Automotive Industry Research Report

Text Analysis of Corporate Sustainability Reports in the Automotive Industry

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1. Introduction

Sustainability has become a critical topic in recent years. In light of this most major fortune 500 companies, including automotive OEM's release annual sustainability reports. This is true by and large for a significant number of the tier-1 suppliers as well. These sustainability reports are separate from the annual reports. The reports outline a company's strategy, goals, and performance for corporate responsibility while focusing on areas of profits, planet and people.

The sustainability reports put out by firms provide a comprehensive view of their approach towards corporate responsibility. Not only do these reports showcase where companies allocate resources but also provide information about tracking their internal sustainability performance. Therefore, the reports allow interested stakeholders to gain important insights about the firm and its approach to corporate responsibility. Indeed, the stakeholder's knowledge of how a firm is handling corporate responsibility via such reports would have an impact on market demand, as well as on Wall Street.

It is important to note that unlike annual reports, firms are not required by the government to publish sustainability reports. The focus on sustainability reporting started with firms making a choice to add a short sustainability section to their annual reports. While some firms still continue to include sustainability as a subsection in the annual report, others have moved to voluntarily publishing comprehensive reports. Publishing such a comprehensive report indicates a more serious commitment towards corporate responsibility by the firm.

Given that corporate sustainability reports provide a true picture of the firm's effort, and serve as a critical mode of communication between the firm and its stakeholders, this research aims to conduct a deeper analysis of sustainability reports to investigate how companies talk about corporate responsibility. In doing so, we hope to uncover underlying patterns and understand the emphasis companies place on aspects of profits, planet, and people. To achieve this objective, we conducted detailed text analysis of reports from the global automotive OEM's and tier-1 suppliers.

To start our analysis, publicly available sustainability reports for years 2015-2017 from *14* unique OEMs, and *62* unique "Top 100" suppliers as denoted by AutoNews.com were collected from company websites. These provided the sample of 117 observations (reports) representing an unbalanced panel that was used for analysis. In conducting the analysis, we first created a data dictionary of potential sustainability-related words. This was done by carefully generating frequency counts of every word in the sustainability reports for two major US OEM's. From these, two researchers manually coded words (with a minimum frequency of 10) as a sustainability/corporate responsibility related word or not and reconciled differences to generate a list of words considered as sustainability words. These were then categorized into four buckets of (a) business, (b) environment, (c) social, and (d) other. (see Appendix A). Following this, a comprehensive text analysis of all the 117 reports was conducted to obtain frequency counts of total words (with a minimum

frequency of 10), as well as the four categories of sustainability words. We then developed four metrics which include:

- Metric 1: Overall sustainability emphasis = total sustainability-related words in a report ÷ total words in the report. This metric, expressed as a percent, provides us with an assessment of emphasis on overall sustainability in a report.
- Metric 2: Business emphasis = total business-related words in a report ÷ total sustainability-related words in a report. This metric, expressed as a percent, provides us with information on the extent to which the business aspect of sustainability is emphasized.
- Metric 3: Environmental emphasis = total environmental related words in a report ÷ total sustainability-related words in the report. This metric, expressed as a percent, provides us with information on the extent to which the environmental aspect of sustainability is emphasized.
- Metric 4: Social emphasis = total social responsibility related words in a report ÷ total sustainability-related words in the report. This metric, expressed as a percent, provides us with information on the extent to which the environmental aspect of sustainability is emphasized.

In addition to finding sustainability emphases, we were also interested in understanding how readable the sustainability reports were. Thus, we utilized three traditional readability metrics available in the literate to evaluate report readability scores. These metrics include: the Gunning-Fog Index, the SMOG Index, and the Flesch-Kincaid test (see Appendix B). The rest of the report is organized as follows. The next section presents an executive summary of our findings, section 3 discusses the detailed findings for overall sustainability emphasis and then section 4 presents the findings wherein sustainability emphasis is broken down by category (business, environmental and social). Finally, the report closes with conclusions in section 5, followed by acknowledgments in section 6.

2. Executive summary

A total of 117 sustainability reports spanning OEM's and suppliers across three years (2015 -2017) were analyzed in this research. Several key insights emerged. These are:

- On average across the whole sample, about 20% of the words used in the reports relate directly to sustainability.

- Firms headquartered in North America tend to have a higher percentage of sustainability-related words in their reports as compared to other regions of the world.

- Supplier reports tend to have a higher percent of sustainability-related words as compared to OEM reports, indicating that suppliers do tend to talk more with sustainability verbiage than OEM's.

- The environmental dimension is the most emphasized dimensions across all reports, followed by business and then social dimension.

- OEM's tend to emphasize the environmental dimension of sustainability more as compared to suppliers in their reports.

- Suppliers are not as mature as OEM's in publishing sustainability reports. However, we observe an increasing trend in the number of supplier reports being published.

- Most sustainability reports read at a late high school to early college level.

3. How is the industry talking about sustainability, overall?

Given the global nature of the automotive industry, in analyzing the overall reports and the proportion of sustainability words (i.e. Metric 1) our aim is to describe patterns in reporting that are evident from a global perspective. We coded the firm location as the country/region in which it is headquartered as the firm location for our global analysis. Metric 1 represents an indicator of how effectively firms are communicating about sustainability. Given that the report is for sustainability a higher value of Metric 1 indicates that most of the conversation in the report is with sustainability-related words (as opposed to non-sustainability words). We also break down the overall analysis by OEM's vs. suppliers.

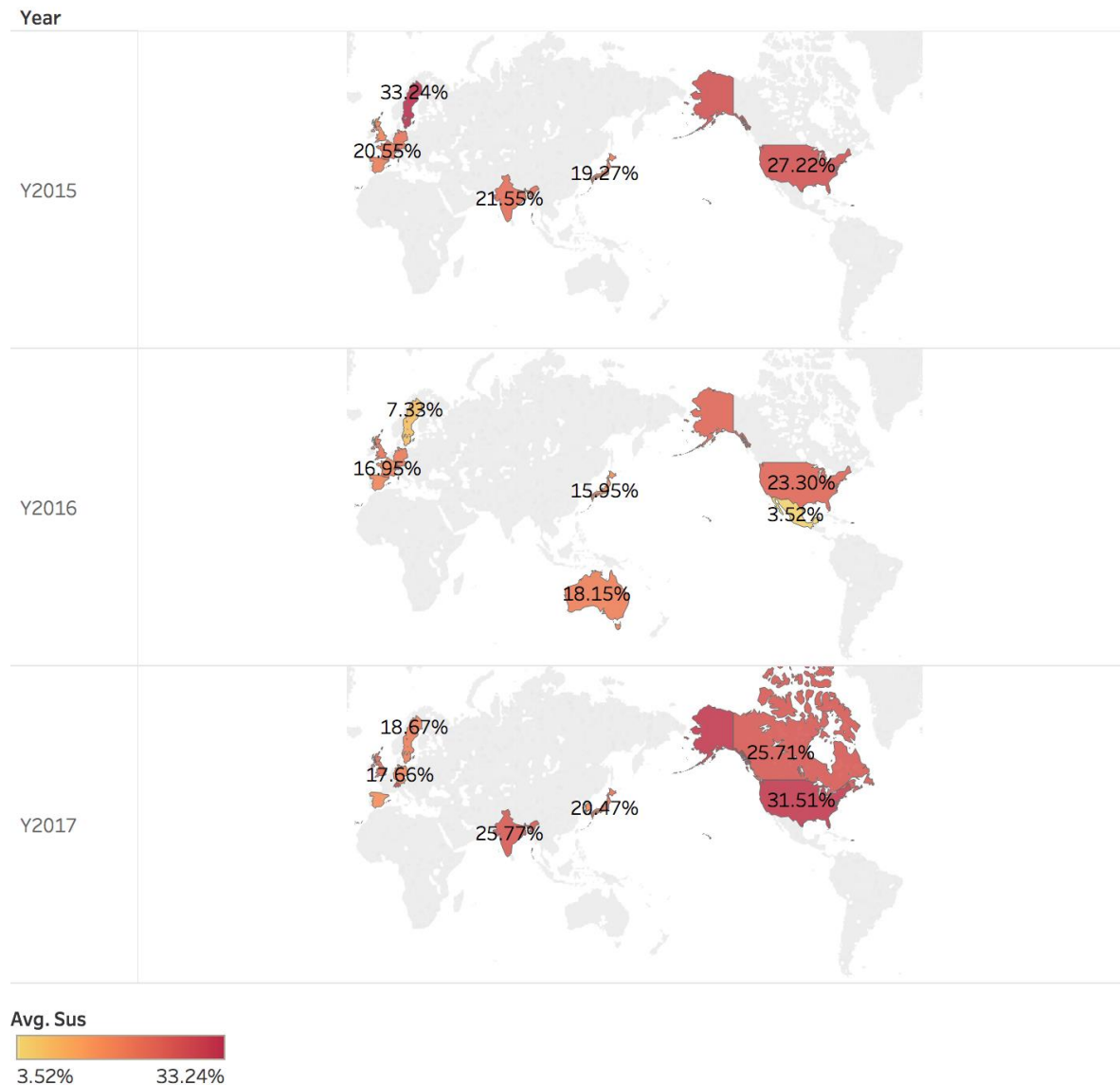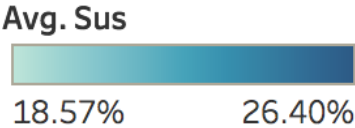### 3.1 How does overall sustainability emphasis change by region?

Figure 1. Metric 1: Overall sustainability emphasis represented globally.

Based on the reports we collected, most of the OEM's and top hundred suppliers in automotive manufacturing are primarily located in North America, Europe, and Japan. Overall in our sample of 117 reports across the three years, the average value of Metric 1 is 20.94% (a standard deviation of 9.28%), with a range of Min: 3.04% to Max: 59%. Figure 1 shows the average sustainability emphasis in the reports aggregated by region (with the region for a company defined as the location of their headquarters). In general, we find that communication effectiveness as reflected in Metric 1 is higher in the USA and Canada (compared to the overall sample average). Interestingly, we found a downward trend between 2015 and 2017 in the European region, wherein the metric falls below the sample average. It is important to note that this may not necessarily indicate that European firm have less overall sustainability emphasis. Rather, remember that Metric 1 is an indicator, simply of communication effectiveness in terms of word usage, i.e. how many words in the report are directly sustainability-related words.

3.2 How is the overall emphasis split by tier?

Table 1. Metric 1: Overall sustainability emphasis by OEM-supplier-year.

	Year			
Tier1	Y2015	Y2016	Y2017	Grand Average
OEM	19.67%	18.57%	19.04%	19.15%
SUP	26.40%	18.83%	23.40%	21.65%
Grand Average	23.28%	18.78%	22.22%	20.94%

Avg. Sus

18.57%   26.40%

In addition to looking at the breakdown by region, we also looked at a breakdown by OEM's vs. Suppliers (see Table 1). Interestingly, usage of sustainability words is higher than the sample average amongst tier 1 suppliers vis-à-vis OEM's. One conceivable explanation is that as suppliers understand that OEM's are valuing sustainability more, they are starting to talk more about sustainability in their reporting. Specifically, the increasing requirements by OEM's for their suppliers to pursue sustainability initiatives communicate to suppliers the importance that OEM's place on sustainability. For example: highlighting the importance of sustainability for OEM's, a report mentioned the OEM's efforts towards "Partnership for A Cleaner Environment" (PACE) program that seeks to align sustainability initiatives with their top 40 strategic suppliers. All OEM's specifically mentioned promoting environmental management throughout their supply chains as well.

3.3 How are individual companies discussing sustainability?

While conducting an industry analysis provides us with some information, we take the next step of breaking down the analysis further and examining individual companies. Please note that individual company names are masked, and it is not possible to link a specific company to the information presented in the report.
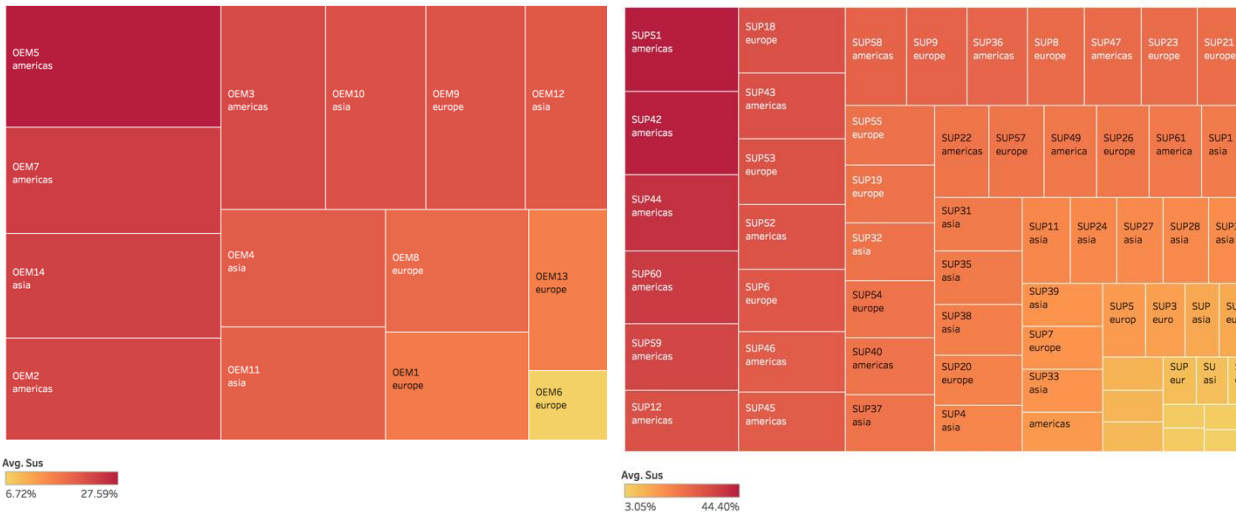

Figure 2a: OEM distribution of overall sustainability words

Figure 2b: Supplier distribution of overall sustainability words

Figure 2 presents the information broken down by for OEM's and Suppliers aggregated across the three years. Of the OEM's who are talking the most about sustainability in their reports, the top two are located in the Americas. The rest are split between Europe and Asia.

In looking at the detailed content of the reports, some examples of topics discussed by the Americas based OEM's include a reduction in waste sent to landfills, reducing carbon intensity, and investments in mobility solutions. Of the OEM's located in Europe and Asia, topics included incorporating sustainability into individual performance goals, optimization of logistics fleets in order to reduce the impact of freight movement, as well as investing in community education on sustainability. It is also interesting to note that compared to 100% of OEMs publishing sustainability reports, only about 60% of the top 100 suppliers have published a sustainability report. Of this 60%, similar to the OEM's, the suppliers that are talking the most about sustainability are headquartered in the Americas. Examples of topics that are emphasized by the Americas based suppliers include visibility into conflict minerals, health and safety of works in manufacturing facilities, and regulatory/ethical compliance.

4.Sustainability emphasis details

We now move to a more fine-grained analysis of emphasis within sustainability. Here we utilize three metrics which represent ratios of the sustainability type (business, environmental, social words) words to total sustainability words. In contrast to Metric 1, Metrics 2-4 are reflective of the relative emphasis firms are placing on business vs environmental vs social sustainability.

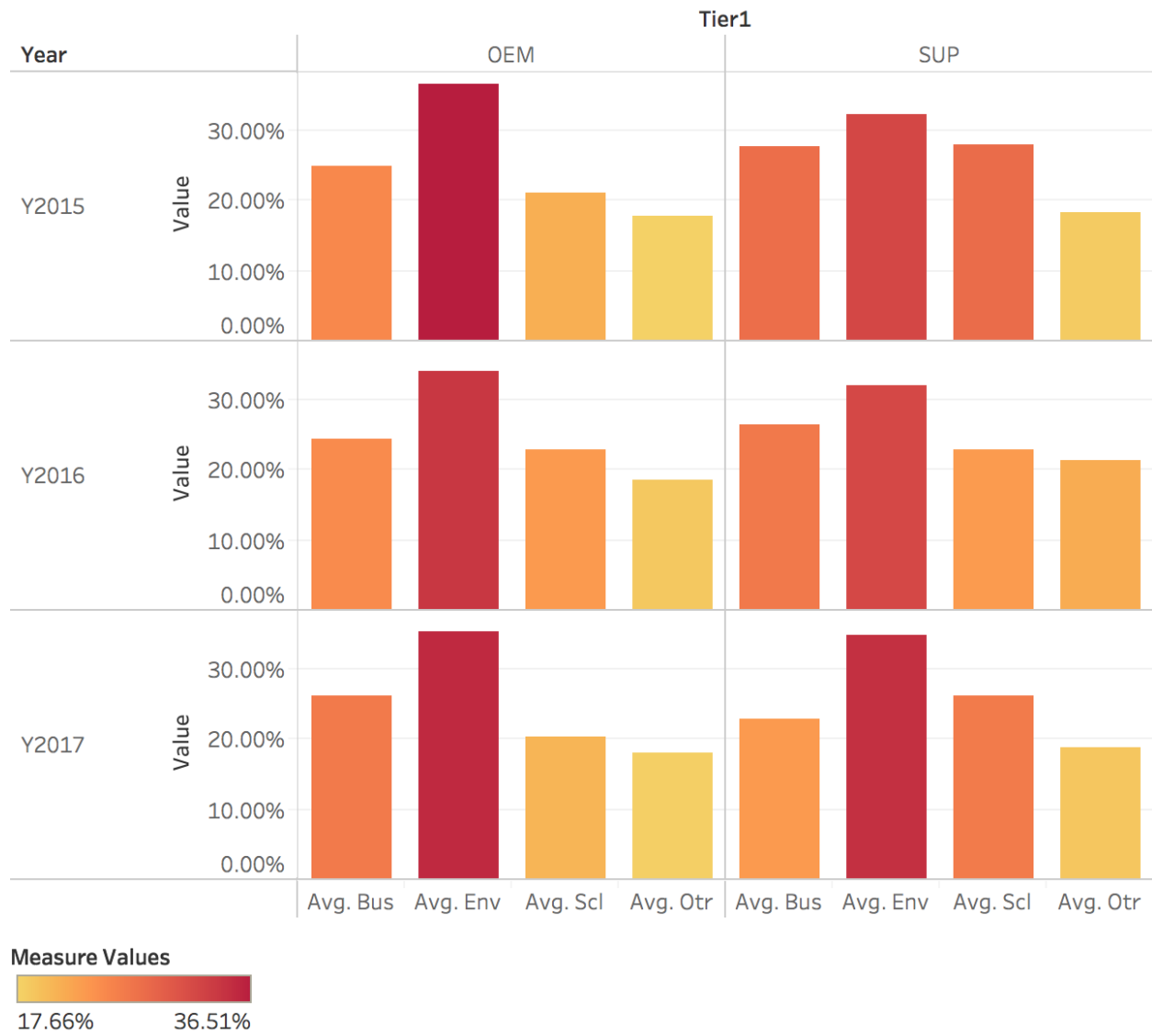## 4.1 What parts of sustainability is the industry talking about the most?

Figure 3. Emphasis breakdown [business, environment, social, other] by tier and year

Figure 3 shows the break-down of the sustainability emphasis for each of the four types (business, environment, social and other). We note that firms are on average emphasizing environmental sustainability the most in their reports, followed by business and social issues. Within this, OEMs were on average emphasizing the environment more than suppliers for the years 2015 and 2016. However, in 2017 suppliers emphasized the environment on average as much as OEMs.

Further, companies are emphasizing the business and social dimensions of sustainability at similar percentages. OEMs discussed business words on average at the same percentage across all 3 years, while suppliers discussed business words less in 2016 and 2017 than they did in 2015.

Social emphasis did not fluctuate much over the 3-year period, however, suppliers are talking more on average about social issues in their reports than OEMs. Within social responsibility, firms are talking about investing in STEM education in locales where they have plants, volunteering in their communities, and investing in talent and workforce development.

4.2 How are firms changing their emphasis over time?

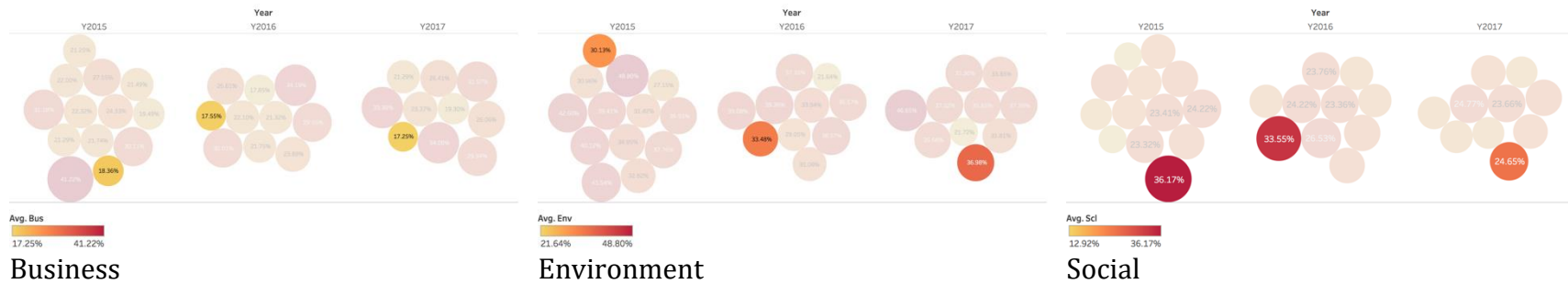Business   Environment   Social

Figure 4. Example of OEM trends for business, environment, and social emphasis

Figure 4 provides some insights into trends observed across the sample. By tracking the emphasis percentages on the dimensions of the 3 sustainability areas (business, environmental, and social) for OEMs, we can see a trend emerging. While business words often tended to stay similar throughout all 3 years, environmental emphasis climbed, and social emphasis declined.

The climb in environmental emphasis here could be due to a shift towards the creation of formalized planning reported by OEMs. This can allow the firm to create a yearly review of their progress towards goals surrounding emissions and provide more systematic, and detailed reporting. The drop in social sustainability emphasis may be a result of the fact that while earlier reports (2015 and 2016) often contained detailed examples the later reports in 2017 move to providing more aggregate information. One report went so far as to drop a complete section on social sustainability.
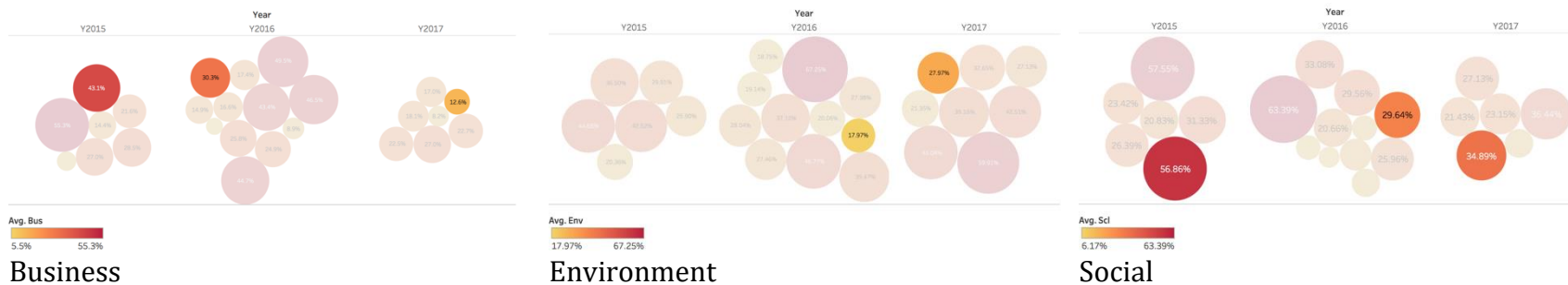
Figure 5. Example of supplier trends for business, environment, and social emphasis

Figure 5 identifies a notable trend observed in supplier reports. The example presented in figure 5 indicates that some supplier companies are maturing in their sustainability reporting. Over the 3 years observed they talked about business-related sustainability much less. Likewise, their social emphasis dropped as well over the 3-year period by over 20%. However, the environmental emphasis grew from 2016 to 2017 (note supplier data for 2015 is more sparse and at times not available).

An interesting observation between 2015 and 2016 is that is that during the 2015 year, a large proportion of suppliers in our sample included sustainability reporting as part of the annual report with a small section. We do see a larger number of separate reports being generated starting 2016. Indicating that while OEM's have more mature sustainability reporting practices, suppliers are starting to follow and catch on.

5.0 How readable are sustainability reports?

Finally, we also conducted a readability analysis of the sustainability reports. Readability scores provide us with information on the reading level (grade school level to college graduate level) with which writing can be understood.
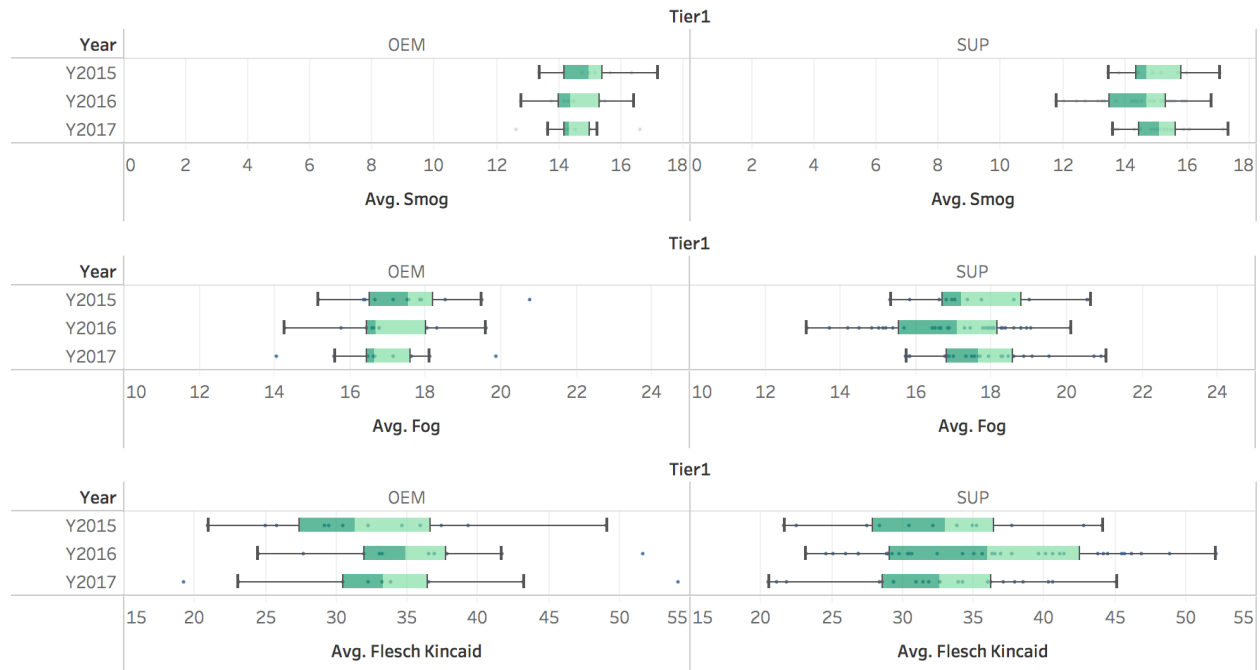

Figure 6. Box-and-whiskers plot for readability indices

The three major readability scores used in this analysis are:

- SMOG Index (see Appendix B for formula): Calculates readability score as the years of education needed to understand the text. A higher score means that you will have to have more education to understand it with a score of 17 indicating a college reading level.

- Gunning-Fog Index (see Appendix B for formula): The Gunning-Fog Index calculates a similar grade level score to the SMOG. The GFI runs from a score of 6 (6th-grade reading level) to a score a 17 (college graduate reading level).

- Flesch-Kincaid Score (see appendix B for formula): Though similar in objective to the GFI and SMOG tests, the Flesch-Kincaid has a scale of 0 to 100, with the higher score being easier to read. For instance, a Flesch-Kincaid score of 100-90 is a 5th-grade reading level. A score of 60-50 is a 10-12th-grade reading level. Any score lower than 30 is a college graduate reading level.

Figure 6 presents the box-and-whisker visualizations of the distributions of the three readability metrics. These figures use a 5-point summary to show distribution. These include a lower extreme (whisker), lower quartile (box), median (middle of the box), upper quartile (box), and upper extreme (upper whisker). When looking at the three major readability scores (SMOG, FOG, and Flesch-Kincaid), most of the sustainability reports are clustered around an entry-level college reading level (overall median for SMOG = 14.82, GFI = 17.29, and Flesch-Kincaid = 33.82). Further, there seems to be consistency between OEM and suppliers as reports for both groups are at similar levels. One suggestion here is that firms may be well served by evaluating whether they would like to increase/decrease the readability of their reports based on the target audience. For example, some stakeholders such as investors may expect more technical and complex information for their decision making which may not be in the current reports. However, the current reading levels of reports seem to be targeted at more of a public/consumer audience in terms of readability.

6.0 Conclusion

The objective of this report was to create a description of how firms are talking about sustainability via their reports. As seen in our analysis, the OEMs are outpacing suppliers in terms of publishing sustainability reports. As previously mentioned, only about 60% percent of the top 100 suppliers are publishing sustainability reports, compared with 100% of OEMs. This was likely due to many suppliers not seeing the cost/benefit of publishing these reports in earlier years. Over the 3-year time window of our data sample, we clearly see a shift that supplier firms have made towards producing separate sustainability reports (as opposed to having them as a subsection in the annual report). This would indicate that larger portions of the supply base for the automotive industry are realizing the importance that OEM's place on sustainability and starting to make the investments needed.

We note that on average across the sample 20% of the words used are directly related to sustainability. The emphasis on using more direct sustainability words tends to be higher in the Americas. Finally, reports are being written at the readability of entry-level college graduates, which is expected when targeting a wide audience. Going forward, firms may consider customizing their reports to the different stakeholders.

7.0 Acknowledgement

We are very thankful to the Automotive Industry Action Group, specifically Mr. J. Scot Sharland and Mr. Joel Karczewski for supporting this research project. We sincerely hope that this research report is useful to the readers.

8.0 Author biographies

<u>John (Jack) Floyd</u> is an Undergraduate Research Assistant within the Department of Marketing and Supply Chain Management in the Mike Ilitch School of Business at Wayne State University. He will be graduating in August 2018 with a B.S. in Global Supply Chain Management Honors. His research interests include sustainability, as well as transportation and logistics.

<u>Dr. Sachin Modi</u> is a Professor of Supply Chain Management at the Mike Ilitch School of Business at Wayne State University. His research focuses on complex manufacturing and service operations with specific emphasis on quantifying the financial value of operations capability, sustainability, and sourcing. He received his Ph.D. in Business with a dual major in Operations Management and Decision Sciences from the Kelley School of Business at Indiana University. Prior to joining Wayne State University, he held faculty positions at Iowa State University and the University of Toledo. During his career, he also spent multiple years in consulting, working at Kanbay Inc. (now a division of Capgemini) and i2 Technologies (now JDA Software Inc.). His research publications have appeared in several leading academic business journals including the *Journal of Operations Management, Production, and Operations Management Journal, the Journal of Marketing, the Journal of Business Ethics, the Journal of Business Logistics* and *the Journal of Supply Chain Management*.

Appendix A

Data Dictionary			
Business	Environmental	Social	Other
governance	sustainability	safety	energy
materials	fuel	people	research
mobility	emissions	communities	policy
electric	water	life	rights
waste	help	employees	impacts
impact	environmental	human	cycle
autonomous	health	community	solutions
electrification	climate	local	progress
innovative	ghg	diversity	alternative
battery	reduce	social	commitment
efficiency	sustainable	employee	drivers
innovation	future	engagement	committed
stakeholders	renewable	students	helping
resources	reduction	inclusion	compliance
consumption	carbon	lives	generation
regulatory	fuels	labor	ethical
efficient	gasoline	diverse	improving
electricity	environment	jobs	united
infrastructure	recycled	together	public
regulations	diesel	education	plastic
stakeholder	gas	volunteering	power
testing	reducing	volunteer	zero
hybrid	responsibility	safe	learn
targets	air	workplace	conflict
africa	footprint	talent	lower
cost	greenhouse	relationships	policies
ethics	minerals	skills	globally
hybrids	responsible	kids	global
development	emission	girls	world
technologies	recycling	inclusive	reduces
developing	hydrogen	society	
values	landfill	disabilities	
commitments	cng		
connectivity	natural		
integrity	science		
resource	eicc		
esg	oil		
evs	reduced		
shareholders	gri		
solar	green		
disclosures	clean		
responsibiliti	tons		
lca	epa		
regulation	cdp		
technology	conservation		
comply	disclosure		
csr	recycle		
electronic	petroleum		
	reuse		
	biodiversity		
	eco		
	family		
	biomethane		
	disposal		
	wastewater		

Appendix B

SMOG Formula

$$Grade = 1.0430 \sqrt{number\ of\ polyllables \times \frac{30}{number\ of\ sentences}} + 3.1291$$

Gunning-Fog Index

$$0.4[\left(\frac{words}{sentences}\right) + 100\left(\frac{complex\ words}{words}\right)]$$

Flesh-Kincaid Grade Level

$$0.39\left(\frac{total\ words}{total\ sentences}\right) + 11.8\left(\frac{total\ syllables}{total\ words}\right) - 15.59$$