	3 (1)	3	3	1			1	0.7156
3	Excluding 2, 5, 7	All	2	2	1		2	1	1	1	1			1	0.5285
4	Excluding 2, 5, 7	All	2	2			2	1	1	1	1				0.6086
5	Excluding 2, 5, 7	All	2	2			2	1	1	1	1	1 (2)			0.6770
6	Excluding 2, 5, 7	All	2	2			2	1	1	1	1	1 (2)	1		0.2723
7	Excluding 2, 4, 5, 7	All	2	2	2 (1)		2	1	1	1	1			1 [2]	0.3132
8	Excluding 2, 5, 7	Excluding F	2	2			2	1	1	1	1				0.7376
9	Excluding 2, 5, 7	Excluding F + E	2	2			2	1	1	1	1				0.7227
10	Excluding 2, 4, 5, 7	Excluding F	2	2 (1)	1		1	1	1	1	1			1 [2]	0.5464
11	All	Excluding F + E	3	2	1 (3)	2	2	1	1	1 [2]	1	1	1	1 (3)	0.7294

This table reports groupings of countries based on principal component analysis using data on IFRS policy choices in 2011. The countries, topics and sectors included vary between each 'run'. Each country is grouped according to the principal component (after varimax rotation) on which it loads the most. Principal components are those with eigenvalues greater than one. The number of principal components and therefore the number of groups differs between the runs. The numbers 1, 2 and 3 in the columns headed by the two-letter country acronyms denote the different groups. For ease of comparison, Germany is always shown in Group 1. A number in brackets (square brackets) denotes the group of the principal component on which the country loads second highest and is shown if the difference between the highest and second highest loading is below 0.05 (0.10), i.e. if the grouping of the country is not very clear. See Table 7 for details on the principal component analysis of run 1. 'KMO' denotes the Kaiser–Meyer–Olkin measure of sampling adequacy. The countries are as in Table 4. In the column 'Sectors', 'F' denotes the financial sector and 'E' denotes the extractive sector. See Table 4 for the definition and frequencies of financial and extractive companies. See Table 3 and Appendix C for details of the topics.

countries (i.e. the objects being classified). Earlier, it was noted that this can affect classification. For example, Pluto is no longer classified as a planet because of the increased number of objects being classified after the discovery of bodies larger than Pluto with orbits further from the sun. We also pointed out that the clustering programs can be affected by which countries are included. We start here by excluding China (for which, all our sample companies are listed on the Hong Kong exchange), South Africa (where many listed companies are influenced[46] from the UK) and Switzerland (where IFRS is not required, and for which we have the smallest sample).

However, the exclusion of one or more countries does not have a large effect on the groupings of the remaining countries (based on principal component analysis), as a study of Table 8 shows. For example, there is no change when two countries are excluded (moving from run 3 to run 4), or when other countries are gradually added (from run 4 to run 5, then run 6). However, exclusion of *three* countries (when moving from run 1 to run 2) changes the grouping of France, although it now associates with more than one group. Furthermore, it is also possible to find effects of excluding a country on the more detailed classifications in dendrogram form. For example, Figs. 1 and 2 show the dendrograms resulting from runs 5 and 6. The only difference in the data is that South Africa is added in run 6; but this causes the position of Switzerland to change. It would therefore be possible for researchers to arrive at different classifications of country X by including or excluding country Y. This might be done deliberately, subconsciously or accidentally. It would be possible for researchers to rationalize the selection of countries, and thereby affect the result.

Excluding topics

The selection of topics/characteristics fundamentally affects the classifications: in effect, the topic scores are being classified, as they are the proxies for the countries. An example from earlier is that the original Linnaean classification of plants chose to ignore everything but reproductive features, but was substantially revised when DNA evidence became available. Let us consider the implications of this by taking the example of Canada, which adopted IFRS in 2011 and which has therefore not been classified before by IFRS practices. One researcher (possibly from France) might hypothesize that Canada would be grouped with France, because French is an official language and because code law is practised in a major province (Québec). The researcher could find support for this prediction by focussing on run 3 of Table 8. However, another researcher (possibly from the UK) might hypothesize that Canada should be grouped with the UK. This could be supported by focussing on run 7.

The difference in classification emerges by excluding one topic (topic 4: does the balance sheet show net assets?). Canadian companies all follow the French approach of not showing net assets. If one were to try to decide which of runs 3 or 7 produces the more meaningful grouping, one would have to face at least two questions: (i) Is topic 4 important for describing a country's accounting system? (ii) Does the choice of Canadian companies result from 'French-ness'? When deciding on (i), we note that the presentation choice does not change any accounting number. When deciding on (ii), we note that most of our Canadian companies are listed in the US[47] and that practice there[48] on topic 4 happens to be the same as French practice under IFRS. Neither of the classifications is 'wrong'. Therefore, the point is a good example of the old insight that no classifications are 'real'. As noted above, different researchers could arrive at different classifications using the same data.

Although no classifications are 'real', some are perhaps more reasonable than others. At the least, researchers should not abdicate responsibility for choosing the characteristics, and they should make their choices overt. We have shown that some accounting classifiers have not complied with those desiderata. For the purposes of this paper (i.e. investigating sensitivity), we do not need to conclude on what is the best answer. However, one could take the view that the exclusion of several presentation topics increases the meaningfulness of a classification because it stresses the more important topics. For example, we can compare runs 2 and 3 (in Table 8). They are both for all sectors of the same nine countries, but run 3's exclusion of the three presentation topics deemed unimportant in Nobes (2011) causes Australia to move into Group 2 (with the UK and Hong Kong), and France, Spain and Italy to join Germany in Group 1. If a further topic (topic 4) which does not affect measurement (or even the size of any total) is excluded as in run 7, then Canada also joins the 'Anglo-Saxon' group. This illustrates the above point: Nobes (2011) would not have been able to show that the two-class accounting world had survived for 30 years if he had chosen a different topic mix. However, we repeat that such judgements are inevitable when classifying in any discipline.

Using our data, after all the 'unimportant' topics are excluded, the multi-dimensional scaling (MDS) result is as in Fig. 3, which shows the 'Anglo' countries on the right-hand side. The dendrogram for the same data is shown as Fig. 4, although this presents a confused picture because of the way in which clustering works (see Appendix A).

Excluding sectors

The effect of excluding sectors can be illustrated in several ways. Comparison of runs 4, 8 and 9 in Table 8 shows that there is not necessarily any effect of such exclusions. All three runs relate to the 11 'important' topics and to seven countries which result in a clear two-group classification using all sectors.[49] First one sector, then two are excluded, but the two groups remain stable. However, the

[46] As for all countries, we excluded companies with foreign influence (see Appendix B).

[47] Specifically, 35 of the 49 Canadian companies in our sample were listed in the US at the end of 2011. We define 'listed in the US' as filing 10-K or 40-F reports with the Securities and Exchange Commission (SEC). The corresponding data is collected from the EDGAR database of the SEC.

[48] See, for example, AICPA (2010, p. 147). There were no format requirements in Canadian GAAP, although almost universal practice was to present 'total assets' as in the US (Ordelheide & KPMG, 2001, p. 552).

[49] The five countries of Kvaal and Nobes (2010), plus Italy (which groups with Spain) and Hong Kong (which groups with the UK).

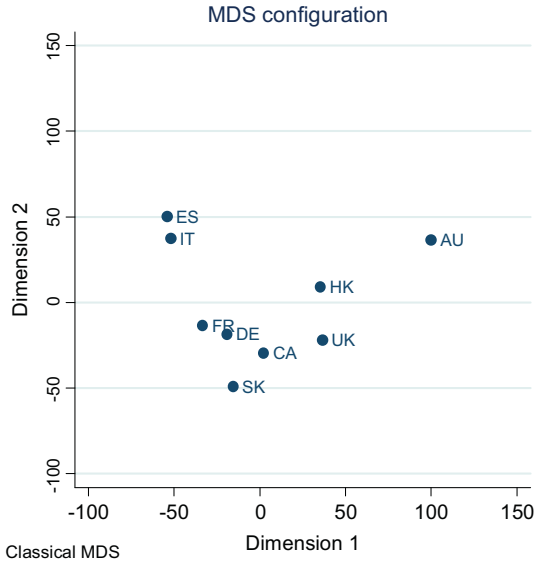

Fig. 3. Multi-dimensional scaling for run 7. This figure shows the results of classical multi-dimensional scaling for run 7. The Mardia measure is 86.28%. See Table 8 for details of the specification of run 7.

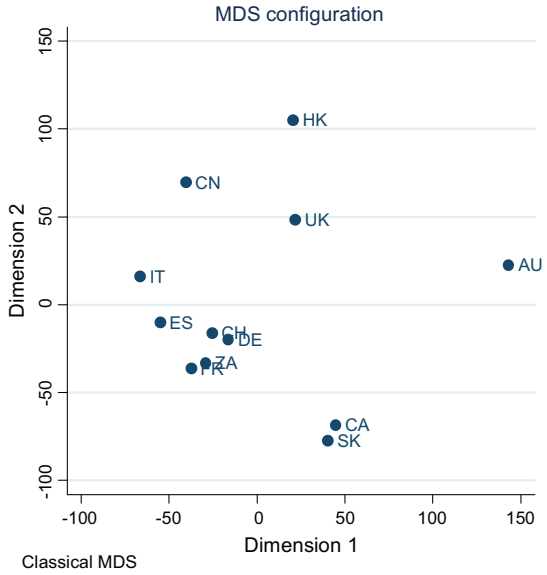

Fig. 5. Multi-dimensional scaling for run 11. This figure shows the results of classical multi-dimensional scaling for run 11. The Mardia measure is 90.97%. See Table 8 for details of the specification of run 11.

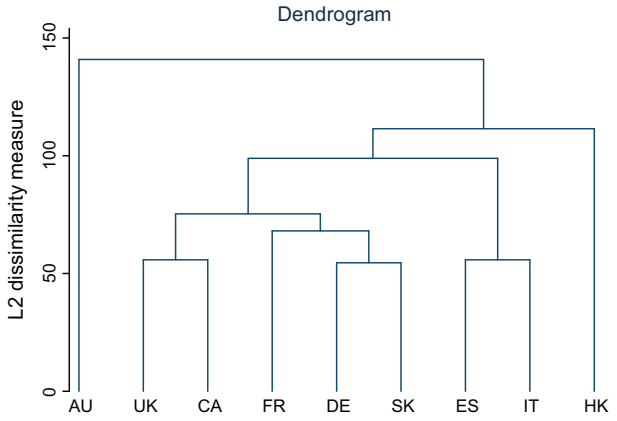

Fig. 4. Dendrogram for run 7. This figure shows the dendrogram of hierarchical clustering using the average linkage method for run 7. See Table 8 for details of the specification of run 7.

exclusion of a sector *can* have an effect. For example, when the financial sector is excluded by moving from run 7 to run 10, it causes Canada and Hong Kong to leave Australia and the UK. Moving from run 1 to run 11 shows the effect of excluding two sectors: Australia is left alone, and the Italy/Spain group disappears.

The exclusion of sectors should not be done lightly. The financial and extractive sectors are very important in several countries (see Table 4). Excluding both of them amounts to ignoring more than half of the accounting 'system' for Australia and Canada, or a third for the UK. Furthermore, much of the international variation (e.g. in the use of fair value) is located in these sectors.

How the countries are grouped, including the new countries

Although vital effects can result from exclusion of topics, and noticeable effects from exclusion of countries or sectors, certain aspects of the classifications are remarkably stable. For example: (a) Italy and Spain are always in the same group, sometimes by themselves, (b) Germany and France are generally in the same group, (c) the UK, Hong Kong and China are generally in the same group, and (d) the UK is never with Germany, France, Italy and Spain. Fig. 5 shows the classification based on multi-dimensional scaling (MDS) for all countries and all topics, but excluding financial and extractive companies (run 11).

Jurisdictions which have not been classified before on the basis of IFRS practices are Canada, China, Hong Kong, South Africa, South Korea and Switzerland. In this present study, Switzerland is never with the UK but, predictably, is generally with Germany and France. South Korea is always with Germany, which is the position of Japan (which has influenced Korea) in previous classifications. Interestingly, despite South Africa's partially British heritage, it is always with Germany and never with the UK. However, like South Korea, South Africa has a version of Roman law. Hong Kong and China are nearly always shown with the UK. This is not surprising, given that Hong Kong's pre-IFRS accounting system was closely modeled on the UK's, and that all the Chinese companies in our sample are listed on the Hong Kong stock exchange. Canada cannot be classified unambiguously.

Our data could be used either to support or to refute the frequently-used dichotomy between common law and code law countries. The source generally relied upon by empirical researchers for that law variable is La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1998). However, doubt was cast by Nobes (1998) on the relevance of the variable as an influence on financial reporting practices; and the point was made more strongly and in more detail by Lindahl and Schadéwitz (2013). Using our data, and focussing on runs 4, 5, 7, 8 and 9 of Table 8, we could show a 100% correlation between the legal dichotomy and our two groupings of countries by IFRS practices. The same

would apply to run 6 if South Africa is scored as having 'Roman Dutch' law (as in legal classifications) rather than as 'English origin' (as in La Porta et al., 1998). However, if we focussed on runs 1, 2, 10 and 11, quite a different story could be told. This is a further illustration of the need for judgement by researchers and caution by readers.

Conclusions

Classification is a fundamental activity in many scientific disciplines and in everyday work in several fields. It pervades society, organizations and accounting. There are indications that classifications in several fields have strongly reflected their classifiers. This was particularly obvious in the way in which man originally classified himself and his world. Although some independence can be achieved by detailed systematic observation, the choice of characteristics to represent the objects being classified remains inevitably a matter of judgement. For example, even though Linnaeus' botanical classification rested on meticulous observation, he chose to ignore most of the observable things about plants. Classifications can still be useful even when arbitrary, though some classifications are now described by scientists as 'natural' rather than arbitrary. Whether a classification is useful or not is related to its purpose. We collated lessons from other fields in preparation for analyzing the long history of classification in international accounting.

Accounting classifications have been extensively referred to in policy-making debates; and they have been used as part of the setting for research on many topics, and as a source of independent variables in empirical research. If the classifications are inappropriate, or have been used inappropriately, the settings or variables are wrong. However, few accounting classifiers have discussed or investigated the robustness of classification to variations in such matters as the number of objects classified and the nature of the characteristics chosen to represent the objects. In our survey of previous accounting classifications, we find a wide range on these matters.

Like early classifications in other fields, the early accounting classifications (items 1–4 of Table 1) seem to reflect the backgrounds of the classifiers. For example, Americans saw a three-class world: US, UK and other. Another point from above is that classification should be based on observation. However, those early accounting classifications did not use data. Other classifications (items 9–11) were also not based on detailed systematic observation but on informal impressions. From the late 1970s, several classifiers (items 5–8 and 12 and 13) did use data, but the data were based on the opinions of others. In terms of the introductory sections of this paper, the evidence was hearsay. None of the classifiers appears to have looked for, or corrected, errors in their databases.

Most accounting classifiers have not addressed the fact that a classification depends entirely on the characteristics chosen to represent the countries being classified. Classifications 5–8 even used data that had been designed to reveal US/UK differences, whereupon the classifications reflected this. Most classifications do not specify their date or the type of companies considered. Where the latter is specified, the scope is listed companies. Nearly all classifiers have ignored sectoral differences, and none has investigated the effect of such differences on classifications.

Our meta-analysis of the previous classifications showed only limited consensus about pairings or wider groups of countries, which suggests a high degree of arbitrariness in the classifications. However, a British group was identified; it did not include North America, which our review suggests is partly because of the biases in the perceptions of the classifiers and in the data.

One of this paper's purposes is to assess the reliability of previous accounting classifications by empirically investigating their sensitivity to variations in a series of factors, i.e. the countries and sectors included, and the characteristics chosen to represent the countries. We do this by hand-picking data on the IFRS choices made on 14 topics by 514 large listed companies from 12 countries in 2011. We report the data on IFRS choices; for five of our countries this is the first time that data on IFRS choices has been reported. We choose to measure observable policy choices because we believe that practices are the best indication of an 'accounting system'. Other data would lead to different classifications. For example, it would also be possible, though difficult, to collect data on other aspects of IFRS practice, e.g. the tendency to make impairments.

When investigating sensitivity by using principal component analysis, we find that the inclusion or exclusion of particular countries does not generally affect how the remaining countries fall into the two (or sometimes three) groups produced. However, in the more detailed classifications resulting from cluster analysis, the inclusion or exclusion of country X can cause country Y to change its position. So, this caveat should be noted by classifiers.

The key issue is the selection of characteristics to represent a country. For example, we show that, by gradually excluding presentation topics (which some researchers have claimed are less fundamental), Australia and Canada join an 'Anglo' group; and another group containing all the continental European countries is formed. By selecting different characteristics, quite different classifications emerge. This means that classifiers should not leave the selection of characteristics to the preparers of databases. The apparent objectivity of relying on someone else's subjectivity (e.g. by using the topics chosen by Price Waterhouse or KPMG for purposes other than classification) is greatly outweighed by the need to address the issue of which characteristics matter.

Our data show stark differences between sectors in IFRS choices on certain topics. This does not generally affect the classifications but, for some sets of the data, the exclusion of one or both sectors does change the classification. Depending on the topics, countries and sectors included, a two-group classification of our countries can be produced which corresponds exactly with a common/code law split. However, it would be possible to produce classifications from our data which do not. Again, on the issues of this paragraph, classifiers should discuss such sensitivity.

Despite the above findings, certain aspects of our classifications are remarkably stable, e.g. Italy and Spain are always in the same group, and never with the UK. We

therefore conclude that our classifications based on IFRS choices are not essentially arbitrary although we find them to be particularly sensitive to the selection of topics. As a by-product of our investigations, we show that Hong Kong companies and IFRS-using Chinese companies (which are listed in Hong Kong) are generally classified with the UK, and that South Africa, South Korea and Switzerland are classified with Germany.

Linnaeus (1751, section 156) stressed the centrality of classification, 'without which botany is chaos'. Classification of accounting systems can also be a useful device for organizing knowledge. However, as in other disciplines, it is fraught with difficulties and judgements, which we have investigated. Given that researchers and others find the activity of classifying irresistible, at least the difficulties and judgements should be disclosed.

Acknowledgements

The authors are grateful, for comments on earlier drafts, to Jane Broadbent, Jane Davison, Brendan McSweeney, Christopher Napier, R.H. Parker, John Roberts and Steve Young, and to David Cooper (the editor) and three anonymous reviewers of this journal. They also thank Shiyun Song and Guojing Tang for research assistance. Financial support was provided by the Department of Accounting and Finance at Lancaster University Management School.

Appendix A. Statistical classification techniques used in this paper

A.1. Principal component analysis

Principal component analysis (sometimes called 'factor analysis') processes the data in order to look for 'components' that are selections of practices with different weights that best explain the variance between the objects of study (in this case, countries). Kim and Mueller (1978) and Hutcheson and Sofroniou (1999) set out the procedures. Having identified the components, the approach then focuses on those that explain the greatest variance. In particular, it is common to select those that have eigenvalues greater than one. Then, each country is assigned to the component (after varimax rotation) on which it loads the most.

Sampling adequacy is checked by the Kaiser–Meyer–Olkin (KMO) measure which can take values of 0–1 (Kaiser, 1970). Scores of above 0.5 can be regarded as acceptable (Hutcheson & Sofroniou, 1999; Kaiser, 1974).

A.2. Cluster analysis

This process first identifies the congruence in policies between each pair of countries. It identifies the most similar pair. It then fuses these two together as a single unit and looks for the next nearest pairing, and so on. The vertical branching lines rise as each new country is added, showing increasing dissimilarity.

A.3. Multi-dimensional scaling

This method represents data as a configuration of points in two dimensions. It does not automatically produce clusters but gives a graphical representation of the distances between the countries: 'When the data have not been forced into clusters, the observer can assess better whether clusters exist.' (Cormack, 1971, p. 340).

Two versions are available: the 'modern' non-metrical solution using two dimensions (Gordon, 1981, chap. 5), and the 'classical' metric solution. A Mardia measure of 'goodness of fit' can show the percentage of the variation which is explained by the two dimensions.

Appendix B. Details of the sample

The countries included in our sample are Australia (AU), United Kingdom (UK), Canada (CA), China (CN), Hong Kong (HK), France (FR), Spain (ES), Italy (IT), Germany (DE), Switzerland (CH), South Africa (ZA) and South Korea (SK). The sample comprises the constituents of the major stock market index of the respective country on 31 December 2005 or 31 December 2010[50] or both. The indexes are: S&P/ASX-50 (AU), FTSE-100 (UK), S&P/TSX-60 (CA), CAC-40 (FR), IBEX-35 (ES), FTSE/MIB-40 (IT), DAX-30 & 10 largest (by market capitalization) constituents of MDAX-50 (DE), SMI (CH), Hang Seng China Enterprises Index (CN), Hang Seng (HK), FTSE/JSE Top 40 (ZA) and KOSPI-50 (SK). The sum of the index constituents is 688.

We exclude certain companies in order to ensure that the national samples are not affected by foreign influence and that we have independent observations. Hence we exclude: foreign companies (e.g. Telecom New Zealand in Australia); subsidiaries of listed foreign companies (e.g. TUI Travel in the United Kingdom, which is a subsidiary of the German TUI); Hong Kong companies with a Chinese ultimate parent, i.e. if the ultimate holding company is a Chinese state-owned enterprise (e.g. China Mobile); companies with other foreign influence, i.e. if the company either has a dual-listed structure (e.g. BHP Billiton, which is listed in Australia and the United Kingdom) or has a headquarters abroad (e.g. Royal Dutch Shell in the United Kingdom, which has its headquarters in the Netherlands); and subsidiaries of listed domestic companies already included in the sample (e.g. Enel Green Power in Italy, which is a subsidiary of Enel). The necessary ownership data are hand-collected and we do not simply look at ownership percentages in order to determine whether or not a company is a subsidiary; for example, Saipem in Italy is a subsidiary of Eni although Eni holds substantially less than half of the share capital and voting rights. This results in the exclusion of 102 companies.

We study 2011 IFRS financial statements. The one exception to this is that we include the first available IFRS financial statements for ten Canadian and four South Korean companies having year-ends other than 31 December 2011. However, there are no such reports for some index

[50] For Canada and South Korea, the two countries where IFRS was not used in 2005, we only include the index constituents on 31 December 2010.

companies: first, 16 companies (mostly from Canada and Switzerland) use US GAAP and are therefore not considered; second, six Chinese companies use Chinese GAAP only (see footnote 35); third, three Canadian companies with rate-regulated activities use Canadian GAAP; fourth, 47 companies were index constituents in 2005 and/or 2010 but had been taken over/delisted by 2011. Consequently, our final sample consists of 514 unique companies (see Table 4 for a breakdown by country). For all these companies, with the exception of some South Korean ones, we used English language reports. For those South Korean companies which did not provide consolidated statements in English, we used the information that we could find from regulatory filings (from the 'DART') or from unconsolidated statements.

Appendix C. Data collection and coding procedures

This Appendix provides details on how we collected the data on observable IFRS policy choices (see Table 3) and on how we coded the data in order to generate binary choice data (see Table 5).

C.1. General procedures

Our default procedure is to record the IFRS policy choices based on the information provided in the financial statements or the accounting policies section of the notes. If there is no or insufficient information, other parts of the notes are searched for the relevant information. We ignore cases without a corresponding number in the current year; this applies when a company states a policy choice which was previously made but is not applicable any more. We also ignore choices that only relate to an associate or joint venture.

C.2. Specific procedures

Topic 1 (income statement format): 'neither' is recorded if the income statement contains both a by-nature and a by-function expense or if the income statement contains so few lines that it is unclear whether it is 'by nature' or 'by function'. We define a binary choice by distinguishing whether or not the income statement is by nature because the 'neither' cases are usually more similar to 'by function' than 'by nature'. For financial companies, this topic is omitted because the distinction between 'by nature' and 'by function' is not applicable to most of them.

Topic 2 (operating profit shown or not): For financial companies, this topic is omitted because for many of them there is only a line for earnings before taxation (EBT) since EBT = operating profit.

Topic 3 (position of equity profits in the income statement): We define a binary choice by distinguishing whether or not the item is included in operating profit, which we consider to be the key issue. Many financial companies do not have a clear 'operating' or 'financing' section in the income statement; for these, we record that equity profits are *not* included in 'operating' if they are clearly separately shown below the operating expenses items. We ignore cases where both options are used (which applies to two companies).

Topic 4 (balance sheet showing net assets or not): Showing 'net current assets' is treated as showing 'net assets'.

Topic 5 (liquidity order of the balance sheet): No specific procedures.

Topic 6 (direct or indirect operating cash flow): Information is collected from the cash flow statement only. Otherwise most companies would use indirect cash flows because those using direct cash flows usually show a reconciliation of an income statement number to cash flow from operating activities in the notes.

Topic 7 (position of dividends received in the cash flow statement): We ignore cases where both options are used for different types of dividends (which applies to nine companies).

Topic 8 (position of interest paid in the cash flow statement): Our assumption is that companies have interest paid, unless there is evidence against it. Therefore if a company uses the indirect method and the cash flow statement does not show interest paid, it can be inferred that interest paid is included in operating cash flows. Interest paid includes capitalized borrowing costs. We ignore cases where both options are used (which applies to four companies). For financial companies, this topic is omitted because IAS 7.33 states that interest paid is 'usually' classified as operating cash flows for a financial institution.

Topic 9 (some property at fair value or not): Only annual revaluations to fair value are considered, not initial recognition, impairments or first-time adoption of IFRS.

Topic 10 (investment property at fair value or not): The choice of valuing some investment property at fair value according to IAS 40.32A is ignored if a company generally uses the cost model.

Topic 11 (some designation of financial instruments at fair value or not): Some fair value designation is only recorded if a company clearly states that financial instruments have been designated as at FVTPL (i.e. the fair value option is used) and the notes show a corresponding number to confirm this. The latter is necessary because many companies have boilerplate notes concerning fair value designation even though there is no such designation in the particular company. For financial companies, this topic is omitted because

many have some fair value designation due to having a large number of financial instruments.

Topic 12 (inventory valuation): Any method other than FIFO or weighted average is ignored. This mainly applies to the 'retail method' used in the retail sector. For financial companies, this topic is omitted because most of them do not report inventories.

Topic 13 (treatment of actuarial gains/losses): Any choice that results in unrecognized actuarial gains and losses (AGL) is treated as using the corridor method, because the key difference between the corridor method and the other options is the existence of unrecognized AGL. We define a binary choice by combining the options 'corridor method' and 'to income in full' because we consider the key issue to be whether or not AGL are ever charged in the income statement, which is not the case under 'actuarial gains and losses to OCI'.

Topic 14 (treatment of joint ventures): The choice of designation as at fair value through profit or loss upon initial recognition (IAS 31.1) is ignored. This only applies to two financial companies in our sample. We ignore the choice of one financial company which uses both proportionate consolidation and the equity method.

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