

***The Quality and Usability of XBRL Filings in the US***

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***Preliminary version Comments welcome***

## ***The Quality and Usability of US SEC XBRL filings***

*In 2009, the US Securities and Exchange Commission (SEC) required all public companies and mutual funds to report their financial information to the SEC using a markup language called eXtensible Business Reporting Language (XBRL). The purpose of this requirement was to improve the accessibility to financial accounting data, increase the information flow between companies and investors, and make it easier and cheaper to collect and analyze data. Some controversy exists whether the benefits from using XBRL based data outweigh the costs associated with the creation of data and the use of the data. As part of that discussion, some claimed that the XBRL filings are of low quality and are difficult to use. The purpose of this paper is to examine the quality and usability of XBRL filings by examining different filing characteristics and mistakes over time. The focus of this paper is on the following characteristics: the use of extended tags, Document and Entity Information (DEI) errors, scale errors, and sign switches. Findings suggested that starting in 2012, there has been a steady improvement in the quality and usability of the XBRL filings in most aspects. Additionally, it seems that the lower quality and usability originates in data in the notes to the financial statements and in data filed by smaller companies. The results presented in the paper are consistent with the notion of companies moving along a learning curve and improving the quality and usability of the XBRL data as they gain more experience tagging. These improvements make it easier to use the XBRL filings and reap the benefits offered by this data. However, in spite of the efforts and improvements, it seems like more work is needed to continue improving the quality of the data.*

## ***The Quality and Usability of US SEC XBRL filings***

### ***Introduction***

*In 2009, the US Securities and Exchange Commission (SEC) required all public companies and mutual funds to report their financial information to the SEC using XBRL (SEC 2009). XBRL is an eXtensible Markup Language (XML) based computer language which structures the form in which financial data is recorded by attaching tags to individual pieces of data. The data can then be retrieved and read by machines.*

*The purpose of requiring the XBRL filings was to improve the information flow between companies and investors and make it easier and cheaper to collect and analyze data. However,*

*some controversy exists whether the benefits from using the data outweigh the costs associated with the creation of the data and overcoming any obstacles for using the data.*

*The purpose of this paper is to examine the quality and usability of the XBRL data since the 2009 mandate until now. In a recent speech, SEC Commissioner Kara Stein, discussed disclosures in the digital age and said “it is important that structured data quality be carefully vetted and monitored” (SEC 2016). This paper answers that call.*

*When filing in XBRL, companies need to assign a tag, and some context to each amount included in the financial statements and notes to the financials. For example, if a company wants to report revenues, they may use a tag called “Revenues”. In addition, companies report some additional information about the amount including the units (likely US dollars in this case), the period, etc. Companies typically choose the XBRL tag from the taxonomy or list of tags published by the Financial Accounting Standards Board (FASB). The SEC mandate, allows companies to create a unique, customized tag. Allowing companies to create their own tag enables companies to report unique amounts. For example, a for profit university may want to report academic revenue separately. There is no academic revenue tag in the taxonomy, so allowing the filer to create a customized, unique tag, would enable them to report this amount. These unique tags are typically referred to as an extension, because they are used to extend the FASB taxonomy.*

*However, the existence of unique tags, makes it more complex to use the XBRL data. Extended tags reduce comparability between companies. It is difficult to compare companies if they are using different tags to tag what is essentially the same information, but it is much more difficult to compare companies if companies are using extended tags. There is no registry of extended tags, and it is difficult to automate the consumption of the data that includes extended*

*tags because it is hard for a machine to “understand” what type of data is included in those tags. The view taken in this paper is that the use of extended tags reduces the usability of the XBRL data by making it harder to automate the consumption of the data.*

*I investigate all XBRL filings between the years 2009 and 2016<sup>1</sup> and investigate the prevalence of errors in the XBRL filings and the use of extended tags. My overall findings show that in most aspects, the quality and usability of the XBRL data has improved over time, after 2012. The analysis suggests that most errors and usability issues (extended tags), stem from the data in the notes to the financial statements. Additionally, results suggest that data filed by smaller companies tends to be of lower quality and usability. This may be caused by smaller companies having less experience tagging in XBRL or by a decision to devote fewer resources to the filing in XBRL. Although clearly there have been significant efforts made to improve the quality of the XBRL data, it is not yet clear to what extent these efforts have been successful.*

*The results presented in this study can be used by filers and filing agents to improve the quality of their filings. The results can also allow regulators to assess the effectiveness of their efforts to increase the quality and usability of the XBRL based data. Specifically, the SEC can examine more closely XBRL filings and potentially ask filers to correct some mistakes before accepting their filings. FASB, as the developer of the US GAAP XBRL taxonomy, can use the results shown here to continue improving the XBRL taxonomy. Finally, users of the financial statements can now use XBRL filings with greater confidence, albeit, further improvement is needed. It seems that at this point, using the “raw”, as filed, XBRL data may be complex. Users may need to rely on the SEC, or other data vendors, and use data for which XBRL mistakes were corrected.*

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<sup>1</sup> Specifically, the sample includes all filings filed until April 15<sup>th</sup>, 2016.

*The paper continues with a section discussing the factors affecting quality and usability of the XBRL filings. It is followed by a section on using XBRL filings and a section discussing the impediments to using the data. After describing the sample used in the study, I review the quality and then the usability of the XBRL filings. I end with concluding remarks.*

### ***Factors affecting the quality and usability of the XBRL filings***

*The quality and usability of XBRL data is primarily determined by the quality of the tagging of the data. The tagging is done either by the filer, or by a third party. Even when the tagging is done by the filers, the filers use typically a third party software.*

*There is undoubtedly a learning curve associated with the tagging of XBRL data. Like any new technology, the adoption and diffusion of the technology takes time. In their paper Hall and Khan (2003) examine the adoption of different new technologies in the US. The paper focuses on the adoption of consumer goods, but serves as an interesting reminder that the adoption of any technology takes time. One example mentioned in the paper is the adoption of a relatively recent technology, personal computers (PC). It took about 20 years for 50 percent of US households to have a PC.*

*Aware of this learning curve, the SEC's XBRL mandate included an initial two year grace period during which there was limited liability on companies' XBRL filings.<sup>2</sup>*

*As an example of the evolution and maturing of the XBRL technology, we can observe the apparent decrease in cost of tagging the XBRL data. A recent study by the American Institute of CPAs (AICPA) and XBRL US<sup>3</sup>, finds that 69 percent of small companies (defined as \$75 million or less in market capitalization), pay \$10,000 or less per year to fully outsource the tagging of*

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<sup>2</sup> "XBRL filings are subject to limited liability within 24 months of the time the filer first is required to submit interactive data files. The limited liability provision terminates entirely as of October 31, 2014" (SEC 2009). <sup>3</sup> XBRL is a non-profit organization with a mission of supporting the implementation of XBRL in the US. It is the local jurisdiction of XBRL International ([www.xbrlus.org](http://www.xbrlus.org)).

*their XBRL filings (AICPA 2015). This amount seems very reasonable and suggests the tagging procedure has matured.*

*If filers know that their XBRL filings are being used, they would have more of an incentive to improve the quality of their XBRL filings and maintain a high quality in the future. The SEC has the role of incentivizing filers. The SEC sent comment letters to companies about their XBRL data. In 2014, looking specifically at the use of custom, extended tags, the SEC published staff observations and a sample comment letter about the use of extended tags (SEC 2014). The publication encouraged filers to use fewer extended tags and showed filers that the SEC is examining the quality of their filings. Another example of the role played by the SEC in ensuring the quality of the XBRL filing was apparent on March 2, 2016. Goldman Sachs Group Inc. filed with the SEC an amended annual report because the annual they filed on February 22, 2016, had incorrect XBRL based data. News about this amended filing was widely interpreted to mean that the SEC is examining the XBRL filings more closely.*

*As the SEC scrutinizes XBRL filings more closely, and as it is seen publicly addressing the quality and usability of XBRL data, filers become more concerned with their XBRL filings and pay more attention to them.*

*Another factor affecting the quality of XBRL filings is the FASB. FASB is in charge of developing the XBRL taxonomy.<sup>3</sup> Since the publication of the initial taxonomy, the FASB's Taxonomy staff continuously makes changes to the taxonomy. The purpose of those changes is to update the taxonomy to include any changes in the accounting rules (US GAAP), and to identify and potentially incorporate common extensions into the taxonomy (FASB 2016). One would*

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<sup>3</sup> *The XBRL taxonomy consists essentially of a list of XBRL tags that are to be used to tag the data filed by companies with the SEC.*

*expect that as the taxonomy improves, filers would have less of a need to use unique, extended tags, and hence increase the usability of the XBRL data.*

*XBRL US also plays an important role in the quality of XBRL data. XBRL US wanted to address what they viewed as “absence of unambiguous guidance for using the US GAAP taxonomy and lack of corporate awareness of errors in their filings” (XBRL US 2016). To that end, they created the Center for Data Quality, and the Data Quality Committee (XBRL US 2015). In addition to providing guidance, XBRL US has developed a set of rules and tools to improve the quality of data.*

*The responsibility for the quality of the XBRL filings lies with the filers, especially now that all filers do not enjoy a limited liability on their XBRL filings. However, several other stakeholders have a role to play in helping and guiding filers and filing agents, and in providing an incentive for the filers to file high quality XBRL filings.*

### ***Using XBRL filings***

*The main advantage of using XBRL filings is that the data is machine readable and hence could be, at least in theory, used more quickly and cheaply than using current data collection methods that involve manual entry. Another advantage of using XBRL based filings is that since all figures in the financial statements and notes to the financial statements are tagged, users have access to much more data than before. In fact, most data from the financial statements or the notes to the financial statements that was previously hand collected, can now be collected using  
XBRL.*

*There is some evidence of the positive impact of using XBRL filings.<sup>4</sup> Yen and Wang (2015) find that the adoption of XBRL is positively associated with the market reaction to earnings surprises. Efendi et al. (2014) find some evidence that XBRL filings increase information efficiency. Sheridan and Drew (2012) find that XBRL enhances information sharing between companies and their various stakeholders. Ly (2012) shows an increase in analysts' coverage and quality of the companies' earnings forecasts empirically after starting to file in XBRL. Boritz and No (2013) find that there are fewer omissions in the XBRL based data compared to other data vendors. Pinsker and Wheeler (2009) conduct a survey and determine that once practitioners and investors are familiar with the benefits of XBRL, they are much more likely to conduct analysis utilizing it. They urge organizations developing and promoting XBRL to put more effort into educating consumers of financial information of the benefits of XBRL reporting.*

*However, other research has raised concerns about the usability and quality of the XBRL filings. Initial evidence about the quality of XBRL filings was not promising. Debreceeny et al. (2010) find that a quarter of the initial filings have mathematical relationship errors.*

*In a more recent study, Hoitash and Hoitash (2015) propose using a measure of accounting complexity based on the number of extensions used by a company. The authors find that higher complexity (as measured by the use of more XBRL tags and extended tags) is associated with lower quality of the accounting information.<sup>5</sup>*

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<sup>4</sup> For an extensive review of XBRL literature see Perdana et al. (2015).

<sup>5</sup> Specifically, the authors find that higher complexity is strongly associated with an increased likelihood of issuing financial statement restatements, disclosing material weaknesses in internal controls, higher levels of abnormal accruals, and higher audit fees.

### ***Impediments to using XBRL data***

*There are several potential impediments to using XBRL based data. One such difficulty with using XBRL filings arises from potential mistakes in the filings. In this context, I examine several types of mistakes including errors in the Document and Entity Information (DEI), scale errors, and sign switches. In addition, the use of company specific, unique XBRL tags, makes it harder to use the XBRL data and compare the data across companies. Following is a review of the different errors I examine in this study as well as a more detailed examination of XBRL extended tags.*

*Every XBRL filing should include information that refers to the entity and the document filed. I examine DEI errors in the following areas:*

- Fiscal Year error*
- Fiscal Period error*
- FY End Date error*
- Fiscal Period End Date error*
- Share Count error*
- Share Date error*

*Identifying these errors is not a trivial process. Most errors are identified by comparing the current filing to prior filings made by the same company. For example, if a company consistently reports a fiscal year end (FYE) of 12/31, and in one filing reports a FYE of 6/30, this may be an error, or the company indeed changed its FYE to 6/30.*

*Scale errors consist of cases in which companies report amounts in the wrong scale. For example, a company reported for 2014, total assets of \$3 billion and in their filing in 2015, they reported total assets for 2014 (for comparison purposes) of \$3 million. It may be that the 2014 total assets were revised to \$3 million, however, it is likely that this is a mistake and it needs to be investigated further.*

*The last type of error I examine is sign switches. Sign switches do not represent an error quite the same way as a scale error. The taxonomy or best practices have defined the appropriate way of reporting amounts for all elements. For example, an income tax expense is supposed to be reported as positive if it is actually an expense, and is supposed to be reported as a negative amount if the company has an income tax credit. By looking at the individual data point, a user cannot know if the number is supposed to be positive or negative because the user does not know if the company has an income tax expense or an income tax credit. Regardless, if the company switched the signs for this amount, the company was bound to have made a mistake in one of the cases (before or after the switch). Similar to the case with scale errors, we observe these switches by comparing the amount filed this period would the corresponding amount filed in prior periods.*

*All errors reported in this paper were checked, typically manually, to determine that these are actually errors and not coincidental revisions.*

*The main problem with these errors is that if a user were to use the “raw” XBRL data as it was filed with the SEC, the data would include incorrect data and may lead to mistakes in the evaluation of the company and to potentially erroneous investment decisions. At the same time, data aggregators should be aware of these errors, identify them and correct them so they can provide users with accurate data.*

*Another impediment to using XBRL data is the use of extended tags. The list of standard tags in the US is published by the Financial Accounting Standards Board (FASB). This list of tags is called the taxonomy. Companies refer to this taxonomy when creating their XBRL filings. In the US however, companies are also allowed to extend the taxonomy by creating their own unique tags. These extensions were allowed to enable companies to report unique information*

*that was not included in the taxonomy. Unfortunately, these extensions are harder to understand by computers because they are not part of any list of known tags, and because XBRL does not currently capture enough information to accurately classify the extensions. Hence a computer reading XBRL filings with extensions needs to “understand” in some way, what is the information conveyed in that tagged data. The main premise here is that the more extensions exist, the harder it is to use the data. The use of extensions makes it difficult to compare companies since some may be using unique (extended) tags to tag what is essentially similar information to the one that other companies tag with a taxonomy tag.*

### ***Sample***

*The data for this study was collected from all the XBRL based filings with the SEC from 2009 to 2016. The data includes all XBRL filings filed until April 15<sup>th</sup>, 2016. It should be noted that because of the date of retrieval, the 2016 fiscal period represents a partial sample for the year because most companies had not yet filed their fiscal 2016 filings. All data about XBRL extensions, as well as the data about the XBRL errors, was provided by Calcbench.<sup>6</sup>*

*The availability of XBRL data has increased over time from participation in the SEC’s voluntary filing program in 2005 to an SEC rule (SEC 2009) that mandates a three-year phase-in of XBRL for all listed corporations. Based on the SEC rule, starting in fiscal year 2012, most public companies were required to tag the “face” financial statements and the details in the financial statement notes in Item 8 of the annual 10-K filings. The tagging of the notes to the financial statements substantially increased the amount of data that was available in XBRL. However, the complexity and uniqueness of that data posed a significant challenge when tagging this information.*

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<sup>6</sup> Calcbench is a provider of XBRL based financial data and tools ([www.calcbench.com](http://www.calcbench.com)).

*The distribution of filings over time is presented in Table 1. As can be seen in the table, the number of filings increases significantly until 2012 when the three-year phase-in ended, and all companies were required to file in XBRL.*

## ***Review of the quality of XBRL filings***

### ***DEI errors***

*I start the review of the quality of the XBRL filings by examining DEI errors. I examine a specific subset of potential DEI errors. As previously described, I examine:*

- Fiscal Year error<sup>7</sup>*
- Fiscal Period error*
- FY End Date error*
- Fiscal Period End Date error*
- Share Count error<sup>8</sup>*
- Share Date error*

*It should be noted that filings in 2009 were not required to contain fiscal periods and years.*

*Although a few filings have as many as 5 errors, the majority of the filings with DEI errors have only one error. The average number of DEI errors per filing with DEI errors is 1.17, and the median number of errors is 1. I focus the analysis on filings with at least one DEI error and not on the number of DEI errors. Table 2 includes the number of XBRL filings with at least one DEI error.*

*I further chart the percentage of filings with DEI errors as a percentage of the total number of filings. This chart is presented in Chart 1. Since the DEI data that is included in the*

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<sup>7</sup> *Fiscal year errors are only identified for companies with a fiscal year end date of December 31<sup>st</sup>, since this is the only case in which the fiscal year can be identified as being right or wrong.*

<sup>8</sup> *A share count error is identified as such if the amount does not match the value in the associated “paper” (html) filing. There may be cases in which the amount in the XBRL filing is actually the correct amount, in which case this would cause this error to be over reported.*

*annual filings and the quarterly filings is the same, I do not examine those separately. As can be seen in the chart, DEI errors do not seem to present a major, or frequent problem. Additionally, when focusing on the period between 2011 and 2015 (when most filings were filed), the number of DEI errors seems to be in the 2% to 3% range, and it seems to be trending downwards.*

### *Scale errors*

*Scale errors represented cases in which a fact is reported in the wrong scale (millions instead of thousands, millions instead of billions, etc.). These types of errors are typically detected by comparing figures for the same period, which are reported in different filings. For example, Revenues for the fiscal year 2012 are reported in the 2012 annual report, but are subsequently reported in the 2013 annual filing, where the 2012 revenues are reported for comparison purposes.*

*Similar to the analysis with DEI error, I focus on filings that have at least one scale error, as opposed to focusing on the number of scale errors. The number of filings with at least one scale error are presented in Table 3. There is an average of 11 scale errors per filing. This average is skewed upwards because of some filings with many scale errors.<sup>9</sup> The median is 4 scale errors per filing.*

*The amount and type of information included in the annual filings and quarterly filings is not the same. On the one hand, the annual filings have many more figures, so it would be expected to find more scale errors in the annual filings than in the quarterly filings. On the other hand, the annual filings are audited, and may be subject to more scrutiny, decreasing the likelihood of finding scale errors. Hence it would be possible to find a different pattern of errors*

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<sup>9</sup> A company filed its annual financial statement in 2012 with 3,683 scale errors.

*between annual and quarterly filings. As a result, I examine annual and quarterly filings separately.*

*Chart 2 presents the percentage of annual filings with at least one scale error. As can be seen in the chart, there is a large increase in scale errors in 2012. The increase is likely a result of many more companies required to file XBRL filings, and a result of the detailed information that was required to be tagged by many companies in 2012. Following the increase in 2012, there seems to be a steady decrease in percentage of annual filings with scale errors. The large increase we observe in 2016 is based on very few filings (9 filings with scale errors, out of 52 for the period), so it is hard to say whether the downward trend ended.*

*When analyzing whether the scale errors appear in the information in the face financials (Income Statement, Balance Sheet, Statement of Cash Flows and Statement of Stockholders Equity) or in the notes to the financial statements, it is clear that the majority of scale errors exist in the data in the notes to the financial statements.*

*Chart 3 presents the percentage of quarterly filings with at least one scale error. The results for the quarterly filings seem to be similar to the ones for the annual filings in that there seems to be a large increase in filings with scale errors in 2012, followed by a steady decrease. Similar to the annual filings, there is an increase in Q1 of 2016, which is also based on relatively few observations, so it is not clear whether the decrease in scale errors continues. Also similar to the annual filings, the scale errors seem to stem from the information in the notes to the financial statements.*

*When comparing the results for the annual filings (Chart 2) and quarterly filings (Chart 3), it is interesting to note that the percentage of annual filings with scale errors (12% to 16%) is larger than the percentage of quarterly filings with scale errors (10% and lower). This*

*difference is likely a result of the complexity and diversity of the information included in the annual filings.*

*To examine whether there is a difference in scale errors between larger and smaller companies, I divide the companies into quartiles based on their total assets for the period. I examine scale errors in both the face financials and footnotes, and for simplicity, focus on annual filings. The percentage of annual filings with at least one scale error, by size of the company, is presented in Chart 4. Overall, the results seem to be similar to the ones presented in Chart 2. As can be seen in the chart, the smaller companies seem to have more scale errors than the larger companies. The larger rate of errors we observe for the smaller companies may be a product of the relative lack of experience in tagging XBRL data resulting from the phased-in adoption.*

#### *Sign switches*

*Amounts in the XBRL filing can be defined as positive or negative. Sign switches are cases in which certain amounts are originally reported as positive and then subsequently as negative or vice versa. As previously explained, there is no way to know if the amount reported in the XBRL filing has the correct sign. However, by focusing on sign switches, we can identify cases in which the company must have made a mistake in one of the periods in which the amount was reported (before or after the switch). Similar to the case with scale errors, we observe these switches by comparing the amount filed this period with the corresponding amount filed in prior periods. Hence, it is of interest to examine sign switches.*

*Table 4 contains the number of filings with at least one sign switch for the different fiscal periods in the sample. As can be seen in the table, sign switches seem to be fairly common. The number of filings with at least one sign switch is much larger than the number of filings that*

*contained DEI errors or scale errors. In addition, many filings have multiple sign switches. There is an average of 6.09 sign switches per filing, with a median of 3 sign switches per filing. The range of sign switches is extensive, with 42 filings with more than 100 sign switches. As can be seen in Table 4 and Chart 5, the problem of sign switches is a substantial problem affecting a large percentage of the filings. One potential explanation for the increase in sign switches may be related to filers correcting mistakes they made in previous filings. The results for the quarterly filings, presented in Chart 6, seem to tell a similar story.*

*XBRL US's Data Quality Committee (DQC)<sup>10</sup> deliberated the problem of XBRL filings including amounts with negative values, although those are supposed to be positive. The DQC further published a data validation rule to address this problem (XBRL US - DQC, 2016). Although this rule became effective only on January 1<sup>st</sup>, 2016, previous discussions in the Committee may have prompted filers and filing agents to start correcting mistakes they previously made, hence causing the rate of sign switches to go up. Unfortunately, error correction is likely just a partial explanation to the large rate, and increase in sign switches. Sign switches still seem to be a significant problem that should continue to be addressed.*

*Similar to the previous examination, I divide the companies into quartiles based on their total assets for the period. I examine annual filings with any sign switch. The percentage of annual filings with at least one sign switch, by size of the company, is presented in Chart 7. Overall, the results seem to be very similar to the ones presented in Chart 5. However, there seems to be a clear difference between the groups. The smaller companies seem to have consistently more sign switches than the larger companies. Moreover, it seems like on average, the larger the company, the fewer sign switches it has. Similar to the argument presented for the*

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<sup>10</sup> The DQC is comprised of filings agents, data vendors and others, and is tasked with developing guidance and rules that would prevent or detect errors in the XBRL filings filed with the SEC. More about the Committee can be found in <https://xbrl.us/data-quality/committee/>

*scale errors, the increased error rate in the group of smaller companies may be a result of the lack of experience tagging XBRL data.*

### *Overview of Errors*

*After examining DEI errors, scale errors and sign switches it seems like the most frequent type of error is scale errors. Overall, the number of filings with errors seems to have risen significantly in 2012, and seems to be improving after that. It seems like both scale errors and sign switches occur primarily in the data in the notes to the financial statements rather than in the face financials. This is to be expected given the relative complexity of footnote data, as well as the relative lack of standardization of the information contained in the notes.*

*When examining the errors by size, results suggest that smaller filers tend to have more errors than the other groups of companies. This higher rate of errors in the smaller companies may happen because these companies have relatively less experience in tagging XBRL data resulting from the phased in adoption of XBRL filings. Alternatively, it could be that smaller companies tend to devote fewer resources to their XBRL filings than the larger companies. Companies have a choice of using a tagging software and tagging the XBRL filings themselves, or using a third-party to tag the filings for them. One potential explanation to the findings that cannot be corroborated using publicly available data, is that smaller companies tend to choose the less costly method of tagging the filings themselves, whereas larger companies hire a thirdparty to tag the filings. This would be consistent with smaller companies making more mistakes.*

## ***Review of the usability of XBRL filings***

*Companies' ability to create unique tags and extend the taxonomy helps with the richness of the data that is provided by companies. However, these extended tags make it more difficult to use the data and compare between companies. I examine the use of extensions (extended tags) over time. Since the amount and type of information included in annual filings is substantially larger and more diverse than in quarterly filings, it would be expected to find a different pattern of use. Hence, I examine annual and quarterly filings separately. The average percentage of extended tags as a percentage of the total number of tags over time is shown in Chart 8 (for the annual filings) and in Chart 9 (for the quarterly filings).*

*As can be seen from Chart 8, there seems to be a substantial increase in the use of extensions in fiscal 2012. This may be related to the end of the phase-in period and the requirement for all companies to file in XBRL.*

*In 2012, companies were also required to tag the notes to the financial statements in detail.<sup>11</sup> Hence, to examine further the source of the increase in use of extended tags, I calculate the average extension rate separately for the face financials and for the notes to the financial statements.*

*This analysis clearly shows that the increase in the use of extended tags originated in the footnotes and not in the face financials. In 2012, many companies were required to tag much more information than before. This information is likely to be more complex than the information included in the face financials. This complexity of the information may have resulted in companies not finding the appropriate taxonomy tag and electing to create a unique tag and extended the taxonomy.*

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<sup>11</sup> This tagging in detail is also referred to as detailed tagging or level four tagging.

*Companies not finding an appropriate tag may have been a result of lack of training or knowledge on the companies' side or on the side of the third party vendor that was tasked with tagging the information. Alternatively, this increased use of extended tags may have resulted from the XBRL taxonomy, published by FASB, not being comprehensive enough. As a result, companies were not able to find an appropriate tag in the taxonomy and therefore created a unique tag.*

*Regardless of the reason for the increase use of extended tags in 2012, Chart 8 shows a significant decrease in the extension rate after 2012. This decrease in the extension rate is evident in both the face financials and the footnotes. The decrease is likely a combination of an improved taxonomy and companies doing a better job finding the appropriate tags within the taxonomy.*

*An analysis of the use of extended tags in quarterly filings is shown in Chart 9. The pattern we observe in the quarterly filings is similar to the one reported in the annual filings. We can observe an increase in 2012, followed by a decrease over time. The increase seems to stem from an increased use in extended tags in the notes to the financials. The use of extended tags in the face financials seems to be constantly decreasing.*

*Overall, the analysis of the use of extended tags in both annual and quarterly filings seems to tell a similar story. Following a large increase in the use of extended tags in 2012, we see a steady decrease in the use of extensions over time. The initial increase is likely a result of many more companies required to tag their financial information in XBRL and a result of the complexity of the information being tagged (the requirement to tag the notes to the financials). The decrease is likely to be a result of companies and third party service providers improving their tagging, as well as improvements in the XBRL taxonomy published by the FASB.*

*To examine whether there is a difference in the use of extended tags between larger and smaller companies, I divide the companies into quartiles based on their total assets for the period. The use of extended tags in the annual filings is show in Chart 10. The results overall are very similar to the ones presented in Chart 8 and show a decrease in the use of extensions over time. As can be seen in the chart, the quartile with smallest firms seems to use more extended tags over time. There is no distinguishable difference between companies in the other quartiles. The results are consistent with smaller firms lagging in the learning curve (which may be a result of the phased implementation of XBRL) or is also consistent with smaller firms spending fewer resources on their tagging.*

### **Conclusion**

*This paper examines the quality and usability of XBRL filings over time. Overall, the results suggest that both the quality and usability of XBRL has improved over time. When examining whether the mistakes were made in the face financials or the notes to the financials, it seems clear that the main source of mistakes is in the notes. The use of extended tags also seems to originate primarily in the notes.*

*When examining the quality and usability of the filings by firm size, it seems that the quality is higher in larger companies. The difference in quality between the different companies may be a product of the phased in mandate for XBRL resulting in larger companies having more experience tagging the data. Alternatively, it could be that smaller companies devote fewer resources to the XBRL tagging than larger companies.*

*One potential explanation to the findings that cannot be corroborated using publicly available data is that smaller companies tend to choose the less costly method of tagging the*

*filings themselves, whereas larger companies hire a third-party to tag the filings. This would result in smaller companies making more mistakes and using more extensions.*

*The results presented in the paper are consistent with the notion of companies generally moving along the learning curve and improving the quality of the XBRL data as they gain more experience.*

*There has been significant effort made by several stakeholders, primarily the SEC, FASB and XBRL US, to improve the XBRL data. These efforts have focused on providing more guidance and tools to individual filers and filing agents to increase the quality of the data. It seems however, that additional work could still be done to improve the quality and usability of the data even further.*

*It seems like many of the efforts to improve the quality of filings have been made in the last few years (for example the SEC comments and the establishment of XBRL US's Center for Data Quality) and may take some more time to take full effect. The access and availability of data increases tremendously when using XBRL based data. However, a current user of XBRL data, or a data aggregator that uses XBRL based data, needs to overcome some obstacles in the form of the errors and use of extended tags described in the paper.*

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Table 1 Sample distribution

This table presents the number and distribution of filings per fiscal period.

<i>Fiscal Period</i>	<i>Number of filings</i>	<i>Percentage of total</i>
<i>Q 1</i>	6	0.00%
<i>Q 2</i>	43	0.03%
<i>Q 3</i>	49	0.03%
<i>Annual</i>	59	0.04%
<b>Total for 2009</b>	<b>157</b>	<b>0.11%</b>
<i>Q 1</i>	405	0.27%
<i>Q 2</i>	1,191	0.80%
<i>Q 3</i>	1,296	0.87%
<i>Annual</i>	1,377	0.93%
<b>Total for 2010</b>	<b>4,269</b>	<b>2.87%</b>
<i>Q 1</i>	1,744	1.17%
<i>Q 2</i>	6,416	4.32%
<i>Q 3</i>	6,885	4.63%
<i>Annual</i>	6,956	4.68%
<b>Total for 2011</b>	<b>22,001</b>	<b>14.80%</b>
<i>Q 1</i>	7,769	5.23%
<i>Q 2</i>	7,872	5.30%
<i>Q 3</i>	7,800	5.25%
<i>Annual</i>	7,733	5.20%
<b>Total for 2012</b>	<b>31,174</b>	<b>20.98%</b>
<i>Q 1</i>	7,633	5.14%
<i>Q 2</i>	7,660	5.15%
<i>Q 3</i>	7,610	5.12%
<i>Annual</i>	7,554	5.08%
<b>Total for 2013</b>	<b>30,457</b>	<b>20.49%</b>
<i>Q 1</i>	7,503	5.05%
<i>Q 2</i>	7,470	5.03%
<i>Q 3</i>	7,460	5.02%
<i>Annual</i>	7,281	4.90%
<b>Total for 2014</b>	<b>29,714</b>	<b>19.99%</b>
<i>Q 1</i>	7,162	4.82%
<i>Q 2</i>	7,147	4.81%
<i>Q 3</i>	7,008	4.72%
<i>Annual</i>	6,347	4.27%
<b>Total for 2015</b>	<b>27,664</b>	<b>18.62%</b>
<i>Q 1</i>	1,575	1.06%
<i>Q 2</i>	1,036	0.70%

<i>Q 3</i>	<i>512</i>	<i>0.34%</i>
<i>Annual</i>	<i>52</i>	<i>0.03%</i>
<b><i>Total for 2016</i></b>	<b><i>3,175</i></b>	<b><i>2.14%</i></b>
<b><i>Grand Total</i></b>	<b><i>148,611</i></b>	<b><i>100.00%</i></b>

*Table 2 Filings with Document and Entity Information Errors*

*The following table shows the count of filings that have at least one Document and Entity Information (DEI) error.*

<i>Fiscal Period</i>	<i>Filings with DEI errors</i>
<i>Q 2</i>	<i>1</i>
<i>Q 3</i>	<i>1</i>
<i>Annual</i>	<i>4</i>
<b><i>Total for 2009</i></b>	<b><i>6</i></b>
<i>Q 1</i>	<i>4</i>
<i>Q 2</i>	<i>22</i>
<i>Q 3</i>	<i>24</i>
<i>Annual</i>	<i>34</i>
<b><i>Total for 2010</i></b>	<b><i>84</i></b>
<i>Q 1</i>	<i>60</i>
<i>Q 2</i>	<i>198</i>
<i>Q 3</i>	<i>243</i>
<i>Annual</i>	<i>202</i>
<b><i>Total for 2011</i></b>	<b><i>703</i></b>
<i>Q 1</i>	<i>291</i>
<i>Q 2</i>	<i>264</i>
<i>Q 3</i>	<i>271</i>
<i>Annual</i>	<i>184</i>
<b><i>Total for 2012</i></b>	<b><i>1,010</i></b>
<i>Q 1</i>	<i>276</i>
<i>Q 2</i>	<i>233</i>
<i>Q 3</i>	<i>243</i>
<i>Annual</i>	<i>148</i>
<b><i>Total for 2013</i></b>	<b><i>900</i></b>
<i>Q 1</i>	<i>234</i>
<i>Q 2</i>	<i>143</i>
<i>Q 3</i>	<i>140</i>
<i>Annual</i>	<i>146</i>
<b><i>Total for 2014</i></b>	<b><i>663</i></b>
<i>Q 1</i>	<i>177</i>
<i>Q 2</i>	<i>85</i>

<i>Q 3</i>	70
<i>Annual</i>	56
<b><i>Total for 2015</i></b>	<b>388</b>
<i>Q 1</i>	39
<i>Q 2</i>	9
<i>Q 3</i>	3
<b><i>Total for 2016</i></b>	<b>51</b>
<b><i>Grand Total</i></b>	<b>3,805</b>

*Table 3 Filings with Scale Errors*

*The following table shows the count of filings that have at least one scale error. The table separates between filings with scale errors in the face financials (Income Statement, Balance Sheet, Statement of Cash Flows and Statement of Stockholders Equity), notes to the financial statements, and anywhere in the filing.*

<i>Fiscal Period</i>	<i>Face Financials</i>	<i>Footnote</i>	<i>Anywhere</i>
<i>Q 2</i>	1		1
<i>Q 3</i>	2		2
<i>Annual</i>	2		2
<b><i>Total for 2009</i></b>	<b>5</b>		<b>5</b>
<i>Q 1</i>	2	1	3
<i>Q 2</i>	8	40	47
<i>Q 3</i>	8	30	36
<i>Annual</i>	18	56	68
<b><i>Total for 2010</i></b>	<b>36</b>	<b>127</b>	<b>154</b>
<i>Q 1</i>	21	24	40
<i>Q 2</i>	88	122	195
<i>Q 3</i>	98	122	207
<i>Annual</i>	225	334	498
<b><i>Total for 2011</i></b>	<b>432</b>	<b>602</b>	<b>940</b>
<i>Q 1</i>	155	162	296
<i>Q 2</i>	187	506	592
<i>Q 3</i>	204	534	633
<i>Annual</i>	417	1,122	1,255
<b><i>Total for 2012</i></b>	<b>963</b>	<b>2,324</b>	<b>2,776</b>
<i>Q 1</i>	236	688	778
<i>Q 2</i>	228	667	765
<i>Q 3</i>	204	557	642
<i>Annual</i>	324	957	1,057
<b><i>Total for 2013</i></b>	<b>992</b>	<b>2,869</b>	<b>3,242</b>
<i>Q 1</i>	185	479	561

<i>Q 2</i>	167	489	560
<i>Q 3</i>	176	477	549
<i>Annual</i>	236	915	981
<b>Total for 2014</b>	<b>764</b>	<b>2,360</b>	<b>2,651</b>
<i>Q 1</i>	146	455	514
<i>Q 2</i>	139	393	450
<i>Q 3</i>	110	374	410
<i>Annual</i>	199	649	697
<b>Total for 2015</b>	<b>594</b>	<b>1,871</b>	<b>2,071</b>
<i>Q 1</i>	34	115	130
<i>Q 2</i>	13	46	52
<i>Q 3</i>	4	17	19
<i>Annual</i>	4	8	9
<b>Total for 2016</b>	<b>55</b>	<b>186</b>	<b>210</b>
<b>Grand Total</b>	<b>3,841</b>	<b>10,339</b>	<b>12,049</b>

*Table 4 Filings with Sign Switches*

The following table shows the count of filings that have at least one sign switch. The table separates between filings with scale errors in the face financials (Income Statement, Balance Sheet, Statement of Cash Flows and Statement of Stockholders Equity), notes to the financial statements, and anywhere in the filing.

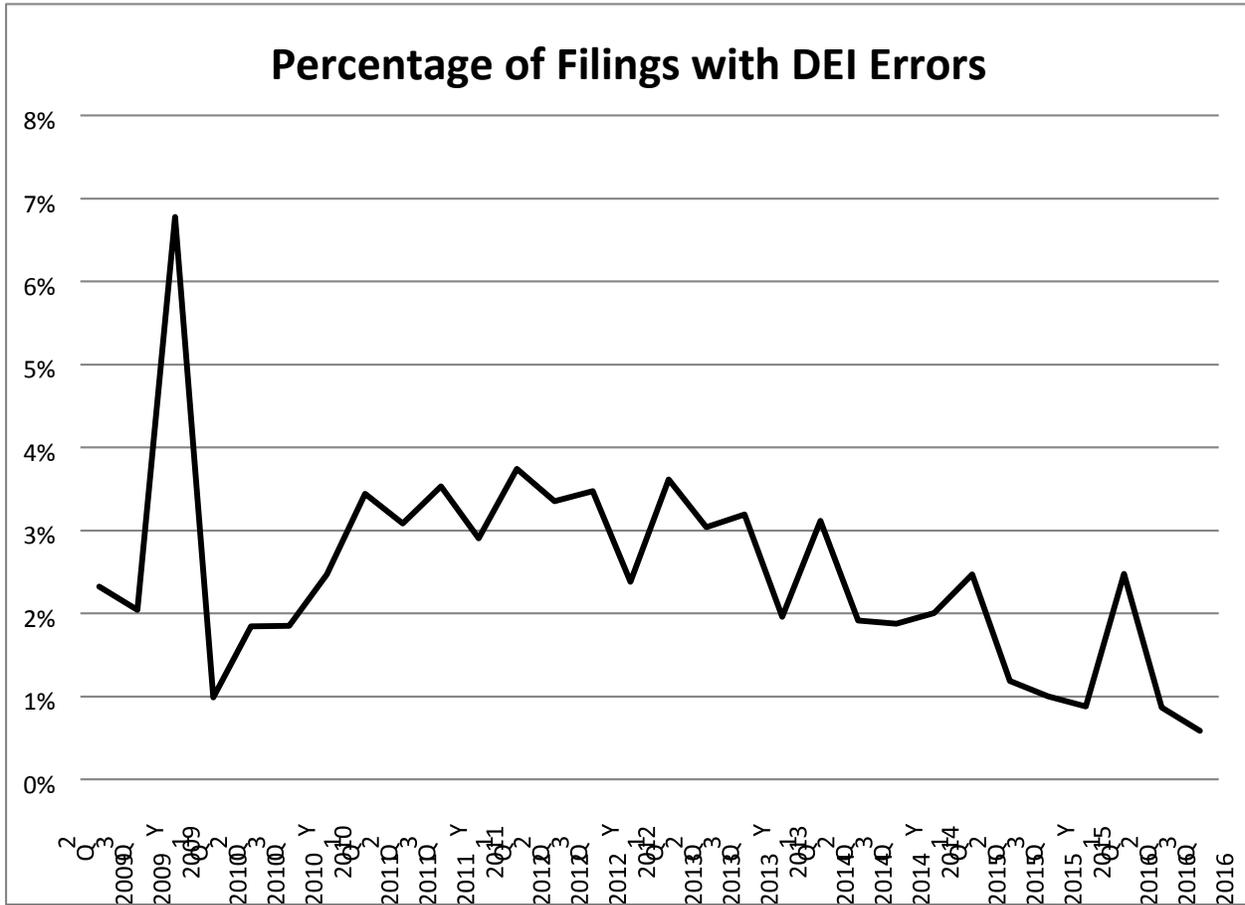
<i>Fiscal Period</i>	<i>Face Financials</i>	<i>Footnote</i>	<i>Anywhere</i>
<i>Q 2</i>	1		1
<i>Q 3</i>	3		3
<i>Annual</i>	10	1	10
<b>Total for 2009</b>	<b>15</b>	<b>1</b>	<b>15</b>
<i>Q 1</i>	31	3	32
<i>Q 2</i>	218	78	233
<i>Q 3</i>	213	148	272
<i>Annual</i>	346	256	388
<b>Total for 2010</b>	<b>808</b>	<b>485</b>	<b>925</b>
<i>Q 1</i>	273	175	325
<i>Q 2</i>	555	341	665
<i>Q 3</i>	779	528	979
<i>Annual</i>	1,248	877	1,424
<b>Total for 2011</b>	<b>2,855</b>	<b>1,921</b>	<b>3,393</b>
<i>Q 1</i>	875	614	1,136
<i>Q 2</i>	2,342	1,221	2,705
<i>Q 3</i>	2,429	1,582	2,994
<i>Annual</i>	3,191	2,704	3,924
<b>Total for 2012</b>	<b>8,837</b>	<b>6,121</b>	<b>10,759</b>
<i>Q 1</i>	2,302	1,725	3,044

<i>Q 2</i>	2,322	2,129	3,303
<i>Q 3</i>	2,276	2,065	3,208
<i>Annual</i>	3,087	3,772	4,549
<b>Total for 2013</b>	<b>9,987</b>	<b>9,691</b>	<b>14,104</b>
<i>Q 1</i>	1,830	1,924	2,844
<i>Q 2</i>	1,963	1,953	2,940
<i>Q 3</i>	1,908	1,921	2,870
<i>Annual</i>	2,687	3,606	4,250
<b>Total for 2014</b>	<b>8,388</b>	<b>9,404</b>	<b>12,904</b>
<i>Q 1</i>	1,621	1,876	2,686
<i>Q 2</i>	1,664	1,893	2,691
<i>Q 3</i>	1,600	1,831	2,581
<i>Annual</i>	2,329	3,471	4,024
<b>Total for 2015</b>	<b>7,214</b>	<b>9,071</b>	<b>11,982</b>
<i>Q 1</i>	513	662	932
<i>Q 2</i>	188	196	313
<i>Q 3</i>	105	117	174
<i>Annual</i>	13	35	39
<b>Total for 2016</b>	<b>819</b>	<b>1,010</b>	<b>1,458</b>
<b>Grand Total</b>	<b>38,922</b>	<b>37,704</b>	<b>55,539</b>

Chart –

1 Percentage of Filings with Document and Entity Information Errors

This chart shows the percentage of filings with at least one Document and Entity Information (DEI) error.



2 Percentage of Annual Filings with Scale Errors

Chart –

*This chart shows the percentage of annual filings with scale errors. The percentage is calculated based on the total number of filings for that fiscal period.*

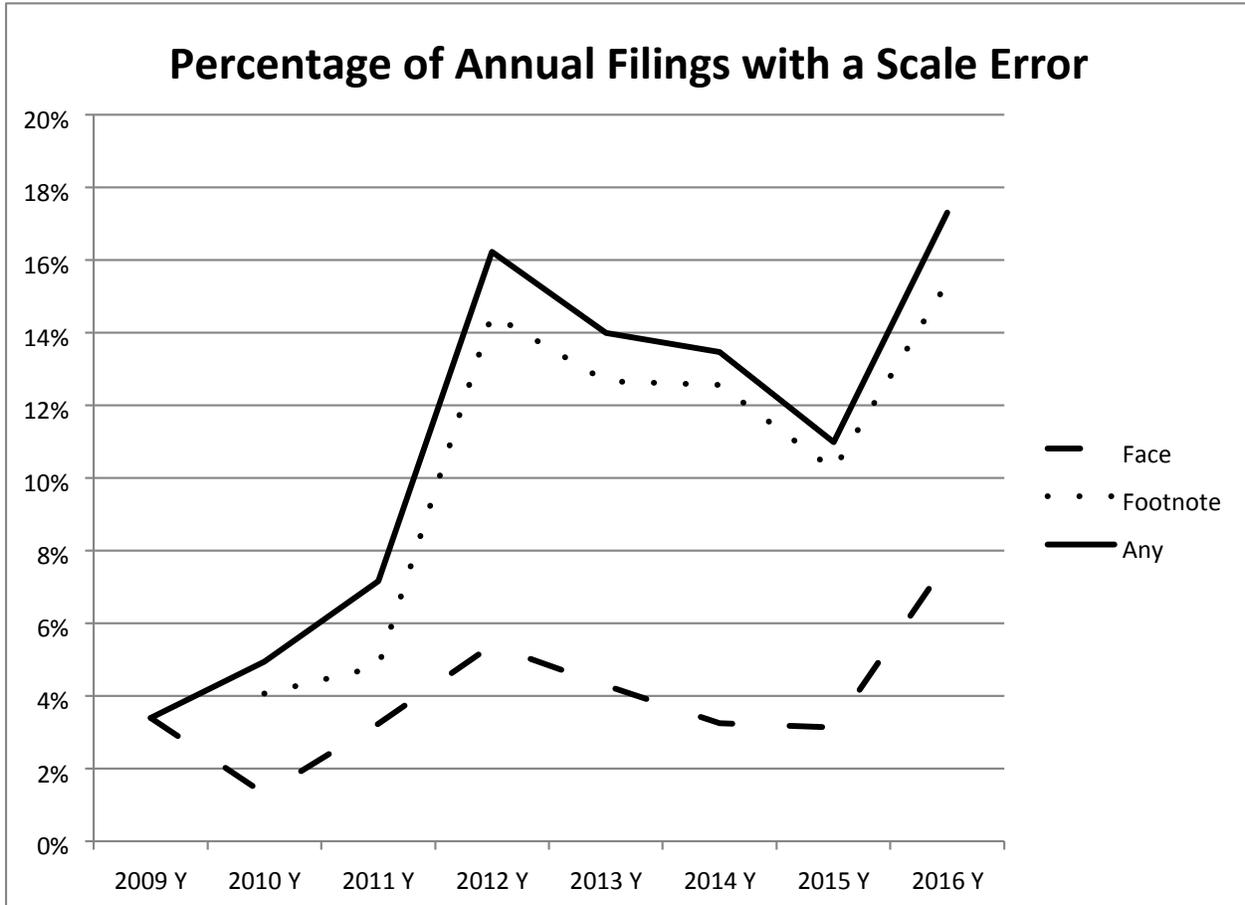
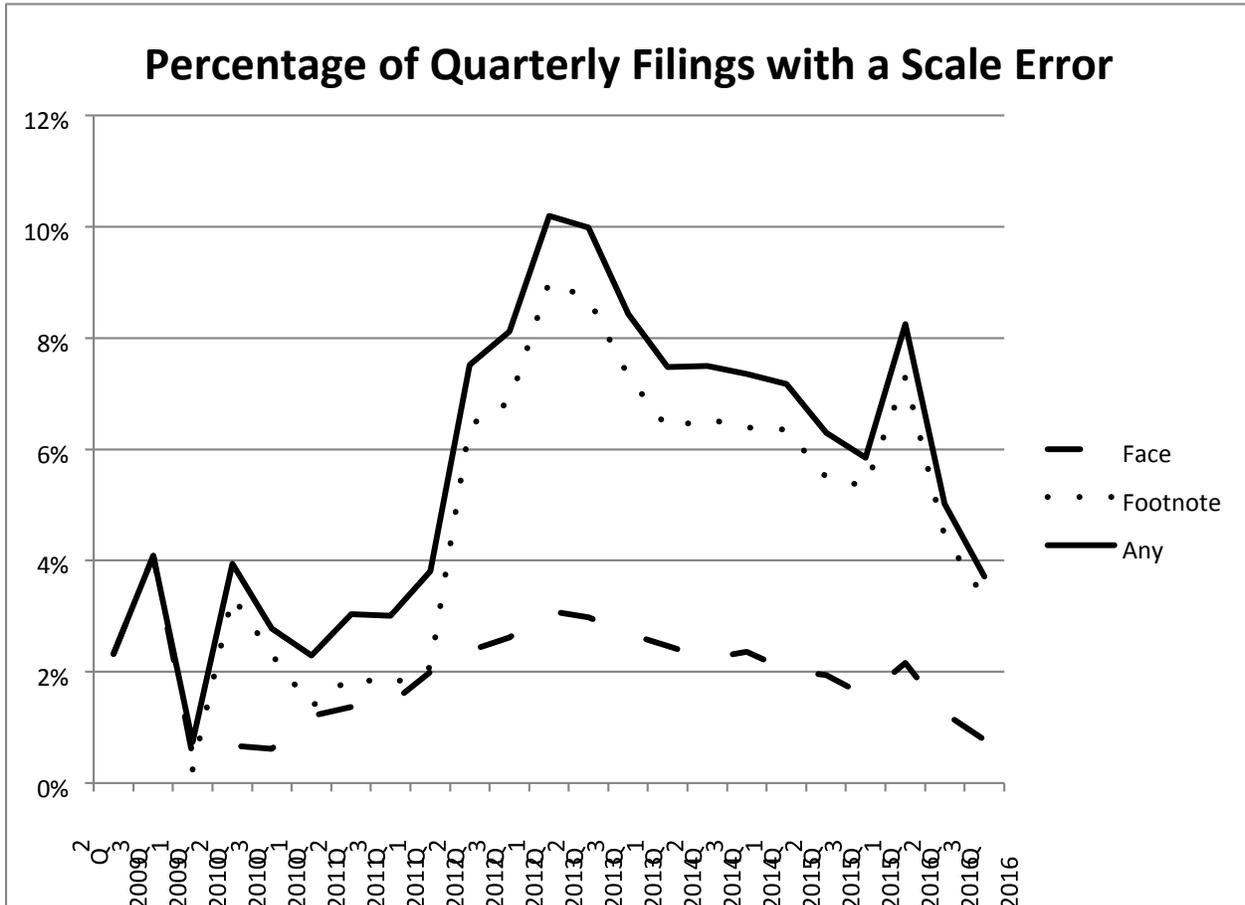


Chart –

### 3 Percentage of Quarterly Filings with Scale Errors

This chart shows the percentage of quarterly filings with scale errors. The percentage is calculated based on the total number of filings for that fiscal period.



*Chart* –

Chart 4 Percentage of Annual Filings with Scale Errors, by Size

This chart shows the percentage of annual filings with scale errors. The percentage is calculated based on the total number of filings for that fiscal period. The companies are divided into quartiles by size, as measured by the total assets for the period.

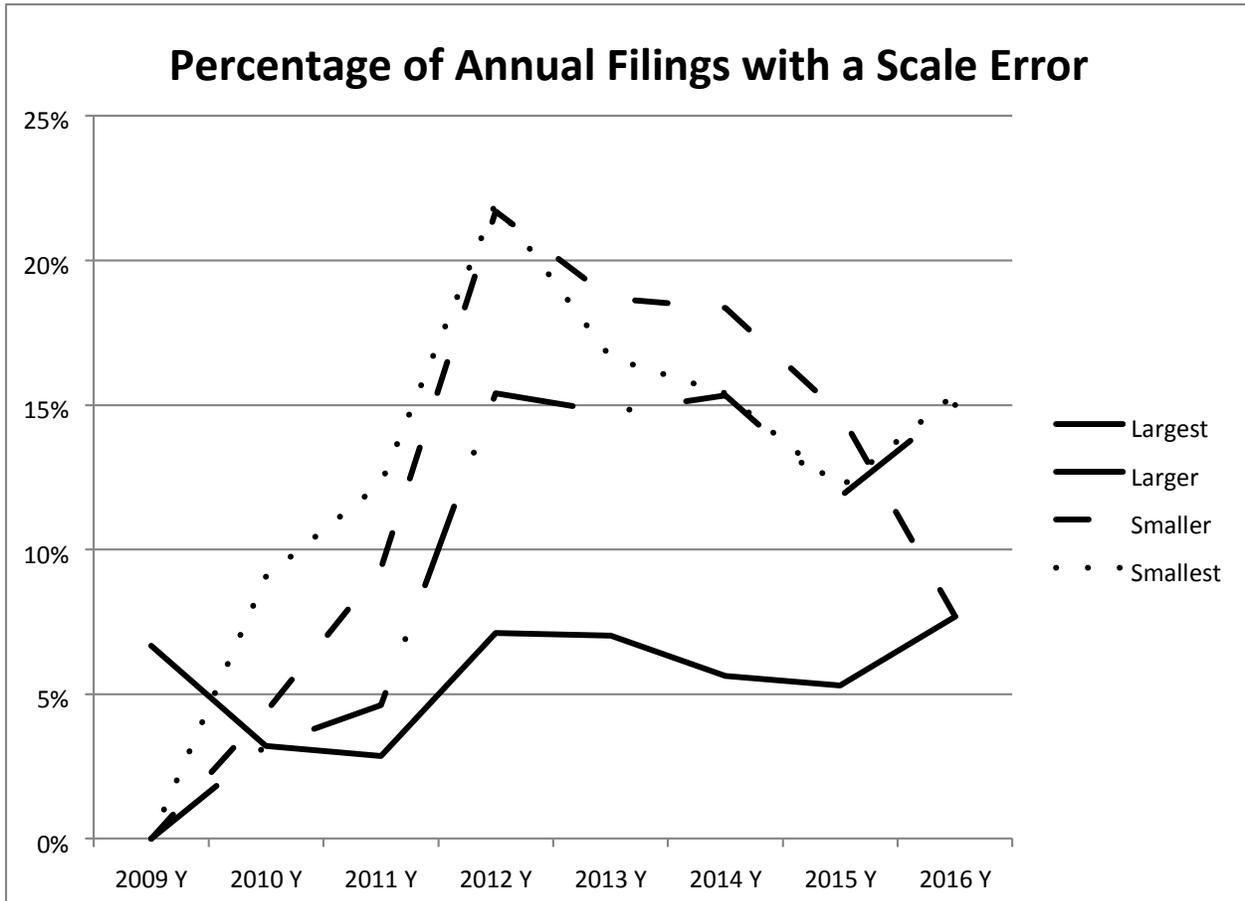


Chart 5 Percentage of Annual Filings with Sign Switches

This chart shows the percentage of annual filings with sign switches. The percentage is calculated based on the total number of filings for that fiscal period.

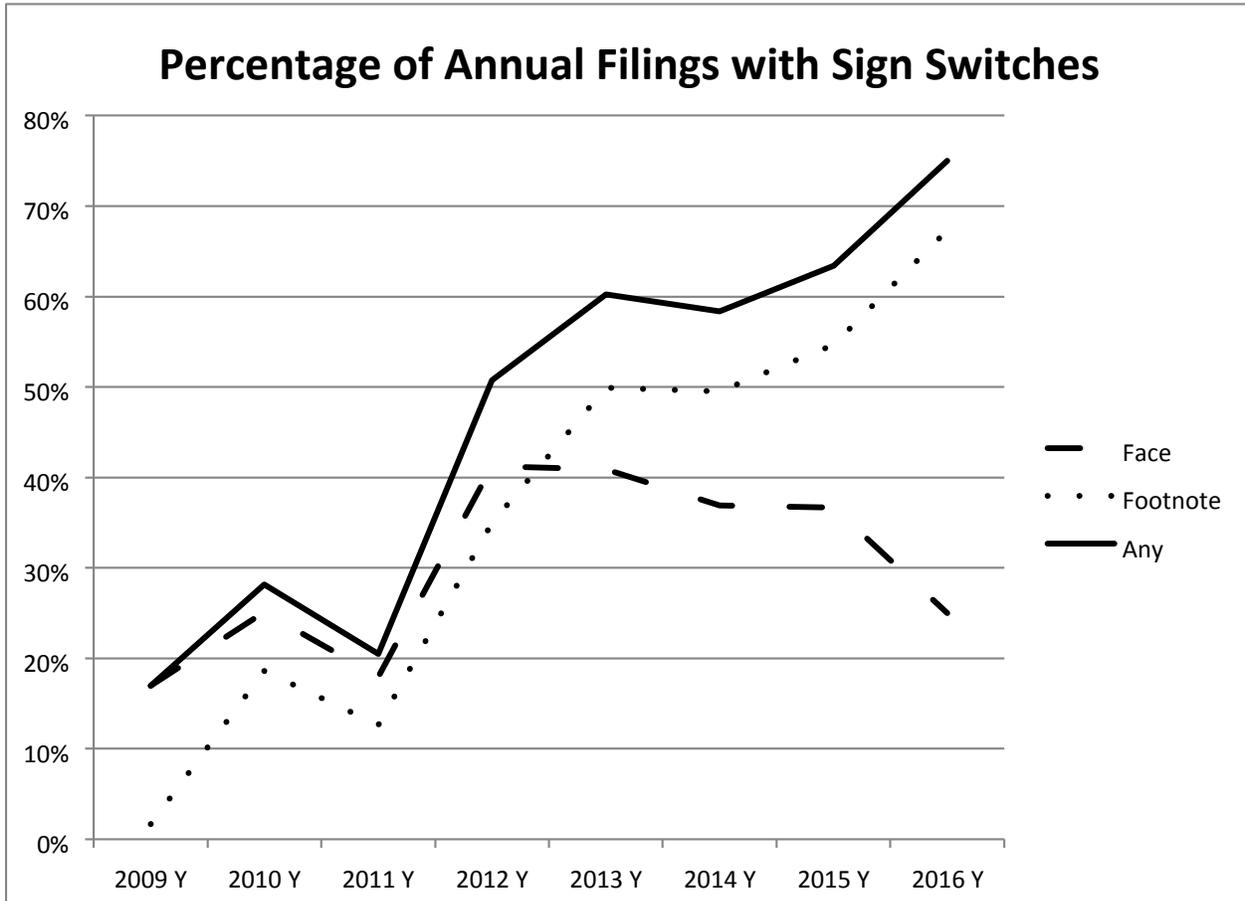


Chart 6 Percentage of Quarterly Filings with Sign Switches

This chart shows the percentage of quarterly filings with sign switches. The percentage is calculated based on the total number of filings for that fiscal period.

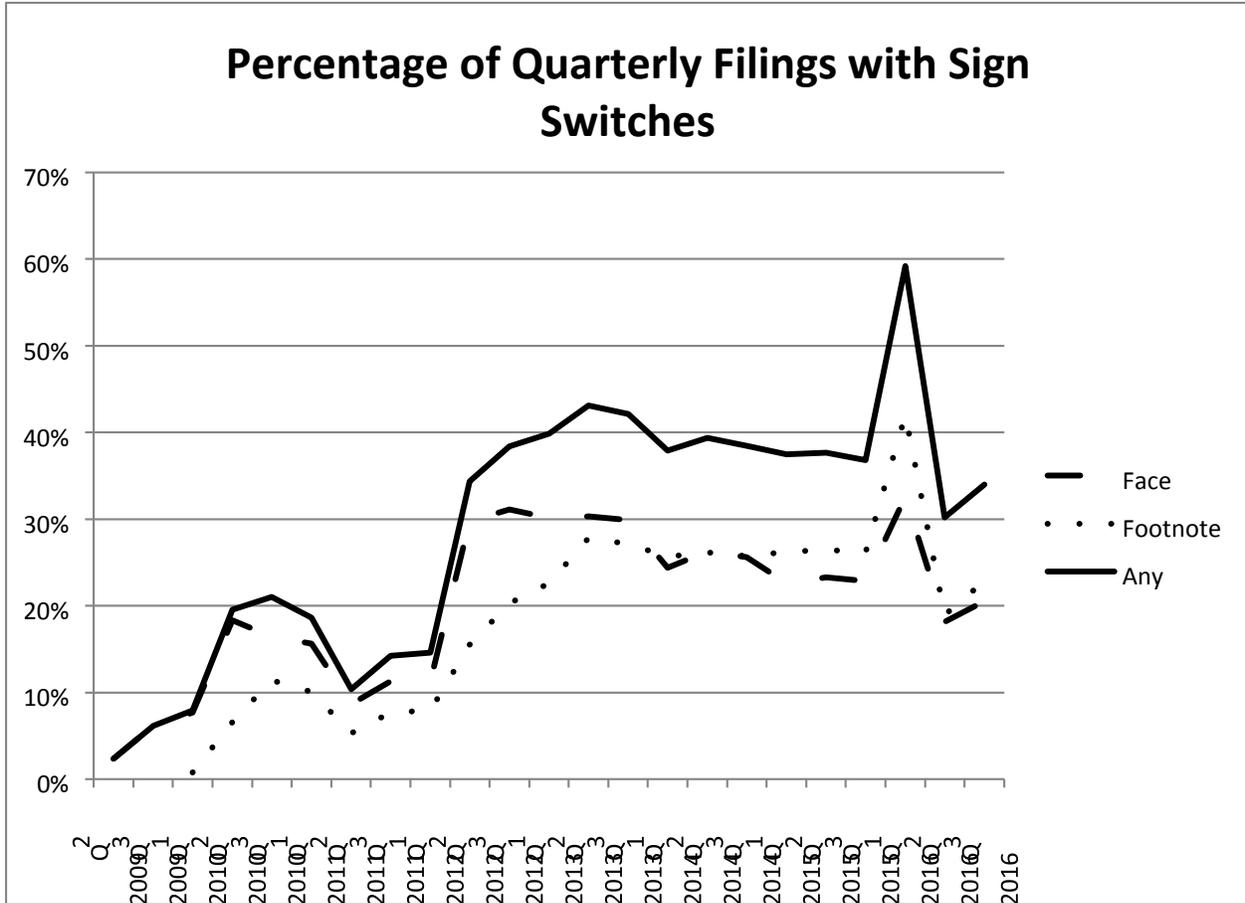


Chart 7 Percentage of Annual Filings with Sign Switches, by Size

This chart shows the percentage of annual filings with sign switches. The percentage is calculated based on the total number of filings for that fiscal period. The companies are divided into quartiles by size, as measured by the total assets for the period.

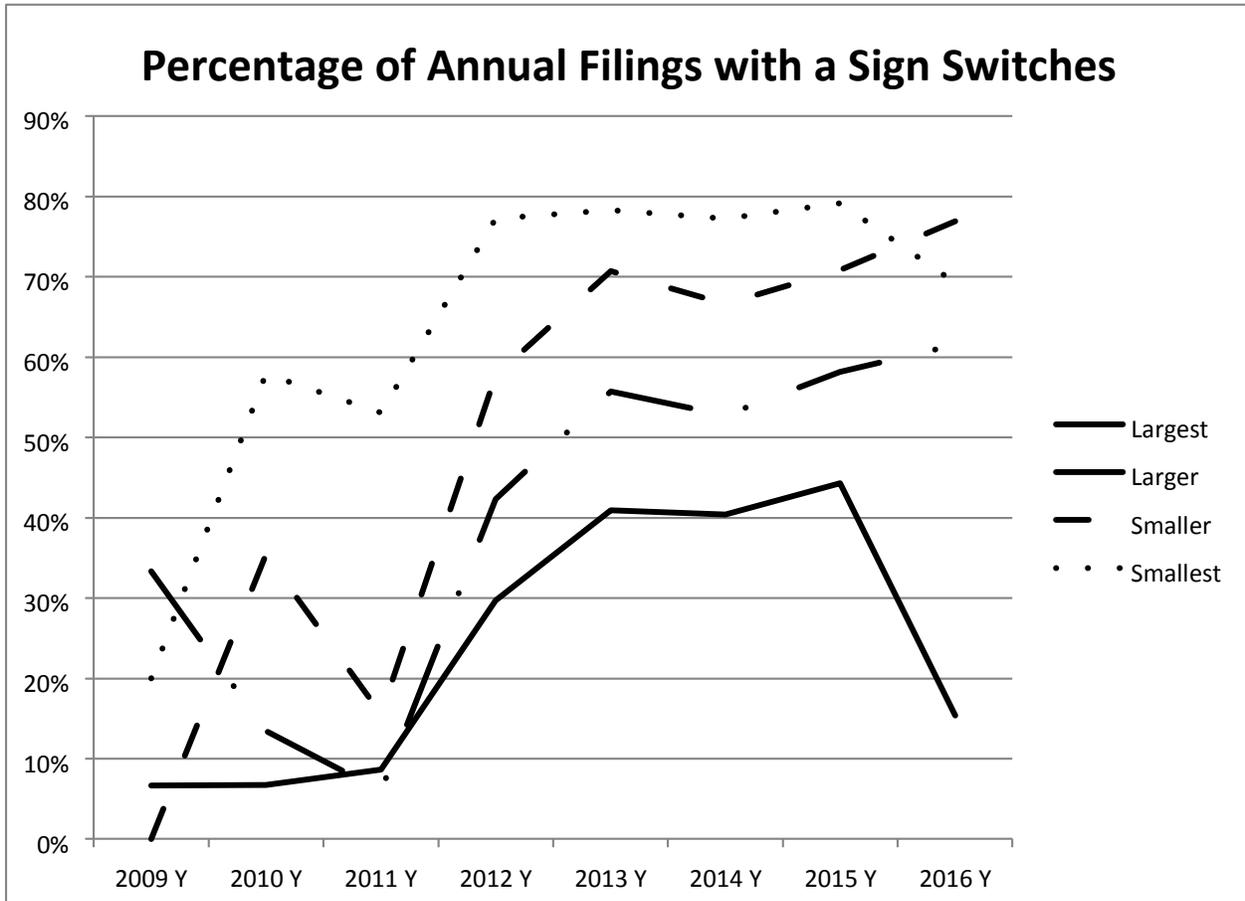


Chart 8 Average Number of Extended Tags over Time - Annual Filings

This chart shows the average number of extended tags, in annual filings, as a percentage of the total tags in the filings over time, using fiscal periods.

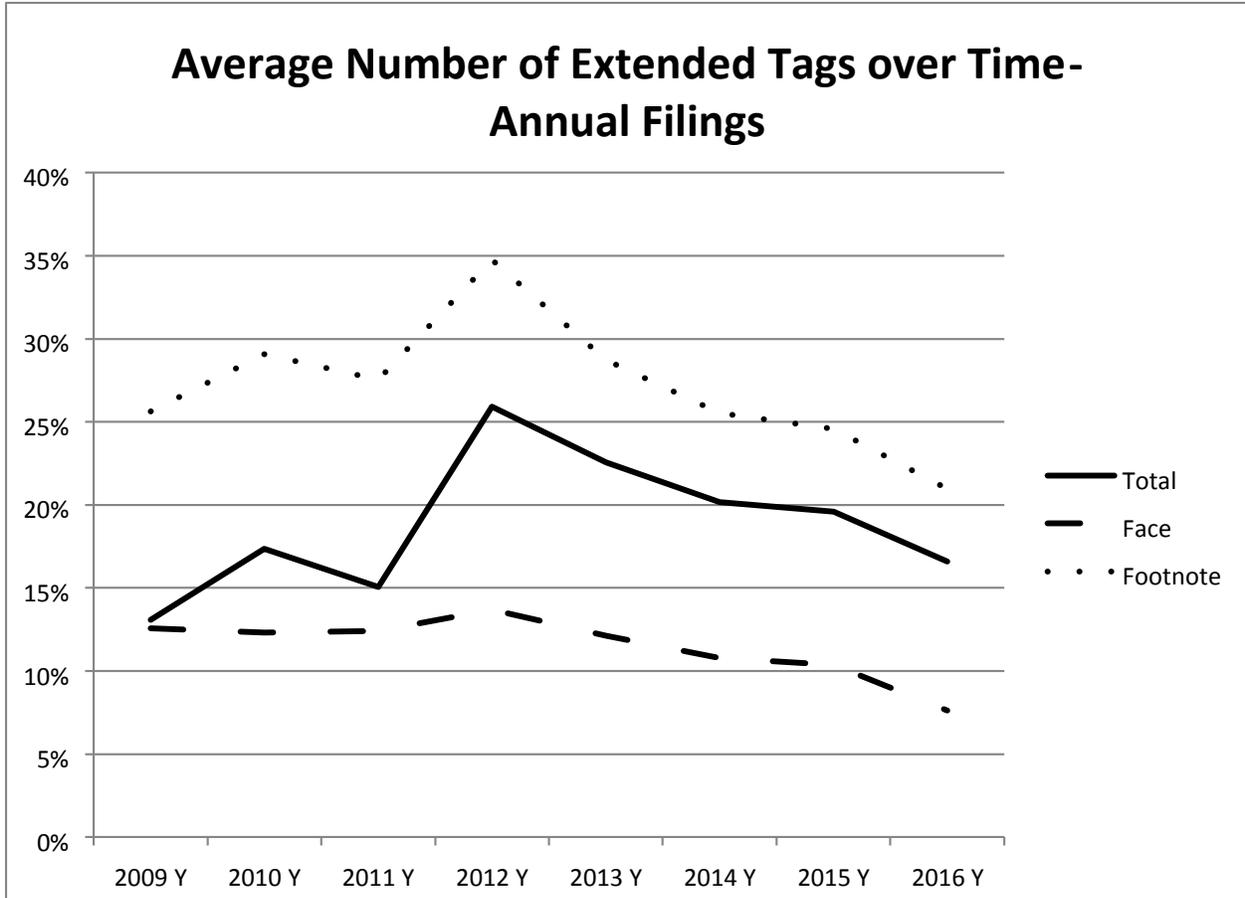


Chart 9 Average Number of Extended Tags over Time - Quarterly Filings

This chart shows the average number of extended tags, in quarterly filings, as a percentage of the total tags in the filings over time, using fiscal periods.

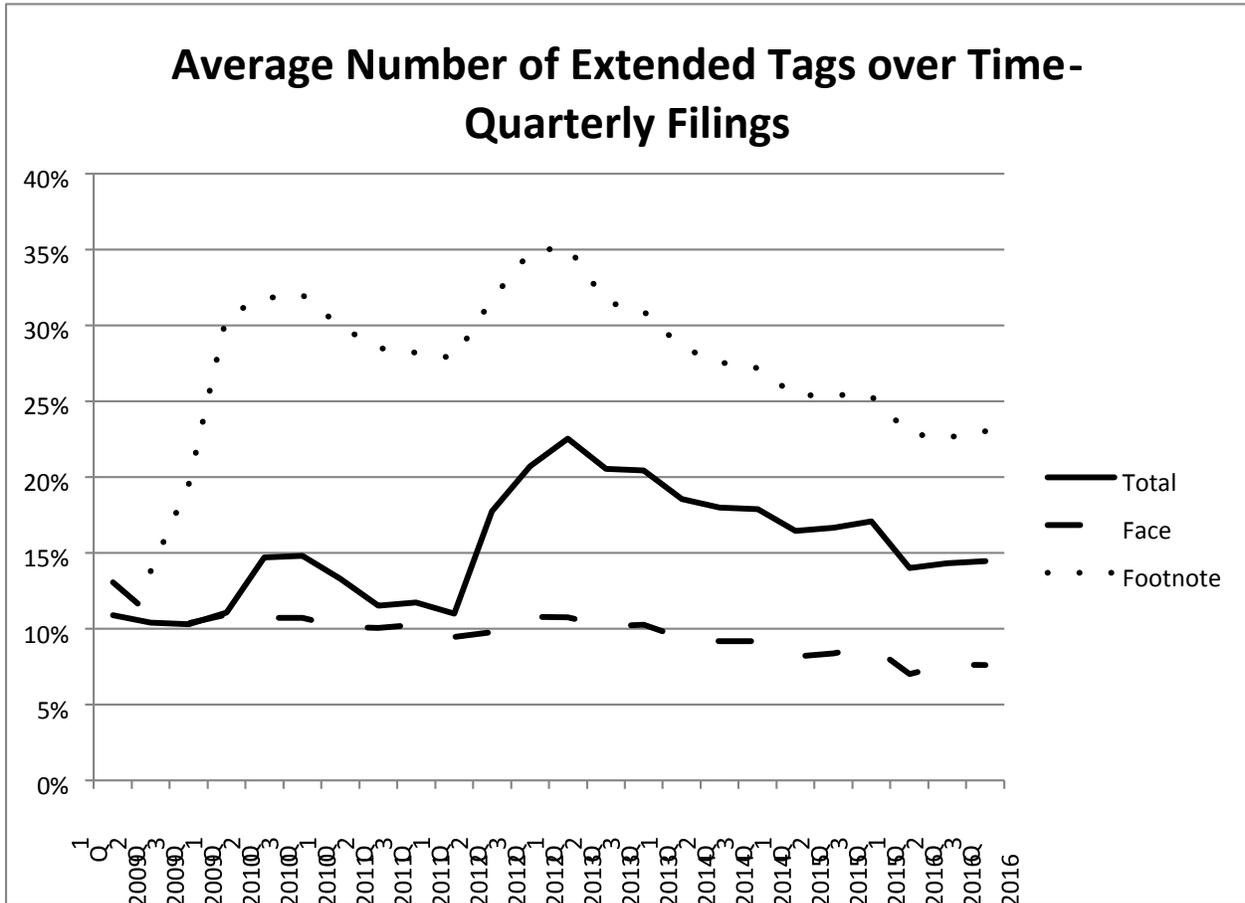


Chart 10 – Average Number of Extended Tags over Time - Annual Filings, by Size

This chart shows the average number of extended tags, in annual filings, as a percentage of the total tags in the filings over time, using fiscal periods. The companies are divided into quartiles by size, as measured by the total assets for the period.

