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Operationalizing servitization using trademark indicators a quantitative study of service theories

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Department of Industrial Engineering & Innovation Sciences

Operationalizing servitization using trademark indicators:

A quantitative study of service theories

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Summary

The aim of this thesis is to answer the research question “*Are the product and service portfolios of firms, as measured by trademarks, in line with the servitization patterns predicted by current literature?*” To answer this question, firstly, an overview of current trends is created by conducting a literature review. From this literature review, four concrete trends are identified from the literature. These trends are as follows: Firstly, depending on the stage of development of a firm or sector, their service portfolios will fluctuate between three types of service offerings (smoothing, adapting and substituting services) (Cusumano, Kahl, & Suarez, 2015). These service types reflect the maturity of the industry and the required auxiliary services needed to help with the adoption of new products by customers.

The second trend from literature concerns the servitization continuum (Bustinza, Vendrell-Herrero, & Baines, 2017; Kowalkowski, Gebauer, Kamp, & Parry, 2017a). The servitization continuum explains how firms offer more services over time as they mature. Therefore, younger firms are expected to offer more products in the beginning of their lifecycle and as they mature the offerings of the firm will include more services.

The third trend is deservitization, meaning that mature firms pass a certain boundary that their offerings will, once again, go from services to products (Kowalkowski, Gebauer, Kamp, et al., 2017a)

The final trend is the growth of “hybrid services” (Bustinza et al., 2017; Cusumano et al., 2015; Visnjic, Jovanovic, Neely, & Engwall, 2017; Visnjic, Ringov, & Arts, 2019; Weking, Brosig, Böhm, Hein, & Krcmar, 2018). Hybrid services in this case entail services that replace products. An example of a hybrid service is the leasing out of equipment to users. In this example, the user is not the owner of the equipment but can use the product as a service.

Through the literature review, shortcomings in previous methods are also identified. In quantitative methods for example, there is no clear definition of how to measure servitization and measures used in studies are not consistent, even when measuring the same phenomena (Calabrese, Levialdi Ghiron, Tiburzi, Baines, & Ziaee Bigdeli, 2019). In quantitative measures, this thesis shows how the research has been focused on a handful of specific sectors and firms.

To measure the trends identified above, a suitable indicator is needed. As proposed by Castaldi (2018), trademarks can be utilized as an indicator to measure services and their characteristics. Trademarks use a standardized classification system, the Nice Classification, to subdivide them up into different product-service categories. These

categories range from chemical products to IT services. The Nice Classification therefore, also indicates if a trademark is either a product or service. The use of trademarks are becoming more important due to the increased focus of intangible assets such as brands and names in products and services (Mendonça & Mamede, 2014; Vargo & Lusch, 2004).

To answer the research question, the identified trends from the literature are tested using trademarks from the United States Patent & Trademark Office database. Because the trends from the literature review were identified for specific sectors, the same sectors were included in this thesis' analysis. This is done to see if the observed trends indeed are present in the sectors. The sectors are namely, the software, hardware and technology, automobiles and parts, and aerospace and defense sectors. The timeframe chosen for this analysis is from the year 1980 until 2017. Using this timeframe, 12,190,873 trademarks are analyzed. Furthermore, a list of the top ranked R&D firms and the entire dataset is used to see how the most innovative firms and the whole market have developed over the same timeframe.

Besides the Nice Classification system, keyword analysis is used to supplement the categorization of trademarks. Keyword analysis identifies specific words in the trademark. If the keyword matches a word used in the trademark, the trademark is sorted into a particular category. By identifying relevant words which describe a certain service, these words can be used to further narrow down the types of services. Keyword analysis is done to identify the three service types from the literature review, which allows one to see trends concerning these services. Besides focusing on the number of services offered, it is also important to identify the diversity of services, or the degree of servitization. By using both the Nice Classifications and keyword-based categories, the degree of servitization can also be measured by looking at the different categories of services in the data. Furthermore, keyword analysis is also used to identify the top ranked R&D firms in the database by matching the trademark owner name.

By conducting the analysis, one can compare and contrast the observations for the different sectors. By comparing the top ranked firms to the whole market trend, one can see that the entire market offers more services and have increased their use of services more than top ranked firms. This shows that there is a servitization effect on these two units of analysis. The difference of the servitization rate for the top ranked firms might be due to R&D being used to create innovative new products instead of trying to add services to old products. This is a possible explanation of why top ranked R&D firms remain focused on products when compared to the entire market.

When looking at the degree of servitization within the top ranked firms and the whole market, there appears to be a large focus on a handful of service types. The same four services dominate the total offerings of services. The degree of servitization is therefore not diverse. This means that services that are being offered are primarily focused for only a few specific uses.

Furthermore, when looking at the servitization trends of specific sectors (software, hardware and technology, automobiles and parts, and aerospace and defense sectors) different observations are made. Automobiles and parts, and aerospace and defense, and hardware and technology show a rise in their service offerings, in accordance with what was expected from literature, but it is not a great shift in the offerings within these sectors as the literature indicates. No deservitization trend can be observed within these two industries, despite the fact that these industries are considered mature. Software on the other hand shows a decrease in the amount of services used. This is due to the nature of the software industry, which in itself offers more services than other industries. In none of the cases, are hybrid services observed to have grown over time.

Finally, from observing the development of the three service types, one sees that each sector develops in separate ways. This is attributed to the fact that these four sectors serve different customers and require services for different auxiliary purposes.

This thesis therefore shows that many of the theories are not completely compatible with the data. The main theory that was reflected in the findings was the servitization continuum, the other theories could not be identified using the approach used in this thesis.

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1. Introduction

Several authors have recognized that services are becoming an important source of revenues for firms (Bustinza et al., 2017; A. Davies, 2004; Gebauer, Edvardsson, Gustafsson, & Witell, 2010; Kowalkowski, Gebauer, & Oliva, 2017; Teece, 1986; Tukker, 2004). In the last few decades, even product-oriented firms that are in their initial stages of development are selling services to help with the adoption of their goods and have started to use services as complements to their products (Cusumano et al., 2015). Cusumano et al. (2015) show how firms in the three stages of industry development, namely the ferment, transition and mature stages, can use this shift towards services to their advantage. Understanding product and service strategies is therefore important to understand how firms or industries behave. This helps with understanding their prospects and if they are using their capabilities to their full extent.

To fully understand this servitization trend, one first needs to have a view on the development of the product and service portfolios for firms within various sectors and why it occurs. Various authors have theorized and shown why specific firms offer more services and how their product and service portfolios change depending on the stage of development of the sector or firm (Bustinza et al., 2017; Cusumano et al., 2015; Kowalkowski, Gebauer, Kamp, et al., 2017a; Teece, 1986; Vargo & Lusch, 2004). This means that each sector will have its own product and service portfolio dynamic due to firms tailoring them to fit their end-consumer.

Currently, most literature concerning servitization is focused on case studies, which follow a handful of companies in specific sectors, and theoretical propositions based on industry research. Besides these qualitative methods, quantitative methods applicable to large-scale studies do exist. For example, Visnjic, Ringov & Arts (2019) use coded revenue data to analyze if the firm's offerings are product or customer-oriented services. This approach relies on data that is provided publicly by firms, but is limited to publicly listed companies only. Moreover, it relies on firms having their revenues separated when filed. Filing revenue data on this basis is not required and therefore depends on the firms' accounting methods. Therefore, this is not a universally applicable data source for wide reaching research. As shown by Bustinza et al. (2015), various authors have tried to use quantitative methods to create models through which to interpret competitive advantages. The authors explain that the lack of a quantitative methods are due to the lack of a cross industry and geographically diverse dataset, which is why qualitative research has been preferred (Bustinza, Bigdeli, Baines, & Elliot, 2015). Furthermore, Calabrese et al. (2019) show that quantitative methods used in the past have various

flaws. These flaws include the use of a single measure for determining servitization trends and inconsistencies across studies (Calabrese et al., 2019). Calabrese et al. (2019) give an overview of how servitization should be measured and what measures have been used in the past, however, the measures that the authors propose are also dependent on voluntary disclosures by firms or nonpublic information.

An approach that maps out the servitization of all sectors quantitatively based on publicly available data is currently not available. Therefore, an empirical method to analyze the product and service portfolios of firms in various sectors is required to fully understand this servitization trend. An empirical method which uses publicly available information is therefore needed to observe and understand developments in servitization. This empirical method will give further insight into quantitative servitization information which are then compared to qualitative servitization theories.

To identify what compositions of product and services portfolios are currently in use and what composition these portfolios has in the past, a trademark-based approach as proposed by Castaldi (2018) is used. Firms rely on trademarks to flag their goods and services. Furthermore, they are required to publicly file these trademarks to claim ownership rights. Trademarks operationalize constructs such as organizational assets, market strategies and capabilities related to commercialization activities (Castaldi, 2018). These inherent characteristics of trademark data can be utilized to indicate the product and service strategies within firms or industries. Trademarks also indicate through standardized criteria under which product or service category they fall. Therefore, trademark data can be used to analyze large datasets from different sectors and this data can be used to map out the development of services by exploiting these standardized criteria.

This thesis will use trademark data to observe different servitization trends. The data will be used to see how servitization trends have quantitatively developed over time and these quantitative trends are compared with trends highlighted by the literature. Below the research objectives and contributions to current literature of this thesis are highlighted together with its structure.

1.1 Research objectives and contribution

The primary objective of this research is to recreate service portfolios industries using publicly available mandated disclosures provided by firms in their trademark filings to: i) study how their offerings have changed through time and ii) provide insight into how

these empirical servitization trends within industries compare with expected patterns from previous research.

The research question that this thesis therefore answers is as follows:

Are the product and service portfolios of firms, as measured by trademarks, in line with the servitization patterns predicted by current literature?

To answer this question the following sub-questions must also be answered to identify and approach the problem at hand. These sub-questions include:

- *What does current and past research claim with regards to the servitization phenomenon and developments?*
- *Why are trademarks suited to measure servitization strategies?*
- *How do certain sectors differ in their product and service development through time?*

The use of trademarks as an indicator is still relatively new which limits the precedent which can be used as a guideline. Trademark data have been used in the past as independent or dependent variables in regressions in other studies to see the effect of trademark stocks (Sandner & Block, 2011), and certain classifications have been mapped out to see how they affect a firm's behavior. But as far as the author is aware, no study has used trademark data to analyze industries using the previously mentioned empirical method.

Further applications include (but are not limited to) using the portfolio of trademarks to understand competition dynamics, how product and services of certain classifications affect market share in a given industry and how innovation strategies must be used to provide either more products or services. Knowledge gained from understanding servitization trends can be used to observe and plan for future market changes concerning the offering of products and services for young sectors and firms. Furthermore, by recognizing cyclical trends in the data predictions on the future developments within sectors become feasible.

This thesis consists of the following chapters: Firstly, in Chapter 2 a brief literature review is conducted to aggregate theories concerning servitization and the use of products and services which will be measured. Secondly, in Chapter 3 an overview of intellectual property rights is given to show why trademarks are particularly suited to analyze the products and service offerings of a firm or industry. Thirdly, in Chapter 4 the methodology of this study is explained together with the tools that will be used to measure servitization trends and compare them to the theory. Potential drawbacks concerning the research

design and generalizability of the study are also further highlighted. Afterwards, the study is conducted and its findings are shown together with accompanying graphs, which will be compared to the theory. Finally, a conclusion is given and the research question is answered. Also, a general approach for future studies and use of this method and findings is provided.

2. Servitization: a brief literature review

In the following chapter a description of the previous literature and their findings is given. This chapter answers the first sub-question posed in this thesis, namely the question of “*What does current and past research say with regards to the servitization phenomenon and developments?*”

This chapter aims to identify a handful of common theories found in the literature. The purpose of identifying these theories is to later use them to see if they can be observed empirically using this thesis’ method. Firstly, the identification of servitization within literature is highlighted and afterwards four theories which show the different types of servitization are identified. The aggregate knowledge obtained from this chapter is used as a lens to observe and understand the findings of this paper. The thesis’s final findings will also be used to see if all theories are represented in the results or if there is complementarity amongst the discussed theories.

2.1 The beginning and recognition of servitization

Since the 1980’s researchers have noted the increasing use of services by manufacturing firms. Research by Teece (1986) and Habermeier (1989) recognized how services can supplement products in the manufacturing sector for increased results. Teece’s research objective was to identify how first-to-market and follower firms can compete and benefit from innovation. In this paper, Teece offers a comprehensive framework that explains how first-mover and follower firms benefit from innovation. The author starts by explaining the phenomenon of how first-to-market innovators are not always the eventual beneficiary of said innovation. The framework is created by using theories found in innovation management and competition literature together with examples by some prominent companies as examples¹. Some smaller firms are also used as examples to illustrate the findings but no comprehensive framework is described how these specific companies were identified. Teece (1986) identifies how firms are using services to offer

¹ These prominent companies include Kodak, Xerox and IBM which were large industry titans at the time of Teece’s writing.

more value to their customers in the form of competitive manufacturing and after sales support help the firm increase and maintain sales.

On the other hand, Habermeier's research was aimed at identifying how services improve products. The reasoning for the increase in service use is due to knowledge that the firm has about the product, the use-based knowledge, which can be applied to the product to offer services that add utility to its usage (Habermeier, 1989). Vargo and Lusch (2004) identify the paradigm shift within the dominant ideas that underpin the worldwide view of marketing theory that occurred during the 1980's. After the 1980's more emphasis was placed on intangible assets and on how to improve product offering through auxiliary services. In this same period, products were replaced as the main unit of exchange by skills and knowledge (Vargo & Lusch, 2004). They show how the initial focus was on the exchange of goods and slowly this focus shifted towards more intangible offerings and services. The authors do this by doing an extensive literature study in the field of marketing through which they produce a timeline which shows how the dominant marketing logic changed.

These papers show the increased focus on services in product offerings and why servitization occurs. However, they do not show what how these trends are observed in product-service portfolios. In the following sections, four theories are highlighted which show how servitization is observed within firms and sectors. These theories and how they identify servitization trends will be used in the empirical section of this thesis.

2.2 The servitization continuum

The first identified trend is the servitization continuum. The theory of the servitization-continuum identifies how manufacturers initially start off with making products and then switch more towards services as they mature (Bustinza et al., 2017; A. Davies, 2004; Gebauer et al., 2010; Kowalkowski, Gebauer, & Oliva, 2017; Tukker, 2004). The phenomenon can be seen within various product companies which aim to diversify their revenue streams, gain a competitive advantage, and as a way for to extend the life of their products (Bustinza et al., 2017; Kowalkowski, Gebauer, Kamp, et al., 2017a)

This continuum starts as transactional interactions and end with product-plus-service solutions co-designed with customers (Bustinza et al., 2017). The product initially gets improved through these interactions and services by the firm that fill in the deficiencies of the product are offered by applying their gained knowledge. Furthermore, the use of services also offers the opportunity to lock in consumers as they grow more dependent on the particular product-service bundle (Bustinza et al., 2017; Visnjic,

Wiengarten, & Neely, 2016). The services offered by the product firm therefore further increase the utility for the customer while also adding new revenue streams for the firm. The product itself can be better differentiated from other competing offerings through the services and therefore can command a better position in the market (Bustinza et al., 2017; Kowalkowski, Gebauer, Kamp, & Parry, 2017b).

Services therefore play an important role for maturing companies as tools to keep themselves and their products relevant in the market. Considering also that as products mature their definitive use-case also becomes clearer (von Hippel, Ogawa, & De Jong, 2011) which allows firms to directly offer relevant auxiliary services to enhance the product.

2.3 Deservitization

Another phenomenon identified in the literature is *deservitization* which is the second identified theory used in this thesis. As product uncertainty reaches a minimum and standards are established far fewer services are needed (Kowalkowski, Gebauer, Kamp, et al., 2017a). Besides trying to gain a competitive advantage by using services, servitization may also come as a result of mature companies wanting to extend the life of their product (Bustinza et al., 2017; Kowalkowski, Gebauer, Kamp, et al., 2017a).

Kowalkowski et al. (2017) propose the concept of deservitization and frame it as a stage that occurs after reaching an inflection point in the servitization continuum. The authors conduct their research by going through literature studies to understand the underlying reasons why the switch to services is occurring and how researching this phenomenon has changed through time. The focus of this research was on the manufacturing and technology industries. The authors also used examples from Xerox and IBM extensively in their paper. The authors show that at a critical point, services will start to cannibalize product sales and to increase sales more focus should be placed on the product. The reason to focus on providing a commoditized product is because the market already knows how and why to use a product which does not require additional services. The authors also show that instead of merely closing down a service, that the sale of a service division to another firm is also one way to deservitize (Benedettini, Swink, & Neely, 2017). Due to the few cases mentioned in Kowalkowski et al. (2017) it is uncertain if this is a general phenomenon or that this is only applicable to a few industries or case studies.

2.4 Three auxiliary service types development

The third of theories is the development of three auxiliary service types as identified by Cusumano et al. (2015). The authors show how services have become more important for businesses due to increased customer interaction through which firms receive tacit knowledge on their customers (Cusumano et al., 2015). This can in turn be used to create a bond with customers and shape future services by incorporating the knowledge. Besides this complementary aspect of services, authors have identified various other reasons which have increased the use of services (Cusumano et al., 2015). Firstly, services are needed to help a transaction take place. Take for example heavy machinery or complex industrial equipment. Service departments, such as dealerships², are required to give customers the confidence to make these large purchases (Oliva & Kallenberg, 2003; Sawhney, Balasubramanian, & Krishnan, 2004). Secondly, customer-specific product and service combinations provide more value to the customer and a better overall solution to the customer's problem which would not have been possible using a standalone product or service (Andrew Davies, Brady, & Hobday, 2006, 2007; Galbraith, 2002). Thirdly, a more intimate bond can be created between the firm and the customer through services that are recurring, such as maintenance, consulting and repair which keep the customer in contact with the firm and help them with subsequent sales (Andrew Davies et al., 2006). And lastly, services offer an alternative source for recurring revenue which provides stability to the firm's earnings when product sales are volatile (Quinn, 1992).

Because of the abovementioned reasons, services have managed to become an important factor in the profitability and innovativeness of a firm. In the following paragraph the theories of how services should be used by product firms depending on the maturity of the industry are discussed.

Cusumano et al. (2015) show that as industries mature and go through the three defined stages of growth, so does their use of products and services. Cusumano et al. (2015), as previously mentioned, use theoretical knowledge and previous literature to establish a framework for companies to use services in their offerings. The composition of these services depends on the maturity of the sector they operate in. The companies that are used in their analysis are selected specifically to prove a point and are larger firms such as IBM, Oracle and Rolls Royce. These firms were chosen due to their prevalence in previous literature. The authors illustrate the advantages that firms can reap from using their hypothesized strategies depending on where their industry is in the three growth

² The authors do not distinguish between dealerships wholly owned by the firm self or third-party dealerships. Because this dealership aspect is not necessarily part of a firm this may cause errors in measuring these types of services in this paper's analysis.

stages. These stages and their proposed strategies are as follows: Firstly, a firm in the 'ferment' stage of growth reaps the most benefits when its market strategy is focused on offering other auxiliary services surrounding a new technology. This is because there is still no dominant market perception of the new technology and these services allow the firm to adapt the technology to the client's needs and allow them to test them out (Cusumano et al., 2015; Teece, 1986; von Hippel et al., 2011). The auxiliary services that can be found in the ferment stage are 'adapting' and 'substitution' services. Adapting services are services that help the client use the new product, such as training or facilitating new uses for the product. Substituting services, as defined by the authors is offering the product as a service to the customer. In other words, instead of purchasing the product outright it is leased out to the customer and the responsibility of maintenance and repair remains with the firm. This is done due to the uncertainty of the use of the product and gives the client flexibility if they do not want to own the product anymore.

Secondly, a firm in the 'transition' stage will offer less adapting and substitution services due to the fact that the new technology has formed a market perception and clients now know what they want and can do with the technology (Cusumano et al., 2015). Because the new technology is understood and customers know exactly what they want from it, fewer auxiliary services are needed to facilitate and sustain the transaction. In this stage services will primarily be 'smoothing' services to help the client to acquire the product without altering it. Examples of smoothing services are insurance and financing (Cusumano et al., 2015).

Lastly, a firm in the 'mature' stage will once again offer more services to differentiate the firm's offering as market entry has increased and there is more competition. At this stage, services are focused on smoothing a transaction and other substituting services are also offered. The use of smoothing services is to expand the potential market of buyers and allow for easy transactions and flexibility for users who would not otherwise use these products.

In essence, what the authors propose is that as industries mature so do the business models (BMs) of these firms. The BMs should also be repositioned to accommodate the changing requirements of the customers. For example, in a ferment market the dominant product design and benefits are not known and therefore BMs that help to accommodate and facilitate adoption are more beneficial in these early stages (Cusumano et al., 2015). In other words, the product and service portfolio of the firms within a particular industry should help add value by facilitating adoption and subsequent product decisions. BMs should therefore be adaptable and should focus on

outcomes instead of a certain product or service. A visual summary of the three stages theory can be found below in Figure 2.1.

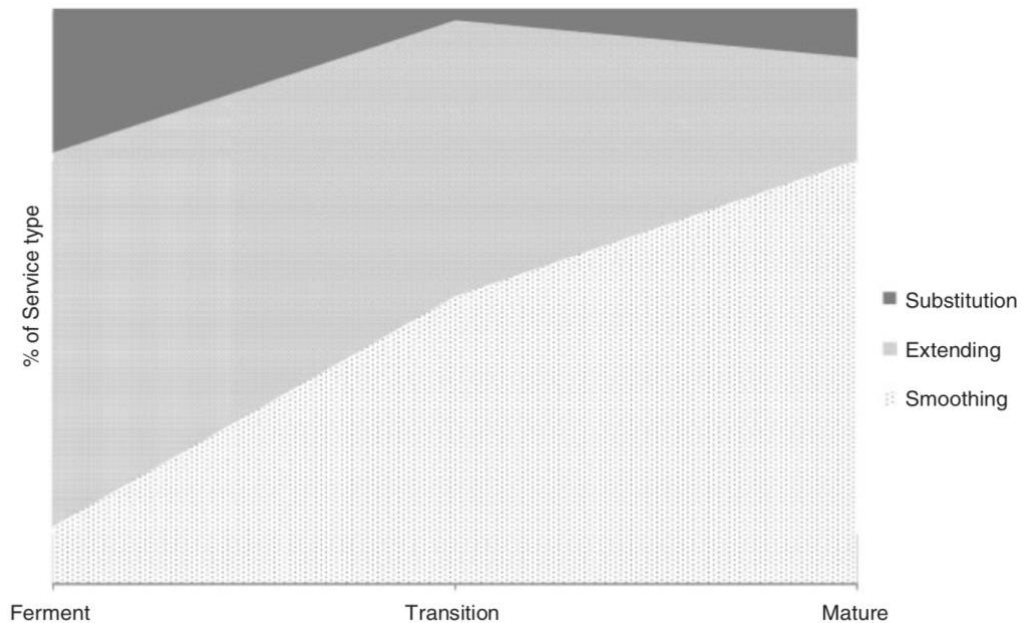


Figure 2.1: Graph showing the development of services over the three stages. Note that in the graph adapting services are denoted as 'extending' Source: Cusumano et al. (2015)

The findings of Cusumano et al. (2015) concerning mature industries are corroborated by Bustinza et al. (2015) who show that manufacturing companies are actively engaging in delivering services, which they do to gain a competitive advantage by having an edge in customer satisfaction and differentiation. Manufacturing companies are considered mature due to their long history and low barriers of entry. Servitization however, is not constant and does not adapt in equilibrium with the firm (Martinez, Neely, Velu, Leinster-Evans, & Bisessar, 2017). Instead, services adapt through different paths and change continuously. In other words, there is no dominant path at first and various firms use different strategies before reaching a market consensus.

Bustinza et al. (2015) provide a framework for understanding how services are used to gain a competitive advantage in the market. The research aims to show the extent in which services help with the creation of advantages relative to a firm's competitors and how performance and value chain positioning are enhanced. The paper focuses on two business-to-business (B2B) sector value chains, namely heavy equipment manufacturing and medical equipment. These industries were chosen to show the difference between their target market, namely upstream (selling to other manufacturers, for heavy equipment) and downstream (selling to end-users, for medical equipment). The research

focuses on value chains to assess the strategic position of firms within the sector as opposed to the profitability or innovativeness. The authors conduct the research quantitative methods and data provided by the firms through a survey conducted by Parametric Technology Corporation (PTC)^{3,4}. Note that although quantitative methods are used for this research, the data is not publicly available and needed to be provided by a separate firm. The authors conclude that services play a vital role in product differentiation and that using the correct services can help the firm reach their specific objectives. Furthermore, the authors also show that customer satisfaction can be improved and core competencies reinforced through more service offerings.

2.5 Growth of hybrid services

The final of the theories are the growth of hybrid service offerings by firms and sectors. Various authors also identify outcome-based contracts (OBCs), or result-oriented services, which have been used in the past to offer specialized services and add more value through synergistic interplay between products and services (Visnjic et al., 2017; Weking et al., 2018). This thesis will further refer to these types of services as “hybrid services” for the sake of consistency. Hybrid services replace the use of a product by offering the customer the use of the product as a service. The definitions of hybrid services are similar to the definition of Cusumano et al. (2015) for a substituting service which was previously discussed. One can therefore see that such services which replace product offerings are well known in the literature but have had various names to describe the same phenomenon. An example where this terminology differs is how the authors use the exact same hybrid product-service of Rolls Royce’s “Power by the Hour” (Bustinza, Gomes, Vendrell-Herrero, & Baines, 2019; Cusumano et al., 2015; Visnjic et al., 2017). This product satisfies the definition of a hybrid product-service because it allows users to pay for the use of the product, in this case an airplane engine, instead of buying the product outright. Although the authors use “Power by the Hour” as an example of how firms have recently started to offer more hybrid services, the trademark for “Power by the Hour” was filed in 1965, showing that the trend might not be as new as expected.

Visnjic et al. (2017) aim to provide an explanation and use for hybrid services and how they can be implemented in firms. For this research the authors used four specific

³In total, 102 firms are analyzed. 52 for heavy equipment and 50 for medical equipment.

⁴PTC is a firm specialized in service management solutions.

firms to illustrate how these hybrid services can be used to add value. The data is collected through interviews and workshops where managers of the four companies are present. The methodology of the paper shows that the authors exclusively focused on the industrial goods manufacturing industry, and they use Caterpillar Inc., Rolls Royce, Hitachi Rail and Bombardier as the main units of analysis. The paper's purpose is to provide a managerial framework

2.6 Relation between theories

All theories mentioned so far seem to work with each other in some way. The theory of deservitization seems contradictory at first with the findings of Cusumano et al. (2015) since both papers use maturing products to explain how either new services or deservitization happens. However, deservitization can be seen as the strategy *after* the mature market strategies proposed by Cusumano et al. (2015) due to the fact that the products have been turned into pure commodities and have no differing characteristics. This adds a further step in their proposed theory. On the other hand, the service-continuum thinking coincides with the findings of Cusumano et al. (2015) because they both recognize the use of more services over time and products will be replaced by more services. It should be noted however, that Cusumano et al.'s (2015) theory is normative and supposes that a firm or industry uses the ideal portfolio of products and services regardless of other factors such as managerial inexperience or firm size. This could be the reason why the assumption of services at the initial stages differ for these theories.

Meanwhile, deservitization contradicts the service-continuum theory since it indicates that after a point that services will reduce, while the opposite is expected in the service-continuum view. These views can also be seen in addition to one another. A different way of viewing this is that a firm switches to more services over time and after reaching an inflection point adapts more product-based operations. Finally, the increased use of hybrid services fits into the theory proposed by Cusumano et al. (2015) since the growth of these hybrid services coincide with substituting services. The service types have different names but both denote the same type of service. The use of hybrid services also fits into the servitization continuum theory because hybrid services remove the need for products and shift the firms' offerings towards more services. Below, an overview of the discussion above is given in matrix form where the interaction of the theories is visualized in Table 2.

	Three services types	Hybrid services	Servitization continuum	Deservitization
Three service types				
Hybrid services	Coincide: Hybrid services fit into the substituting service category which is expected to grow over time.			
Servitization continuum	Coincide: Both theories show that more services are used over time.	Coincide: Hybrid services growth indicates that more services are used in accordance with the continuum.		
Deservitization	Contradictory: Deservitization states that products will become more important for mature firms while the three service types theory indicate that more services should be used.	Contradictory: Deservitization states that products will become more important while hybrid services claim that providing products as a service is more important.	Contradictory: Deservitization states that products will become more important for mature firms while servitization continuum states that mature firms will use more services.	

Table 2: Matrix which indicates how the theories work with or against each other.

Furthermore, the research conducted to find these theories only focuses on a handful of sectors, namely software, technology, heavy industry such as aerospace and automobiles (Bustinza et al., 2017; Cusumano et al., 2015; Kowalkowski, Gebauer, Kamp, et al., 2017b; Visnjic et al., 2019). The same companies are also analyzed in various papers, with IBM, Xerox and Rolls-Royce appearing frequently throughout many studies. This shows how concentrated the research has been in the previous years and why an empirical method to measure entire industries is necessary to prove these theories.

2.7 Effect of technological innovation on servitization

Besides understanding how services are used in the product-service portfolios of firms, it is also important to understand the intensity of the use of services. In other words, it is important to know if the firm is predominantly using services or products in their offerings (Ayala, Gerstlberger, & Frank, 2019; Visnjic et al., 2019).

What can be seen from this is that innovation can take on two forms for firms. On the one hand, innovation is producing a superior product that is supported with services and on the other hand, innovation is providing the most relevant services to a customer to solve their specific problem (Ayala et al., 2019). Visnjic et al. (2019) propose that firms that focus more on technical innovation will use more products in their portfolio which can be measured by looking at a firm's R&D.

Visnjic et al. (2019) propose that R&D intensive industries focus more on product-oriented service strategies. R&D expenditures are required to continually create new complementary technologies and resources for the product which reduce customer uncertainty. With this uncertainty over existing technology firms need to develop competences by understanding customer needs, key priorities, and the product use environment to achieve product-market fit, achieve dominance in design, secure differentiation from low-cost competition, or survive a technology race (Visnjic et al., 2019). Firms with high R&D expenditures therefore focus more on technological innovation to compete in the market.

Because firms differ in their servitization strategy based on their innovativeness, it is therefore important to observe how the most technologically innovative firms behave and how their servitization developments coincide or differ from the four identified theories above. Therefore, a distinction must be made between firms with high R&D expenditures and firms with less expenditures. By looking at the difference between innovative and less innovative firms it is possible to observe how developments in the servitization-continuum, deservitization, the three service types and hybrid services differ in both cases. Further detail on how technologically innovative firms are identified and how the difference between them and other firms are observed is found in Chapter 4.

2.8 Summary

In this chapter the literature concerning servitization trends within industries is compiled and compared. The first which describes the use of services within an industry is the product-service continuum which posits that young industries start off only with product offerings and afterwards shift towards more services. This is done to extend the life of a product by offering more value to customers through services.

Furthermore, deservitization is also an important phenomenon found in the literature that occurs after industries mature. This is due to products being commoditized since the dominant market perception is already known and services do not add value to the it or

cannibalize on the product offering. This phenomenon is not discussed in the previously stated theories above.

Cusumano et al. (2015) show that there are three stages within an industry and during each of these stages a different portfolio of products and services are needed to offer the best result for the firm. The literature also talks about hybrid product-services which replace the use of products with a substituting service. According to the three stages theory, this should occur in ferment and mature markets and is used to give flexibility to new users in the beginning and in mature market to get a competitive advantage over other competitors. Besides substituting services, the other two important service types are adapting and smoothing services.

This chapter also introduces the literature's distinct difference between service-oriented and product-oriented offerings. Visnjic et al. (2019) propose that R&D expenditures can be used to identify firms which focus more on product-oriented innovations due to the higher investment needs of products. Due to this difference, it is important to observe how the two different groups behave with regards to the four identified theories.

Using the findings from the literature review, the results from this thesis can be compared. These theories can be understood by observing how they reflect themselves in the data and if they can be viewed using the methods of this research. The theories that will therefore be used are:

- The servitization continuum (Bustinza et al., 2017; Kowalkowski, Gebauer, Kamp, et al., 2017a)
- Deservitization (Kowalkowski, Gebauer, Kamp, et al., 2017a)
- The three service types development (Cusumano et al., 2015)
- The growth of "hybrid services" (Bustinza et al., 2017; Cusumano et al., 2015; Visnjic et al., 2017, 2019; Weking et al., 2018)

In the following chapter, the choice of indicators used to identify these trends in the data is explained. Afterwards, the methods used to measure these trends are explained in Chapter 4.

3. Trademarks and their use as servitization indicators

This chapter discusses the characteristics of trademarks and other intellectual properties. Why trademarks are uniquely suited to identify and flag products and services is explained and how these can be used to measure servitization. This chapter answers the

second sub-question posited by this thesis, namely, “*Why are trademarks suited to measure servitization strategies?*”

In this chapter, firstly, the theory behind intellectual property rights (IPRs) with regards to trademarks is explained and examples are given on how they are employed will be given. The second section gives an explanation how trademarks specifically operationalize business constructs. Thirdly, how trademarks are used in this thesis to measure and separate services is explained.

3.1 Trademarks as intellectual property rights

Trademarks are used to protect names and distinctive signs that are owned by a creator to differentiate the product or service being offered from other competing products or services in a market (WIPO, 2016). To apply for a trademark, the product or service either needs to be in use, or there is a clear intent to use by the owner. If this criterion is not met, the trademark will either be rejected or be cancelled. A trademark can protect either a product or service name. When a firm applies for a trademark it is classified using a standardized system. This classification system for products and services will be discussed in detail in Section 3.2. If the product or service does not comply with these criteria the application will be rejected.

What makes trademarks uniquely suited to measure products and services as opposed to other Intellectual Property Rights (IPRs) is the fact that they protect both products and services (WIPO, 2016). Other IPRs, such as patents, copyrights and industrial design protect new inventions, works of literature and aesthetic aspects of a product respectively. Copyrights and industrial designs therefore cannot be used to indicate which products and services are employed because they protect a completely different type of IP. Patents on the other hand, only protect novel inventions. Therefore, patents only protect new products in the market. Patents are not suitable therefore, to measure services. The problem of using patents is further exacerbated when considering that firms are still able to use patents owned by other firms through a licensing agreement. Although a patent is owned by one firm, a different firm can still create an entirely new product by using this patent. Furthermore, patents do not have the requirement that they need to be used in the market. A firm can use the protection that the patent provides to exclude other competitors from using the new innovation.

Trademarks on the other hand do not protect a certain type of product or service, only how they are identified (WIPO, 2016). Therefore, trademarks encompass the unique product and service offerings from different firms, even if they are similar in nature.

Trademarks furthermore, have the requirement that they must have an intent to be used in the market or are currently in use. This ensures that trademarks reflect products and services that are considered useful for the firms since they are actually in use.

3.2 How trademarks operationalize products and services

From the description above, one can see that trademarks are used to protect a firm's product and service offering and how they serve as an indicator. These abovementioned characteristics allows insight into which products and services the firm is currently using or intends to use in the future. Besides the use of trademarks as a measure, this section will show how trademarks indicate other important factors in products and services.

Although in recent years the use of trademarks in studies has been limited, trademarks are becoming more important due to the changing dynamics of how firms use IP to protect their intangible assets (Castaldi, 2018). The three important factors as identified by Castaldi (2018) in the changing of this dynamic are, firstly, symbols are used to capture intended meanings in a product to profile certain value propositions (Mendonça & Mamede, 2014). Secondly, as previously mentioned in the introduction of this paper, firms are depending more on services and service-oriented business strategies (Castaldi, 2009; Cusumano et al., 2015; Teece, 1986; Vargo & Lusch, 2004), these offerings cannot be protected by patents as can be done for products and therefore trademarks have started to play a more important role in the protection of IPRs. And thirdly, due to the rise of ICT firms trademarks were used to build reputational value and combine product and services offerings together (Gao & Hitt, 2012; Smith, 2011).

Furthermore, trademarks can either be abandoned by the owner or extended through a payment of renewal fees to the trademark office. Owners may abandon their trademarks for different reasons, including failure to show that the trademark is used in market and retirement of a product or service. When a trademark is abandoned it is considered 'dead' and when it is still in use it is filed as 'alive'. This allows one to see how the use of trademark registrations have evolved within a sector or company and gives insight in which market strategies are being used by looking at how many products and services are in use.

Trademarks are classified according the International Classification of Goods and Services for the Purposes of the Registration of Marks (the Nice classification). Companies that operate within the countries who participate in this classification system are

required to register their trademarks using this classification system⁵. The classification system includes 45 numbered goods and services indicators, the use of this classification can be observed in the examples of Oreos and Power-by-the-Hour in Section 3.1⁶. This classification also distinguishes between classifications that relate to goods and services. Class 1 through 34 are exclusively used for goods and 35 through 45 are exclusive for services. As previously illustrated in the Oreo example, each Nice class number also indicated which sector the trademark pertains to. This distinction in classification allows one to use the classes to distinguish the products and services used in a firm or sector. Using a trademark stock of a selected sector one can therefore see what portfolio of products and services said group is using.

Because of the above-mentioned characteristics of trademarks, one can use them to operationalize product and service offerings of firms. By looking at the trademarks in a firm's IP portfolio one can see how certain companies use their product offerings and if there is a trend towards more services by using the Nice classifications. In other words, trademarks operationalize the market strategies employed by firms (Castaldi, 2018). Therefore, trademarks are an effective tool to analyze firm market behavior and competitive strategies.

To illustrate how trademarks work in action, take the trademark filing of "Oreo"⁷, the famous cream filled cookies. The existence of the Oreo trademark means that the idea behind a cream filled cookie named "Oreo" is protected. Another firm is still allowed to create a cookie with the same composition as an Oreo, but that firm cannot call their own cookie an Oreo. The trademark therefore protects the creator of the Oreo in the sense that it can differentiate its product from imitators and that all associations with the Oreo brand are therefore owned by the trademark owner. Other information obtained from the trademarks are the Nice class listed on the trademark, in this case Nice Class 30 which classifies the product in the category of "pastries and confectionery"⁸. The trademark

⁵ As of March 25th 2019 there are 87 states who have officially ratified the agreement, with the newest states having joined in 2008 (WIPO, 2019). There are however, states who use this system without being ratifying members.

⁶ A complete list of all classes together with a short description of the classes can be found in Appendix A.

⁷ Trademark registration number: [4791022](#)

⁸ The entire description of Class 30 is as follows: Coffee, tea, cocoa, sugar, rice, tapioca, sago, artificial coffee; flour and preparations made from cereals, bread, pastry and confectionery, ices; honey, treacle; yeast, baking- powder; salt, mustard; vinegar, sauces (condiments); spices; ice.

filing also shows that the owner is Intercontinental Great Brands LLC, a subsidiary of Mondelez International, the corporate owner of the Oreo cookie brand. The complete overview of the trademark registration is found in Appendix C.

An example of a service trademark is “Power-By-The-Hour”, which is a service through which aircraft engines are rented out to aircraft owners and all the maintenance, repairs and installation are cared for⁹. This trademark therefore protects the use of Power-By-The-Hour as a name for all aircraft engine rental and repair services. This trademark has the Nice classification of Class 37 which corresponds with the category “repair and installation”¹⁰. The trademark record also includes the owner as Rolls-Royce. The complete overview of the trademark registration is found in Appendix C.

Using the information provided from the trademark, one can see what the trademark protects, what classification the trademark has and who the owner of the trademark is. In the following section, further detail is provided about the classification system and how trademarks are used to operationalize products and services.

3.3 Trademarks as indicators for services

From the description above, one can see why trademarks are suited to measure products and services and how they measure specific characteristics. By utilizing these aspects of trademarks, they can be used to identify i) whether a trademark is a product or a service ii) what kind of product or service a trademark is. Furthermore, as previously stated, trademarks need to be publicly filed in order for a firm to obtain its protection benefits. Therefore, trademarks are uniquely suited to measure the different theories identified in Chapter 2.

Trademarks therefore allow one to measure the extension dimension of servitization as proposed by Calabrese et al. (2019). The distinction between products and services allows one to see the quantity and growth of services in relation to products. This allows for the measurement of the servitization continuum and deservitization trends. The ability to separate between different service types also allows to identify what specific types of services have grown over time. This allows one to identify the three service types and in turn hybrid services.

⁹ Trademark registration number: [0814702](#)

¹⁰ The entire description of Class 37 is as follows: Building construction; repair; installation services.

As shown, trademarks are a unique indicator that allows one to measure the required dimensions to observe the identified theoretical trends. In Chapter 4 below, the methodology employed to use trademarks and link them to the theory and the selected sectors together with explicit criteria used to evaluate the trends are highlighted.

3.4 Summary

In sum, there are various ways in which an owner of a particular service or product can protect an invention or brand. Trademarks are one such way and allows the owner to protect various aspects that protect products and services. Using the Nice classification system, the various trademarks for goods and services can be distinguished and analyzed. This allows one to see what products or services a selected group of firms or a sector uses in their market strategy.

Due to the properties of trademarks, they can be used to operationalize constructs within the firm. This has become more relevant due to the extensive use of trademarks in recent years to protect intangible assets. Because of the characteristics of trademarks, they are an effective tool to analyze the market strategies of firms and can therefore be used to view their product and service offerings.

4. Methodology

This chapter explains the methods and tools used and how this will answer this thesis's research question. As previously illustrated in Chapters 2 and 3, the theories on how product and service portfolios change over time are summarized and the use of trademarks as an indicator is justified to measure this portfolio.

This chapter will discuss how trademarks are used to measure the theoretical trends of product and service offerings. Firstly, a proposed quantitative approach is introduced which includes approaches found in the literature. Secondly, the choice of database and data collection are explained. Thirdly, the measures and criteria used to observe these theoretical trends are highlighted and how the most innovative firms are distinguished. Afterwards, the use of product-service ratios and keyword analysis is explained and how these will be used to observe the theoretical trends is highlighted. Furthermore, how the sectors and the top firms are identified and how they will be used in the analysis and details such as accounting for subsidiaries are also highlighted. Finally, data quality measures which will be used in this thesis's analysis are highlighted.

4.1 A proposed quantitative approach

Besides the methodologies as described above, there have been numerous other quantitative methods that aim to describe servitization within sectors. These methods however, as recognized by the work of Calabrese et al. (2019) are flawed. The authors' work shows how previous quantitative studies have used inconsistent measures for servitization and in many cases have focused only on a single measure. By considering previous methods and literature, the authors create an approach which can be used to measure servitization trends within sectors and firms. The aim of their research is to offer a framework that can be used to fully measure servitization by using standardized measures.

The approach proposed by Calabrese et al. (2019) suggests that when measuring servitization, three dimensions must be taken into consideration, i) extension ii) infusion and iii) orientation. Extension includes the measurement of the amounts of services and the growth of the different types of services within a sector or firm. Infusion refers to how much revenue is extracted by each service. And, orientation refers to service strategies employed by the management. The authors propose a standardized way of measuring each dimension separately.

The infusion dimension requires nonpublic information from the firm to fully comprehend each service's revenue streams. This falls outside of the scope of this thesis due to its reliance on the use of nonpublic disclosures. The orientation dimension also falls outside of this thesis's scope because it focuses on managerial behavior and strategies instead of understanding the trends and behavior of the market.

Therefore, the extension dimension serves as the primary dimension which is employed in this thesis to measure servitization trends. The extension dimension is split up into two separate parts which measure the degree of servitization, i) the absolute quantity of services offered and ii) the diversity of services offered. True servitization therefore not only entails the use of services, but also the use of a diverse range of services (Calabrese et al., 2019).

This thesis aims to measure the four identified theoretical trends by adapting the use of the extension dimension of servitization as proposed by Calabrese et al. (2019). The quantity of services and its growth over time shows how services have increased or decreased their share of total offerings in a given sector. By using the quantity, one can therefore observe the servitization continuum and deservitization trend within the data. These trends relate to how product-service portfolios of firms and sectors change over time based on the number of services. By identifying different services and observing the

diversity of services at any given point the development of the three service types and the growth of hybrid services are observed.

The approach therefore offers a standardized way to measure the four theories using the extension dimension. Although the authors propose an approach of how to effectively measure servitization, they do not state which indicators to use within the approach. This thesis builds on their approach by using trademarks as the main indicator for measuring the number of services and the types of services within a certain sector. Further information on how the four identified theories are observed within the data can be found in Section 4.3.

For this thesis, four sectors are identified based on their prevalence in the literature. As previously stated in Section 2.6, the primary sectors which are found in the literature are the software, technology and heavy industries such as aerospace and automobiles. Because these sectors are linked to the theories and where one would expect to see these theories empirically they are used as units of analysis. The findings for each sector will be compared to the expected trend from the literature. In Section 4.6, the process of identification for these sectors is explained in further detail.

Furthermore, the overall trends will also be analyzed for the entire market and for the most innovative firms. The difference between the most innovative firms and less innovative firms in their servitization development is important due to their differing approaches to offering products and services. Further detail is provided in Section 4.6 on how the most innovative firms are identified.

4.2 Data collection and choice of database

For the purposes of this paper a publicly available database that houses the required trademark data is used. Using the United States Patent and Trademark Office (USPTO), a detailed view is given on which trademarks were granted to specific companies. The USPTO database contains data from many years and is used to create large data samples which can be analyzed. Trademarks in the database contain the required Nice classifications which will allow for the analysis and distinction of the goods and services. Specifically, the USPTO Trademark Case Files Dataset will be utilized as composed by. The Trademark Case Files Dataset contains detailed information on trademark applications filed with or registrations issued by the USPTO between January 1870 and February 2018 and is derived by the USPTO from the their main database for administering trademarks and includes data on mark characteristics, prosecution events, ownership, classification, third-party oppositions, and renewal history (Graham,

Hancock, Marco, & Myers, n.d.; USPTO, n.d.)¹¹. The use of the USPTO as the data source however, restricts the sample to firms that have trademark filings in the US only. Concerns about geographic focusing is limited however, due to the US being a large country where both many local and international companies operate.

The database is divided into various smaller datasets which can be downloaded separately. The relevant datasets will be downloaded and merged to form one single database with all required information to conduct this thesis’s analysis. These relevant datasets are: owner, classification, international classification and statement data. The owner data includes data that include the name of the trademarks’ owners which are used to identify companies. Classification data shows the dates where the trademarks were first filed and when it was first used in commerce. By knowing the filing date of the trademark, the year of application is identified and is used to sort the trademarks per year. International classification data includes the Nice classifications for each trademark which will be used to identify when a trademark is a product or service. And finally, statement data includes the description of each trademark, which gives the specific description of each trademark. This statement data is used for keyword analysis which will be elaborated on in Section 4.3. Table 3 below, gives an overview of the data and its use for the thesis.

Dataset name	Data	Use
Owner	Names of the owners of the trademarks	Identify the companies who own the trademarks
Classification	Filing and commercial use dates	Sort trademarks per year
International classification	Nice classifications	Separate goods and services trademarks
Statement	Trademark descriptions	Keyword analysis

Table 3: Overview of which USPTO data is employed for this thesis and its use

Although the data dates back to 1870, the timespan of this analysis will start from 1980 and will end in 2017. The 1980’s is the period where Teece (1986) and Vargo & Lusch (2004) first wrote and acknowledge servitization trends within firms, and 2017 is chosen as the final year because of its proximity to the current date. The 1980-2017 timespan will allow one to see if the servitization trend theories identified by the various authors during these years are reflected in the data. 2018 and 2019 are not considered due to the lack of data compared to other years. This lack of data in the most recent years

¹¹ These files can be found at <https://www.uspto.gov/learning-and-resources/electronic-data-products/trademark-case-files-dataset-0>

is attributed to new trademark applications not being completely processed by the USPTO into the case file database from their main database.

4.3 Observing theoretical trends in the data and criteria

In Chapter 2 Servitization: A brief literature review, four theories are identified. These theories are namely, i) the development of the three service types, ii) the servitization continuum, iii) deservitization and iv) the growth of hybrid services. To effectively measure how these trends are reflected in the data criteria are required to validate the theoretical trends. This section explains how product-service ratios and different service types are used and identified to measure the theory's trends.

Firstly, the servitization continuum is observed by looking at how the product-service ratios have changed through time. To observe these product-service ratios, all service trademarks must be identified and divided by the total amount of trademarks for any given year. The change in composition of these product-service offerings through the years will show how product and service offerings have changed. The criteria used to measure the servitization continuum and deservitization are therefore if services are expected to grow from 1980 in absolute terms and after a certain point services should decrease in share respectively. To observe the servitization continuum, cumulative and yearly numbers are used to see how the total number of services have changed as a share of total offerings and how this changes per year. Furthermore, to observe deservitization yearly numbers are used. Yearly numbers are chosen to measure this effect due to high service growth in previous years make changes in later years harder to measure. To compensate for the lack of cumulative numbers, services must keep declining systemically after reaching a peak in a certain year. Further details on how the product-service ratios are calculated are provided in Section 4.4. Below in Table 4 an overview of the methods used to measure the theories is found.

Secondly, to measure the development of the three service types, the separate service types need to be identified. The services need to be clearly identified and separated and their development through time can then be observed. To properly separate smoothing, adapting and substituting services, unique characteristics for each need to be identified. To identify the different service types, keyword analysis is employed to separate the individual service types with unique identifiers. Due to hybrid services being equivalent to the Cusumano et al. (2015) definition of substituting services the same criteria can be used to observe how many hybrid services are offered by firms. Given the theories' expectations the share of hybrid services should show an absolute increase starting from

1980. Furthermore, to measure the development of the three service types, the expected trend as proposed by Cusumano et al. (2015) is used. This trend is namely that initially adapting and substituting services should dominate the service offerings and smoothing services should be marginal. In the following stage smoothing services is expected to grow quickly and reduce the share of substituting and adapting services. In the final stage, smoothing services are expected to continue with its increase of total service share and substituting services will grow again while adapting service lose share. The authors do not specify how much share each service type should comprise. Only a visual representation (shown in Figure 2.1) indicates the expected share for each service type. For the purposes of this thesis, the following criteria are used to observe the development of the three service types:

- Firstly, substituting and adapting services comprise the majority of all service offerings for a young sector while smoothing services should comprise a small fraction of all services.
- Secondly, smoothing services should increase its share in the total service offerings and substituting and adapting services should decrease.
- Thirdly, substituting and smoothing services increase and adapting services lose total share.

For each sector the periods which constitute the ferment, transition and mature phases differ and are also not defined. The development within each sector is therefore observed individually and whether the trends are truly present will be shown. To observe this development, cumulative numbers are used to observe how total service offerings have changed over time which furthermore helps smooth out the erratic increases and decreases per year for each service type. Further details on how keyword analysis is used to define the service types and how different approaches are used for the aggregated groups and individual sectors are provided in Section 4.3.

Theory	Method	Criteria	Data
The servitization continuum (Bustinza et al., 2017; Kowalkowski, Gebauer, Kamp, et al., 2017a)	By using product-service ratios to observe how the share of services changes over time.	Services should increase their overall share in all product and service offerings.	Cumulative and yearly
Deservitization (Kowalkowski, Gebauer, Kamp, et al., 2017a)	By using product-service ratios to observe how the share of services changes over time.	After reaching a peak, services as an overall share of all product and service offerings decreases continuously.	Yearly

Three service types (Cusumano et al., 2015)	Keyword analysis for identification of the different service types followed by a measurement of how the services change over time.	First stage: adapting and substituting services are dominant in total service offerings. Second stage: Smoothing services gains share in total service offerings. Third stage: Substituting and smoothing services grow their share in total service offerings.	Cumulative
The growth of “hybrid services” (Bustinza et al., 2017; Cusumano et al., 2015; Visnjic et al., 2017, 2019; Weking et al., 2018)	Keyword analysis for identification of hybrid services followed by a measurement of how the service changes over time.	Hybrid services are equivalent to substituting services. An absolute increase in substituting services is expected in the data.	Cumulative

Table 4: Overview of theories together with how they will be measured and their criteria

In the following segments, how trademarks are used to create measures for product-service ratios and how they can be used to separate different service types are explained together with the identification methods for the relevant sectors and the most innovative firms.

Furthermore, the difference between technological innovative firms and less innovative firms must be identified in this study. As previously mentioned, Visnjic et al. (2019) show that high R&D spending firms are more product oriented and focus more on technical innovations. To differentiate between these two types of firms, a list of the top R&D expending firms is used to identify the most technologically innovative firms. These innovative firms are compared with the entire dataset to see how they differ from the total market activity in their offerings. The high R&D spenders and the total market are then used in the analyses for the four theories to see how the two differ in their servitization developments.

4.4 Servitization and deservitization

To see how the product and service mix has changed throughout the years a historical product-service ratio is required. This ratio is calculated by dividing the total amount of service trademarks within the data by the total amount of product trademarks to create a ratio for a given year. By executing this process for all years and indicating the respective ratios that fall within the scope of this research the progression of the use of services are observed.

In other words, the share of services within the total stock of trademarks is observed over time. This method will show if the servitization continuum as described by

Kowalkowski et al. (2017) and Bustinza et al. (2017), which shows how firms offer more services through time, can be measured using quantitative techniques based on trademarks. This method will also provide insight into the phenomenon of deservitization as identified by Kowalkowski et al. (2017).

To create the above-mentioned ratios, all trademarks with Classes 35 through 45 are considered services in accordance with the Nice classification. All other trademarks (Classes 1 through 34) are considered products as per the classification. In the data, this is represented using a dummy variable, with 0 denoting services and 1 denoting products. Using the prevalence of the products and services Classes in each sector an overall product-service ratio can be created and its ratio is mapped through time.

4.5 Three service types and hybrid services

To create a ratio which allows for a comparison to the Cusumano et al. (2015) theory of three service types (smoothing, adapting and substituting services), a distinction must be made within the service trademarks to find which service type they pertain to. By understanding how the service types change over time for sectors, the degree of servitization can be observed through the three service types.

Smoothing services are services that facilitate the transaction without altering the product. As previously stated, this includes, amongst other things, financing and insurance. The description provided by Cusumano et al. (2015) corresponds with the description of the Nice Class 36 which includes insurance, financing and monetary affairs. Trademarks with this Class therefore can be easily identified as a smoothing service and are included in the data as such.

Identifying substitution and adapting services however is trickier due to the nature of said services. These services are highly adaptable for various situations and cross service classification boundaries. For example, customizing software could fall in the software category as well as technological or consulting services. Therefore, keyword analysis is used to analyze their goods and services description in the trademark filing to find what exactly these services entail. Keyword analysis is the use of important words or other indicators to distinguish relevant data from other data.

In other words, certain keywords are used to scan through all trademark descriptions to identify their category. This is done using the trademark statement data. Whenever there is a match between the search term and the description, the trademark is flagged as the required category. To identify the service types, it is therefore required to produce a list of relevant keywords to identify that are related to adapting and

substituting services. These keywords are then used to sift through the trademark statements to match trademarks that fit the description of the adapting and substituting services.

Therefore, instead of a single or combination of Nice classes to distinguish the adapting and substituting service types, a list of keywords is produced which identify the relevant trademarks. The keywords are chosen using the characteristics of the services and what kind of activities are expected within these categories. For example, adapting services allow consumers to customize and adapt product offerings. Therefore, these two terms, in various different forms, together with other keywords are used to find the adapting services within the dataset. Other keywords that pertain to the class of adapting include terms such as consulting, training and finding new uses for products. For substituting services, which replace products by offering services in their stead, terms such as leasing, as a service are used together with maintenance and repair. By using the description of these service types found in Cusumano et al. (2015) a complete list of keywords is identified. The keywords and criteria used to create the different service types are found below in Table 5:

Smoothing	Adapting	Substituting
((Nice Class 36))	Customize Customizing Customer service New uses Adapt Adapting Training Consulting Integration Integrate Tailored Tailor	Lease Leasing Outcome Replace As a Service Maintenance Repair Pay per use <i>In lieu</i> Maintain

Table 5: Keywords and criteria used to identify the three service types in the data.

Furthermore, hybrid services have been identified by various authors under various names as shown in Chapter 2. Cusumano et al. (2015) give this service the name of substituting services which also occurs when companies mature. By identifying these hybrid services through the above-mentioned method and comparing the incidence of them to the total amount of trademarks through time one can see how this type of service has grown and if there is indeed a trend.

However, the theory proposed by Cusumano et al. (2015) relate to firms or sectors and cannot be generalized for whole markets. Whole markets consist of various industries

in different stages of development and will skew the data. Therefore, to observe servitization trends for general markets the approach proposed by Calabrese et al. (2019) is used. The authors state that to effectively measure servitization one needs to also consider the different types of services employed by an industry or firm. The authors do not state how these different types should be measured, but by using Nice Class data the trends within service classes are observed. Using the Nice Classes for the top ranked firms and the whole dataset, the trend of types of services are observed. Although the others propose their own set of service types to measure, the categories do not differ substantially for using Nice Classes¹². Therefore, to distinguish the various service types the Nice Classes are used instead. Through Nice Classes 35 to 45 different types of services are identified and by looking at these 10 service types for each unit of analysis one can see how the different types of services change as a percentage of offered services by looking at the cumulative trend over the years. By using this measure the degree of servitization within the top ranked firms and the whole market are observed.

4.6 Top firms and industry selection

To gain relevant insights on specific industries, they must first be identified in the database. Due to the wide vast number of companies within the database, a selection of a few firms per industry is therefore needed. A list of the worldwide top 2000 firms ranked by their R&D expenditure is therefore used. This list is derived from the European Commission's Joint Research Center and uses R&D and capital expenditures to find the most innovative companies (Hernández et al., 2017). The list includes names of the firms together with their sectors. The list will be used to identify the various industries using the known firms of this list. By using the firms with the highest R&D expenditure, it is therefore ensured that the included firms are at the forefront of innovation and are using their capabilities to offer the most innovative products and services in their sector.

Similar with identifying the different service types, the included firms are identified in the database by using their names as keywords, and comparing them to the owner name data. Through this method, the owner data in the database is matched with the names of the top ranked firm list.

To identify the relevant trademarks two methods will be used. Firstly, these top ranked firms are identified in the database using keyword analysis. These top ranked firms are used to view how the top firms behave with regards to servitization. Due to the

¹² Calabrese et al. (2019) propose 96 service categories in their work.

focus on higher R&D expenditure, these firms are more innovative with their product and service portfolios. The ratio for the top ranked is compared to the trend within the entire database to see if there are any differences between trends for the entire market and the most innovative firms. The sector composition of the top ranked firms is found in Appendix D.

Secondly, the sectors that will be analyzed, are the software, technology and hardware, automobiles and parts, and aerospace and defense sectors¹³ since these are the sectors which were the most prevalent in the literature. Because one would expect the theories to be seen specifically in these sectors, due to their use in the literature, these will be analyzed using the empirical trademark method of this thesis. The industries are then analyzed using the approach described above which observes the four theories.

Conducting these analyses answers the main four theories from the literature review in Section 2.1. Analyzing the service ratios over time for the whole dataset, the top ranked firms, and the select industries gives insight into i) the servitization continuum and ii) deservitization. And, by looking at how the three service types develop over time we can see if iii) sectors behave in the manner predicted by Cusumano et al. (2015) and iv) the growth of hybrid services. An overview of the data over the years for the product and service shares and the three service types for each category of analysis is found in Appendix E and F respectively.

The software, hardware and technology, automobiles and parts, and aerospace and defense sectors are identified using the industry data for the top ranked firms. Because these firms are categorized within each sector they can be used to identify their respective sector. By identifying the top firms within a select industry these can be matched with their trademarks within the database by using the firm names as keywords. This method excludes smaller firms from the industries, but these smaller firms comparably should have a much smaller trademark output when compared to the large firms used to identify the industries. Therefore, by only using the largest firms, a representative dataset for each industry can still be created. The sample sizes and trademarks within this thesis's database for each industry, top ranked and entire dataset are summarized in Table 6 below.

Industry	Sample size firms (n)	Trademarks in database
Entire dataset	2,157,984	12,190,873
Top ranked	2000	51,864

¹³ These are the sector names used in the list derived from the European Commission's Joint Research Center.

Aerospace and defense	46	3,404
Automobiles and parts	126	4,903
Software	188	19,024
Technology and hardware	293	4,870

Table 6: Sample sizes for the four chosen industries for additional analyses

This method however, has drawbacks. Including only high-ranking R&D, as previously mentioned, biases the set towards large companies that are at the forefront of trying to achieve market dominance over their competitors. For the purposes of this paper, which aims to see if the theories are reflected in real life, a concentrated group that are actively trying to enhance their products and services for maximum profit and market dominance is ideal. The conclusions of this research cannot be confidently generalized sector wide, but the theorized trends can be more easily observed using this data.

In the data retrieved from the USPTO the owner of the trademark is sometimes a sub-entity of the main corporation. Looking back to the Oreo trademark example in Section 3.2, where the owner of the trademark in the US is not the Mondelez International but a subsidiary named Intercontinental Great Brands LLC, with no obvious connection to the mother corporation. This occurrence will inevitably bias the data towards trademarks held by the only by the parent company. Measures to include keywords into the identified firms within the scope of this research might exacerbate the problem by including firms with similar names. For example, if one were to search for subsidiaries for Apple Inc. using this method through adding the keyword “technologies”, one would find any subsidiary of Apple that includes the term technologies in it, but the company Red Apple Technologies, an Indian mobile gaming and application developer would also appear. Even if an effective keyword list were to be found for a single firm, it does not mean that it is also applicable for another firm within the same sector and excludes the subsidiaries with no clear relation such as Intercontinental Great Brands. Therefore, only trademarks owned by the parent company are considered to not increase the precision error by using erroneous subsidiaries.

4.7 Data quality

Because this thesis identifies the industries, top firms and service types using keyword analysis, a verification step is needed to see if the retrieved data is relevant. To measure the accuracy of the data employed in this thesis, two important criteria are therefore considered, namely, the recall and precision of the data. Recall entails that all relevant data is collected through the keyword analysis and least possible relevant data is

excluded. In other words, recall measures whether all important data is flagged by the keyword analysis. Precision on the other hand entails that the number of irrelevant data is minimized in the retrieved set. Precision therefore measures how accurate the retrieved data is and how much irrelevant data is present. The aim is therefore to have a high rate for both measures to ensure that the data is relevant. To summarize in terms of formulae:

$$\text{Recall} = \frac{\text{Relevant trademarks retrieved}}{\text{Total relevant trademarks from source}}$$

$$\text{Precision} = \frac{\text{Relevant trademarks retrieved}}{\text{Total trademarks retrieved}}$$

The aim of finding the right data is therefore to maximize both recall and precision when searching through a source database. This is achieved through the careful addition of keywords with “and”, “or” and “not” operators which include and exclude terms in the search within the trademark description.

To test for the precision of the data for the creation of the top ranked category, a sample of 100 randomly selected trademarks are used to test how accurately the keywords sorted them. Through this method the accuracy in which the keyword analysis incorporates the correct firms is calculated and is considered when final conclusions are made. The complete list of the 100 randomly selected firms is found in Appendix G.

To estimate the recall of the data, a set of 51 randomly selected firms are identified individually in the database. The set of 51 firms will reflect the composition of the sectors in the top ranked list¹⁴. The final list of the 51 known firms used for the recall test can be found in Appendix H. A single random trademark owned by the firm is then selected and checked if it appears in the keyword generated top ranked list used in this thesis’s analysis.

The same process is repeated for the constructed smoothing, adapting and substituting service categories. For the precision test, 50 randomly selected trademarks per type are identified and each is checked manually to see if they indeed fit the description of their service type. For the recall test, 20 trademarks are identified for each type and they are checked to see if they were flagged as their respective service type. The complete list of the 50 randomly trademarks for each service type is found in Appendix J and the 20 identified service types are found in Appendix K.

¹⁴ This composition is found in Appendix D.

Furthermore, due to the size of the database it is difficult to manually correct all classifications that are provided by the keyword analysis. Some errors, although they are not expected to be much, might be in the data and the random selection of the test dataset also may provide a biased view of how the precision and recall of the data is interpreted. By conducting the recall and precision test, this error is estimated and the findings are used to see how reliable the data retrieval process was.

4.8 Summary

This chapter provides an approach on how to observe servitization theories in particular sectors. Firstly, this chapter uses the approach provided by Calabrese et al. (2019) to create the framework through which the theories will be measured using trademark data. To find the relevant trademarks and firms to analyze, the USPTO database is used due to its public availability, its large time span and the plethora of firms within the database.

How the product-service ratios are used to analyze how the servitization-continuum and the deservitization trend can be observed. This is done by observing historical product-service ratios to see how their portfolios have developed over time.

The three auxiliary services are distinguished using Class 36, which corresponds with smoothing services and keyword analysis provides the indicators for adapting and substitution services. Through this approach, the theories of the three service types and the growth of hybrid services can be observed. Furthermore, for the top ranked and the whole dataset it is not possible to analyze the three service types because the services are a function of industry maturity. Since the whole dataset and the top ranked firms are formed out of different industries with different maturities this method cannot be applied to them. Therefore, an alternative method using the Nice Classes for services are observed for the whole dataset and the top ranked firms. The use of the service Nice Classes also function as an additional check on the three service types to see how different types of services evolve through time.

Furthermore, how the most innovative firms are distinguished is also highlighted in this chapter. Together with how the data retrieved from analyzing the top firms together with the whole dataset the difference in behavior between these two categories is observed.

5. Results

In this chapter, the methodology explained in Chapter 4 is employed to find the results needed to answer the remaining sub-question posited in Chapter 1. Namely, “*How do sectors differ in their product and service development through time?*”

To start, this chapter first gives some insight into the key descriptive statistics of the data, including the results of the recall and precision tests. Afterwards, the product-service ratios are calculated for the software, hardware and technology, automobiles and parts, and aerospace and defense sectors together with the behavior of the entire dataset and the top ranked firms to see what servitization trend can be seen. Thirdly, the trend of the different service types is graphed out for these two groups using the Nice Classes to see the variety of services that are employed for the four sectors and the whole dataset and top ranked firms. Furthermore, the results will be and the implications of these findings are discussed.

5.1 Key descriptive statistics

Before conducting the analysis, statistical tests are run on the data to see how reliable the results are and if there are any statistical insights this thesis needs to consider. The first of these analyses is checking if the sectors variables created using the firm names overlap with each other. This overlap test sees if firms from one sector are erroneously placed into different sectors. Because the sectors encompass different firms they should have the minimal possible overlap because of the differing sector focuses of firms in the data. To test this correlation, the trademarks from one sector are compared to the trademarks that fall under another sector. The results of the correlation test are found in Table 7 below.

	Automobiles and parts	Technology and hardware	Aerospace and defense	Software
Automobiles and parts	4,903			
Technology and hardware	0	4,870		
Aerospace and defense	0	0	3,404	
Software	0	6	0	19,024

Table 7: Results of the overlap test, with the numbers in the table indicating the total number of trademarks that overlap between different sectors.

The results of the test show that there is barely any overlap in the sectors. Nearly all sectors do not share any trademarks. The only two sectors that share trademarks are the software and technology and hardware sectors. The shared trademarks are owned by the

same company, the LSI Corporation. This firm is indeed present in the top ranked list and is listed as a technology and hardware company. However, the small overlap is miniscule in the data. The overlap represents 0.03% (6 divided by 19,024) of all software trademarks and 0.12% (6 divided by 4870) for all technology and hardware firms. The overlap also concerns only 1 firm out of 188 and 293, for software and technology and hardware respectively. Therefore, the error barely has any significance on the trends that are observed.

Furthermore, a Pearson’s pairwise correlation test is run on the three service types to see how much the trademarks correlate. The correlation test shows if trademarks that are flagged as one type of service are also flagged as another. By looking at the theory of the three service types in the strictest sense, there should be no or barely any correlation between the service types. The results of which are found in Table 8 below.

	Smoothing	Adapting	Substituting
Smoothing	1.000		
Adapting	-0.0065*	1.000	
Substituting	0.0254*	0.0820*	1.000

Table 8: Results of the pairwise Pearson’s correlation test for the three service types. All values with an asterisk () are statistically significant within a 95% confidence interval.*

The correlation coefficients between the service types are all statistically significant when using a 95% confidence interval (all have values of $p < 0.00001$). One can also see that the substituting service types correlate the most with the other services. This correlation relates to the fact that substituting services encompass a wider range of service offerings that may overlap with the other service types. However, the coefficients are all relatively small and show the effect is negligible.

The final statistical tests are the recall and precision test as described in Section 4.5 To see if the keyword approach of identifying the top ranked firms is reliable a precision test is conducted. 100 random trademarks are chosen from the constructed top ranked list from the database and the firm names from the original list¹⁵. From this test, it shows that 77 of the 100 are relevant for the analysis. The remaining 23 that are not relevant for analysis ended up on the list due to having particular keywords in their names which led to them erroneously being added to the list. Controlling for all of these irrelevant firms is impossible due to the size of the list. What this relevancy rate means

¹⁵ The full list of the 100 random trademarks is found in Appendix F.

is that for every 100 trademarks gathered using this methodology, 23 are irrelevant. The data therefore contains a rate of error. Given that the trademarks are identified using the company names as keywords, and that these company names are not mutually exclusive such as the example of Apple Inc, the American tech company, and Red Apple Inc, an Indian software company an error rate is expected using the methodology. However, a roughly 77% relevancy rate is deemed suitable for this analysis since it still captures relevant trademarks in its majority.

For the recall test, random trademarks owned by a known company within the top ranked is chosen as a reference¹⁶. The chosen trademarks owned by the firms are listed in Appendix I together with the results. From the recall test results, one can see that 37 trademarks out of the 51 were flagged for the top ranked list, resulting in a recall of 73%. This means that for every 100 relevant trademarks in the database that are relevant, the methodology of this thesis does not identify 27 of them. Similarly, the precision test, this rate of error is contributed to the fact that the database is exceedingly large and that the keywords used may not necessarily flag the correct trademarks. The 73% recall rate however, is considered suitable for this analysis since it still captures a significant amount of the relevant trademarks.

The same statistical test are run for the three service types to check for their precision and recall. 50 randomly selected trademarks are used for each service type and are checked to see if the trademarks do indeed fit into the flagged service. The precision for the three service types are, 42% for smoothing, 58% for adapting and 52% for substituting services. This means that for every 100 trademarks gathered using this method for the services 42, 58 and 52 trademarks are relevant respectively for each service. This shows that there is a lot of noise included in the identified service types. However, for every keyword added to the analysis the possibility increases that more irrelevant trademarks are added into the service types. Therefore, adding more keywords will not increase the precision of the analysis. The data also does not include a consistent error which flags a certain type of trademark over another. Therefore, adding “not” operators will only exclude a handful of trademarks and the error rate will not meaningfully decrease. The precision for the three service types are roughly equal, meaning that comparing the service types with each other will allow the error to cancel in in terms of magnitude¹⁷.

¹⁶ The list of the known chosen companies chosen for this test can be found in Appendix G.

¹⁷ The full list of the 50 randomly selected trademarks is found in Appendix I.

The recall of the three service types is also tested for the three service types. 20 trademarks are manually chosen from the dataset which are definite matches for the services types. These trademarks are checked to see if they are flagged as their respective service type. The recall results are, 85% for smoothing, 65% for adapting and 100% for substituting services¹⁸. This shows that for every 100 trademarks identified, 15, 35 and 0 trademarks are not identified respectively for each service type. This shows that overall, the recall is high for the service types, with adapting services as the worst. The extremely high recall for substituting services indicates that the keywords used have a very high rate of recall for the service. But, the keywords still flag many trademarks that do not fit into the substituting trademark type.

Given the recall and precision test of the three service types it shows that the employed keywords identify the relevant trademarks well but include a lot of noise. However, since the service shares will be compared with each other and the noise is roughly equal for each service type the statistics can be used to conduct this thesis's analysis.

5.2 Servitization continuum and deservitization

Now that the data has been validated, the product-service ratios are calculated for the four sectors and the whole dataset and top ranked firms. The ratios are observed in two ways, firstly by looking at new offerings per year and secondly, by looking at the cumulative numbers for services and total trademarks. By looking at the new offerings per year, one can see the growth of services per year in an economy through these new registrations. The new offerings per year reflect the use of services per year over time. The cumulative numbers show how as a share of new products and services over time how services have grown. By using the cumulative numbers, one can see how the share of services have grown overall by considering how services have caught up to products over the years.

5.2.1 Four industries

From the data gathered using this report's methodology, the four main sectors that can be analyzed are the automobile and parts, the aerospace and defense, technology and hardware and software sectors. This serves to further focus trends to a handful of relevant industries and to see what is observed from these trends.

¹⁸ The full list of the 20 identified trademarks is found in Appendix J.

Using the trademark dataset, one can see how these industries have supplemented their products with trademarks over the years. In figures 5.1 and 5.2 below, the overview of this development can be seen.

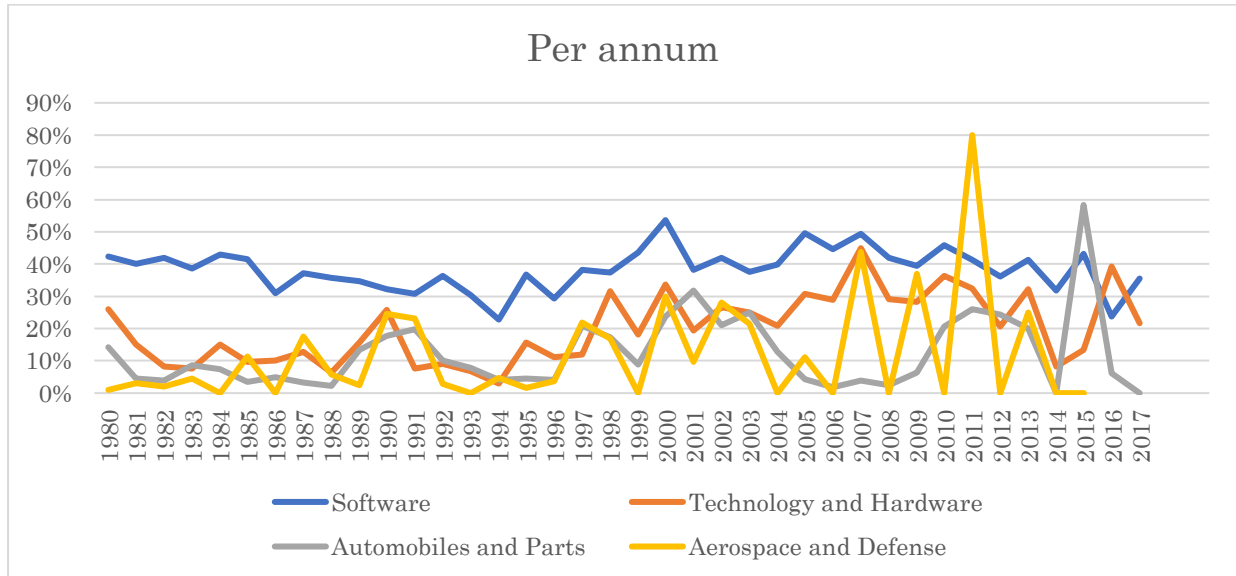


Figure 5.1: The servitization trend for the four sectors based on the percentage share of service trademarks from the total per year. Trendlines are omitted for a better overview.

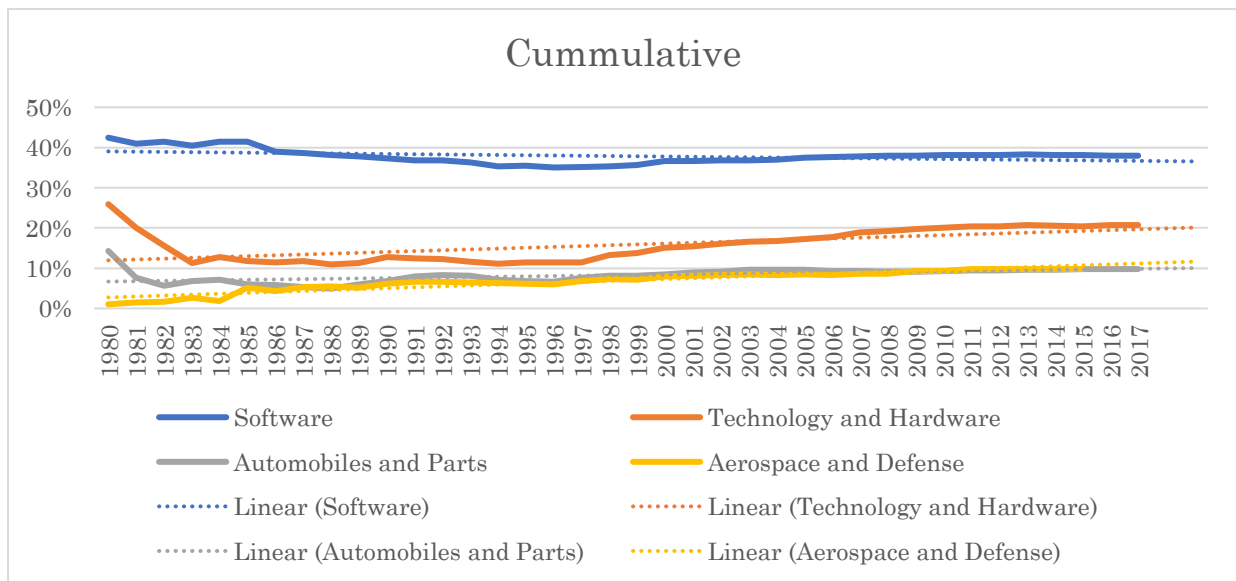


Figure 5.2: The servitization trend for the four sectors based on the percentage share of service trademarks from the total cumulatively.

From the figures above, one can see how these four sectors have evolved over time with regards to their service offerings. The other sectors, which focus more on manufacturing, show that there is a slight increase in their service offerings over time, when looking at the cumulative trend. But, the new service offerings per year fluctuate

heavily in recent years, especially for aerospace and defense in 2011 (going from 0% to 80% of new trademarks in a year) and automobiles and parts in 2015 (going 0% to 58% of new trademarks in a year). For the technology and hardware, automobiles and parts and, aerospace and defense sectors there is a clear cumulative trend towards offering more services. An overview of the slopes and intercepts of the trendlines can be found in Appendix K.

Considering the criteria posited in Section 4.2, these manufacturing focused sectors therefore show that they do follow the servitization continuum trend as expected from the literature. The software sector, however, demonstrates a slight decline in their service offerings starting in the year 2000, reaching a peak of 54% and systematically declines afterwards and therefore exhibits a small deservitization trend. Similarly, for technology and hardware, a peak of 44% is reached in 2007. Considering that software is not a manufacturing sector and that their offerings are mainly focused on services this makes sense. One can see however, that the focus in the software sector is shifting slightly towards offering more products instead of services. Because of the wide swings in service offerings for the aerospace and defense, and automobiles and parts no clear conclusion can be made deservitization. The implications of these findings are discussed in Section 5.4 Discussion.

5.2.2 Effect of innovation

The numbers for the whole dataset and the top ranked firms reflect changes in the general economy and the most innovative firms respectively. By looking at these numbers, servitization trends that pertain to the market are observed. In Figure 5.3 below, the share of services within the total amount of new trademarks each year is given and in Figure 5.4 the cumulative numbers are observed.

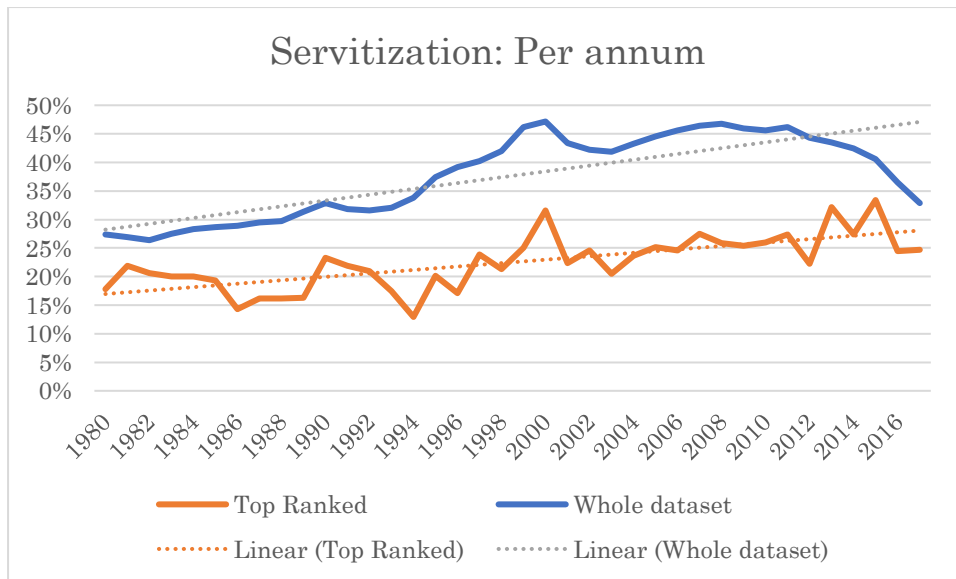


Figure 5.3: Servitization trends for the whole dataset and top ranked with the percentages in the y-axis showing the share of service trademarks within the total amount of new trademarks for each year.

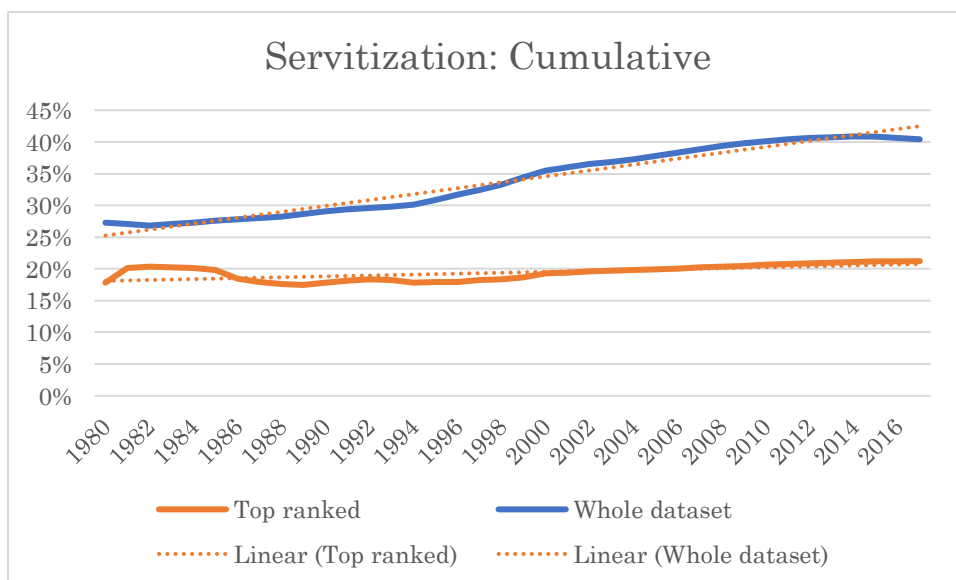


Figure 5.4: Cumulative servitization trends for the whole dataset and top ranked with the percentages in the y-axis showing the cumulative share of service trademarks within the total amount of new trademarks for each year.

Figure 5.3 and 5.4 show that the top ranked offers fewer new services every year when compared to the whole dataset and overall. This shows that the higher the R&D expenditure of the firm, the more focused it is on offering more products instead of services, which is in line with the findings of Visnjic et al. (2019). An overview of the slopes and intercepts of the trendlines can be found in Appendix L.

For the top ranked firms, new services increased from roughly 18% of all new products and services in 1980 to 20% in 2017. This indicates that for the top ranked firms that there is a slight increase in the use of services per year. When considering the

cumulative trend, the share of services as a whole of all products and services over time, one can see a slight increase from roughly 18% in 1980 to 21% in 2017. The graph however, shows a much flatter trendline which indicates that the services are not growing as quickly as a proportion of the firms' product-service portfolios.

The whole dataset on the other hand, shows a much stronger trend towards offering more services. The whole dataset offered more services in 1980 than the top ranked firms did and have grown this proportion much more over time than the top ranked firms. For instance, the whole dataset increased their new services per year from 27% in 1980 to 32% in 2017. Both numbers being significantly higher than the top ranked firms on a yearly basis. When looking at the number cumulatively, one can see a strong trend of more services being offered as a share of all products and services over time. Starting from 27% in 1980 and ending at 40% in 2017.

Furthermore, for the whole dataset a clear decrease in the services offered per year is observed starting in year 2011 where the share of services reached 46% and eventually decreased to 32% at the end of the data series. This shows that services as a share of total product and service offerings have decreased by 14% in 6 years' time. For the top ranked firms, various periods of decreases are seen, especially from 1990 to 1994 (9% decrease) and from 2000 to 2003 (11% decrease). However, these decreases are not consistent and over time the service offerings keep on growing past the initial high. From 2015 to 2017 there is a 9% decrease in service offerings per year, but the time period of this decrease is too short to conclude that there is a systemic shift to offering fewer services.

As a whole, the graphs for both the whole dataset and the top ranked trend upwards, showing that there is a trend towards offering more services. This positive trend towards offering more services confirms that servitization continuum theory of Kowalkowski et al. (2017) and Bustinza et al. (2017) can be observed for these populations of firms. What the data shows is a positive trend over time for the two lines, indicating that per year more services are being offered and that the share of services over time is also increasing. As claimed by both papers, firms start offering more services as they mature, as time progresses, both the top ranked firms and the whole dataset offer more services as a whole indicating that there is an effect on offering more services as the two mature. Using the criteria described in Section 4.2 to measure the theories of deservitization and the servitization continuum, one sees that in absolute terms, for both yearly and cumulative data, the amount of services increases. Therefore, the effect of the servitization continuum is observed. The trend for deservitization can be observed from the yearly data for the whole dataset which starts to systemically offer fewer services

starting in year 2011. For the top ranked firms, a consistent decrease in new service offerings cannot be observed.

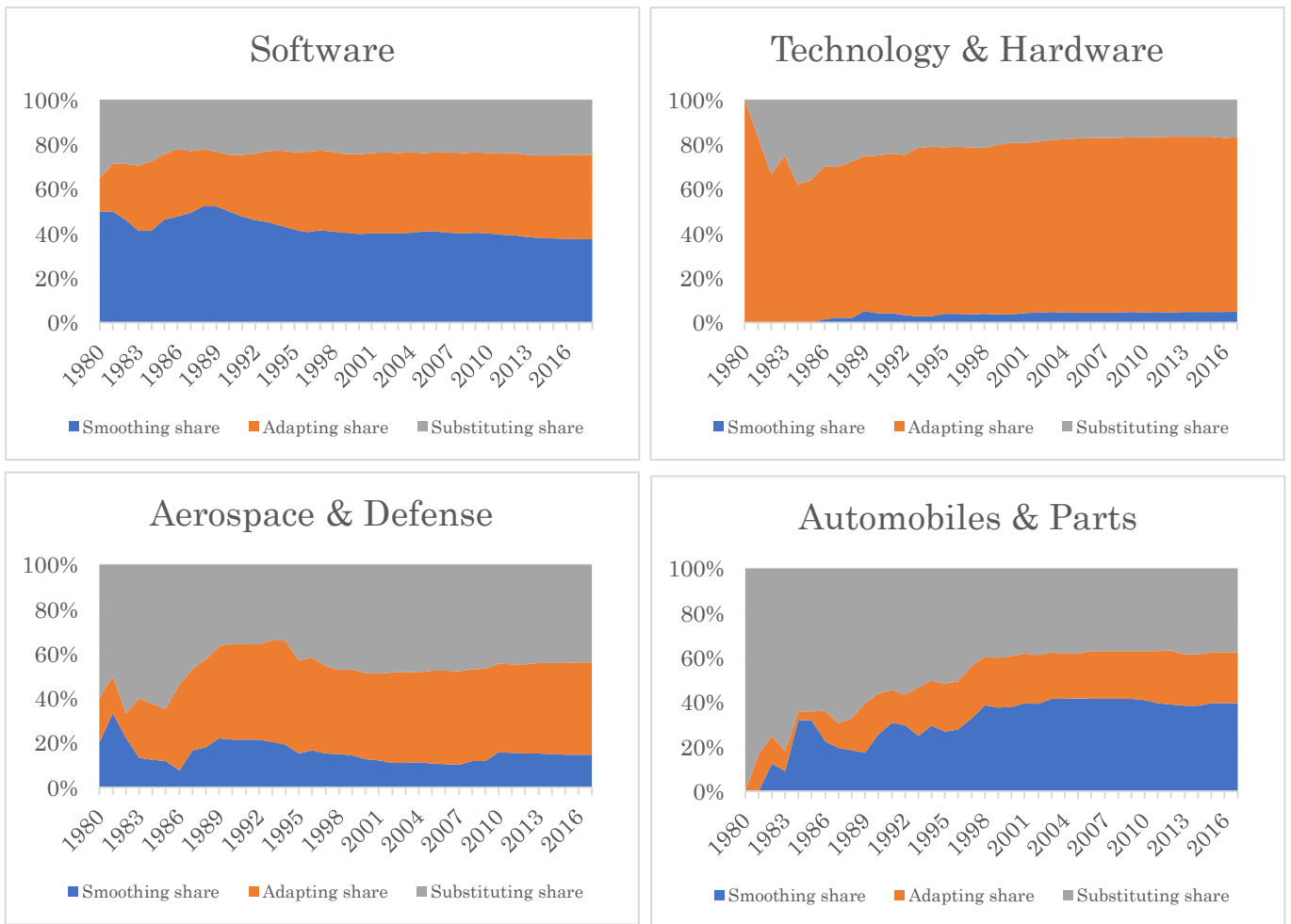
What one can therefore observe from these numbers is that the whole dataset, which is comprised of far more numerous and smaller firms that more services are being offered when compared to the top ranked firms. In Section 5.4, these results are discussed together with possible explanations of why this phenomenon is observed.

5.3 Development of service types

5.3.1 Four industries

Using the service type data, the development of the three service types (smoothing, adapting and substituting) can be observed in the data for the four selected industries. The results of this section will be compared to theory of Cusumano et al. (2015) to see if the developments follow the expected pattern¹⁹. The pattern is summarized as follows, in the beginning there is a large share of adapting services with few substitution and smoothing services. Afterwards, smoothing services grow and substitution and adapting services decline. Finally, smoothing services become the dominant service type with substitution services also growing and adapting services declining. Besides understanding how different service types develop within separate industries, and if they follow the predicted trends found in literature. This also gives additional insight into how services develop based on sector requirements and characteristics. In the following figures, the findings of these sectors can be found.

¹⁹ The illustration of the pattern is found in Figure 2.1.



Figures 5.5 through 5.8: The cumulative distribution of the three service types. On the left the data for the software sector can be found and on the right the data for the technology and hardware sector.

As can be seen from the figures above, none of the sectors follow the expected trend of the three services. The software industry shows a relative stability in the share of the three service types. This shows that their offerings do not change much over time. The service types do not behave in the expected pattern as posited by the literature. Smoothing share decreases over time while adapting keeps expanding. This is the opposite of what is expected using the criteria for the theory which posits that smoothing should grow over time and adapting should decrease. One explanation for this phenomenon is that there is constantly new software that is being developed and that the more mature software products are also constantly changing. Software products are comparatively easy to create and modify leading to high rates of change within the industry. Software products are also more easily adaptable due to the relative ease of changing the product, cost, and the fact that current users can immediately switch to newer versions of the product. Because of this high rate of change, the three service types remain constant over time since they

are supporting the product offerings to ensure the best possible outcome. Because of the dynamic nature of software products, where mature software is renewed and modified, the expected development of the three service types cannot be seen.

The technology and hardware sector demonstrate a clear preference towards offering adapting services, with the other two service types being negligible. By looking at the services, one can see that initially substituting and adapting comprise the majority of the market (with the overwhelming majority of services being adapting), from 1980 to 1984. Afterwards, smoothing services appear and take a portion of the total service share while adapting services decline and substituting services declining. Finally, adapting services continue to grow, taking away the share from substituting services. The first stages in the development of the services within technology and hardware follow the trend posited in the literature. However, the following stages diverge from the expected development and therefore does not meet the criteria to prove the trend. One explanation for this, is the inherent nature of “technology”. The technological sector’s main goal is to produce novel products which would require services such as consulting, advising and training. These types of services fall under the adapting service type. Therefore, because of the nature of the sector, other types of services are sidelined to focus on services that aid with the adoption of new products.

The aerospace and defense sector initially focus heavily on substitution services, but as time progresses adapting services take on a bigger role. Smoothing services do not make up a large part in the service offerings. The larger role of adapting services indicates that there is a need for advisory or training services for the products in the sector. This could be due to the increased complexity of the products offered, which requires training the users to utilize these products. Substituting services indicate that firms are offering new ways to use their products through leasing and pay-per-use types of agreements. Considering the costs of the products in this industry, this is a logical offering. The continuous growth of adapting services does not coincide with the criteria set to verify the trend within the data.

Finally, the automobile and parts sector initially demonstrates a clear preference for substituting services with adapting services having a small share. Together these services comprise the majority of the service offerings in the sector from 1980 to 1982. Afterwards, smoothing services take up a large proportion of the total service share while adapting services decrease and substituting services increase from 1982 to 1985. Afterwards, adapting services continuously grows in lockstep with the other two services. The initial two stages follow the expected trend but only comprise a short time span. The

latter stage differs from the expected criteria to observe the trend in the data. This initial focus on offering substituting services could relate the fact that by the 1980's it was clear what to expect from an automobile and how to use it. Therefore, adapting services were not needed to aid users into utilizing their products. Smoothing services, such as insurance and financing, might have been taken care of by other specialized companies (such as banks and insurance companies) and only afterwards did automobile companies step into this role.

As for the growth of substituting services, the software sector initially started with a 35% share of all services in 1980 and declines to 25% in 2017. For the technology and hardware sector, substituting services reach a high of 38% of all services in 1984 and subsequently decline to 17% in 2017. For the aerospace and defense sector, substituting services reached a high of 67% of all services offered in 1982 and systematically declined to 44% in 2017. Finally, for automobiles and parts, substituting services comprised 100% of all services in 1980 and declined systematically over time to reach 38% of all services in 2017. In all cases, the substituting services have decreased despite the literature claiming that these hybrid services should increase over time. The implications of these findings are discussed further in Section 5.4.

5.3.2 Effect of innovation

In this section, the development of the different types of services are analyzed and their trends are shown. As discussed in the methodology of this thesis, it is not possible to use the three service types of Cusumano et al. (2015) for the whole dataset and the top ranked firms since they consist of various industries in different stages of development. Therefore, the Nice Classes are used to see how different types of services develop over time. As the theory suggests, the different types of services should become more equal over time since instead of focusing on one type of service. The services are measured cumulatively over time to see how the shares have changed. The results for the whole dataset and the top ranked firms are found below in Figure 5.3.

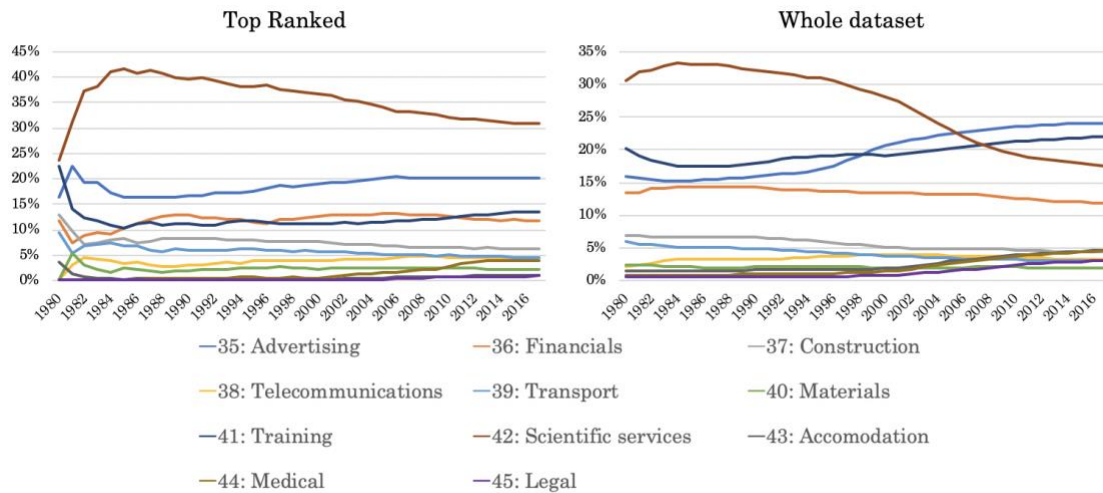


Figure 5.9: The trend of the different service types as a percentage of all services for the whole dataset and the top ranked firms. The different curves indicate the Nice Classes. A short is added to denote what the Nice Class entails.

By looking at the findings above, one can see that the service types converge over time. For the whole dataset, there is an initial focus in 1980 on Nice Class 42 which are scientific and technological services, with other services lagging behind. The distribution of the service types shows that there are four service types that are dominant throughout all the years. Namely, Nice Classes 35, 36, 41 and 42, which are advertising, insurance, education and training and scientific and technological services. An overview of all the Service Classes is found below in Table 9 for ease of comparison. In 1980, these four service types comprised 80% of all services and in 2017 this number decreases somewhat to 75%. The other types of services do not change significantly over time.

Class	Description
35	Advertising; business management; business administration; office functions
36	Insurance; financial affairs; monetary affairs; real estate affairs
37	Building construction; repair; installation services
38	Telecommunications
39	Transport; packaging and storage of goods; travel arrangement
40	Treatment of materials
41	Education; providing of training; entertainment; sporting and cultural activities
42	Scientific and technological services and research and design relating thereto; industrial analysis and research

	services; design and development of computer hardware and software; legal services
43	Services for providing food and drink; temporary accommodation
44	Medical services; veterinary services; hygienic and beauty care for human beings or animals; agricultural products
45	Legal services; security services for the physical protection of tangible property and individuals

Table 9: Overview of descriptions per service Nice classes.

For the top ranked firms, a similar trend is observed. Initially Class 42 is the predominant service type, similar to the whole dataset, but the predominance holds steady throughout the years. The predominance of Class 42 shows that more innovative firms keep on offering scientific and technological services. The other dominant service types for the top ranked services are identical to the whole dataset, namely, Classes 35, 36 and 41 (which are advertising, insurance, education and training). By adding Classes 35, 36, 41 and 42 together (the same classes as in the whole dataset) comprise 74% of all services in 1980 and 77% in 2017. The concentration in only Classes 42 and 35 however, are so dominant that these two together comprise roughly 50% of all services for top ranked firms.

In both the whole dataset and the top ranked firms, one can see that variety of services do not change significantly over time. By combining the findings in 5.2 and the results above, one can conclude that the rate of new services are increasing over time, but, the diversity of the types of services remain concentrated in only four types. The implications of these findings are discussed below in Section 5.4 Discussion.

5.4 Discussion

From the results in the previous section, one can conclude the following: Firstly, in Section 5.2.1, when looking at the servitization trends of specific sectors different observations are made. The two heavy industries, automobiles and part, and aerospace and defense, show a rise in their service offerings, in accordance with what was expected from literature. The growth of services is evident, but it is not a monumental shift in the offerings within these sectors as the literature indicates. However, considering that the sectors used in this thesis are constructed from the firms with the highest R&D expenditures, the initial conclusion of R&D leading to more product offerings might also affect the results. The conclusion of a small servitization trend, is therefore limited to the firms within the heavy industries with the highest R&D expenditure. Furthermore, no

deservitization trend can be observed within the heavy industries, despite the fact that these industries are considered mature. The expected deservitization effect proposed by Kowalkowski et al. (2017) cannot be seen in these industries, despite the fact that these are mature industries that should display such an effect. The lack of this effect, again, could be due to the exclusive use of high R&D investing firms.

Secondly, in Section 5.2.2, by contrasting the servitization trend of the whole dataset and the top ranked firms, it becomes evident that the market as a whole offers more services in their total offerings. The magnitude of offering more services for the top ranked firms is much less, however. This can be explained by how the top ranked firms were chosen based on their R&D expenditure. What the servitization trend for the top ranked firms tells from comparing it with the whole dataset is that the more R&D is invested, the less services are offered per year and as a whole. Higher rates of R&D therefore indicate that firms are using their funds to produce new products instead of offering complimentary services to old products in accordance with expectations from Visnjic et al. (2019). Furthermore, when looking at the whole dataset's new service offerings per year, one can see that fewer services are being offered, showing that the market (or the dominant parts of it) are undergoing a deservitization trend.

Thirdly, in Section 5.3.1, from observing the development of the three service types, one sees that each sector develops in separate ways. At first, this seems logical, but considering the framework by Cusumano et al. (2015) which generalizes the trend for all product firms. However, again, the results might be biased due to the prevalence of exclusively high R&D investing firms. These firms are using their R&D to rebuild themselves constantly by offering new solutions. This can lead to issues since these firms do not strictly follow the ferment, transition and mature stages described by Cusumano et al. (2015).

Finally, in Section 5.3.2, the concentrations of the service types in the whole dataset and the top ranked firms are observed. For both the top ranked firms and the whole dataset one can observe a constant concentration of services within their offerings. Namely, advertising, insurance, education and training and scientific and technological services. The concentration of these services show that these remain the most relevant for whole markets. Considering the nature of the services, the importance of these types of services are deduced. Advertising services are important for firms because they inform consumers about their new products. Insurance services are useful for older services since this helps with the purchasing decision of products that already have a dominant market logic, education and training services are required for new products to teach new users

how to use new product features and services (Cusumano et al., 2015). Furthermore, scientific and technological services are required to innovate and improve their software and hardware products. What these services have in common are that all of them are required throughout the various stages of a firm's lifecycle. In essence, these services dominate the landscape of offerings because they are required to inform, teach, allow for faster adoption and innovation in new offerings. This is in line with the thinking of Cusumano et al. (2015) where they identify the three service types. In the case of whole markets and selected firms, this theory is reflected by the types of services that they offer.

Continuing with the results found in Section 5.3.2, one can see that the technology and hardware sector undergoes a trend towards more servitization, as expected from a manufacturing industry. Software on the other hand shows a decrease in the amount of services used. This is due to the nature of the software industry, which in itself offers more services than other industries. The literature does not explicitly say that a servitization trend is expected in the software sector, meaning that the result neither supports nor rejects the literature. However, it does show that non-manufacturing industries need not follow the same pattern of servitization.

5.5 Summary

In sum, this chapter starts with an overview of some key statistics that show the validity of the data. The correlation between the sectors is negligible and there is only some overlap between the three service types. The recall and precision test results are also favorable, showing the keywords used to create the trademarks of the top ranked firms database retrieve the relevant data for this analysis.

The results of the analyses of the whole dataset and top ranked firms are shown and contrasted. The results show that the top ranked firms offer fewer services when compared to the market as a whole. This is speculated to be a result from the high R&D expenditure of the top ranked firms, which use these investments to produce new products instead of services. The servitization trend is also analyzed for the technology and hardware, aerospace and defense, automobiles and parts, and technology sectors. The findings are in line with what the literature states, but the magnitude of the servitization trend, especially for the heavy industries, is not reflected in the data.

Analyzing the different service types for the top ranked firms and whole dataset show that these service types remain fairly constant over time, with the vast majority of services focusing on four types. This could be a function of the fact that various industries are present in both groups and therefore a true trend cannot be seen. This limitation is

remedied in the analysis of the four sectors separately which use three specific service types. The analysis of the four sectors show that every sector develops in their own way depending on their characteristics and needs, contradicting the literature. However, this could be due to the sectors being composed of only innovative firms that do not follow the traditional life cycle of firms because they are constantly reinventing themselves and changing their products.

6. Conclusion

This thesis set out to answer the research question “*Are the product and service portfolios of firms, as measured by trademarks, in line with the servitization patterns predicted by current literature?*”. To answer this question, Chapter 2 set out to give an overview of the theories concerning servitization in literature. In this chapter, four main servitization trends can be observed. Namely, a trend towards offering more services as firms mature, a deservitization trend that occurs after products mature, an increase in hybrid services and development of the three service types. Chapter 3 sets out to show how trademarks can be employed to measure products and service portfolios of firms. Chapter 4 lays out the methodology that will be used to answer this thesis’s research question, and Chapter 5 gives the results using this methodology and an overview of how different sectors behave differently concerning the evolution of their offerings.

Answering the research question, this thesis shows that the main theory from literature that can be observed using this method is the servitization-continuum, which shows that as industries offer more services as they mature. Deservitization could only be observed in one instance, namely, when considering the whole dataset’s service and product trademarks. Hybrid services were not growing as the literature predicted and seemed to be losing ground in the heavy industries. Hybrid services, despite being framed as something new and developing, have existed for a long time. This can be seen from this thesis’s results and the literature’s use of “Power by the Hour” as the quintessential example of a hybrid service, despite existing since 1965. Finally, the development of the three service types is not reflected in the data and varies considerably by sector. Therefore, using trademark data, one can only see one of the theories reflected definitively in the data.

6.1 Limitations

A number of limitations need to be considered before discussing the conclusions of this thesis. Firstly, the use of trademarks for measuring products and services is still very

young and its applicability for other research is still unproven. More studies that utilize trademarks as indicators in the same way as this thesis are therefore required to smooth out any faults in the methodology and make its overall use more robust through more iterations.

Secondly, this thesis uses high R&D ranking firms to construct the sectors which are used as the units of analysis to compare the theories. The theories are generalized and apply to a general firm or industry. By concentrating the units of analysis to top percentile firms, this biases the data and can skew the results. Therefore, the results of this thesis should not be generalized to include the entirety of the sectors analyzed.

Thirdly, the keyword analysis used by this thesis can greatly be improved on by adding more keywords and criteria for service or product types. This can identify more trademarks that can be used to conduct research.

6.2 Future research

This thesis has shown that the use of trademarks offers unique insights into the development of firms and industries. Initially, future research should focus on repeating this study with a larger pool of firms per sector. Although this thesis improves on previous literature sample sizes, the bias towards large R&D intensive firms is still clear. By conducting this analysis over a wider range of firms within a specific sector more generalizable insights can be gathered.

As proposed by Calabrese et al. (2019) future steps include adding revenue or profit measures to each trademark to see what value is created per service. This however requires voluntary disclosures from firms on their revenues per service type. By adding these profit measures to trademarks the added value of each trademark is calculated and how they change over time. By conducting the analysis with these revenue measures, the value of services as compared to products can be compared. A deeper understanding of servitization can therefore be analyzed.

This thesis also only uses the primary Nice Class for each trademark to classify where the product or service belongs, in reality, certain trademarks have various Nice Classes. In future research, these other Classes should also be considered and added into the data to further see how the different Classes interact and how trademarks that are registered as products and services can be identified.

This thesis also opens the door for the use of trademarks to analyze firms in detail. By looking at what kind of products or services are currently being offered within firms or industries one can see how these influence business performances. By looking into

trademarks that protect products or services that are still not on the market, predictions can also be made on how and why firms will offer these new filings. By looking at trademarks that are filed but currently not in use, but will be used in the market in the future, future trends can be observed and planned for.

Furthermore, other regions can also be analyzed using this approach and subsequently compared. By comparing regions, one can see how different regions use services to add value. Trends from e.g. Asia can be compared to Africa and North America and the differences show where markets and consumers focus on and demand.

This thesis opens the door for research into further industries and for use on the firm level. Understanding how a firm uses services when compared to the broader industry gives insight into how the firm will perform and where the focus lies in its market strategy.

7. References

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8. Appendices

Appendix A: Overview of product and service Nice classifications and their descriptions.

Goods

Class	Description
1.	Chemicals used in industry, science and photography, as well as in agriculture, horticulture and forestry; unprocessed artificial resins, unprocessed plastics; manures; fire extinguishing compositions; tempering and soldering preparations; chemical substances for preserving foodstuffs; tanning substances; adhesives used in industry
2.	Paints, varnishes, lacquers; preservatives against rust and against deterioration of wood; colorants; mordants; raw natural resins; metals in foil and powder form for use in painting, decorating, printing and art
3.	Bleaching preparations and other substances for laundry use; cleaning, polishing, scouring and abrasive preparations; non-medicated soaps; perfumery, essential oils, non-medicated cosmetics, non-medicated hair lotions; non-medicated dentifrices
4.	Industrial oils and greases; lubricants; dust absorbing, wetting and binding compositions; fuels (including motor spirit) and illuminants; candles and wicks for lighting
5.	Pharmaceuticals, medical and veterinary preparations; sanitary preparations for medical purposes; dietetic food and substances adapted for medical or veterinary use, food for babies; dietary supplements for humans and animals; plasters, materials for dressings; material for stopping teeth, dental wax; disinfectants; preparations for destroying vermin; fungicides, herbicides
6.	Common metals and their alloys, ores; metal building materials for building and construction; transportable buildings of metal; materials of metal for railway tracks; non-electric cables and wires of common metal; ironmongery, small items of metal pipes and tubes of metal; metal containers for storage or transport; safes; ores
7.	Machines and machine tools; motors and engines (except for land vehicles); machine coupling and transmission components (except for land vehicles); agricultural

	implements other than hand-operated; incubators for eggs; automatic vending machines
8.	Hand tools and implements (hand-operated); cutlery; side arms; razors
9.	Scientific, nautical, surveying, photographic, cinematographic, optical, weighing, measuring, signaling, checking (supervision), life-saving and teaching apparatus and instruments; apparatus and instruments for conducting, switching, transforming, accumulating, regulating or controlling electricity; apparatus for recording, transmission or reproduction of sound or images; magnetic data carriers, recording discs; compact discs, DVDs and other digital recording media; mechanisms for coin-operated apparatus; cash registers, calculating machines, data processing equipment, computers; computer software; fire-extinguishing apparatus
10.	Surgical, medical, dental and veterinary apparatus and instruments; artificial limbs, eyes and teeth; orthopedic articles; suture materials; therapeutic and assistive devices adapted for the disabled; massage apparatus; apparatus, devices and articles
11.	Apparatus for lighting, heating, steam generating, cooking, refrigerating, drying, ventilating, water supply and sanitary purposes
12.	Vehicles; apparatus for locomotion by land, air or water
13.	Firearms; ammunition and projectiles; explosives; fireworks
14.	Precious metals and their alloys; jewelry, precious and semi-precious stones; horological and chronometric instruments
15.	Musical instruments
16.	Paper and cardboard; printed matter; bookbinding material; photographs; stationery and office requisites, except furniture; adhesives for stationery or household purposes; artists' and drawing materials; paintbrushes; typewriters and office requisites (except furniture); instructional and teaching materials (except apparatus); plastic materials foreshets, films and bags for wrapping and packaging; printers' type,; printing blocks
17.	Unprocessed and semi-processed rubber, gutta-percha, gum, asbestos, mica and substitutes for all these materials; plastics and resins in extruded form for use in manufacture; packing, stopping and insulating materials; flexible pipes, tubes and ho

18.	Leather and imitations of leather; animal skins, and hides; trunks and travelling luggage and carrying bags; umbrellas and parasols; walking sticks; whips, harness and saddlery; collars, leashes and clothing for animals
19.	Building materials (non-metallic); non-metallic rigid pipes for building; asphalt, pitch and bitumen; non-metallic transportable buildings; monuments, not of metal
20.	Furniture, mirrors, picture frames; containers, not of metal, for storage or transport; unworked or semi-worked bone, horn, ivory, whalebone or mother-of-pearl; shells; meerschaum; yellow amber
21.	Household or kitchen utensils and containers; combs and sponges; brushes, (except paintbrushes); brush-making materials; articles for cleaning purposes; steelwool; unworked or semi-worked glass, (except building glass used in building); glassware, porcelain and earthenware
22.	Ropes and string; nets; tents, awnings, and tarpaulins; awnings of textile or synthetic materials; sails; sacks for the transport and storage of materials in bulk; padding, cushioning and stuffing materials, (except of paper, cardboard, rubber or plastics); raw fibrous textile materials and substitutes therefor
23.	Yarns and threads, for textile use
24.	Textiles and substitutes for textiles; bed covers; table covers household linen; curtains of textile or plastic
25.	Clothing, footwear, headgear
26.	Lace and embroidery, ribbons and braid; buttons, hooks and eyes, pins and needles; artificial flowers; hair decorations; false hair
27.	Carpets, rugs, mats and matting, linoleum and other materials for covering existing floors; wall hangings (non-textile)
28.	Games, toys and playthings; video game apparatus; gymnastic and sporting articles; decorations for Christmas trees
29.	Meat, fish, poultry and game; meat extracts; preserved, frozen, dried and cooked fruits and vegetables; jellies, jams, compotes; eggs; milk and milk products; edible oils and fats
30.	Coffee, tea, cocoa and artificial coffee; rice; tapioca and sago; flour and preparations made from cereals; bread, pastries and confectionery; edible ices; sugar, honey, treacle; yeast, baking-powder; salt; mustard; vinegar, sauces (condiments); spices; ice

31.	Raw and unprocessed agricultural, aquacultural, horticultural and forestry products; raw and unprocessed grains and seeds; fresh fruits and vegetables, fresh herbs; natural plants and flowers; bulbs, seedlings and seeds for planting; live animals; foodstuffs and beverages for animals; malt
32.	Beers; mineral and aerated waters and other non-alcoholic beverages; fruit beverages and fruit juices; syrups and other preparations for making beverages
33.	Alcoholic beverages (except beers)
34.	Tobacco; smokers' articles; matches

Services

Class	Description
35.	Advertising; business management; business administration; office functions
36.	Insurance; financial affairs; monetary affairs; real estate affairs
37.	Building construction; repair; installation services
38.	Telecommunications
39.	Transport; packaging and storage of goods; travel arrangement
40.	Treatment of materials
41.	Education; providing of training; entertainment; sporting and cultural activities
42.	Scientific and technological services and research and design relating thereto; industrial analysis
43.	Services for providing food and drink; temporary accommodation
44.	Medical services; veterinary services; hygienic and beauty care for human beings or animals; agricultural products
45.	Legal services; security services for the physical protection of tangible property and individuals;

Source: WIPO, 2019

Appendix B: Overview of the top ranked firms with their respective sectors and countries.

Rank	Company name	Sector
1	VOLKSWAGEN AG	Automobiles & Parts
2	SAMSUNG ELECTRONICS CO.,LTD.	Electronic & Electrical Equipment
3	MICROSOFT CORP	Software & Computer Services
4	INTEL CORP	Technology Hardware & Equipment
5	TOYOTA MOTOR CORPORATION	Automobiles & Parts

6	ROCHE HOLDING AG	Pharmaceuticals & Biotechnology
7	NOVARTIS AG	Pharmaceuticals & Biotechnology
8	MERCK & CO., INC.	Pharmaceuticals & Biotechnology
9	JOHNSON & JOHNSON	Pharmaceuticals & Biotechnology
10	PFIZER INC	Pharmaceuticals & Biotechnology
11	DAIMLER AG	Automobiles & Parts
12	GENERAL MOTORS COMPANY	Automobiles & Parts
13	GOOGLE INC.	Software & Computer Services
14	ROBERT BOSCH GMBH	Automobiles & Parts
15	SANOPI	Pharmaceuticals & Biotechnology
16	HONDA MOTOR CO LTD	Automobiles & Parts
17	SIEMENS AG	Electronic & Electrical Equipment
18	CISCO SYSTEMS INC	Technology Hardware & Equipment
19	PANASONIC CORPORATION	Leisure Goods
20	GLAXOSMITHKLINE PLC	Pharmaceuticals & Biotechnology
21	INTERNATIONAL BUSINESS MACHINES CORP	Software & Computer Services
22	NOKIA OYJ	Technology Hardware & Equipment
23	FORD MOTOR CO	Automobiles & Parts
24	SONY CORPORATION	Leisure Goods
25	NISSAN MOTOR CO LTD	Automobiles & Parts
26	ELI LILLY AND COMPANY	Pharmaceuticals & Biotechnology
27	BAYERISCHE MOTOREN WERKE AG	Automobiles & Parts
28	TELEFONAKTIEBOLAGET LM ERICSSON	Technology Hardware & Equipment
29	ORACLE CORP	Software & Computer Services
30	EUROPEAN AERONAUTIC DEFENCE AND SPACE COMPANY EADS N.V.	Aerospace & Defence
31	HUAWEI TECHNOLOGIES CO., LTD.	Technology Hardware & Equipment
32	GENERAL ELECTRIC COMPANY	General Industrials
33	ASTRAZENECA PLC	Pharmaceuticals & Biotechnology
34	FIAT S.P.A.	Automobiles & Parts
35	ABBOTT LABORATORIES	Pharmaceuticals & Biotechnology
36	BAYER AG	Pharmaceuticals & Biotechnology
37	HITACHI LTD	Electronic & Electrical Equipment
38	QUALCOMM INC	Technology Hardware & Equipment
39	DENSO CORPORATION	Automobiles & Parts
40	BRISTOL-MYERS SQUIBB COMPANY	Pharmaceuticals & Biotechnology
41	TAKEDA PHARMACEUTICAL CO., LTD.	Pharmaceuticals & Biotechnology
42	C.H. BOEHRINGER SOHN AG & CO. KG	Pharmaceuticals & Biotechnology
43	TOSHIBA CORPORATION	General Industrials
44	CANON INC	Technology Hardware & Equipment
45	HEWLETT-PACKARD COMPANY	Technology Hardware & Equipment
46	APPLE INC.	Technology Hardware & Equipment
47	AMGEN INCORPORATED	Pharmaceuticals & Biotechnology

48	PEUGEOT S.A.	Automobiles & Parts
49	ALCATEL-LUCENT S.A.	Technology Hardware & Equipment
50	NIPPON TELEGRAPH AND TELEPHONE CORPORATION	Fixed Line Telecommunications
51	AB VOLVO	Industrial Engineering
52	EMC CORP	Technology Hardware & Equipment
53	SAP AG	Software & Computer Services
54	BOEING COMPANY (THE)	Aerospace & Defence
55	FUJITSU LIMITED	Software & Computer Services
56	LG ELECTRONICS INC.	Leisure Goods
57	KONINKLIJKE PHILIPS N.V.	General Industrials
58	RENAULT	Automobiles & Parts
59	CATERPILLAR INC	Industrial Engineering
60	CONTINENTAL AG	Automobiles & Parts
61	FINMECCANICA S.P.A.	Aerospace & Defence
62	UNITED TECHNOLOGIES CORPORATION	Aerospace & Defence
63	BASF SE	Chemicals
64	STMICROELECTRONICS N.V.	Technology Hardware & Equipment
65	BROADCOM CORP	Technology Hardware & Equipment
66	PETROCHINA COMPANY LIMITED	Oil & Gas Producers
67	OTSUKA HOLDINGS CO LTD	Pharmaceuticals & Biotechnology
68	DAIICHI SANKYO CO., LTD.	Pharmaceuticals & Biotechnology
69	ASTELLAS PHARMA INC.	Pharmaceuticals & Biotechnology
70	E. I. DU PONT DE NEMOURS AND COMPANY	Chemicals
71	PROCTER & GAMBLE CO	Household Goods & Home Construction
72	MERCK KGAA	Pharmaceuticals & Biotechnology
73	TATA MOTORS LIMITED	Automobiles & Parts
74	FUJIFILM HOLDINGS CORP.	Electronic & Electrical Equipment
75	TEXAS INSTRUMENTS INC	Technology Hardware & Equipment
76	EBAY INC	General Retailers
77	HONEYWELL INTERNATIONAL INC	General Industrials
78	NOVO NORDISK A/S	Pharmaceuticals & Biotechnology
79	mitsubishi electric corporation	Electronic & Electrical Equipment
80	NESTLE S.A.	Food Producers
81	GILEAD SCIENCES INC	Pharmaceuticals & Biotechnology
82	NEC CORPORATION	Software & Computer Services
83	BOMBARDIER INC	Aerospace & Defence
84	DOW CHEMICAL COMPANY (THE)	Chemicals
85	3M COMPANY	General Industrials
86	SHARP CORPORATION	Electronic & Electrical Equipment
87	CELGENE CORP	Pharmaceuticals & Biotechnology
88	RENESAS ELECTRONICS CORPORATION	Electronic & Electrical Equipment
89	HON HAI PRECISION INDUSTRY CO., LTD.	Electronic & Electrical Equipment

90	WESTERN DIGITAL CORP	Technology Hardware & Equipment
91	AISIN SEIKI CO LTD	Automobiles & Parts
92	MEDTRONIC INC	Health Care Equipment & Services
93	MITSUBISHI CHEMICAL HOLDINGS CORPORATION	Chemicals
94	ZTE CORP.	Technology Hardware & Equipment
95	ABB LTD	Industrial Engineering
96	MONSANTO CO	Chemicals
97	BLACKBERRY LIMITED	Technology Hardware & Equipment
98	VALE S.A.	Mining
99	TELEFONICA SA	Fixed Line Telecommunications
100	SAFRAN	Aerospace & Defence
101	BANCO SANTANDER SA	Banks
102	SUMITOMO CHEMICAL COMPANY LIMITED	Chemicals
103	ROYAL BANK OF SCOTLAND GROUP PLC (THE)	Banks
104	DEERE & CO	Industrial Engineering
105	FACEBOOK, INC.	Software & Computer Services
106	TAIWAN SEMICONDUCTOR MANUFACTURING COMPANY LIMITED	Technology Hardware & Equipment
107	EISAI CO LTD	Pharmaceuticals & Biotechnology
108	SUZUKI MOTOR CORPORATION	Automobiles & Parts
109	ADVANCED MICRO DEVICES INC	Technology Hardware & Equipment
110	BIOGEN IDEC INC.	Pharmaceuticals & Biotechnology
111	UNILEVER GROUP	Food Producers
112	ROYAL DUTCH SHELL PLC	Oil & Gas Producers
113	RICOH CO LTD	Technology Hardware & Equipment
114	TEVA PHARMACEUTICAL INDUSTRIES LIMITED	Pharmaceuticals & Biotechnology
115	AT&T INC.	Fixed Line Telecommunications
116	SYNGENTA AG	Chemicals
117	APPLIED MATERIALS INC	Technology Hardware & Equipment
118	PETROLEO BRASILEIRO S.A.	Oil & Gas Producers
119	HYUNDAI MOTOR COMPANY CO.,LTD.	Automobiles & Parts
120	DELPHI AUTOMOTIVE PLC	Automobiles & Parts
121	ALSTOM S.A.	Industrial Engineering
122	SCHLUMBERGER N.V.	Oil Equipment, Services & Distribution
123	ELECTRONIC ARTS INC	Software & Computer Services
124	NVIDIA CORP	Technology Hardware & Equipment
125	DANAHER CORP	Electronic & Electrical Equipment
126	SERVIER MONDE	Pharmaceuticals & Biotechnology
127	SEAGATE TECHNOLOGY PUBLIC LIMITED COMPANY	Technology Hardware & Equipment
128	BAXTER INTERNATIONAL INC	Health Care Equipment & Services
129	ZF FRIEDRICHSHAFEN AG	Automobiles & Parts
130	JUNIPER NETWORKS INC	Technology Hardware & Equipment
131	SUMITOMO ELECTRIC INDUSTRIES, LTD.	Electronic & Electrical Equipment

132	MOTOROLA SOLUTIONS, INC.	Technology Hardware & Equipment
133	DELL, INC.	Technology Hardware & Equipment
134	ORANGE	Fixed Line Telecommunications
135	BT GROUP PLC	Fixed Line Telecommunications
136	YAHOO INC	Software & Computer Services
137	TOTAL S.A.	Oil & Gas Producers
138	MARVELL TECHNOLOGY GROUP LTD	Technology Hardware & Equipment
139	FIAT INDUSTRIAL S.P.A.	Industrial Engineering
140	CHINA RAILWAY CONSTRUCTION CORPORATION LIMITED	Construction & Materials
141	L'OREAL SA	Personal Goods
142	EXXON MOBIL CORP	Oil & Gas Producers
143	MAZDA MOTOR CORPORATION	Automobiles & Parts
144	SK HYNIX INC.	Technology Hardware & Equipment
145	UCB NV/SA	Pharmaceuticals & Biotechnology
146	CHINA RAILWAY GROUP LTD.	Construction & Materials
147	SYMANTEC CORP	Software & Computer Services
148	ALLERGAN INC	Pharmaceuticals & Biotechnology
149	SCHNEIDER ELECTRIC SA	Electronic & Electrical Equipment
150	ROLLS-ROYCE HOLDINGS PLC	Aerospace & Defence
151	TELSTRA CORPORATION LIMITED	Technology Hardware & Equipment
152	BRIDGESTONE CORPORATION	Automobiles & Parts
153	VIVENDI	Media
154	DEUTSCHE BANK AG	Banks
155	VALEO SA	Automobiles & Parts
156	CHINA PETROLEUM & CHEMICAL CORPORATION	Oil & Gas Producers
157	THALES SA	Aerospace & Defence
158	MICRON TECHNOLOGY INC	Technology Hardware & Equipment
159	SAIC MOTOR CORPORATION LIMITED	Automobiles & Parts
160	NETAPP, INC.	Technology Hardware & Equipment
161	FOREST LABORATORIES INC	Pharmaceuticals & Biotechnology
162	BOSTON SCIENTIFIC CORP	Health Care Equipment & Services
163	NIKON CORPORATION	Leisure Goods
164	SAMSUNG DISPLAY CO.,LTD.	Electronic & Electrical Equipment
165	SHIRE PLC	Pharmaceuticals & Biotechnology
166	TOKYO ELECTRON LIMITED	Technology Hardware & Equipment
167	KONICA MINOLTA, INC.	Technology Hardware & Equipment
168	ASAHI KASEI CORPORATION	Chemicals
169	COMPAGNIE GENERALE DES ETABLISSEMENTS MICHELIN (C.G.E.M.) SA	Automobiles & Parts
170	AUSTRALIA AND NEW ZEALAND BANKING GROUP	Banks
171	ASML HOLDING N.V.	Technology Hardware & Equipment
172	YAMAHA MOTOR CO LTD	Automobiles & Parts
173	KIA MOTORS CORPORATION	Automobiles & Parts

174	TELECOM ITALIA S.P.A.	Fixed Line Telecommunications
175	MEDIATEK INC.	Technology Hardware & Equipment
176	HSBC HOLDINGS PLC	Banks
177	VERTEX PHARMACEUTICALS (OLD)	Pharmaceuticals & Biotechnology
178	INTUIT INC	Software & Computer Services
179	ADOBE SYSTEMS INC	Software & Computer Services
180	FREESCALE SEMICONDUCTOR, LTD.	Technology Hardware & Equipment
181	OLYMPUS CORP.	Health Care Equipment & Services
182	CUMMINS INC.	Industrial Engineering
183	ISUZU MOTORS LIMITED	Industrial Engineering
184	RAYTHEON COMPANY	Electronic & Electrical Equipment
185	BARCLAYS PLC	Banks
186	KOMATSU LTD	Industrial Engineering
187	ELECTRICITE DE FRANCE SA	Electricity
188	NIPPON STEEL & SUMITOMO METAL CORPORATION	Industrial Metals & Mining
189	LSI CORPORATION	Technology Hardware & Equipment
190	CA, INC.	Software & Computer Services
191	LAM RESEARCH CORP	Technology Hardware & Equipment
192	ST JUDE MEDICAL INC	Health Care Equipment & Services
193	BP PLC	Oil & Gas Producers
194	AGILENT TECHNOLOGIES INC	Electronic & Electrical Equipment
195	TENCENT HOLDINGS LIMITED	Software & Computer Services
196	JAPAN TOBACCO INC	Tobacco
197	AUTOMATIC DATA PROCESSING INC	Support Services
198	mitsubishi heavy industries ltd	General Industrials
199	CNH GLOBAL N.V.	Industrial Engineering
200	XEROX CORP	Technology Hardware & Equipment
201	OPEN JOINT STOCK COMPANY GAZPROM	Oil & Gas Producers
202	CHEVRON CORPORATION	Oil & Gas Producers
203	ZYNGA INC.	Support Services
204	LIEBHERR-INTERNATIONAL S.A.	Industrial Engineering
205	KIRIN HOLDINGS CO., LTD.	Beverages
206	CORNING INC	Technology Hardware & Equipment
207	COMPAGNIE DE SAINT GOBAIN SA	Construction & Materials
208	TDK CORPORATION	Electronic & Electrical Equipment
209	COVIDIEN PUBLIC LIMITED COMPANY	Health Care Equipment & Services
210	NINTENDO CO LTD	Leisure Goods
211	LENOVO GROUP LIMITED	Technology Hardware & Equipment
212	TORAY INDUSTRIES INC	Chemicals
213	LOCKHEED MARTIN CORP	Aerospace & Defence
214	SHIONOGI & COMPANY LIMITED	Pharmaceuticals & Biotechnology
215	NXP SEMICONDUCTORS N.V.	Technology Hardware & Equipment

216	SANDISK CORP	Technology Hardware & Equipment
217	INFINEON TECHNOLOGIES AG	Technology Hardware & Equipment
218	AUTODESK INC	Software & Computer Services
219	TE CONNECTIVITY LTD.	Electronic & Electrical Equipment
220	UBISOFT ENTERTAINMENT SA	Software & Computer Services
221	THOMSON REUTERS CORPORATION	Support Services
222	SYNOPSYS INC	Software & Computer Services
223	TEXTRON INC	Aerospace & Defence
224	AMADEUS IT HOLDING, S.A.	Software & Computer Services
225	SEIKO EPSON CORPORATION	Technology Hardware & Equipment
226	FUJI HEAVY INDUSTRIES LIMITED	Automobiles & Parts
227	HENKEL AG & CO. KGAA	Household Goods & Home Construction
228	MURATA MANUFACTURING CO. LIMITED	Electronic & Electrical Equipment
229	ACCENTURE PLC	Support Services
230	ASAHI GLASS COMPANY LIMITED	General Industrials
231	WHIRLPOOL CORP	Household Goods & Home Construction
232	PEPSICO INC	Beverages
233	HELLA KGAA HUECK & CO.	Automobiles & Parts
234	KYOCERA CORPORATION	Electronic & Electrical Equipment
235	EMERSON ELECTRIC CO	Electronic & Electrical Equipment
236	DONGFENG MOTOR GROUP COMPANY LIMITED	Automobiles & Parts
237	POSCO	Industrial Metals & Mining
238	NAVISTAR INTERNATIONAL CORP	Industrial Engineering
239	BECTON, DICKINSON AND COMPANY	Health Care Equipment & Services
240	NATIONAL AUSTRALIA BANK LIMITED	Banks
241	MAXIM INTEGRATED PRODUCTS INC	Technology Hardware & Equipment
242	HTC CORPORATION	Technology Hardware & Equipment
243	MCKESSON CORPORATION	Health Care Equipment & Services
244	AREVA	Electricity
245	ONO PHARMACEUTICAL CO LTD	Pharmaceuticals & Biotechnology
246	NORTHROP GRUMMAN CORPORATION	Electronic & Electrical Equipment
247	ANALOG DEVICES INC	Technology Hardware & Equipment
248	JOHNSON CONTROLS INC	Automobiles & Parts
249	EVONIK INDUSTRIES AG	Chemicals
250	KONINKLIJKE DSM N.V.	Chemicals
251	STATOIL ASA	Oil & Gas Producers
252	OMRON CORPORATION	Electronic & Electrical Equipment
253	ACTELION LTD	Pharmaceuticals & Biotechnology
254	CITRIX SYSTEMS INC	Software & Computer Services
255	AKZO NOBEL NV	Chemicals
256	KOREA ELECTRIC POWER CORPORATION	Electricity
257	AVAYA INC	Technology Hardware & Equipment

258	CARL ZEISS AG	Health Care Equipment & Services
259	SOCIÉTÉ GÉNÉRALE	Banks
260	CSR CORPORATION LIMITED	Industrial Engineering
261	DASSAULT SYSTEMES SA	Software & Computer Services
262	VODAFONE GROUP PUBLIC LIMITED COMPANY	Mobile Telecommunications
263	KAWASAKI HEAVY INDUSTRIES LTD	General Industrials
264	XILINX INC	Technology Hardware & Equipment
265	DASSAULT AVIATION SA	Aerospace & Defence
266	COMMONWEALTH BANK OF AUSTRALIA	Banks
267	SANDVIK AB	Industrial Engineering
268	STRYKER CORPORATION	Health Care Equipment & Services
269	MONDELEZ INTERNATIONAL, INC.	Food Producers
270	OAO LUKOIL	Oil & Gas Producers
271	HALLIBURTON CO	Oil Equipment, Services & Distribution
272	KLA TENCOR CORP	Technology Hardware & Equipment
273	CADENCE DESIGN SYSTEMS INC	Software & Computer Services
274	AUTOLIV, INC.	Automobiles & Parts
275	PPG INDUSTRIES INC	Construction & Materials
276	BRITISH AMERICAN TOBACCO P.L.C.	Tobacco
277	AMAZON.COM, INC.	General Retailers
278	TOYOTA INDUSTRIES CORPORATION	Automobiles & Parts
279	H. LUNDBECK A/S	Pharmaceuticals & Biotechnology
280	KT CORPORATION	Fixed Line Telecommunications
281	EATON CORPORATION PLC	Electronic & Electrical Equipment
282	GIVAUDAN SA	Chemicals
283	ROHM COMPANY LIMITED	Technology Hardware & Equipment
284	SHIN-ETSU CHEMICAL CO., LTD.	Chemicals
285	BROTHER INDUSTRIES LTD	Technology Hardware & Equipment
286	KAO CORPORATION	Personal Goods
287	UNICREDIT SPA	Banks
288	SALESFORCE.COM, INC.	Software & Computer Services
289	SEGA SAMMY HOLDINGS INC	Travel & Leisure
290	BSH BOSCH UND SIEMENS HAUSGERÄTE GMBH	Household Goods & Home Construction
291	JTEKT CORP.	Industrial Engineering
292	TOYOTA BOSHOKU CORPORATION	Automobiles & Parts
293	INNOLUX CORP.	Electronic & Electrical Equipment
294	PHILIP MORRIS INTERNATIONAL INC.	Tobacco
295	WISTRON CORPORATION	Technology Hardware & Equipment
296	REED ELSEVIER PLC	Media
297	CHINA CNR CORPORATION LIMITED	Industrial Engineering
298	ZOETIS INC.	Pharmaceuticals & Biotechnology
299	PARKER HANNIFIN CORP	Industrial Engineering

300	FRESENIUS SE & CO. KGAA	Health Care Equipment & Services
301	MITSUBISHI MOTORS CORPORATION	Automobiles & Parts
302	HOSPIRA, INC.	Pharmaceuticals & Biotechnology
303	ACTAVIS, INC.	Pharmaceuticals & Biotechnology
304	DIEHL STIFTUNG & CO. KG	General Industrials
305	NIDEC CORPORATION	Electronic & Electrical Equipment
306	CENTRAL JAPAN RAILWAY COMPANY	Travel & Leisure
307	PIONEER CORPORATION	Electronic & Electrical Equipment
308	MYLAN INC.	Pharmaceuticals & Biotechnology
309	JFE HOLDINGS INC	Industrial Metals & Mining
310	DAIKIN INDUSTRIES LIMITED	General Industrials
311	TELJIN LIMITED	Chemicals
312	ADVANTEST CORPORATION	Technology Hardware & Equipment
313	MAHLE GMBH	Automobiles & Parts
314	COMPAL ELECTRONICS INC	Electronic & Electrical Equipment
315	INTESA SANPAOLO	Banks
316	DELTA ELECTRONICS INC	Electronic & Electrical Equipment
317	AJINOMOTO COMPANY INC	Food Producers
318	THERMO FISHER SCIENTIFIC INC.	Health Care Equipment & Services
319	SOLVAY SA	Chemicals
320	SUNGARD DATA SYSTEMS INC.	Software & Computer Services
321	GENERAL DYNAMICS CORP	Aerospace & Defence
322	BAIDU INC.	Software & Computer Services
323	LLOYDS BANKING GROUP PLC	Banks
324	LEXMARK INTERNATIONAL INC	Technology Hardware & Equipment
325	SAUDI BASIC INDUSTRIES CORPORATION (SAUDI JOINT STOCK COMPANY)	Chemicals
326	CHINA COMMUNICATIONS CONSTRUCTION COMPANY LIMITED	Construction & Materials
327	GOODYEAR TIRE & RUBBER CO	Automobiles & Parts
328	mitsui chemicals inc	Chemicals
329	CSL LIMITED	Pharmaceuticals & Biotechnology
330	EXPEDIA, INC.	Travel & Leisure
331	ON SEMICONDUCTOR CORP	Technology Hardware & Equipment
332	HARRIS CORP	Technology Hardware & Equipment
333	CIENA CORP	Technology Hardware & Equipment
334	IPSEN SA	Pharmaceuticals & Biotechnology
335	DNB ASA	Banks
336	BYD COMPANY LIMITED	Electronic & Electrical Equipment
337	KUBOTA CORPORATION	General Industrials
338	FUJI ELECTRIC CO., LTD.	Electronic & Electrical Equipment
339	BROCADE COMMUNICATIONS SYSTEMS INC	Technology Hardware & Equipment
340	DAI NIPPON PRINTING CO LTD	Media
341	KIMBERLY CLARK CORP	Personal Goods

342	KOBE STEEL LIMITED	Industrial Metals & Mining
343	AU OPTRONICS CORPORATION	Electronic & Electrical Equipment
344	METALLURGICAL CORPORATION OF CHINA LTD	General Industrials
345	LIFE TECHNOLOGIES CORPORATION	Pharmaceuticals & Biotechnology
346	QUANTA COMPUTER INC.	Technology Hardware & Equipment
347	ALTERA CORP	Technology Hardware & Equipment
348	DANONE	Food Producers
349	BAKER HUGHES INC	Oil Equipment, Services & Distribution
350	HEBEI IRON & STEEL CO., LTD.	Industrial Metals & Mining
351	HEXAGON AB	Industrial Engineering
352	HYUNDAI MOBIS CORP.	Automobiles & Parts
353	AVAGO TECHNOLOGIES LIMITED	Technology Hardware & Equipment
354	KDDI CORPORATION	Technology Hardware & Equipment
355	ALPS ELECTRIC CO LTD	Electronic & Electrical Equipment
356	GRÖNENTHAL PHARMA GMBH & CO. KOMMANDITGESELLSCHAFT	Pharmaceuticals & Biotechnology
357	KNORR-BREMSE AKTIENGESELLSCHAFT	Industrial Engineering
358	SHANGHAI ELECTRIC GROUP COMPANY LIMITED	Industrial Engineering
359	NETFLIX, INC.	General Retailers
360	AB ELECTROLUX	Household Goods & Home Construction
361	NEFTYANAYA KOMPANIYA ROSNEFT	Oil Equipment, Services & Distribution
362	GARMIN LTD.	Leisure Goods
363	ONYX PHARMACEUTICALS INC	Pharmaceuticals & Biotechnology
364	RWE AG	Gas, Water & Multi-utilities
365	UNITED MICROELECTRONICS CORPORATION	Technology Hardware & Equipment
366	ROCKWELL COLLINS INC	Aerospace & Defence
367	CERNER CORP	Software & Computer Services
368	THYSSENKRUPP AG	Industrial Metals & Mining
369	NITTO DENKO CORPORATION	Chemicals
370	BMC SOFTWARE INC	Software & Computer Services
371	AGCO CORP	Industrial Engineering
372	TOYODA GOSEI CO LTD	Automobiles & Parts
373	MENTOR GRAPHICS CORP	Software & Computer Services
374	TERUMO CORPORATION	Health Care Equipment & Services
375	GDF SUEZ	Gas, Water & Multi-utilities
376	ATLAS COPCO AB	Industrial Engineering
377	IHI CORP.	Industrial Engineering
378	MELJI HOLDINGS CO., LTD	Food Producers
379	BIOMARIN PHARMACEUTICAL INC	Pharmaceuticals & Biotechnology
380	RHEINMETALL AG	Automobiles & Parts
381	GREAT WALL TECHNOLOGY COMPANY LIMITED	Technology Hardware & Equipment
382	SEKISUI CHEMICAL CO LTD	Construction & Materials
383	VISTEON CORP	Automobiles & Parts

384	YOKOGAWA ELECTRIC CORPORATION	Electronic & Electrical Equipment
385	ASUSTEK COMPUTER INCORPORATION	Technology Hardware & Equipment
386	ZODIAC AEROSPACE	Aerospace & Defence
387	VESTAS WIND SYSTEMS A/S	Alternative Energy
388	EDWARDS LIFESCIENCES CORP	Health Care Equipment & Services
389	COMPAGNIE MERIEUX ALLIANCE	Pharmaceuticals & Biotechnology
390	SK TELECOM CO.,LTD.	Fixed Line Telecommunications
391	EMBRAER - EMPRESA BRASILEIRA DE AERONAUTICA S.A. (OLD)	Aerospace & Defence
392	BEHR GMBH & CO. KG	Automobiles & Parts
393	HARMAN INTERNATIONAL INDUSTRIES INC	Leisure Goods
394	ARCELORMITTAL S.A.	Industrial Metals & Mining
395	GKN PLC	Automobiles & Parts
396	WARTSILA OYJ	Industrial Engineering
397	PACCAR INC	Industrial Engineering
398	ENI SPA	Oil & Gas Producers
399	LINKEDIN CORPORATION	Software & Computer Services
400	CSR PLC	Technology Hardware & Equipment
401	CALSONIC KANSEI CORPORATION	Automobiles & Parts
402	TESLA MOTORS INC	Automobiles & Parts
403	LEGRAND	Electronic & Electrical Equipment
404	INGERSOLL-RAND PLC	Industrial Engineering
405	RECKITT BENCKISER GROUP PLC	Household Goods & Home Construction
406	TAISHO PHARMACEUTICAL HOLDINGS CO., LTD.	Pharmaceuticals & Biotechnology
407	JX HOLDINGS, INC.	Oil & Gas Producers
408	B BRAUN MELSUNGEN AG	Health Care Equipment & Services
409	ILLINOIS TOOL WORKS INC	Industrial Engineering
410	BORGWARNER INC	Automobiles & Parts
411	N.V. UMICORE S.A.	Industrial Metals & Mining
412	TOGNUM AG	Industrial Engineering
413	TERADATA CORPORATION	Software & Computer Services
414	SOCIETE NATIONALE DES CHEMINS DE FER FRANCAIS	Industrial Transportation
415	CHIESI FARMACEUTICI S.P.A.	Pharmaceuticals & Biotechnology
416	ROCKWELL AUTOMATION, INC.	Industrial Engineering
417	COLGATE PALMOLIVE CO	Personal Goods
418	JDS UNIPHASE CORP	Technology Hardware & Equipment
419	RED HAT INC	Software & Computer Services
420	ZF LENKSYSTEME GMBH	Automobiles & Parts
421	WEATHERFORD INTERNATIONAL LTD.	Oil Equipment, Services & Distribution
422	TRIMBLE NAVIGATION LTD	Electronic & Electrical Equipment
423	YAMAHA CORPORATION	Leisure Goods
424	NOVOZYMES A/S	Pharmaceuticals & Biotechnology
425	TRUMPF GMBH + CO. KG	General Industrials

426	MICROCHIP TECHNOLOGY INC	Technology Hardware & Equipment
427	INDRA SISTEMAS SA	Software & Computer Services
428	TESCO PLC	General Retailers
429	THE SAGE GROUP PLC.	Software & Computer Services
430	LANXESS AG	Chemicals
431	HILTI AKTIENGESELLSCHAFT	Construction & Materials
432	ARM HOLDINGS PLC	Electronic & Electrical Equipment
433	TERADYNE INC	Technology Hardware & Equipment
434	BAE SYSTEMS PLC	Aerospace & Defence
435	POU CHEN CORPORATION	Personal Goods
436	L'AIR LIQUIDE, SOCIÉTÉ ANONYME POUR L'ÉTUDE ET L'EXPLOITATION DES PROCÉDÉS GEORGES CLAUDE	Chemicals
437	ATMEL CORP	Technology Hardware & Equipment
438	SKF AB	Industrial Engineering
439	KANEKA CORPORATION	Chemicals
440	JVC KENWOOD CORPORATION	Leisure Goods
441	KERRY GROUP PUBLIC LIMITED COMPANY	Food Producers
442	VOITH GMBH	General Industrials
443	FREUDENBERG & CO. KOMMANDITGESELLSCHAFT	General Industrials
444	DANFOSS A/S	Industrial Engineering
445	AMDOCS LIMITED	Software & Computer Services
446	ADVANCED SEMICONDUCTOR ENGINEERING INC	Technology Hardware & Equipment
447	CLAAS KGAA MBH	Industrial Engineering
448	TELLABS INC	Technology Hardware & Equipment
449	THE TOKYO ELECTRIC POWER COMPANY INCORPORATED	Electricity
450	SHOWA DENKO K K	Chemicals
451	GENERAL MILLS INC	Food Producers
452	PIRELLI & C. S.P.A.	Automobiles & Parts
453	NATIONAL INSTRUMENTS CORP	Electronic & Electrical Equipment
454	INTERNATIONAL FLAVORS & FRAGRANCES INC	Chemicals
455	FURUKAWA ELECTRIC CO LTD	General Industrials
456	ELBIT SYSTEMS LTD.	Aerospace & Defence
457	FANUC LTD	Industrial Engineering
458	KOITO MANUFACTURING CO LTD	Automobiles & Parts
459	ILLUMINA INC	Pharmaceuticals & Biotechnology
460	WACKER CHEMIE AG	Chemicals
461	GEMALTO N.V.	Electronic & Electrical Equipment
462	ENDO HEALTH SOLUTIONS, INC	Pharmaceuticals & Biotechnology
463	TAKATA CORPORATION	Automobiles & Parts
464	CNOOC LIMITED	Oil & Gas Producers
465	SUMITOMO RUBBER INDUSTRIES LTD	Automobiles & Parts
466	ZIMMER HOLDINGS, INC.	Health Care Equipment & Services
467	NUANCE COMMUNICATIONS, INC.	Software & Computer Services

468	GRUNDFOS A/S	Industrial Engineering
469	JSR CORPORATION	Chemicals
470	TOMTOM NV	Electronic & Electrical Equipment
471	DEUTSCHE BORSE AG	Financial Services
472	CONOCOPHILLIPS	Oil & Gas Producers
473	LINEAR TECHNOLOGY CORP	Technology Hardware & Equipment
474	PORTUGAL TELECOM SGPS SA	Fixed Line Telecommunications
475	ACCIONA S.A.	Construction & Materials
476	NCR CORP	Technology Hardware & Equipment
477	SAMSUNG ELECTRO-MECHANICS CO.,LTD.	Electronic & Electrical Equipment
478	HYUNDAI HEAVY INDUSTRIES CO.,LTD.	Industrial Engineering
479	PMC SIERRA INC	Technology Hardware & Equipment
480	INTERNATIONAL GAME TECHNOLOGY	Leisure Goods
481	MARKS AND SPENCER GROUP P.L.C.	General Retailers
482	ALEXION PHARMACEUTICALS INC	Pharmaceuticals & Biotechnology
483	AGFA GEVAERT NV	Electronic & Electrical Equipment
484	PTC INC.	Software & Computer Services
485	BIO RAD LABORATORIES INC	Health Care Equipment & Services
486	ALMIRALL, S.A.	Pharmaceuticals & Biotechnology
487	THE SWATCH GROUP LTD.	Personal Goods
488	DRÖGERWERK AG & CO. KGAA	Health Care Equipment & Services
489	SKYWORKS SOLUTIONS, INC.	Technology Hardware & Equipment
490	FONTERRA CO-OPERATIVE GROUP LIMITED	Food Producers
491	MTU AERO ENGINES AG	Aerospace & Defence
492	TECHNICOLOR	Media
493	MAXINGVEST AG	Beverages
494	YUE YUEN INDUSTRIAL (HOLDINGS) LIMITED	Personal Goods
495	POLYCOM INC	Technology Hardware & Equipment
496	JOHNSON MATTHEY PLC	Chemicals
497	TOKAI RIKA CO., LTD.	Automobiles & Parts
498	EASTMAN KODAK CO	Leisure Goods
499	NISSHINBO HOLDINGS INC.	Personal Goods
500	ASSA ABLOY AB	Construction & Materials
501	KELLOGG COMPANY	Food Producers
502	WM MORRISON SUPERMARKETS PLC	Food & Drug Retailers
503	RELIANCE INDUSTRIES LIMITED	Chemicals
504	SANY HEAVY INDUSTRY CO., LTD.	Industrial Engineering
505	KUDELSKI SA	Software & Computer Services
506	RSA INSURANCE GROUP PLC	Nonlife Insurance
507	COMMERZBANK AG	Banks
508	DONGFANG ELECTRIC CORPORATION LIMITED	Industrial Engineering
509	C.R. BARD INC	Health Care Equipment & Services

510	EASTMAN CHEMICAL CO	Chemicals
511	ALCOA INC	Industrial Metals & Mining
512	SUNTORY HOLDINGS LIMITED	Nonequity Investment Instruments
513	ASM INTERNATIONAL NV	Technology Hardware & Equipment
514	LITE-ON TECHNOLOGY CORPORATION	Technology Hardware & Equipment
515	KRONES AG	Industrial Engineering
516	ESSILOR INTERNATIONAL SA	Health Care Equipment & Services
517	ELAN CORPORATION PUBLIC LIMITED COMPANY	Pharmaceuticals & Biotechnology
518	GETINGE AB	Health Care Equipment & Services
519	ARKEMA	Chemicals
520	MATTEL INC	Leisure Goods
521	THE KANSAI ELECTRIC POWER COMPANY INCORPORATED	Electricity
522	SEMICONDUCTOR MANUFACTURING INTERNATIONAL CORPORATION	Technology Hardware & Equipment
523	SANTEN PHARMACEUTICAL CO LTD	Pharmaceuticals & Biotechnology
524	SK HOLDINGS CO.,LTD.	Oil Equipment, Services & Distribution
525	NAMCO BANDAI HOLDINGS INC	Leisure Goods
526	CAREFUSION CORPORATION	Health Care Equipment & Services
527	BE AEROSPACE INC	Aerospace & Defence
528	IBERDROLA SA	Electricity
529	CLARIANT AG	Chemicals
530	BRUKER CORPORATION	Health Care Equipment & Services
531	HASBRO INC	Leisure Goods
532	CYPRESS SEMICONDUCTOR CORP	Technology Hardware & Equipment
533	DEUTSCHE TELEKOM AG	Fixed Line Telecommunications
534	DOVER CORP	Industrial Engineering
535	KURARAY CO LTD	Chemicals
536	CHINA COMMUNICATIONS SERVICES CORPORATION LIMITED	Fixed Line Telecommunications
537	E.ON SE	Gas, Water & Multi-utilities
538	ING BANK NV	Banks
539	SIKA AG	Chemicals
540	CYMER INC	Technology Hardware & Equipment
541	APPLIED MICRO CIRCUITS CORP	Technology Hardware & Equipment
542	NTN CORPORATION	Industrial Engineering
543	EAST JAPAN RAILWAY COMPANY	Travel & Leisure
544	VARIAN MEDICAL SYSTEMS INC	Health Care Equipment & Services
545	MOLEX INC	Electronic & Electrical Equipment
546	TOPPAN PRINTING CO LTD	Support Services
547	TOTO LTD	Construction & Materials
548	ENEL SPA	Electricity
549	ECOLAB INC	Chemicals
550	TATUNG COMPANY LIMITED	Electronic & Electrical Equipment
551	ANHEUSER-BUSCH INBEV	Beverages

552	SOHU.COM INC.	Software & Computer Services
553	ICAHN ENTERPRISES L.P.	General Industrials
554	RF MICRO DEVICES INC	Technology Hardware & Equipment
555	ITRON INC	Electronic & Electrical Equipment
556	KRAFT FOODS GROUP, INC.	Food Producers
557	F5 NETWORKS INC	Technology Hardware & Equipment
558	SINOHYDRO GROUP LTD.	Construction & Materials
559	MITSUBISHI GAS CHEMICAL COMPANY INC	Chemicals
560	EBERSPACHER HOLDING GMBH & CO. KG	Automobiles & Parts
561	METRO AG	General Retailers
562	RICHTER GEDEON VEGYESZETI GYAR RT	Pharmaceuticals & Biotechnology
563	SAMSUNG TECHWIN CO.,LTD.	Leisure Goods
564	SERCO GROUP PLC	Support Services
565	STANLEY BLACK & DECKER, INC.	Household Goods & Home Construction
566	PRITHVI INFORMATION SOLUTIONS LIMITED	Software & Computer Services
567	IBIDEN CO LTD	Electronic & Electrical Equipment
568	BOLLORE	Industrial Transportation
569	REALTEK SEMICONDUCTOR CORP.	Technology Hardware & Equipment
570	UNITED THERAPEUTICS CORP	Pharmaceuticals & Biotechnology
571	INFOSYS LIMITED	Software & Computer Services
572	SAAB AB	Aerospace & Defence
573	GIESECKE & DEVRIENT GESELLSCHAFT MIT BESCHRANKTER HAFTUNG	Support Services
574	FUJIKURA LTD	Electronic & Electrical Equipment
575	MACRONIX INTERNATIONAL COMPANY LIMITED	Technology Hardware & Equipment
576	SMITH & NEPHEW PLC	Health Care Equipment & Services
577	ARRIS GROUP, INC.	Technology Hardware & Equipment
578	SEATTLE GENETICS INC	Pharmaceuticals & Biotechnology
579	IDEMITSU KOSAN CO., LTD.	Oil & Gas Producers
580	INTUITIVE SURGICAL INC	Health Care Equipment & Services
581	INTEGRATED DEVICE TECHNOLOGY INC	Technology Hardware & Equipment
582	NEWELL RUBBERMAID INC.	Household Goods & Home Construction
583	ADIDAS AG	Personal Goods
584	MICROSEMI CORP	Technology Hardware & Equipment
585	EMULEX CORP	Technology Hardware & Equipment
586	SMITHS GROUP PLC	Electronic & Electrical Equipment
587	CHONGQING CHANGAN AUTOMOBILE COMPANY LIMITED	Automobiles & Parts
588	KWS SAAT AG	Food Producers
589	TOYO SEIKAN GROUP HOLDINGS LTD.	General Industrials
590	INTERSIL CORP	Technology Hardware & Equipment
591	METSO OYJ	Industrial Engineering
592	VOEST-ALPINE AG	Industrial Metals & Mining
593	MERZ GMBH & CO. KGAA	Pharmaceuticals & Biotechnology

594	PEGATRON CORPORATION	Technology Hardware & Equipment
595	GRIFOLS, S.A.	Pharmaceuticals & Biotechnology
596	OPEN TEXT CORPORATION	Software & Computer Services
597	TRW AUTOMOTIVE HOLDINGS CORP.	Automobiles & Parts
598	MISYS LIMITED	Software & Computer Services
599	GEELY AUTOMOBILE HOLDINGS LIMITED	Automobiles & Parts
600	ALLSCRIPTS HEALTHCARE SOLUTIONS INC	Software & Computer Services
601	LIXIL GROUP CORPORATION	Construction & Materials
602	HOYA CORPORATION	Leisure Goods
603	UBE INDUSTRIES LIMITED	General Industrials
604	OKI ELECTRIC INDUSTRY CO LTD	Technology Hardware & Equipment
605	TRIQUINT SEMICONDUCTOR INC	Technology Hardware & Equipment
606	TPK HOLDING COMPANY LIMITED	Electronic & Electrical Equipment
607	FAIRCHILD SEMICONDUCTOR INTERNATIONAL INC	Technology Hardware & Equipment
608	DST SYSTEMS INC	Software & Computer Services
609	BRITISH SKY BROADCASTING GROUP PLC	Media
610	FINISAR CORP	Technology Hardware & Equipment
611	SMC CORPORATION	Industrial Engineering
612	PACE PLC	Technology Hardware & Equipment
613	NISSAN CHEMICAL INDUSTRIES LTD	Chemicals
614	KO◆ HOLDING A.S.	General Industrials
615	SHISEIDO COMPANY LIMITED	Personal Goods
616	VERIFONE SYSTEMS, INC.	Technology Hardware & Equipment
617	NCSOFT CORPORATION	Software & Computer Services
618	QIHOO 360 TECHNOLOGY CO LTD	Software & Computer Services
619	INVENSYS PLC	Electronic & Electrical Equipment
620	QLOGIC CORP	Technology Hardware & Equipment
621	HEIDELBERGER DRUCKMASCHINEN AG	Industrial Engineering
622	ISRAEL AEROSPACE INDUSTRIES LIMITED	Aerospace & Defence
623	CREE INC	Technology Hardware & Equipment
624	NEKTAR THERAPEUTICS	Pharmaceuticals & Biotechnology
625	SONOVA HOLDING AG	Health Care Equipment & Services
626	TIBCO SOFTWARE INC	Software & Computer Services
627	LOGITECH INTERNATIONAL SA	Technology Hardware & Equipment
628	MEGGITT PLC	Aerospace & Defence
629	LAFARGE SA	Construction & Materials
630	KION GROUP AG	Industrial Engineering
631	GREAT WALL MOTOR CO., LTD.	Automobiles & Parts
632	HUNTSMAN CORPORATION	Chemicals
633	ALERE, INC.	Health Care Equipment & Services
634	JOHN LEWIS PARTNERSHIP PLC	General Retailers
635	GALENICA AG	Pharmaceuticals & Biotechnology

636	LYONDELLBASELL INDUSTRIES N.V.	Chemicals
637	BIOMET INC	Health Care Equipment & Services
638	SYMRISE AG	Chemicals
639	KONGSBERG GRUPPEN ASA	Aerospace & Defence
640	CHINA NATIONAL CHEMICAL ENGINEERING CO LTD	Construction & Materials
641	TECHTRONIC INDUSTRIES COMPANY LIMITED	Electronic & Electrical Equipment
642	WEBASTO SE	Automobiles & Parts
643	DAICEL CORPORATION	Chemicals
644	ENDRESS+HAUSER AG	Electronic & Electrical Equipment
645	GAMESA CORPORACION TECNOLOGICA SA	Industrial Engineering
646	THE YOKOHAMA RUBBER COMPANY LIMITED	Automobiles & Parts
647	WINBOND ELECTRONICS CORPORATION	Technology Hardware & Equipment
648	SASOL LIMITED	Oil & Gas Producers
649	ROVI CORP.	Software & Computer Services
650	YAKULT HONSHA CO LTD	Food Producers
651	WEICHAI POWER COMPANY LIMITED	Automobiles & Parts
652	PRADA SPA	Personal Goods
653	NOVATEK MICROELECTRONICS CORPORATION	Electronic & Electrical Equipment
654	DAINIPPON SCREEN MFG CO LTD	Technology Hardware & Equipment
655	RIVERBED TECHNOLOGY, INC.	Technology Hardware & Equipment
656	HISAMITSU PHARMACEUTICAL CO, INC.	Pharmaceuticals & Biotechnology
657	INFORMATICA CORP	Software & Computer Services
658	TYCO INTERNATIONAL LIMITED	General Industrials
659	CTRIIP.COM INTERNATIONAL LIMITED	Travel & Leisure
660	SYNAPTICS INCORPORATED	Technology Hardware & Equipment
661	HUSQVARNA AB	Industrial Engineering
662	MOCHIDA PHARMACEUTICAL CO LTD	Pharmaceuticals & Biotechnology
663	KONINKLIJKE AHOLD NV	Food & Drug Retailers
664	WOODWARD, INC.	Industrial Engineering
665	LOTUS CARS LIMITED	Automobiles & Parts
666	TSINGHUA TONGFANG CO., LTD	Technology Hardware & Equipment
667	SUMITOMO BAKELITE COMPANY LIMITED	Chemicals
668	BENTELER INTERNATIONAL AKTIENGESELLSCHAFT	Automobiles & Parts
669	TOSOH CORPORATION	Chemicals
670	PITNEY BOWES INC	Technology Hardware & Equipment
671	VATTENFALL AB	Electricity
672	RAMBUS INC	Technology Hardware & Equipment
673	CHUNGHWA PICTURE TUBES, LTD.	Electronic & Electrical Equipment
674	INVENTEC CORPORATION	Technology Hardware & Equipment
675	DOLBY LABORATORIES, INC.	Media
676	DR REDDY'S LABORATORIES LIMITED	Pharmaceuticals & Biotechnology
677	SYSMEX CORPORATION	Health Care Equipment & Services

678	GLORY LTD	Industrial Engineering
679	SK INNOVATION CO., LTD.	Oil & Gas Producers
680	SPREADTRUM COMMUNICATIONS, INC.	Technology Hardware & Equipment
681	PETROLEOS DE VENEZUELA S A	Oil & Gas Producers
682	MELLANOX TECHNOLOGIES, LTD.	Technology Hardware & Equipment
683	SANKEN ELECTRIC CO LTD	Technology Hardware & Equipment
684	YANDEX N.V.	Software & Computer Services
685	AKAMAI TECHNOLOGIES INC	Software & Computer Services
686	FLIR SYSTEMS INC	Electronic & Electrical Equipment
687	SILICON LABORATORIES INC	Technology Hardware & Equipment
688	ZEON CORPORATION	Chemicals
689	HARLEY DAVIDSON INC	Automobiles & Parts
690	VEOLIA ENVIRONNEMENT	Gas, Water & Multi-utilities
691	ASHLAND INC	Chemicals
692	JIANGLING MOTORS CORPORATION LIMITED	Automobiles & Parts
693	CHEIL INDUSTRIES INC.	Chemicals
694	SMA SOLAR TECHNOLOGY AG	Alternative Energy
695	ALTRIA GROUP, INC.	Tobacco
696	NHK SPRING CO LTD	Automobiles & Parts
697	SEALED AIR CORP	General Industrials
698	ALTANA AKTIENGESELLSCHAFT	Chemicals
699	SPECTRIS PLC	Electronic & Electrical Equipment
700	ACI WORLDWIDE, INC.	Software & Computer Services
701	ALKERMES PLC	Pharmaceuticals & Biotechnology
702	KRKA DD NOVO MESTO	Pharmaceuticals & Biotechnology
703	SOFTWARE AG	Software & Computer Services
704	GUANGZHOU AUTOMOBILE GROUP CO., LTD.	Automobiles & Parts
705	LINDE AG	Chemicals
706	DIALOG SEMICONDUCTOR PLC	Technology Hardware & Equipment
707	OC OERLIKON CORPORATION AG	General Industrials
708	COMPAGNIE INDUSTRIELLE ET FINANCIERE D INGENIERIE S.A.	Electronic & Electrical Equipment
709	PERKINELMER INC	Electronic & Electrical Equipment
710	ANSYS INC	Software & Computer Services
711	CONSTELLATION SOFTWARE INC.	Software & Computer Services
712	GEA GROUP AG	Industrial Engineering
713	IMAGINATION TECHNOLOGIES GROUP PLC	Technology Hardware & Equipment
714	FIRST SOLAR, INC.	Alternative Energy
715	NISSAN SHATAI CO LTD	Automobiles & Parts
716	NIPPON SHOKUBAI CO LTD	Chemicals
717	ORION OYJ	Pharmaceuticals & Biotechnology
718	MITSUBISHI MATERIALS CORPORATION	Industrial Metals & Mining
719	REGENERON PHARMACEUTICALS INC	Pharmaceuticals & Biotechnology

720	TELEDYNE TECHNOLOGIES INCORPORATED	Aerospace & Defence
721	HOLOGIC INC	Health Care Equipment & Services
722	GAMELOFT SE	Software & Computer Services
723	ARRIUM LIMITED	Industrial Metals & Mining
724	CLOROX CO	Household Goods & Home Construction
725	SVENSKA CELLULOSA AB SCA	Forestry & Paper
726	RIO TINTO PLC	Mining
727	EXELIXIS INC	Pharmaceuticals & Biotechnology
728	BURELLE SA	General Industrials
729	BARCO NV	Electronic & Electrical Equipment
730	CAMPBELL SOUP CO	Food Producers
731	KORBER AG	General Industrials
732	BOREALIS AG	Chemicals
733	KYORIN HOLDINGS, INC.	Pharmaceuticals & Biotechnology
734	PERFECT WORLD CO., LTD.	Software & Computer Services
735	CHUNGHWA TELECOM CO., LTD.	Fixed Line Telecommunications
736	POLARIS INDUSTRIES INC	Industrial Engineering
737	MITSUMI ELECTRIC CO LTD	Technology Hardware & Equipment
738	INTERNATIONAL RECTIFIER CORP	Technology Hardware & Equipment
739	CUBIST PHARMACEUTICALS INC	Pharmaceuticals & Biotechnology
740	TCL COMMUNICATION TECHNOLOGY HOLDINGS LIMITED	Technology Hardware & Equipment
741	FIBERHOME TELECOMMUNICATION TECHNOLOGIES CO., LTD.	Fixed Line Telecommunications
742	LONZA GROUP AG	Chemicals
743	SWISSCOM AG	Fixed Line Telecommunications
744	MEDICINES CO	Pharmaceuticals & Biotechnology
745	AIR PRODUCTS & CHEMICALS INC	Chemicals
746	TENNECO INC.	Automobiles & Parts
747	ROPER INDUSTRIES INC	Electronic & Electrical Equipment
748	OSAKA GAS CO LTD	Gas, Water & Multi-utilities
749	SCHINDLER HOLDING AG	Industrial Engineering
750	ALIBABA.COM LTD.	Software & Computer Services
751	HAMAMATSU PHOTONICS KK	Electronic & Electrical Equipment
752	NIPPON KAYAKU CO LTD	Chemicals
753	YASKAWA ELECTRIC CORPORATION	Electronic & Electrical Equipment
754	PUMA SE	Personal Goods
755	ADTRAN INC	Technology Hardware & Equipment
756	LEONI AG	Electronic & Electrical Equipment
757	AMERICAN AXLE & MANUFACTURING HOLDINGS, INC.	Automobiles & Parts
758	SALIX PHARMACEUTICALS, LTD.	Pharmaceuticals & Biotechnology
759	SELLAFIELD LIMITED	General Industrials
760	NORDDEUTSCHE LANDESBANK GIROZENTRALE NORD/LB	Banks
761	RABOBANK NEDERLAND	Banks

762	DENKI KAGAKU KOGYO KABUSHIKI KAISHA	Chemicals
763	NICE SYSTEMS LIMITED	Software & Computer Services
764	QIAGEN NV	Pharmaceuticals & Biotechnology
765	VALLOUREC S.A.	Industrial Engineering
766	CHUBU ELECTRIC POWER COMPANY,INCORPORATED	Electricity
767	HYOSUNG CORPORATION	General Industrials
768	MASTERCARD INC.	Financial Services
769	CGG S.A.	Oil Equipment, Services & Distribution
770	MAHINDRA & MAHINDRA LIMITED	Automobiles & Parts
771	COCHLEAR LIMITED	Health Care Equipment & Services
772	SICK AG	Electronic & Electrical Equipment
773	BOUYGUES SA	Construction & Materials
774	HEIDELBERGCEMENT AG	Construction & Materials
775	AVICHINA INDUSTRY & TECHNOLOGY COMPANY LIMITED	Industrial Transportation
776	BABCOCK & WILCOX CO	Electronic & Electrical Equipment
777	NSK LTD	Industrial Engineering
778	NGK INSULATORS LTD.	General Industrials
779	ABENGOA S.A.	General Industrials
780	ELECTRONICS FOR IMAGING INC	Technology Hardware & Equipment
781	EMERGENT BIOSOLUTIONS INC.	Pharmaceuticals & Biotechnology
782	RESMED INC	Health Care Equipment & Services
783	SEMTECH CORP	Technology Hardware & Equipment
784	VERINT SYSTEMS, INC.	Software & Computer Services
785	WINCOR NIXDORF AG	Software & Computer Services
786	KISSEI PHARMACEUTICAL COMPANY LIMITED	Pharmaceuticals & Biotechnology
787	COBHAM PLC	Aerospace & Defence
788	DISCO CORPORATION	Technology Hardware & Equipment
789	SHIMANO INC	Leisure Goods
790	TATE & LYLE PUBLIC LIMITED COMPANY	Food Producers
791	THERAVANCE, INC	Pharmaceuticals & Biotechnology
792	NEWMARKET CORPORATION	Chemicals
793	FMC CORP	Chemicals
794	JOH. VAILLANT GMBH & CO. KG	Industrial Engineering
795	INFINERA CORP.	Technology Hardware & Equipment
796	VALSPAR CORP	Construction & Materials
797	MUNDIPHARMA RESEARCH LIMITED	Pharmaceuticals & Biotechnology
798	AKER SOLUTIONS ASA	Industrial Engineering
799	FMC TECHNOLOGIES INC	Industrial Engineering
800	HORIBA LTD	Electronic & Electrical Equipment
801	AVID TECHNOLOGY INC	Media
802	TOKUYAMA CORPORATION	Chemicals
803	MOOG INC	Aerospace & Defence

804	SUMITOMO HEAVY INDUSTRIES LTD	Industrial Engineering
805	USHIO INC	Electronic & Electrical Equipment
806	PERRIGO CO	Pharmaceuticals & Biotechnology
807	INDAP SWEDEN AB	Health Care Equipment & Services
808	TOYOBO CO LTD	Chemicals
809	TIVO INC	Leisure Goods
810	HENRY JACK & ASSOCIATES INC	Software & Computer Services
811	WMS INDUSTRIES INC	Travel & Leisure
812	NETEASE, INC.	Software & Computer Services
813	ORBITAL SCIENCES CORP	Aerospace & Defence
814	SUN PHARMACEUTICAL INDUSTRIES LIMITED	Pharmaceuticals & Biotechnology
815	CIRRUS LOGIC INC	Technology Hardware & Equipment
816	TAIWAN POWER COMPANY	Electricity
817	OLD MUTUAL PLC	Life Insurance
818	KONE OYJ	Industrial Engineering
819	FRESENIUS MEDICAL CARE AG & CO. KGAA	Health Care Equipment & Services
820	TOKYO GAS CO LTD	Gas, Water & Multi-utilities
821	FUJITSU GENERAL LIMITED	Construction & Materials
822	BÖHLER HOLDING AG	Industrial Engineering
823	CSG SYSTEMS INTERNATIONAL INC	Software & Computer Services
824	METTLER TOLEDO INTERNATIONAL INC	Electronic & Electrical Equipment
825	ENERGIZER HOLDINGS INC	Household Goods & Home Construction
826	TOKAI RUBBER INDUSTRIES LTD	Automobiles & Parts
827	CHECK POINT SOFTWARE TECHNOLOGIES LIMITED	Software & Computer Services
828	MEIDENSHA CORPORATION	General Industrials
829	AMCOR LIMITED	General Industrials
830	SHIMADZU CORPORATION	Electronic & Electrical Equipment
831	ANRITSU CORPORATION	Electronic & Electrical Equipment
832	BALLY TECHNOLOGIES, INC.	Travel & Leisure
833	ASAHI GROUP HOLDINGS LTD.	Beverages
834	CAE INC	Aerospace & Defence
835	HERAEUS HOLDING GESELLSCHAFT MIT BESCHRÄNKTER HAFTUNG	Industrial Metals & Mining
836	RED BULL TECHNOLOGY LIMITED	Automobiles & Parts
837	BETFAIR GROUP PLC	Travel & Leisure
838	CAVIUM, INC.	Technology Hardware & Equipment
839	REPSOL S.A.	Oil & Gas Producers
840	ARUBA NETWORKS, INC.	Technology Hardware & Equipment
841	OJI HOLDINGS CORPORATION	Forestry & Paper
842	OSHKOSH CORPORATION	Industrial Engineering
843	OMNIVISION TECHNOLOGIES INC	Technology Hardware & Equipment
844	BEIQI FOTON MOTOR COMPANY LIMITED	Industrial Engineering
845	FUNAI ELECTRIC CO LTD	Electronic & Electrical Equipment

846	WILLIAM DEMANT HOLDING A/S	Health Care Equipment & Services
847	SINA CORPORATION	Technology Hardware & Equipment
848	STORA ENSO OYJ	Forestry & Paper
849	SPANSION INC.	Technology Hardware & Equipment
850	SALZGITTER AG	Industrial Metals & Mining
851	ESTERLINE TECHNOLOGIES CORP	Aerospace & Defence
852	ALFA LAVAL AB	Industrial Engineering
853	SAMSUNG C&T CORP.	Electronic & Electrical Equipment
854	HARMONIC INC	Technology Hardware & Equipment
855	TATA STEEL LIMITED	Industrial Metals & Mining
856	INTERMUNE INC	Pharmaceuticals & Biotechnology
857	XYLEM INC.	Gas, Water & Multi-utilities
858	BRUNSWICK CORP	Leisure Goods
859	AVERY DENNISON CORPORATION	Chemicals
860	ACTIVE NETWORK, INC., (THE)	Software & Computer Services
861	CHINA SHIPBUILDING INDUSTRY COMPANY LTD	Industrial Engineering
862	SHANDA GAMES LIMITED	Leisure Goods
863	NIPPON SHINYAKU CO LTD	Pharmaceuticals & Biotechnology
864	IRONWOOD PHARMACEUTICALS, INC.	Pharmaceuticals & Biotechnology
865	LEAR CORP	Automobiles & Parts
866	WABCO HOLDINGS INC.	Automobiles & Parts
867	FISERV INC	Support Services
868	DONG-A SOCIO HOLDINGS CO.,LTD.	Pharmaceuticals & Biotechnology
869	LION CORPORATION	Personal Goods
870	XYPATEX LIMITED	Technology Hardware & Equipment
871	ALLISON TRANSMISSION HOLDINGS, INC.	Software & Computer Services
872	ESTEE LAUDER COMPANIES INC. (THE)	Personal Goods
873	HEIWA CORPORATION	Industrial Engineering
874	TAISEI CORPORATION	Construction & Materials
875	ANDRITZ AG	Industrial Engineering
876	SCHOTT AG	Construction & Materials
877	SIGMA DESIGNS INC	Technology Hardware & Equipment
878	COMPUWARE CORPORATION	Software & Computer Services
879	WORKDAY, INC.	Software & Computer Services
880	TAKASAGO INTERNATIONAL CORPORATION	Chemicals
881	CELANESE CORPORATION	Chemicals
882	DIC CORP.	Chemicals
883	MANNKIND CORPORATION	Pharmaceuticals & Biotechnology
884	SENER GRUPO DE INGENIERIA SOCIEDAD ANONIMA	Aerospace & Defence
885	GEORG FISCHER AG	Industrial Engineering
886	QISDA CORPORATION	Technology Hardware & Equipment
887	OBAYASHI CORPORATION	Construction & Materials

888	MEYER BURGER TECHNOLOGY AG	Industrial Engineering
889	TESSERA TECHNOLOGIES, INC.	Technology Hardware & Equipment
890	BELGACOM SA	Fixed Line Telecommunications
891	EDENRED	Support Services
892	PRYSMIAN S.P.A.	Electronic & Electrical Equipment
893	MINDRAY MEDICAL INTERNATIONAL LIMITED	Health Care Equipment & Services
894	SORIN S.P.A.	Health Care Equipment & Services
895	SEB S.A.	Household Goods & Home Construction
896	WATERS CORP	Health Care Equipment & Services
897	NEXANS SA	Electronic & Electrical Equipment
898	ACER INC.	Technology Hardware & Equipment
899	SHUTTERFLY, INC.	Software & Computer Services
900	IXIA	Software & Computer Services
901	AISAN INDUSTRY CO., LTD.	Automobiles & Parts
902	PRAXAIR INC	Chemicals
903	CHINA NATIONAL MATERIALS CO. LTD.	Construction & Materials
904	RACKSPACE HOSTING, INC.	Software & Computer Services
905	MICROSTRATEGY INC	Software & Computer Services
906	KAJIMA CORPORATION	Construction & Materials
907	ISHIHARA SANGYO KAISHA, LTD.	Chemicals
908	SULZER AG	Industrial Engineering
909	GN STORE NORD AS	Technology Hardware & Equipment
910	JAPAN AVIATION ELECTRONICS INDUSTRY LIMITED	Electronic & Electrical Equipment
911	MAKITA CORPORATION	Household Goods & Home Construction
912	ISRAEL CORPORATION LIMITED	General Industrials
913	TRANSMISSIONS AND ENGINEERING SERVICES NETHERLANDS B.V.	Industrial Engineering
914	CHINA TELECOM CORPORATION LIMITED	Technology Hardware & Equipment
915	ARISTOCRAT LEISURE LIMITED	Travel & Leisure
916	ZOOMLION HEAVY INDUSTRY SCIENCE AND TECHNOLOGY CO., LTD.	Industrial Engineering
917	CORETRONIC CORPORATION	Leisure Goods
918	MSCI INC.	Financial Services
919	MEAD JOHNSON NUTRITION COMPANY	Food Producers
920	GTECH S.P.A.	Travel & Leisure
921	SHANGHAI ZHENHUA HEAVY INDUSTRY CO., LTD.	General Industrials
922	TOPCON CORPORATION	Health Care Equipment & Services
923	NPS PHARMACEUTICALS INC	Pharmaceuticals & Biotechnology
924	ENTROPIC COMMUNICATIONS, INC.	Technology Hardware & Equipment
925	KYUSHU ELECTRIC POWER COMPANY INCORPORATED	Electricity
926	IDEXX LABORATORIES INC	Health Care Equipment & Services
927	EPICOR SOFTWARE CORP	Software & Computer Services
928	WEST JAPAN RAILWAY COMPANY	Travel & Leisure
929	FEI COMPANY	Technology Hardware & Equipment

930	COOPER-STANDARD HOLDINGS INC.	Automobiles & Parts
931	DELHAIZE GROUP SA	Food & Drug Retailers
932	AXIS AB	Technology Hardware & Equipment
933	PHOENIX CONTACT GMBH & CO. KG	Electronic & Electrical Equipment
934	HAGER SE	Industrial Engineering
935	PENTAIR LTD	General Industrials
936	TRAFIKVERKET	Industrial Transportation
937	ELEKTA AB (PUBL)	Health Care Equipment & Services
938	SHIMIZU CORPORATION	Construction & Materials
939	FUSION-IO, INC.	Technology Hardware & Equipment
940	SUNPLUS TECHNOLOGY CO., LTD.	Technology Hardware & Equipment
941	RINNAI CORPORATION	Household Goods & Home Construction
942	CONAGRA FOODS, INC.	Food Producers
943	IAC/INTERACTIVECORP	Software & Computer Services
944	LABORATOIRE FRANCAIS DU FRACTIONNEMENT ET DES BIOTECHNOLOGIES	Pharmaceuticals & Biotechnology
945	DAEWOO SHIPBUILDING & MARINE ENGINEERING CO., LTD.	Industrial Engineering
946	AMPHENOL CORP	Electronic & Electrical Equipment
947	CARGOTEC OYJ	Industrial Engineering
948	FRIESLANDCAMPINA INTERNATIONAL HOLDING B.V.	Food Producers
949	WARNER CHILCOTT PUBLIC LIMITED COMPANY	Pharmaceuticals & Biotechnology
950	VEECO INSTRUMENTS INC	Electronic & Electrical Equipment
951	AIXTRON SE	Technology Hardware & Equipment
952	PANTECH CO.,LTD.	Technology Hardware & Equipment
953	BEKAERT SA/NV	Industrial Metals & Mining
954	SHANGHAI MECHANICAL & ELECTRICAL INDUSTRY CO., LTD.	Industrial Engineering
955	CASIO COMPUTER CO LTD	Leisure Goods
956	DYSON TECHNOLOGY LIMITED	General Industrials
957	SHANGHAI TUNNEL ENGINEERING CO., LTD.	Construction & Materials
958	MITAC INTERNATIONAL CORP.	Electronic & Electrical Equipment
959	BANK OF IRELAND	Banks
960	LVMH MOET HENNESSY - LOUIS VUITTON SA	Personal Goods
961	TECHNIP	Oil Equipment, Services & Distribution
962	AZBIL CORPORATION	Electronic & Electrical Equipment
963	FUJI MACHINE MFG. CO., LTD.	Electronic & Electrical Equipment
964	POWERCHIP TECHNOLOGY CORPORATION	Technology Hardware & Equipment
965	AMER SPORTS OYJ	Leisure Goods
966	SSE PLC	Electricity
967	MINEBEA CO LTD	Industrial Engineering
968	INTERMEC, INC.	Technology Hardware & Equipment
969	AEROFLEX HOLDING CORP.	Electronic & Electrical Equipment
970	NATIONAL FEDERATION OF FISHERIES COOPERATIVES	Food Producers
971	ZUMTOBEL AG	Electronic & Electrical Equipment

972	BUCHER INDUSTRIES AG	Industrial Engineering
973	SILICONWARE PRECISION INDUSTRIES COMPANY LIMITED	Technology Hardware & Equipment
974	JARDEN CORPORATION	Household Goods & Home Construction
975	L-3 COMMUNICATIONS HOLDINGS, INC.	Aerospace & Defence
976	ADEKA CORP.	Chemicals
977	STADA ARZNEIMITTEL AG	Pharmaceuticals & Biotechnology
978	CITIZEN HOLDINGS CO., LTD.	Electronic & Electrical Equipment
979	THORATEC CORP	Health Care Equipment & Services
980	MANITOWOC CO INC	Industrial Engineering
981	ZEBRA TECHNOLOGIES CORP	Electronic & Electrical Equipment
982	IMMUNOGEN INC	Pharmaceuticals & Biotechnology
983	SINOPEC ENGINEERING (GROUP) CO., LTD.	Oil Equipment, Services & Distribution
984	AMADA CO LTD	Industrial Engineering
985	ADVA AG OPTICAL NETWORKING	Technology Hardware & Equipment
986	KASPERSKY LABS LIMITED	Software & Computer Services
987	SPIRENT COMMUNICATIONS PLC	Technology Hardware & Equipment
988	KONTRON AG	Technology Hardware & Equipment
989	DEUTSCHE POST AG	Industrial Transportation
990	LUPIN LIMITED	Pharmaceuticals & Biotechnology
991	DENTSPLY INTERNATIONAL INC	Health Care Equipment & Services
992	TOTVS S.A.	Software & Computer Services
993	GENTEX CORP	Automobiles & Parts
994	KCC CORPORATION	Construction & Materials
995	AMETEK INC	Electronic & Electrical Equipment
996	ARIAD PHARMACEUTICALS INC	Pharmaceuticals & Biotechnology
997	BANG & OLUFSEN A/S	Leisure Goods
998	DIEBOLD INC	Technology Hardware & Equipment
999	NIPPON SHEET GLASS CO LTD	Construction & Materials
1000	LINTEC CORPORATION	Forestry & Paper
1001	RECORDATI SPA	Pharmaceuticals & Biotechnology
1002	POSTNORD AB	Industrial Transportation
1003	CHRISTIAN DIOR SA	Personal Goods
1004	TOYO INK SC HOLDINGS CO., LTD.	Industrial Engineering
1005	TENARIS S.A.	Oil Equipment, Services & Distribution
1006	NYSE EURONEXT	Financial Services
1007	PALL CORP	Industrial Engineering
1008	ADVANTECH CO., LTD.	Technology Hardware & Equipment
1009	CADILA HEALTHCARE LIMITED	Pharmaceuticals & Biotechnology
1010	ZIOPHARM ONCOLOGY, INC.	Pharmaceuticals & Biotechnology
1011	FUJISHOJI CO.,LTD.	Household Goods & Home Construction
1012	DEUTZ AG	Industrial Engineering
1013	COFIDE - GRUPPO DE BENEDETTI S.P.A.	General Industrials

1014	SOGEFI S.P.A.	Automobiles & Parts
1015	ASIAINFO-LINKAGE, INC.	Software & Computer Services
1016	ALLIED IRISH BANKS PLC	Banks
1017	FINCANTIERI - CANTIERI NAVALI ITALIANI S.P.A.	Industrial Engineering
1018	PINAFORE COOPERATIEF U.A.	Support Services
1019	MICRO-STAR INTERNATIONAL CO., LTD.	Technology Hardware & Equipment
1020	LEXICON PHARMACEUTICALS, INC.	Pharmaceuticals & Biotechnology
1021	HUGO BOSS AG	Personal Goods
1022	KEYENCE CORPORATION	Electronic & Electrical Equipment
1023	UNISYS CORP	Software & Computer Services
1024	WILLIAMS GRAND PRIX HOLDINGS PLC	Travel & Leisure
1025	HITACHI ZOSEN CORPORATION	Industrial Engineering
1026	FORTINET INC	Software & Computer Services
1027	SMITHFIELD FOODS INC	Food Producers
1028	VISMA AS	Software & Computer Services
1029	NEUROSEARCH A/S	Pharmaceuticals & Biotechnology
1030	CPFL ENERGIA S.A.	Gas, Water & Multi-utilities
1031	DEUTSCHE BAHN AKTIENGESELLSCHAFT	Travel & Leisure
1032	PLANTRONICS INC	Technology Hardware & Equipment
1033	ANGLO AMERICAN PLC	Mining
1034	SANDEN CORPORATION	Automobiles & Parts
1035	SEI INVESTMENTS COMPANY	Financial Services
1036	RENREN INC.	Software & Computer Services
1037	OAO SCIENTIFIC PRODUCTION CORPORATION IRKUT	Aerospace & Defence
1038	DAIFUKU CO. LTD.	Industrial Engineering
1039	KINGFA SCIENCE & TECHNOLOGY CO., LTD.	General Industrials
1040	METALL ZUG AG	Household Goods & Home Construction
1041	NISSIN KOGYO CO LTD	Automobiles & Parts
1042	KBC GROEP NV/ KBC GROUPE SA	Banks
1043	VALEANT PHARMACEUTICALS INTERNATIONAL, INC.	Pharmaceuticals & Biotechnology
1044	TAIYO YUDEN COMPANY LIMITED	Electronic & Electrical Equipment
1045	SEIKAGAKU CORPORATION	Pharmaceuticals & Biotechnology
1046	OWENS CORNING	Construction & Materials
1047	CHENG SHIN RUBBER INDUSTRY CO., LTD	Automobiles & Parts
1048	NOK CORPORATION	Automobiles & Parts
1049	NIPPON ELECTRIC GLASS CO., LTD.	Electronic & Electrical Equipment
1050	ALBEMARLE CORP	Chemicals
1051	HANKOOK TIRE WORLD WIDE CO., LTD	Automobiles & Parts
1052	MAGNACHIP SEMICONDUCTOR CORPORATION	Technology Hardware & Equipment
1053	IMMSI SPA	Automobiles & Parts
1054	COHERENT INC	Electronic & Electrical Equipment
1055	SINGAPORE TECHNOLOGIES ENGINEERING LTD	Construction & Materials

1056	TAKE TWO INTERACTIVE SOFTWARE INC	Software & Computer Services
1057	HEARTWARE INTERNATIONAL, INC	Health Care Equipment & Services
1058	BIAL - SGPS, S.A	Pharmaceuticals & Biotechnology
1059	MCCORMICK & CO INC	Food Producers
1060	NOF CORPORATION	Chemicals
1061	LATTICE SEMICONDUCTOR CORP	Technology Hardware & Equipment
1062	SILICON IMAGE INC	Technology Hardware & Equipment
1063	YAMAZAKI BAKING CO LTD	Food Producers
1064	CHINA YUCHAI INTERNATIONAL LIMITED	Industrial Engineering
1065	EXPERIAN PLC	Support Services
1066	MERRIMACK PHARMACEUTICALS, INC.	Pharmaceuticals & Biotechnology
1067	B456 SYSTEMS, INC.	Electronic & Electrical Equipment
1068	JDA SOFTWARE GROUP INC	Software & Computer Services
1069	MICROS SYSTEMS INC	Technology Hardware & Equipment
1070	PEGASYSTEMS INC	Software & Computer Services
1071	RIGEL PHARMACEUTICALS INC	Pharmaceuticals & Biotechnology
1072	BOBST GROUP SA	Industrial Engineering
1073	COMVERSE, INC.	Software & Computer Services
1074	MANDO CORPORATION	Automobiles & Parts
1075	HONG LEONG ASIA LIMITED	Construction & Materials
1076	ASTON MARTIN HOLDINGS (UK) LIMITED	Automobiles & Parts
1077	NEXTER SYSTEMS	Aerospace & Defence
1078	AOL, INC.	Software & Computer Services
1079	TEREX CORP	Industrial Engineering
1080	NEOPOST SA	Technology Hardware & Equipment
1081	AAC TECHNOLOGIES HOLDINGS INC.	Electronic & Electrical Equipment
1082	SUPER MICRO COMPUTER, INC.	Technology Hardware & Equipment
1083	AVON PRODUCTS INC	Personal Goods
1084	GLENMARK PHARMACEUTICALS LIMITED	Pharmaceuticals & Biotechnology
1085	SHOWA CORPORATION	Automobiles & Parts
1086	BHP BILLITON PLC	Mining
1087	HANMI PHARM. CO.,LTD.	Pharmaceuticals & Biotechnology
1088	NIPRO CORPORATION	Health Care Equipment & Services
1089	DENDREON CORP	Pharmaceuticals & Biotechnology
1090	NIHON KOHDEN CORPORATION	Health Care Equipment & Services
1091	PILATUS FLUGZEUGWERKE AG	Aerospace & Defence
1092	QUINTILES LIMITED	Pharmaceuticals & Biotechnology
1093	QUANTUM CORPORATION	Technology Hardware & Equipment
1094	TOHOKU ELECTRIC POWER COMPANY INCORPORATED	Electricity
1095	GT ADVANCED TECHNOLOGIES, INC.	Electronic & Electrical Equipment
1096	GILDEMEISTER AG	Industrial Engineering
1097	ROLAND CORPORATION	Leisure Goods

1098	ULTRA ELECTRONICS HOLDINGS PLC	Aerospace & Defence
1099	DANIELI & C. OFFICINE MECCANICHE SPA	Industrial Engineering
1100	AVG TECHNOLOGIES NV	Software & Computer Services
1101	WESTPORT INNOVATIONS INC	Industrial Engineering
1102	CABOT CORP	Chemicals
1103	MERITOR, INC.	Automobiles & Parts
1104	AKKA TECHNOLOGIES SA	Support Services
1105	KAKEN PHARMACEUTICAL CO LTD	Pharmaceuticals & Biotechnology
1106	DAIWA HOUSE INDUSTRY COMPANY LIMITED	Household Goods & Home Construction
1107	COMPAGNIE FINANCIERE RICHEMONT SA	General Retailers
1108	AUTONEUM HOLDING AG	Automobiles & Parts
1109	KOENIG UND BAUER AG	Industrial Engineering
1110	AVEO PHARMACEUTICALS, INC.	Pharmaceuticals & Biotechnology
1111	GS YUASA CORPORATION	Electronic & Electrical Equipment
1112	ORBOTECH LTD.	Electronic & Electrical Equipment
1113	SUNEDISON INC	Technology Hardware & Equipment
1114	TOKYO OHKA KOGYO CO LTD	Chemicals
1115	TOYO TIRE & RUBBER CO LTD	Automobiles & Parts
1116	INFINITY PHARMACEUTICALS INC.	Pharmaceuticals & Biotechnology
1117	IMPAX LABORATORIES INC	Pharmaceuticals & Biotechnology
1118	WEG S.A.	Industrial Engineering
1119	CHINA MOTOR CORPORATION	Automobiles & Parts
1120	POSTE ITALIANE SPA	Industrial Transportation
1121	HIMAX TECHNOLOGIES, INC.	Technology Hardware & Equipment
1122	CHINA RONGSHENG HEAVY INDUSTRIES GROUP HOLDINGS LIMITED	Industrial Engineering
1123	SINO BIOPHARMACEUTICAL LIMITED	Pharmaceuticals & Biotechnology
1124	MAREL HF.	Industrial Engineering
1125	HANWHA CHEMICAL CORPORATION	Chemicals
1126	SECOM CO LTD	Support Services
1127	OREXIGEN THERAPEUTICS, INC.	Pharmaceuticals & Biotechnology
1128	RENISHAW P L C	Electronic & Electrical Equipment
1129	CENTROTHERM PHOTOVOLTAICS AG	Alternative Energy
1130	IMI PLC	Industrial Engineering
1131	EHOSTAR CORPORATION	Technology Hardware & Equipment
1132	NUFARM LTD	Chemicals
1133	NIPPON PAINT CO LTD	Industrial Engineering
1134	NISSHIN SEIFUN GROUP INC	Food Producers
1135	MOMENTA PHARMACEUTICALS, INC.	Pharmaceuticals & Biotechnology
1136	HILL-ROM HOLDINGS, INC.	Equity Investment Instruments
1137	INVESTMENT TECHNOLOGY GROUP	Financial Services
1138	HYUNDAI ENGINEERING & CONSTRUCTION CO.,LTD.	Construction & Materials
1139	SIGMA ALDRICH CORP	Chemicals

1140	LEGO A/S	Leisure Goods
1141	MEDASSETS, INC.	Software & Computer Services
1142	NIPPON SODA COMPANY LIMITED	Chemicals
1143	DIGITAL RIVER INC	Software & Computer Services
1144	GFK SE	Support Services
1145	MODINE MANUFACTURING CO	Automobiles & Parts
1146	NOVOMATIC AG	Travel & Leisure
1147	NIPPON PAPER INDUSTRIES CO., LTD.	Forestry & Paper
1148	MINDSPEED TECHNOLOGIES, INC.	Technology Hardware & Equipment
1149	INTERDIGITAL, INC.	Technology Hardware & Equipment
1150	SNAP ON INC	Household Goods & Home Construction
1151	SARTORIUS AG	Electronic & Electrical Equipment
1152	VIROPHARMA INC	Pharmaceuticals & Biotechnology
1153	ASHOK LEYLAND LIMITED	Automobiles & Parts
1154	HYSTER-YALE MATERIALS HANDLING, INC.	Automobiles & Parts
1155	SHOWA SHELL SEKIYU K K	Oil & Gas Producers
1156	SONUS NETWORKS INC	Technology Hardware & Equipment
1157	GROUPE ERAMET SA	Industrial Metals & Mining
1158	SOMFY SA	Electronic & Electrical Equipment
1159	ADVENT SOFTWARE INC	Software & Computer Services
1160	OCLARO, INC.	Technology Hardware & Equipment
1161	EXELIS INC.	Electronic & Electrical Equipment
1162	CRANE CO.	Industrial Engineering
1163	AMORE PACIFIC GROUP	Personal Goods
1164	CALIX, INC.	Technology Hardware & Equipment
1165	STEC, INC.	Technology Hardware & Equipment
1166	CEMEX, S.A.B. DE C.V.	Construction & Materials
1167	GANSU JIU STEEL GROUP HONG XING IRON & STEEL CO., LTD.	Industrial Metals & Mining
1168	DONGFENG AUTOMOBILE CO., LTD.	Automobiles & Parts
1169	LG UPLUS CORP.	Mobile Telecommunications
1170	CIPLA LIMITED	Pharmaceuticals & Biotechnology
1171	VALUECLICK INC	Media
1172	KARL STORZ GMBH & CO. KG	Health Care Equipment & Services
1173	ACCURAY INCORPORATED	Health Care Equipment & Services
1174	GREEN CROSS HOLDINGS CORPORATION	Pharmaceuticals & Biotechnology
1175	BLACKBAUD, INC.	Software & Computer Services
1176	ULTIMATE SOFTWARE GROUP INC	Software & Computer Services
1177	JUNGHEINRICH AG	Industrial Engineering
1178	BOLIDEN AB	Mining
1179	ITALCEMENTI S.P.A.	Construction & Materials
1180	BELDEN INC.	Electronic & Electrical Equipment
1181	APTARGROUP INC	General Industrials

1182	ZERIA PHARMACEUTICAL CO LTD	Pharmaceuticals & Biotechnology
1183	BTG PLC	Pharmaceuticals & Biotechnology
1184	XIAMEN JINGLONG MOTOR CO., LTD.	Automobiles & Parts
1185	CHUGOKU ELECTRIC POWER CO INC	Electricity
1186	SUZUKEN CO LTD	Pharmaceuticals & Biotechnology
1187	ALLIANT TECHSYSTEMS INC	Aerospace & Defence
1188	ELRINGKLINGER AG	Automobiles & Parts
1189	W. R. GRACE & CO.	Chemicals
1190	W♦STENROT & W♦RTTEMBERGISCHE	Banks
1191	HIROSE ELECTRIC COMPANY LIMITED	Technology Hardware & Equipment
1192	CRAY INC.	Technology Hardware & Equipment
1193	BASILEA PHARMACEUTICA AG	Pharmaceuticals & Biotechnology
1194	NVC LIGHTING HOLDING LIMITED	Household Goods & Home Construction
1195	FIRST TRACTOR COMPANY LIMITED	Industrial Engineering
1196	DELTA ELECTRONICS (THAILAND) PCL	Electronic & Electrical Equipment
1197	SAIC, INC.	Software & Computer Services
1198	NABTESCO CORPORATION	Industrial Engineering
1199	CEGEDIM SA	Software & Computer Services
1200	SGL CARBON SE	Chemicals
1201	SOPHOS LIMITED	Software & Computer Services
1202	ASPEN TECHNOLOGY INC	Software & Computer Services
1203	DALIAN HUARUI HEAVY INDUSTRY GROUP CO., LTD.	Industrial Engineering
1204	S.O.I.TEC SILICON ON INSULATOR TECHNOLOGIES	Technology Hardware & Equipment
1205	KULICKE & SOFFA INDUSTRIES INC	Technology Hardware & Equipment
1206	CHINA ZHONGWANG HOLDINGS LIMITED	Industrial Metals & Mining
1207	ELECTRIC POWER DEVELOPMENT COMPANY LIMITED	Electricity
1208	LANTIQ DEUTSCHLAND GMBH	Technology Hardware & Equipment
1209	WEBSense INC	Software & Computer Services
1210	STANLEY ELECTRIC CO LTD	Automobiles & Parts
1211	DELTEK INC.	Software & Computer Services
1212	REALNETWORKS INC	Software & Computer Services
1213	BAVARIAN NORDIC A/S	Pharmaceuticals & Biotechnology
1214	KAYABA INDUSTRY CO LTD	Industrial Engineering
1215	CAMERON INTERNATIONAL CORPORATION	Oil Equipment, Services & Distribution
1216	ITT CORPORATION	General Industrials
1217	ZHEJIANG CHINT ELECTRICS COMPANY LIMITED	Electronic & Electrical Equipment
1218	F-SECURE OYJ	Software & Computer Services
1219	POWERWAVE TECHNOLOGIES INCORPORATED	Technology Hardware & Equipment
1220	TRULY INTERNATIONAL HOLDINGS LIMITED	Electronic & Electrical Equipment
1221	VINCI	Construction & Materials
1222	MITSUBISHI CORPORATION	General Industrials
1223	CEPHEID	Pharmaceuticals & Biotechnology

1224	OWENS ILLINOIS INC	General Industrials
1225	REYNOLDS AMERICAN INC.	Tobacco
1226	NORITZ CORPORATION	General Industrials
1227	SILVER SPRING NETWORKS, INC.	Software & Computer Services
1228	ROCKWOOD HOLDINGS, INC.	Chemicals
1229	SIERRA WIRELESS INCORPORATED	Technology Hardware & Equipment
1230	JUKI CORPORATION	Industrial Engineering
1231	SWEDISH ORPHAN BIOVITRUM AB	Pharmaceuticals & Biotechnology
1232	VERISIGN INC	Software & Computer Services
1233	TCL MULTIMEDIA TECHNOLOGY HOLDINGS LIMITED	Technology Hardware & Equipment
1234	PARROT	Technology Hardware & Equipment
1235	NETSCOUT SYSTEMS INC	Software & Computer Services
1236	EIZO CORPORATION	Technology Hardware & Equipment
1237	CHR. HANSEN HOLDING A/S	Pharmaceuticals & Biotechnology
1238	LG LIFE SCIENCES, LTD.	Pharmaceuticals & Biotechnology
1239	COMSTOCK RESOURCES INC	Oil & Gas Producers
1240	SK CHEMICALS CO.,LTD.	Chemicals
1241	FLSMIDTH & CO. A/S	Industrial Engineering
1242	KINGSOFT CORPORATION LIMITED	Software & Computer Services
1243	TRIUMPH GROUP INC	Aerospace & Defence
1244	TELENAV, INC.	Technology Hardware & Equipment
1245	NETGEAR, INC.	Fixed Line Telecommunications
1246	ZHEN DING TECHNOLOGY HOLDING LIMITED	Electronic & Electrical Equipment
1247	NUVOTON TECHNOLOGY CORPORATION	Electronic & Electrical Equipment
1248	FORD OTOMOTIV SANAYI A.S.	Automobiles & Parts
1249	CHINA SINOMA INTERNATIONAL ENGINEERING CO., LTD.	Construction & Materials
1250	QUALITY SYSTEMS INC	Health Care Equipment & Services
1251	MARUBENI CORPORATION	Industrial Engineering
1252	MKS INSTRUMENTS INC	Technology Hardware & Equipment
1253	TORO CO	Industrial Engineering
1254	PEARSON PLC	Media
1255	NICHIAS CORPORATION	General Industrials
1256	MORNINGSTAR, INC.	Financial Services
1257	E.G.O. BLANC UND FISCHER & CO. GMBH	Household Goods & Home Construction
1258	FAW CAR CO., LTD.	Automobiles & Parts
1259	CURTISS WRIGHT CORP	Aerospace & Defence
1260	FAGOR ELECTRODOMESTICOS SCL	Household Goods & Home Construction
1261	DONALDSON CO INC	Industrial Engineering
1262	NOVATEL WIRELESS INC	Technology Hardware & Equipment
1263	FAIR ISAAC CORPORATION	Software & Computer Services
1264	NEMETSCHEK AG	Software & Computer Services
1265	KSB AG	Industrial Engineering

1266	ARRAY BIOPHARMA INC	Pharmaceuticals & Biotechnology
1267	KANSAI PAINT CO LTD	Construction & Materials
1268	UPM-KYMMENE OYJ	Forestry & Paper
1269	SILICON GRAPHICS INTERNATIONAL CORP	Technology Hardware & Equipment
1270	YUANDA CHINA HOLDINGS LIMITED	Construction & Materials
1271	EFFEM HOLDINGS LIMITED	Food Producers
1272	OIL & NATURAL GAS CORPORATION LIMITED	Oil Equipment, Services & Distribution
1273	CENTRAL GLASS CO LTD	Construction & Materials
1274	AURIGA INDUSTRIES A/S	Chemicals
1275	AMARIN CORPORATION PLC	Pharmaceuticals & Biotechnology
1276	RISO KAGAKU CORPORATION	Technology Hardware & Equipment
1277	LUBRIZOL LIMITED	Chemicals
1278	UNICHARM CORPORATION	Personal Goods
1279	CLOVIS ONCOLOGY, INC.	Pharmaceuticals & Biotechnology
1280	MIRACA HOLDINGS INC.	Pharmaceuticals & Biotechnology
1281	CABOT MICROELECTRONICS CORP	Technology Hardware & Equipment
1282	KUKA AG	Industrial Engineering
1283	SHIKOKU ELECTRIC POWER CO INC	Electricity
1284	E INK HOLDINGS INC.	Electronic & Electrical Equipment
1285	TELENOR ASA	Mobile Telecommunications
1286	SEIKO HOLDINGS CORPORATION	Personal Goods
1287	mitsui engineering & shipbuilding co ltd	Industrial Engineering
1288	ANCESTRY.COM INC.	Software & Computer Services
1289	HERSHEY COMPANY (THE)	Food Producers
1290	TOFAS TORK OTOMOBIL FABRIKASI A.S.	Automobiles & Parts
1291	ADVANCED ENERGY INDUSTRIES INC	Electronic & Electrical Equipment
1292	EBARA CORPORATION	Industrial Engineering
1293	CHINA STEEL CORPORATION	Industrial Metals & Mining
1294	ZELTIA S.A.	Pharmaceuticals & Biotechnology
1295	SOLARWORLD AG	Alternative Energy
1296	ULVAC INC	Industrial Engineering
1297	SIMCORP A/S	Software & Computer Services
1298	NORSK HYDRO ASA	Industrial Metals & Mining
1299	JOHN WOOD GROUP P.L.C.	Industrial Engineering
1300	FOSUN INTERNATIONAL LIMITED	Pharmaceuticals & Biotechnology
1301	AFFYMETRIX INC	Pharmaceuticals & Biotechnology
1302	LAIRD PLC	Electronic & Electrical Equipment
1303	COMPUTERSHARE LIMITED	Software & Computer Services
1304	IKANOS COMMUNICATIONS	Technology Hardware & Equipment
1305	TECAN GROUP AG	Pharmaceuticals & Biotechnology
1306	mitsui & co ltd	General Industrials
1307	PETROLEUM GEO-SERVICES ASA	Oil Equipment, Services & Distribution

1308	ANALOGIC CORP	Electronic & Electrical Equipment
1309	MICREL INC	Technology Hardware & Equipment
1310	VISHAY INTERTECHNOLOGY INC	Electronic & Electrical Equipment
1311	VTECH HOLDINGS LIMITED	Technology Hardware & Equipment
1312	CHINA INTERNATIONAL MARINE CONTAINERS (GROUP) CO., LTD.	General Industrials
1313	NETSUTTE INC.	Software & Computer Services
1314	MORINAGA MILK INDUSTRY CO LTD	Food Producers
1315	FINATIS SA	Real Estate Investment & Services
1316	TSUMURA & CO	Pharmaceuticals & Biotechnology
1317	ASCOM HOLDING AG	Technology Hardware & Equipment
1318	GIGABYTE TECHNOLOGY COMPANY LIMITED	Technology Hardware & Equipment
1319	TELEFLEX INC	Health Care Equipment & Services
1320	NIHON UNISYS LTD	Software & Computer Services
1321	MAKINO MILLING MACHINE COMPANY LIMITED	Industrial Engineering
1322	TI FLUID SYSTEMS LIMITED	Automobiles & Parts
1323	HUMAX CO.,LTD.	Technology Hardware & Equipment
1324	CHICONY ELECTRONICS CO., LTD.	Technology Hardware & Equipment
1325	CHENG UEI PRECISION INDUSTRY CO., LTD.	Electronic & Electrical Equipment
1326	CAIXA GERAL DE DEPOSITOS	Banks
1327	AZ ELECTRONIC MATERIALS S.A	Chemicals
1328	MITEL NETWORKS CORPORATION	Technology Hardware & Equipment
1329	SOPRA GROUP	Software & Computer Services
1330	TELIASONERA AB	Fixed Line Telecommunications
1331	IPSOS SA	Media
1332	VOLCANO CORPORATION	Health Care Equipment & Services
1333	ACS, ACTIVIDADES DE CONSTRUCCION Y SERVICIOS, S.A.	Construction & Materials
1334	NESTE OIL OYJ	Oil & Gas Producers
1335	COLOPLAST A/S	Health Care Equipment & Services
1336	ATMI INC	Technology Hardware & Equipment
1337	GROHE HOLDING GMBH	Industrial Engineering
1338	ARLA FOODS AMBA	Food Producers
1339	SHORETEL, INC.	Technology Hardware & Equipment
1340	SUDZUCKER AG	Food Producers
1341	CHURCH & DWIGHT CO INC	Chemicals
1342	RDA MICROELECTRONICS, INC.	Technology Hardware & Equipment
1343	SAXA HOLDINGS, INC.	Technology Hardware & Equipment
1344	AASTRA TECHNOLOGIES LIMITED	Technology Hardware & Equipment
1345	AVIO SPA	Aerospace & Defence
1346	GEBERIT AG	General Industrials
1347	MICRO FOCUS INTERNATIONAL PLC	Software & Computer Services
1348	GLU MOBILE INC.	Software & Computer Services
1349	ISIS PHARMACEUTICALS INC	Pharmaceuticals & Biotechnology

1350	AMKOR TECHNOLOGY INC	Technology Hardware & Equipment
1351	SUMCO CORPORATION	Technology Hardware & Equipment
1352	CSM NV	Food Producers
1353	FORTUM OYJ	Electricity
1354	KONINKLIJKE KPN NV	Fixed Line Telecommunications
1355	VIASAT INC	Technology Hardware & Equipment
1356	LITE-ON IT CORP.	Technology Hardware & Equipment
1357	UNIMICRON TECHNOLOGY CORPORATION	Electronic & Electrical Equipment
1358	ACORDA THERAPEUTICS, INC.	Pharmaceuticals & Biotechnology
1359	MYRIAD GENETICS INC	Pharmaceuticals & Biotechnology
1360	VESTEL ELEKTRONIK SANAYI VE TICARET A.S.	Electronic & Electrical Equipment
1361	NKT HOLDING A/S	Electronic & Electrical Equipment
1362	INCYTE CORPORATION	Pharmaceuticals & Biotechnology
1363	SPX CORP	Industrial Engineering
1364	NAGASE & CO LTD	Chemicals
1365	DOWA HOLDINGS CO., LTD.	Mining
1366	STRAUMANN HOLDING AG	Health Care Equipment & Services
1367	PROGRESS SOFTWARE CORP	Software & Computer Services
1368	FARADAY TECHNOLOGY CORPORATION	Technology Hardware & Equipment
1369	CYTEC INDUSTRIES INC	Chemicals
1370	SEIREN CO LTD	Personal Goods
1371	JUSUNG ENGINEERING CO., LTD.	Technology Hardware & Equipment
1372	SAMSUNG SDI CO.,LTD.	Electronic & Electrical Equipment
1373	AVEVA GROUP PLC	Software & Computer Services
1374	NEWPORT CORP	General Industrials
1375	AEOLUS TYRE CO., LTD.	Automobiles & Parts
1376	DAIDO STEEL CO LTD	Industrial Metals & Mining
1377	SIRONA DENTAL SYSTEMS, INC.	Health Care Equipment & Services
1378	SAWAI PHARMACEUTICAL CO LTD	Pharmaceuticals & Biotechnology
1379	KOBAYASHI PHARMACEUTICAL CO LTD	Pharmaceuticals & Biotechnology
1380	PIRAMAL ENTERPRISES LIMITED	Pharmaceuticals & Biotechnology
1381	SYNCHRONOSS TECHNOLOGIES, INC.	Software & Computer Services
1382	JGC CORPORATION	Industrial Engineering
1383	GIGASET AG	Financial Services
1384	HANNSTAR DISPLAY CORPORATION	Technology Hardware & Equipment
1385	MORPHOSYS AG	Pharmaceuticals & Biotechnology
1386	SANYO CHEMICAL INDUSTRIES LTD	Chemicals
1387	SENSATA TECHNOLOGIES HOLDING N.V.	Electronic & Electrical Equipment
1388	GS ENGINEERING & CONSTRUCTION CORP.	Construction & Materials
1389	BG GROUP PLC	Oil & Gas Producers
1390	DANA HOLDING CORPORATION	Automobiles & Parts
1391	BRASKEM S.A.	Chemicals

1392	ZHEJIANG HISUN PHARMACEUTICAL CO., LTD.	Pharmaceuticals & Biotechnology
1393	WINTEK CORPORATION	Technology Hardware & Equipment
1394	ENIRO AB	Media
1395	THE TIMKEN COMPANY	Industrial Engineering
1396	COOPER COMPANIES INC	Health Care Equipment & Services
1397	STATS CHIPPAC LTD.	Technology Hardware & Equipment
1398	A.O. SMITH CORPORATION	Electronic & Electrical Equipment
1399	DURATA THERAPEUTICS, INC.	Pharmaceuticals & Biotechnology
1400	REALPAGE INC	Software & Computer Services
1401	TOWA PHARMACEUTICAL CO LTD	Pharmaceuticals & Biotechnology
1402	GERON CORPORATION	Pharmaceuticals & Biotechnology
1403	SVENSKA HANDELSBANKEN	Banks
1404	CHINA WIRELESS TECHNOLOGIES LIMITED	Technology Hardware & Equipment
1405	INTEGRA LIFESCIENCES HOLDINGS CORP	Health Care Equipment & Services
1406	EZAKI GLICO CO LTD	Food Producers
1407	SILICON MOTION TECHNOLOGY CORPORATION	Technology Hardware & Equipment
1408	ENTEGRIS INC	Technology Hardware & Equipment
1409	COOPER TIRE & RUBBER CO	Automobiles & Parts
1410	SCOTT'S MIRACLE-GRO COMPANY (THE)	Chemicals
1411	WANXIANG QIANCHAO CO., LTD.	Automobiles & Parts
1412	THK CO LTD	Industrial Engineering
1413	KUREHA CORP.	Chemicals
1414	LENNOX INTERNATIONAL INC	Construction & Materials
1415	GRAMMER AG	Automobiles & Parts
1416	OSI SYSTEMS INC	Electronic & Electrical Equipment
1417	HAEMONETICS CORP	Health Care Equipment & Services
1418	FIDESSA GROUP PLC	Software & Computer Services
1419	DANSKE BANK A/S	Banks
1420	SEQUENOM INC	Health Care Equipment & Services
1421	ICAP PLC	Financial Services
1422	GUIDEWIRE SOFTWARE, INC.	Software & Computer Services
1423	KURITA WATER INDUSTRIES LTD	Gas, Water & Multi-utilities
1424	TOAGOSEI CO LTD	Chemicals
1425	PAUL HARTMANN AG	Health Care Equipment & Services
1426	HINDALCO INDUSTRIES LIMITED	Industrial Metals & Mining
1427	XINYU IRON & STEEL COMPANY LIMITED	Industrial Metals & Mining
1428	UNITIKA LTD	Personal Goods
1429	TIETO OYJ	Software & Computer Services
1430	FURUNO ELECTRIC CO LTD	Electronic & Electrical Equipment
1431	CHAOWEI POWER HOLDINGS LIMITED	Electronic & Electrical Equipment
1432	KOSE CORPORATION	Personal Goods
1433	NISSIN FOOD HOLDINGS CO., LTD.	Food Producers

1434	TSUBAKIMOTO CHAIN CO LTD	Industrial Engineering
1435	SEKISUI HOUSE LIMITED	Household Goods & Home Construction
1436	GIANT INTERACTIVE GROUP INC	Software & Computer Services
1437	LTX-CREDENCE CORP	Technology Hardware & Equipment
1438	EXFO INC.	Technology Hardware & Equipment
1439	GUERBET SA	Pharmaceuticals & Biotechnology
1440	PORTOLA PHARMACEUTICALS, INC.	Pharmaceuticals & Biotechnology
1441	WOLFSON MICROELECTRONICS PLC	Technology Hardware & Equipment
1442	AMYRIS INC	Chemicals
1443	JEOL LIMITED	Industrial Engineering
1444	ALPHA NETWORKS INCORPORATION	Technology Hardware & Equipment
1445	FURIEX PHARMACEUTICALS, INC.	Pharmaceuticals & Biotechnology
1446	STELLA INTERNATIONAL HOLDINGS LIMITED	Personal Goods
1447	ISEKI & CO LTD	Industrial Engineering
1448	ATHENAHEALTH, INC	Software & Computer Services
1449	SYNTA PHARMACEUTICALS CORP.	Pharmaceuticals & Biotechnology
1450	COMPUGROUP MEDICAL AG	Software & Computer Services
1451	RPM INTERNATIONAL INC.	Chemicals
1452	RICHTEK TECHNOLOGY CORPORATION	Electronic & Electrical Equipment
1453	HENGTONG OPTIC-ELECTRIC CO., LTD.	Technology Hardware & Equipment
1454	ONCONOVA THERAPEUTICS, INC.	Pharmaceuticals & Biotechnology
1455	ANTHERA PHARMACEUTICALS, INC.	Pharmaceuticals & Biotechnology
1456	HALMA PUBLIC LIMITED COMPANY	Electronic & Electrical Equipment
1457	HOMEAWAY, INC.	Software & Computer Services
1458	GRACO INC	Industrial Engineering
1459	SHINKO ELECTRIC INDUSTRIES CO., LTD.	Technology Hardware & Equipment
1460	DEXIA	Banks
1461	SMART TECHNOLOGIES INC.	Technology Hardware & Equipment
1462	MONOLITHIC POWER SYSTEMS, INC.	Technology Hardware & Equipment
1463	VECTURA GROUP PLC	Pharmaceuticals & Biotechnology
1464	ORICA LIMITED	Chemicals
1465	SHANGHAI FOSUN PHARMACEUTICAL (GROUP) CO., LTD.	Pharmaceuticals & Biotechnology
1466	COMBA TELECOM SYSTEMS HOLDINGS LIMITED	Technology Hardware & Equipment
1467	HITTITE MICROWAVE CORPORATION	Technology Hardware & Equipment
1468	BARRY CALLEBAUT AG	Food Producers
1469	SAKATA SEED CORPORATION	Food Producers
1470	OCTAPHARMA AG	Pharmaceuticals & Biotechnology
1471	WILO SE	Industrial Engineering
1472	ASKA PHARMACEUTICAL CO., LTD.	Pharmaceuticals & Biotechnology
1473	JENOPTIK AG	Industrial Engineering
1474	POWERTECH TECHNOLOGY INC.	Technology Hardware & Equipment
1475	ASTEX PHARMACEUTICALS, INC.	Pharmaceuticals & Biotechnology

1476	HANESBRANDS INC.	Personal Goods
1477	MILLER HERMAN INC	Household Goods & Home Construction
1478	ROCKWELL MEDICAL, INC.	Health Care Equipment & Services
1479	EXEDY CORPORATION	Automobiles & Parts
1480	A&D COMPANY LIMITED	Health Care Equipment & Services
1481	ZHENGZHOU YUTONG BUS CO., LTD.	Automobiles & Parts
1482	GENUS PLC	Pharmaceuticals & Biotechnology
1483	XJ ELECTRIC CO., LTD.	Electronic & Electrical Equipment
1484	UNITED ONLINE INC	Software & Computer Services
1485	DONGBU HITEK CO.,LTD.	Chemicals
1486	WISTRON NEWEB CORPORATION	Technology Hardware & Equipment
1487	THE9 LIMITED	Travel & Leisure
1488	JOY GLOBAL INC	Mining
1489	RADISYS CORP	Technology Hardware & Equipment
1490	BHARAT HEAVY ELECTRICALS LIMITED	Industrial Engineering
1491	I.M.A. INDUSTRIA MACCHINE AUTOMATICHE S.P.A.	Industrial Engineering
1492	YAMABIKO CORPORATION	Industrial Engineering
1493	ONCOTHERAPY SCIENCE INC	Pharmaceuticals & Biotechnology
1494	CONSTELLIUM N.V.	Industrial Metals & Mining
1495	CERAGON NETWORKS LTD.	Technology Hardware & Equipment
1496	BROOKS AUTOMATION, INC.	Industrial Engineering
1497	GENOMIC HEALTH, INC.	Pharmaceuticals & Biotechnology
1498	DE LONGHI SPA	Household Goods & Home Construction
1499	COMMVault SYSTEMS, INC	Software & Computer Services
1500	ENBW ENERGIE BADEN-Württemberg AG	Electricity
1501	TESARO, INC.	Pharmaceuticals & Biotechnology
1502	UNIZYX HOLDING CORPORATION	Technology Hardware & Equipment
1503	FORTUNE BRANDS HOME & SECURITY, INC.	Household Goods & Home Construction
1504	CELLEX THERAPEUTICS, INC.	Pharmaceuticals & Biotechnology
1505	ROHTO PHARMACEUTICAL CO LTD	Pharmaceuticals & Biotechnology
1506	THE JAPAN STEEL WORKS LTD	Industrial Engineering
1507	SHANDONG CHENMING PAPER HOLDINGS LIMITED	Forestry & Paper
1508	PACIFIC BIOSCIENCES OF CALIFORNIA INC	Pharmaceuticals & Biotechnology
1509	TIANNENG POWER INTERNATIONAL LIMITED	Electronic & Electrical Equipment
1510	SHINDENGEN ELECTRIC MANUFACTURING CO LTD	Technology Hardware & Equipment
1511	RIETER HOLDING AG	Industrial Engineering
1512	PAR PHARMACEUTICAL COMPANIES, INC.	Pharmaceuticals & Biotechnology
1513	TACHI-S CO LTD	Automobiles & Parts
1514	NORDEX SE	Alternative Energy
1515	KTM AG	Automobiles & Parts
1516	MAXLINEAR, INC.	Technology Hardware & Equipment
1517	Mölnlycke HEALTH CARE AB	Health Care Equipment & Services

1518	ALK-ABELLO A/S	Pharmaceuticals & Biotechnology
1519	TADANO LTD	Industrial Engineering
1520	OUTOTEC OYJ	Industrial Engineering
1521	NIPPON CHEMI-CON CORPORATION	Electronic & Electrical Equipment
1522	AUXILIUM PHARMACEUTICALS, INC.	Pharmaceuticals & Biotechnology
1523	SS&C TECHNOLOGIES HOLDINGS, INC.	Software & Computer Services
1524	PLAYTECH PLC	Software & Computer Services
1525	POWER INTEGRATIONS INC	Electronic & Electrical Equipment
1526	INTERACTIVE INTELLIGENCE GROUP, INC.	Software & Computer Services
1527	TRELLEBORG AB	General Industrials
1528	PRIMAX ELECTRONICS LIMITED	Technology Hardware & Equipment
1529	WACKER NEUSON SE	Industrial Engineering
1530	CONSTANT CONTACT, INC.	Software & Computer Services
1531	MEGMILK SNOW BRAND CO LTD	Food Producers
1532	WOCKHARDT LIMITED	Pharmaceuticals & Biotechnology
1533	OPTIMER PHARMACEUTICALS, INC.	Pharmaceuticals & Biotechnology
1534	BIOTEST AG	Pharmaceuticals & Biotechnology
1535	ELMOS SEMICONDUCTOR AG	Technology Hardware & Equipment
1536	AMS AG	Technology Hardware & Equipment
1537	NOVA CHEMICALS CORPORATION	Chemicals
1538	MEADWESTVACO CORPORATION	General Industrials
1539	KOREA GAS CORP.	Gas, Water & Multi-utilities
1540	TECO ELECTRIC & MACHINERY CO., LTD.	Electronic & Electrical Equipment
1541	ASTRONICS CORPORATION	General Industrials
1542	STONERIDGE INC	Automobiles & Parts
1543	RUAG HOLDING AG	Aerospace & Defence
1544	MANHATTAN ASSOCIATES INC	Software & Computer Services
1545	UNIBET GROUP PLC	Travel & Leisure
1546	NIHON NOHYAKU CO LTD	Chemicals
1547	SPLUNK INC.	Software & Computer Services
1548	SHERWIN WILLIAMS COMPANY (THE)	General Industrials
1549	KEMIRA OYJ	Chemicals
1550	INDUSTRIAL & FINANCIAL SYSTEMS AB	Software & Computer Services
1551	BE SEMICONDUCTOR INDUSTRIES NV	Technology Hardware & Equipment
1552	MANZ AG	Industrial Engineering
1553	TAIHEIYO CEMENT CORPORATION	Construction & Materials
1554	CJ CORP.	Food Producers
1555	SAFT GROUPE SA	Electronic & Electrical Equipment
1556	SKYWORTH DIGITAL HOLDINGS LIMITED	Electronic & Electrical Equipment
1557	RENESOLA LTD	Electronic & Electrical Equipment
1558	HOUSE FOODS CORPORATION	Food Producers
1559	CHEMTURA CORPORATION	Chemicals

1560	KOMORI CORPORATION	Industrial Engineering
1561	ADVANCED DIGITAL BROADCAST HOLDINGS SA	Technology Hardware & Equipment
1562	ANADIGICS INC	Technology Hardware & Equipment
1563	MABUCHI MOTOR CO LTD	Electronic & Electrical Equipment
1564	SERVICENOW, INC.	Software & Computer Services
1565	RUCKUS WIRELESS, INC.	Mobile Telecommunications
1566	CONCUR TECHNOLOGIES INC	Software & Computer Services
1567	YURA COPORATION	Electronic & Electrical Equipment
1568	BENETTON GROUP SPA	Personal Goods
1569	COSMO OIL CO LTD	Oil & Gas Producers
1570	SUMITOMO OSAKA CEMENT CO LTD	Construction & Materials
1571	HYBRID AIR VEHICLES LIMITED	Automobiles & Parts
1572	POLA ORBIS HOLDINGS INC	Personal Goods
1573	KOLON INDUSTRIES INC.	General Industrials
1574	VOLTERRA SEMICONDUCTOR CORP.	Technology Hardware & Equipment
1575	CEGID GROUP	Software & Computer Services
1576	YOUVIEW TV LTD	Media
1577	T HASEGAWA CO LTD	Personal Goods
1578	DORR AG	Industrial Engineering
1579	MASIMO CORPORATION	Health Care Equipment & Services
1580	NGK SPARK PLUG CO LTD	Automobiles & Parts
1581	KIKKOMAN CORPORATION	Food Producers
1582	INFOBLOX INC.	Software & Computer Services
1583	SIME DARBY BERHAD	General Industrials
1584	LCH CLEARNET GROUP LIMITED	Financial Services
1585	CROWN HOLDINGS, INC.	General Industrials
1586	TYSON FOODS INC	Food Producers
1587	MELEXIS N.V.	Technology Hardware & Equipment
1588	PHARMATHEN S.A.	Pharmaceuticals & Biotechnology
1589	AXWAY SOFTWARE SA	Software & Computer Services
1590	ALIGN TECHNOLOGY INC	Health Care Equipment & Services
1591	DIALOGIC, INC.	Software & Computer Services
1592	VITESSE SEMICONDUCTOR CORP	Technology Hardware & Equipment
1593	HOMAG GROUP AG	Industrial Engineering
1594	LONKING HOLDINGS LIMITED	Industrial Engineering
1595	SIRIUS XM RADIO INC.	Media
1596	ROFIN SINAR TECHNOLOGIES INC	Industrial Engineering
1597	SPECTRUM PHARMACEUTICALS, INC.	Pharmaceuticals & Biotechnology
1598	ETERNAL CHEMICAL CO LTD	Chemicals
1599	FUJI OIL COMPANY LIMITED	Food Producers
1600	MEDIDATA SOLUTIONS, INC.	Software & Computer Services
1601	DATALOGIC SPA	Electronic & Electrical Equipment

1602	SIM TECHNOLOGY GROUP LIMITED	Technology Hardware & Equipment
1603	MAINOVA AG	Gas, Water & Multi-utilities
1604	ACCTON TECHNOLOGY CORPORATION	Technology Hardware & Equipment
1605	DSP GROUP INC	Technology Hardware & Equipment
1606	LUOSSAVAARA-KIIRUNAVAARA AKTIEBOLAG	Mining
1607	LG CORP.	Electronic & Electrical Equipment
1608	NOMURA RESEARCH INSTITUTE, LTD.	Software & Computer Services
1609	LEONHARD KURZ STIFTUNG & CO. KG	General Industrials
1610	HAREON SOLAR TECHNOLOGY CO., LTD.	General Industrials
1611	K+S AKTIENGESELLSCHAFT	Chemicals
1612	DAYIE SPECIAL STEEL CO., LTD.	Industrial Metals & Mining
1613	EUROPEAN SPALLATION SOURCE ESS AB	Pharmaceuticals & Biotechnology
1614	POLYONE CORPORATION	Chemicals
1615	KAPSCH TRAFFICOM AG	Electronic & Electrical Equipment
1616	EDP - ENERGIAS DE PORTUGAL, S.A.	Electricity
1617	TRIOUS THERAPEUTICS, INC.	Pharmaceuticals & Biotechnology
1618	PALO ALTO NETWORKS, INC.	Software & Computer Services
1619	NIPPON SUISAN KAISHA LTD	Food Producers
1620	GREEN MOUNTAIN COFFEE ROASTERS, INC.	Beverages
1621	MTR CORPORATION LIMITED	Travel & Leisure
1622	EICHER MOTORS LTD.	Automobiles & Parts
1623	PHISON ELECTRONICS CORP.	Electronic & Electrical Equipment
1624	BEMIS COMPANY, INC.	General Industrials
1625	ANACOR PHARMACEUTICALS INC	Pharmaceuticals & Biotechnology
1626	SOURCEFIRE, INC.	Software & Computer Services
1627	COGNEX CORP	Electronic & Electrical Equipment
1628	BLUESCOPE STEEL LIMITED	Industrial Metals & Mining
1629	MICRONIC MYDATA AB	Technology Hardware & Equipment
1630	NOBEL BIOCARE HOLDING AG	Health Care Equipment & Services
1631	CHINA FIRST HEAVY INDUSTRIES CO., LTD.	Industrial Engineering
1632	STERIS CORP	Health Care Equipment & Services
1633	WESTINGHOUSE AIR BRAKE TECHNOLOGIES CORP	Industrial Engineering
1634	ALTEK CORPORATION	Leisure Goods
1635	SEOUL SEMICONDUCTOR CO.,LTD.	Technology Hardware & Equipment
1636	GEMTEK TECHNOLOGY COMPANY LIMITED	Technology Hardware & Equipment
1637	ACTIVE BIOTECH AB	Pharmaceuticals & Biotechnology
1638	IDB HOLDING CORPORATION LTD	Real Estate Investment & Services
1639	HOSHIZAKI ELECTRIC CO., LTD.	Construction & Materials
1640	GENTHERM INC	Automobiles & Parts
1641	MINE SAFETY APPLIANCES CO	Health Care Equipment & Services
1642	LUMINEX CORP	Pharmaceuticals & Biotechnology
1643	DEMAND MEDIA INC.	Software & Computer Services

1644	CYBERONICS INC	Health Care Equipment & Services
1645	METASWITCH NETWORKS LTD	Software & Computer Services
1646	LU THAI TEXTILE CO., LTD.	Personal Goods
1647	DATANG TELECOM TECHNOLOGY CO., LTD	Technology Hardware & Equipment
1648	EXTREME NETWORKS INC	Technology Hardware & Equipment
1649	MIBA AG	Automobiles & Parts
1650	GLEN ELECTRIC LIMITED	Household Goods & Home Construction
1651	INNER MONGOLIA BAOTOU STEEL RAREEARTH HI-TECH CO., LTD	Mining
1652	AXCELIS TECHNOLOGIES INC	Electronic & Electrical Equipment
1653	LATECOERE SA	Aerospace & Defence
1654	TAMRON CO LTD	Leisure Goods
1655	PANGANG GROUP STEEL VANADIUM & TITANIUM CO., LTD.	Industrial Metals & Mining
1656	NIPPON SEIKI CO LTD	Electronic & Electrical Equipment
1657	COTY INC.	Personal Goods
1658	ARBITRON INC	Media
1659	FORMFACTOR, INC.	Technology Hardware & Equipment
1660	WIPRO LIMITED	Software & Computer Services
1661	BENESSE HOLDINGS INC.	General Retailers
1662	QLIK TECHNOLOGIES INC	Software & Computer Services
1663	NICHICON CORPORATION	Electronic & Electrical Equipment
1664	ROCKWOOL INTERNATIONAL A/S	Construction & Materials
1665	CPC CORPORATION, TAIWAN	Oil Equipment, Services & Distribution
1666	EVERTZ TECHNOLOGIES LIMITED	Leisure Goods
1667	CEZ A.S.	Electricity
1668	KINSUS INTERCONNECT TECHNOLOGY CORPORATION	Electronic & Electrical Equipment
1669	KENNAMETAL INC	Industrial Engineering
1670	CREATIVE TECHNOLOGY LTD	Technology Hardware & Equipment
1671	SEACHANGE INTERNATIONAL INC	Software & Computer Services
1672	ABILITY ENTERPRISE COMPANY LIMITED	Electronic & Electrical Equipment
1673	KEWPIE CORPORATION	Food Producers
1674	GARDNER DENVER INC	Industrial Engineering
1675	STANDARD LIFE PLC	Life Insurance
1676	DYNAVAX TECHNOLOGIES CORPORATION	Pharmaceuticals & Biotechnology
1677	AVIAT NETWORKS, INC.	Technology Hardware & Equipment
1678	RBC INVESTOR SERVICES LIMITED	Financial Services
1679	RUDOLPH TECHNOLOGIES, INC.	Industrial Engineering
1680	QINETIQ GROUP PLC	Support Services
1681	FUKUDA DENSHI CO LTD	Health Care Equipment & Services
1682	JIVE SOFTWARE, INC.	Software & Computer Services
1683	DONGBU CORPORATION	Construction & Materials
1684	EMS-CHEMIE HOLDING AG	Chemicals
1685	WEIR GROUP PLC(THE)	Industrial Engineering

1686	HITACHI KOKI CO LTD	Electronic & Electrical Equipment
1687	INTRALINKS HOLDINGS, INC.	Software & Computer Services
1688	ACHILLION PHARMACEUTICALS, INC.	Pharmaceuticals & Biotechnology
1689	FLOWSERVE CORP	Industrial Engineering
1690	GTX, INC.	Pharmaceuticals & Biotechnology
1691	NEXEN TIRE CORP.	Automobiles & Parts
1692	ACCELRY'S, INC.	Software & Computer Services
1693	CHEMRING GROUP PLC	Aerospace & Defence
1694	QAD INC	Software & Computer Services
1695	LINC ENERGY LTD	General Retailers
1696	VICOR CORP	Electronic & Electrical Equipment
1697	SOLAZYME, INC.	Oil & Gas Producers
1698	VESUVIUS PLC	Industrial Engineering
1699	FOXCONN TECHNOLOGY CO., LTD.	Technology Hardware & Equipment
1700	SUNTECH POWER HOLDINGS CO., LTD.	Electronic & Electrical Equipment
1701	UNIT4 N.V.	Software & Computer Services
1702	FUCHS PETROLUB AG	Chemicals
1703	WAGO HOLDING GMBH	Electronic & Electrical Equipment
1704	NATS HOLDINGS LIMITED	Industrial Transportation
1705	TELECOMMUNICATION SYSTEMS INC	Software & Computer Services
1706	COMTECH TELECOMMUNICATIONS CORP	Technology Hardware & Equipment
1707	EPIZYME, INC.	Pharmaceuticals & Biotechnology
1708	BRADY CORP	Electronic & Electrical Equipment
1709	ZHEJIANG LONGSHENG GROUP CO., LTD	Chemicals
1710	OXFORD INSTRUMENTS PLC	Electronic & Electrical Equipment
1711	BIC SA	Household Goods & Home Construction
1712	NEOPHOTONICS CORP	Technology Hardware & Equipment
1713	MELCO HOLDINGS INC	Software & Computer Services
1714	NOLATO AB	Chemicals
1715	ZHEJIANG DAHUA TECHNOLOGY COMPANY LIMITED	Leisure Goods
1716	GUNZE LIMITED	Personal Goods
1717	GUODIAN TECHNOLOGY & ENVIRONMENT GROUP CORPORATION LIMITED	Electricity
1718	CHI MEI CORPORATION	General Industrials
1719	EXACT SCIENCES CORP	Pharmaceuticals & Biotechnology
1720	VELOXIS PHARMACEUTICALS A/S	Pharmaceuticals & Biotechnology
1721	ALLIED TELESIS HOLDINGS K.K.	Technology Hardware & Equipment
1722	SILICON INTEGRATED SYSTEMS CORP.	Technology Hardware & Equipment
1723	XOMA CORPORATION	Pharmaceuticals & Biotechnology
1724	FUYAO GLASS GROUP INDUSTRIES CO., LTD.	General Industrials
1725	NICHI-IKO PHARMACEUTICAL COMPANY LIMITED	Pharmaceuticals & Biotechnology
1726	MICRONICS JAPAN CO LTD	Technology Hardware & Equipment
1727	IBA ION BEAM APPLICATIONS SA	Health Care Equipment & Services

1728	DRIL-QUIP INC	Industrial Engineering
1729	ASIA VITAL COMPONENTS COMPANY LIMITED	Technology Hardware & Equipment
1730	MOVE, INC.	Software & Computer Services
1731	BEIJING SIFANG AUTOMATION COMPANY LIMITED	Electronic & Electrical Equipment
1732	LINCOLN ELECTRIC HOLDINGS INC	Industrial Engineering
1733	IROBOT CORPORATION	Software & Computer Services
1734	AEROVIRONMENT, INC.	Aerospace & Defence
1735	JAMES HARDIE INDUSTRIES PLC	Construction & Materials
1736	ELECTRO SCIENTIFIC INDUSTRIES INC	Electronic & Electrical Equipment
1737	RADIANT OPTO-ELECTRONICS CORP.	Electronic & Electrical Equipment
1738	TEBIAN ELECTRIC APPARATUS STOCK CO., LTD.	Electronic & Electrical Equipment
1739	TAIHO KOGYO CO LTD	Automobiles & Parts
1740	NAPP PHARMACEUTICAL HOLDINGS LIMITED	Pharmaceuticals & Biotechnology
1741	VAISALA OYJ	Electronic & Electrical Equipment
1742	CASETEK HOLDINGS LIMITED	Electronic & Electrical Equipment
1743	GALDERMA HOLDING AB	Pharmaceuticals & Biotechnology
1744	TAIYO NIPPON SANSO CORPORATION	Chemicals
1745	HEXCEL CORP	Chemicals
1746	SMK CORPORATION	Electronic & Electrical Equipment
1747	KIOR, INC.	Chemicals
1748	LEAPFROG ENTERPRISES, INC.	Leisure Goods
1749	TONGKUN GROUP CO., LTD.	General Retailers
1750	NORDSON CORP	Industrial Engineering
1751	BROADSOFT INC	Software & Computer Services
1752	IDEX CORP	Industrial Engineering
1753	SIMCERE PHARMACEUTICAL GROUP	Pharmaceuticals & Biotechnology
1754	DIGITAL GENERATION, INC.	Media
1755	INSIDE SECURE	Electronic & Electrical Equipment
1756	WITTINGTON INVESTMENTS LIMITED	Food Producers
1757	EPPENDORF AG	Health Care Equipment & Services
1758	SHENZHEN TAT FOOK TECHNOLOGY COMPANY LIMITED	Technology Hardware & Equipment
1759	YPSOMED HOLDING AG	Health Care Equipment & Services
1760	RADWARE LTD.	Software & Computer Services
1761	COHU INC	Technology Hardware & Equipment
1762	HAN'S LASER TECHNOLOGY CO., LTD.	Industrial Engineering
1763	SSAB AB	Industrial Metals & Mining
1764	ENRICHMENT TECHNOLOGY COMPANY LIMITED	Industrial Engineering
1765	XINJIANG GOLDWIND SCIENCE & TECHNOLOGY CO. LTD.	Industrial Engineering
1766	VALIO OY	Food Producers
1767	HOLCIM LTD.	Construction & Materials
1768	NRG ENERGY, INC.	Electricity
1769	STEELCASE INC.	Household Goods & Home Construction

1770	ENPHASE ENERGY, INC.	Electronic & Electrical Equipment
1771	SIMPSON MANUFACTURING CO INC	General Industrials
1772	AEROPORTS DE PARIS SA	Industrial Transportation
1773	LUDWIG KROHNE GMBH & CO. KOMMANDITGESELLSCHAFT	Industrial Engineering
1774	HAIER ELECTRONICS GROUP CO., LTD.	Industrial Engineering
1775	HOKKAIDO ELECTRIC POWER CO INC	Electricity
1776	EPISTAR CORPORATION	Electronic & Electrical Equipment
1777	TAKARA HOLDINGS INC	Beverages
1778	ENDOCYTE, INC.	Pharmaceuticals & Biotechnology
1779	LARGAN PRECISION COMPANY LIMITED	Leisure Goods
1780	AUTONAVI HOLDINGS LIMITED	Software & Computer Services
1781	UNIPRES CORPORATION	Automobiles & Parts
1782	TOA CORPORATION	Technology Hardware & Equipment
1783	FISHER & PAYKEL HEALTHCARE CORPORATION LIMITED	Health Care Equipment & Services
1784	CHINA ERZHONG GROUP (DEYANG) HEAVY INDUSTRIES COMPANY LIMITED	Industrial Engineering
1785	CGI GROUP INC.	Technology Hardware & Equipment
1786	HARBIN PHARMACEUTICAL GROUP CO., LTD.	Pharmaceuticals & Biotechnology
1787	FENG TAY ENTERPRISES CO., LTD.	Personal Goods
1788	KATAKURA INDUSTRIES CO LTD	Personal Goods
1789	NACHI-FUJIKOSHI CORPORATION	Industrial Engineering
1790	GOGO INC.	Mobile Telecommunications
1791	NUVASIVE, INC	Health Care Equipment & Services
1792	NATUS MEDICAL INC	Health Care Equipment & Services
1793	MARTIN MARIETTA MATERIALS INC	Mining
1794	KUMHO PETRO CHEMICAL CO.,LTD.	Chemicals
1795	MINTH GROUP LIMITED	Automobiles & Parts
1796	EDWARDS HOLDCO LIMITED	Industrial Engineering
1797	TECHNOLOGY ONE LIMITED	Software & Computer Services
1798	M/A-COM TECHNOLOGY SOLUTIONS HOLDINGS, INC.	Technology Hardware & Equipment
1799	EXACT HOLDING NV	Software & Computer Services
1800	GUANGZHOU HAIGE COMMUNICATIONS GROUP INCORPORATED COMPANY	Technology Hardware & Equipment
1801	WIRECARD AG	Electronic & Electrical Equipment
1802	KAGOME CO LTD	Food Producers
1803	ACUITY BRANDS, INC.	Household Goods & Home Construction
1804	SENSIENT TECHNOLOGIES CORP	Chemicals
1805	TNS, INC.	Fixed Line Telecommunications
1806	KT&G CORPORATION	Tobacco
1807	SAPPORO HOLDINGS LIMITED	Beverages
1808	NIPPON MEAT PACKERS INC	Food Producers
1809	OCI COMPANY LIMITED	Chemicals
1810	F.C.C. CO LTD	Automobiles & Parts
1811	TOMY COMPANY LTD	Leisure Goods

1812	ICOM INCORPORATED	Technology Hardware & Equipment
1813	SDL PLC	Software & Computer Services
1814	MONITISE PLC	Software & Computer Services
1815	O2MICRO INTERNATIONAL LTD	Electronic & Electrical Equipment
1816	RAUTARUUKKI OYJ	Industrial Metals & Mining
1817	AIR WATER INC	General Industrials
1818	SHENGUAN HOLDINGS (GROUP) LTD.	Food Producers
1819	INPHI CORPORATION	Technology Hardware & Equipment
1820	QUESTCOR PHARMACEUTICALS INC	Pharmaceuticals & Biotechnology
1821	WEB.COM GROUP, INC.	Software & Computer Services
1822	DOT HILL SYSTEMS CORP	Technology Hardware & Equipment
1823	PEREGRINE SEMICONDUCTOR CORPORATION	Technology Hardware & Equipment
1824	IDENIX PHARMACEUTICALS, INC.	Pharmaceuticals & Biotechnology
1825	SPIRIT AEROSYSTEMS HOLDINGS, INC.	Aerospace & Defence
1826	ION GEOPHYSICAL CORPORATION	Software & Computer Services
1827	IPEK DOGAL ENERJİ KAYNAKLARI ARASTIRMA VE ÜRETİM AŞ.	Media
1828	HIKMA PHARMACEUTICALS PLC	Pharmaceuticals & Biotechnology
1829	COMSCORE, INC.	Support Services
1830	MUEHLBAUER HOLDING AG & CO KGAA	Electronic & Electrical Equipment
1831	ITAUTEC S.A. - GRUPO ITAUTEC	Technology Hardware & Equipment
1832	KOFAX PLC	Software & Computer Services
1833	DIODES INC	Electronic & Electrical Equipment
1834	NORITAKE CO LTD	Construction & Materials
1835	TRAVELSKY TECHNOLOGY LIMITED	Technology Hardware & Equipment
1836	TONGLING JINGDA SPECIAL MAGNET WIRE CO., LTD.	Technology Hardware & Equipment
1837	ZALICUS INC.	Pharmaceuticals & Biotechnology
1838	SAKAI CHEMICAL INDUSTRY CO LTD	Chemicals
1839	WENDEL	Financial Services
1840	ASIA OPTICAL COMPANY INC	Leisure Goods
1841	BILLION INDUSTRIAL HOLDINGS LIMITED	Personal Goods
1842	MEGACHIPS CORPORATION	Electronic & Electrical Equipment
1843	3W POWER S.A.	Alternative Energy
1844	CELL THERAPEUTICS INC	Pharmaceuticals & Biotechnology
1845	WEST PHARMACEUTICAL SERVICES INC.	Pharmaceuticals & Biotechnology
1846	CHINA XD ELECTRIC CO LTD	Electronic & Electrical Equipment
1847	CHINA CSSC HOLDINGS LIMITED	Industrial Engineering
1848	DIAGEO PLC	Beverages
1849	OREXO AB	Pharmaceuticals & Biotechnology
1850	KONECRANES OYJ	Industrial Engineering
1851	BEIJING ZHONGKE SANHUAN HIGH-TECH CO., LTD.	Electronic & Electrical Equipment
1852	LS CORP.	General Industrials
1853	VIA TECHNOLOGIES, INC.	Technology Hardware & Equipment

1854	HARBINGER GROUP INC	Household Goods & Home Construction
1855	SPECTRUM BRANDS HOLDINGS, INC.	Electronic & Electrical Equipment
1856	TABLEAU SOFTWARE, INC.	Software & Computer Services
1857	BAZAARVOICE, INC.	Support Services
1858	DIGITAL CHINA HOLDINGS LIMITED	Software & Computer Services
1859	LEUZE GESCHFTSFHRUNGS- GMBH	Support Services
1860	CARLISLE COMPANIES INC	General Industrials
1861	D.E MASTER BLENDEERS 1753 N.V.	Beverages
1862	PORTIGON AG	Banks
1863	BOTTOMLINE TECHNOLOGIES INC	Software & Computer Services
1864	KONKA GROUP CO., LTD.	Technology Hardware & Equipment
1865	TOMRA SYSTEMS ASA	Industrial Engineering
1866	RENEWABLE ENERGY CORPORATION ASA	Alternative Energy
1867	DIASORIN S.P.A.	Pharmaceuticals & Biotechnology
1868	MEDIVIR AB	Pharmaceuticals & Biotechnology
1869	MERCURY SYSTEMS INC	Technology Hardware & Equipment
1870	WE MADE ENTERTAINMENT CO.,LTD.	Software & Computer Services
1871	COSTAR GROUP INC	Software & Computer Services
1872	VOSSLOH AG	Industrial Engineering
1873	JIANGSU CHANGJIANG ELECTRONICS TECHNOLOGY CO., LTD.	Technology Hardware & Equipment
1874	COMPLETE GENOMICS, INC.	Pharmaceuticals & Biotechnology
1875	VERITAS AG	Automobiles & Parts
1876	AGILYSYS, INC.	Technology Hardware & Equipment
1877	DEXCOM, INC.	Health Care Equipment & Services
1878	CJ CHEILJEDANG CORPORATION	Food Producers
1879	U-BLOX HOLDING AG	Electronic & Electrical Equipment
1880	AT&S AUSTRIA TECHNOLOGIE & SYSTEMTECHNIK AG	Electronic & Electrical Equipment
1881	LOEWE AG	Electronic & Electrical Equipment
1882	ELTEK ASA	Fixed Line Telecommunications
1883	PACIFIC METALS CO LTD	Industrial Metals & Mining
1884	OM GROUP INC	Chemicals
1885	LIVEPERSON INC	Software & Computer Services
1886	NETDRAGON WEBSOFT INC.	Software & Computer Services
1887	RIKEN VITAMIN CO LTD	Food Producers
1888	MERGE HEALTHCARE INCORPORATED	Software & Computer Services
1889	SYMMETRICOM INC	Technology Hardware & Equipment
1890	YUEYANG FOREST & PAPER CO., LTD.	Forestry & Paper
1891	CATCHER TECHNOLOGY COMPANY LIMITED	Technology Hardware & Equipment
1892	VISTAPRINT N.V.	Support Services
1893	SIMPLO TECHNOLOGY COMPANY LIMITED	Technology Hardware & Equipment
1894	NUTRECO N.V.	Food Producers
1895	DAIHEN CORPORATION	General Industrials

1896	SHFL ENTERTAINMENT, INC.	Household Goods & Home Construction
1897	ARTHROCARE CORP	Health Care Equipment & Services
1898	DAINICHISEIKA COLOUR & CHEMICALS MFG CO LTD	Chemicals
1899	OCZ TECHNOLOGY GROUP, INC.	Technology Hardware & Equipment
1900	FORMOSA PLASTICS CORPORATION	General Industrials
1901	HUNAN VALIN STEEL COMPANY LIMITED	Industrial Engineering
1902	VIVUS INC	Pharmaceuticals & Biotechnology
1903	MICRONAS SEMICONDUCTOR HOLDING AG	Technology Hardware & Equipment
1904	ZHEJIANG MEDICINE CO., LTD.	Pharmaceuticals & Biotechnology
1905	HUNTER DOUGLAS N.V.	Household Goods & Home Construction
1906	WEYERHAEUSER CO	Forestry & Paper
1907	THULE GROUP AB	Automobiles & Parts
1908	OMEROS CORPORATION	Pharmaceuticals & Biotechnology
1909	AMICUS THERAPEUTICS, INC.	Pharmaceuticals & Biotechnology
1910	OBRASCON HUARTE LAIN S.A.	Construction & Materials
1911	KINGDEE INTERNATIONAL SOFTWARE GROUP COMPANY LIMITED	Software & Computer Services
1912	TEOLLISUUDEN VOIMA OYJ	Electricity
1913	EMDEON INC.	Health Care Equipment & Services
1914	INTEVAC INC	Technology Hardware & Equipment
1915	ALI CORPORATION	Technology Hardware & Equipment
1916	ARAKAWA CHEMICAL INDUSTRIES LTD	Chemicals
1917	KVK TEKNOLOJI URUNLERI VE TICARET A S	Technology Hardware & Equipment
1918	INVACARE CORP	Health Care Equipment & Services
1919	NXC CORPORATION	Software & Computer Services
1920	ALUMINUM CORPORATION OF CHINA LIMITED	Industrial Metals & Mining
1921	ISTA PHARMACEUTICALS INC	Pharmaceuticals & Biotechnology
1922	NIBE INDUSTRIER AB	Industrial Engineering
1923	MORI SEIKI COMPANY LIMITED	Industrial Engineering
1924	ONCOLYTICS BIOTECH INC	Health Care Equipment & Services
1925	CHINA LESSO GROUP HOLDINGS LIMITED	General Industrials
1926	SHIROKI CORPORATION	Automobiles & Parts
1927	AUDIENCE, INC.	Electronic & Electrical Equipment
1928	DARFON ELECTRONICS CORPORATION	Technology Hardware & Equipment
1929	D-LINK CORPORATION	Technology Hardware & Equipment
1930	XENOPORT, INC.	Pharmaceuticals & Biotechnology
1931	DAIKOKU DENKI CO LTD	Software & Computer Services
1932	SAME DEUTZFAHR GROUP SPA	Industrial Engineering
1933	IPG PHOTONICS CORPORATION	Electronic & Electrical Equipment
1934	ZEALAND PHARMA A/S	Pharmaceuticals & Biotechnology
1935	HANGZHOU SUNYARD SYSTEM ENGINEERING CO., LTD.	Software & Computer Services
1936	INDESIT COMPANY S.P.A.	Household Goods & Home Construction
1937	STALLERGENES SA	Pharmaceuticals & Biotechnology

1938	MITSUBISHI PENCIL CO LTD	Household Goods & Home Construction
1939	UNIVERSAL ENTERTAINMENT CORPORATION	Industrial Engineering
1940	NISSHA PRINTING CO LTD	General Industrials
1941	CS COMMUNICATION & SYSTEMES	Software & Computer Services
1942	ACBEL POLYTECH INC.	Electronic & Electrical Equipment
1943	ANITE PLC	Software & Computer Services
1944	BRAINLAB AG	Health Care Equipment & Services
1945	TOWER SEMICONDUCTOR LTD.	Technology Hardware & Equipment
1946	MISAWA HOMES CO., LTD.	Construction & Materials
1947	ELITEGROUP COMPUTER SYSTEMS CO., LTD.	Technology Hardware & Equipment
1948	STARRAG GROUP HOLDING AG	Industrial Engineering
1949	BIOINVENT INTERNATIONAL AB	Pharmaceuticals & Biotechnology
1950	KRATON PERFORMANCE POLYMERS, INC.	Chemicals
1951	ZHEJIANG DUN AN ARTIFICIAL ENVIRONMENT EQUIPMENT CO., LTD.	Industrial Engineering
1952	CRODA INTERNATIONAL PUBLIC LIMITED COMPANY	Chemicals
1953	MORGAN ADVANCED MATERIALS PLC	General Industrials
1954	INTEGRATED SILICON SOLUTION INC	Technology Hardware & Equipment
1955	AEON CO., LTD.	General Retailers
1956	MICROELECTRONICS TECHNOLOGY INC	Technology Hardware & Equipment
1957	SUN CORPORATION	Industrial Engineering
1958	DIGI INTERNATIONAL INC	Technology Hardware & Equipment
1959	HCL TECHNOLOGIES LIMITED	Software & Computer Services
1960	ROYAL TEN CATE NV	General Industrials
1961	HALOZYME THERAPEUTICS, INC.	Pharmaceuticals & Biotechnology
1962	XIAMEN TUNGSTEN CO., LTD.	Industrial Metals & Mining
1963	FUJIMI INCORPORATED	Chemicals
1964	DRESSER-RAND GROUP INC.	Industrial Engineering
1965	HEICO CORP	Aerospace & Defence
1966	CHONG KUN DANG PHARM. CORP.	Pharmaceuticals & Biotechnology
1967	LI NING COMPANY LIMITED	Personal Goods
1968	ZUKEN INC	Electronic & Electrical Equipment
1969	ARENA PHARMACEUTICALS INC	Pharmaceuticals & Biotechnology
1970	TREND MICRO INCORPORATED	Software & Computer Services
1971	HUBER UND SUHNER AG	Electronic & Electrical Equipment
1972	ARMSTRONG WORLD INDUSTRIES, INC.	Construction & Materials
1973	GENCORP INC	Aerospace & Defence
1974	SWEDBANK AB	Banks
1975	SBI HOLDINGS, INC.	Financial Services
1976	NIPPON FLOUR MILLS CO LTD	Food Producers
1977	MAKHTESHIM-AGAN INDUSTRIES LTD.	Chemicals
1978	YINGLI GREEN ENERGY HOLDING COMPANY LIMITED	Electronic & Electrical Equipment
1979	ULTRATECH INC	Technology Hardware & Equipment

1980	ESCO TECHNOLOGIES INC	Electronic & Electrical Equipment
1981	UNIVERSAL DISPLAY CORP	Electronic & Electrical Equipment
1982	ACCELINK TECHNOLOGIES COMPANY LIMITED	Electronic & Electrical Equipment
1983	ECHELON CORP	Software & Computer Services
1984	SHIMA SEIKI MFG., LTD	Industrial Engineering
1985	DELTA GALIL INDUSTRIES LTD.	Personal Goods
1986	FERRO CORP	Chemicals
1987	YUM! BRANDS, INC.	Travel & Leisure
1988	GLOBAL UNICHIP CORP.	Technology Hardware & Equipment
1989	TATA CONSULTANCY SERVICES LIMITED	Software & Computer Services
1990	NIHON DEMPYA KOGYO CO LTD	Electronic & Electrical Equipment
1991	FIVES	Industrial Engineering
1992	LISI	Industrial Engineering
1993	RHI AG	Industrial Engineering
1994	SYNERON MEDICAL LTD.	Health Care Equipment & Services
1995	BELIMO HOLDING AG	Industrial Engineering
1996	HORMEL FOODS CORP	Food Producers
1997	NEUSTAR, INC.	Software & Computer Services
1998	INSMED INC	Pharmaceuticals & Biotechnology
1999	GENMAB A/S	Pharmaceuticals & Biotechnology
2000	MGI COUTIER SA	Automobiles & Parts

Appendix C: Overview of two trademark examples



Word Mark OREO
Goods and Services IC 030, US 046, G & S: Cookies, FIRST USE: 20140201, FIRST USE IN COMMERCE: 20140201
Mark Drawing Code (3) DESIGN PLUS WORDS, LETTERS, AND/OR NUMBERS
Design Search Code 08.01.05 - Cookies; Fortune cookies
Serial Number 85896743
Filing Date April 5, 2013
Current Basis 1A
Original Filing Basis 1B
Published for Opposition June 25, 2013
Registration Number 4791022
Registration Date August 11, 2015
Owner (REGISTRANT) Intercontinental Great Brands LLC LIMITED LIABILITY COMPANY DELAWARE 100 DeForest Avenue East Hanover NEW JERSEY 07936
Assignment Recorded ASSIGNMENT RECORDED
Attorney of Record Melissa V. Harrup
Prior Registrations 0093009;1927379;1928734
Disclaimer NO CLAIM IS MADE TO THE EXCLUSIVE RIGHT TO USE ROUND SHAPE OF THE CIRCULAR COOKIE DESIGN APART FROM THE MARK AS SHOWN
Description of Mark Color is not claimed as a feature of the mark. The mark consists of a smiling sandwich cookie with the word "OREO" embossed on the top of the smiling cookie sandwich design. The outside edge of the top cookie contains short vertical lines to create the appearance of ridges. Inside the ridges, two concentric circles appear, the first containing broken lines with a small dot in between each broken line and the second containing a ring of flowers made of four triangles centered around a dot, with a dot between each flower design. In the center of the concentric circles, the word "OREO" appears in capital letters surrounded by an oval with a straight line protruding from the top of the oval with two perpendicular lines crossing the line, the bottom of those two lines being slightly longer than the top line. Two triangles appear above and below the word "OREO" in the oval and six triangles appear around the oval with two above and four below the oval. The sandwich is separated slightly so that the two O's in the word "OREO" and icing appears as a smiling face, with the letter O's serving as the eyes of the face and the icing serving as the smile
Type of Mark TRADEMARK
Register PRINCIPAL
Live/Dead Indicator LIVE

POWER BY THE HOUR

Word Mark POWER BY THE HOUR
Goods and Services IC 037. US 103. G & S: AIRCRAFT ENGINE REPAIR, MAINTENANCE, AND EXCHANGE SERVICES. FIRST USE: 19640800. FIRST USE IN COMMERCE: 19640800
Mark Drawing Code (1) TYPED DRAWING
Serial Number 72233247
Filing Date November 24, 1965
Current Basis 1A
Original Filing Basis 1A
Published for Opposition June 21, 1966
Registration Number 0814702
Registration Date September 6, 1966
Owner (REGISTRANT) BRISTOL SIDDELEY ENGINES LIMITED CORPORATION UNITED KINGDOM FILTON, BRISTOL ENGLAND
 (LAST LISTED OWNER) ROLLS-ROYCE PLC COMPANY BY CHANGE OF NAME FROM GREAT BRITAIN 65 BUCKINGHAM GATE LONDON GREAT BRITAIN SW1 6AT
Assignment Recorded ASSIGNMENT RECORDED
Attorney of Record Thomas W. Brooke
Type of Mark SERVICE MARK
Register PRINCIPAL
Affidavit Text SECT 15. SECTION 8(10-YR) 20160209.
Renewal 2ND RENEWAL 20160209
Live/Dead Indicator LIVE

Appendix D: Overview of share of sectors in the top ranked firms

Sector	Share in top ranked
Aerospace & Defense	3.6%
Alternative Energy	0.2%
Automobiles & Parts	10.4%
Banks	2.6%
Beverages	0.6%
Chemicals	5.4%
Construction & Materials	1.8%
Electricity	0.8%
Electronic & Electrical Equipment	8.0%
Financial Services	0.2%
Fixed Line Telecommunications	1.8%
Food Producers	1.8%
Gas, Water & Multi-utilities	0.4%
General Industrials	3.2%
General Retailers	1.0%
Health Care Equipment & Services	3.6%
Household Goods & Home Construction	1.2%
Industrial Engineering	7.0%
Industrial Metals & Mining	1.6%
Industrial Transportation	0.2%
Leisure Goods	2.2%
Media	0.8%
Mining	0.2%
Mobile Telecommunications	0.2%
Oil & Gas Producers	3.0%
Oil Equipment, Services & Distribution	1.0%
Personal Goods	1.6%

Pharmaceuticals & Biotechnology	10.6%
Software & Computer Services	7.2%
Support Services	0.8%
Technology Hardware & Equipment	15.8%
Tobacco	0.6%
Travel & Leisure	0.6%

Appendix E: Overview of services and total amount of trademarks for each unit of analysis

Year	Top ranked		Whole dataset		Automobiles and Parts		Aerospace and Defense		Software		Technology and Hardware	
	Services	Total	Services	Total	Services	Total	Services	Total	Services	Total	Services	Total
1980	85	449	28,397	103,891	3	21	1	97	73	172	7	27
1981	133	619	31,152	115,992	2	44	1	33	105	262	5	33
1982	162	776	34,665	131,423	3	78	1	50	139	332	3	36
1983	216	1,024	38,268	138,889	8	92	4	88	160	414	9	118
1984	390	1,909	41,196	145,782	14	190	0	102	336	781	23	153
1985	465	2,340	45,470	158,867	6	173	22	193	376	906	18	185
1986	359	2,460	46,286	160,273	10	200	0	110	287	924	13	129
1987	404	2,434	48,911	166,217	6	187	10	57	335	901	22	172
1988	422	2,552	50,698	170,332	3	130	10	174	316	885	9	143
1989	354	2,142	55,309	176,436	20	150	3	120	253	728	15	96
1990	251	1,060	55,883	169,998	17	96	14	57	149	462	29	112
1991	302	1,281	56,733	178,447	29	147	9	39	204	661	4	53
1992	297	1,356	62,415	197,602	19	190	1	35	216	595	10	111
1993	312	1,709	69,768	218,017	22	279	0	29	214	704	11	164
1994	251	1,873	76,877	227,427	26	642	1	21	147	645	3	101
1995	357	1,709	97,611	260,891	18	396	1	62	239	649	20	128
1996	273	1,599	111,635	284,562	10	244	2	55	195	664	18	163
1997	359	1,481	117,515	292,209	56	269	16	73	221	578	19	160
1998	311	1,463	129,820	309,506	28	161	9	53	185	495	66	209
1999	386	1,479	164,421	356,048	7	79	0	25	277	634	45	249
2000	503	1,553	170,478	361,522	22	93	18	60	339	632	66	196
2001	342	1,504	150,069	345,599	20	63	3	31	207	543	36	185
2002	360	1,474	152,523	361,411	20	95	7	25	213	507	55	207
2003	297	1,435	160,360	382,830	26	104	3	14	180	480	39	156
2004	293	1,217	171,256	396,155	14	110	0	21	176	441	30	144
2005	280	1,110	189,893	426,221	4	94	3	27	265	535	43	140
2006	258	1,040	201,662	442,434	2	108	0	19	185	414	42	145
2007	267	949	220,749	475,270	2	52	7	16	203	411	71	158

2008	247	971	225,223	481,697	2	83	0	10	150	358	50	172
2009	258	1,029	226,554	492,696	4	63	17	46	142	359	49	173
2010	322	1,261	229,021	501,744	7	34	0	7	142	310	37	102
2011	336	1,210	232,394	503,404	14	54	8	10	130	314	35	108
2012	220	942	231,469	522,808	10	41	0	2	97	269	20	97
2013	229	704	230,130	529,037	10	50	2	8	129	313	39	121
2014	177	636	228,115	537,343	0	15	0	5	81	254	6	72
2015	157	475	218,501	537,953	14	24	0	3	94	218	6	45
2016	79	300	191,938	526,752	2	32	0	0	45	189	24	61
2017	41	158	125,092	380,115	0	18	0	0	26	73	10	46

Appendix F: Overview of three services types for all units of analysis

Year	Top ranked			Whole dataset			Automobiles and Parts			Aerospace and defense			Software			Technology and Hardware		
	Smooth ing	Adapting	Substitu ting	Smooth ing	Adapting	Substitu ting	Smooth ing	Adapting	Substitu ting	Smooth ing	Adapting	Substitu ting	Smooth ing	Adapting	Substitu ting	Smooth ing	Adapting	Substitu ting
1980	10	7	13	3,787	1,999	1,995	0	0	3	1	1	3	10	3	7	0	1	0
1981	5	8	6	4,271	2,208	1,843	0	1	2	1	0	0	4	3	1	0	4	1
1982	17	12	18	5,214	2,592	2,240	1	0	1	0	0	3	12	8	8	0	1	2
1983	24	31	28	5,448	2,965	2,485	0	0	3	0	3	3	16	16	14	0	9	2
1984	33	38	35	6,049	2,907	2,554	7	0	7	0	0	1	20	16	11	0	8	9
1985	61	29	26	6,494	3,406	2,745	0	0	0	0	0	1	45	22	15	0	11	5
1986	52	60	20	6,852	3,867	2,755	0	4	7	0	6	3	36	23	10	1	12	1
1987	61	40	38	7,177	3,800	2,728	1	0	9	3	1	0	47	15	22	1	13	6
1988	70	43	48	7,302	3,778	2,944	0	2	1	1	2	0	61	17	18	0	15	3
1989	53	22	52	7,983	4,594	3,120	1	6	2	3	4	1	35	11	21	4	6	0
1990	32	42	39	7,477	4,872	3,358	8	0	5	0	1	0	16	20	22	0	19	6
1991	24	37	25	7,420	5,039	3,180	9	0	8	0	0	0	8	24	11	0	5	0
1992	31	40	24	7,709	5,735	3,462	1	0	5	0	0	0	18	35	11	0	19	7
1993	30	77	37	9,515	6,370	4,396	1	12	9	0	2	0	24	35	9	0	30	2
1994	29	54	24	10,433	6,962	4,706	9	1	3	0	2	1	16	37	12	0	6	0
1995	17	60	48	12,288	8,706	5,717	0	4	8	1	5	12	14	32	22	3	14	5
1996	24	47	30	14,036	10,424	6,420	2	1	0	2	3	2	15	37	13	2	30	8
1997	73	57	49	15,539	11,323	6,779	18	11	4	3	9	15	47	27	16	0	27	8
1998	55	41	36	16,626	12,489	7,332	17	0	0	3	7	12	22	28	22	2	21	7
1999	64	68	63	21,334	15,270	8,884	0	2	3	0	3	2	49	37	46	1	35	4
2000	74	102	58	21,957	17,823	9,814	4	4	2	0	5	9	47	61	31	2	39	6
2001	61	64	38	19,820	16,059	8,566	6	0	0	0	4	5	42	33	18	3	27	6
2002	53	69	31	19,928	16,112	8,628	2	1	4	0	8	6	40	45	19	4	25	5
2003	49	48	37	20,994	15,683	8,589	10	0	2	0	1	0	32	28	21	2	25	2
2004	39	52	26	22,300	16,826	8,507	4	1	5	1	1	2	31	17	11	0	31	2
2005	54	35	31	24,968	17,383	9,275	2	0	1	0	7	4	51	27	29	1	18	3
2006	30	39	22	25,934	18,719	9,542	2	4	0	0	1	1	23	22	9	1	17	2

2007	15	65	41	26,401	20,181	10,205	0	0	0	0	1	2	14	30	14	2	29	6
2008	16	48	26	24,907	20,850	10,606	0	0	0	3	0	0	10	14	12	1	28	6
2009	32	44	29	24,078	22,343	11,403	0	0	0	2	8	7	29	26	14	3	19	2
2010	21	48	31	22,794	23,126	11,319	0	2	1	10	0	0	11	15	14	0	12	3
2011	19	48	30	23,209	23,629	12,347	0	6	3	0	3	3	3	25	13	2	8	2
2012	10	46	19	22,588	25,532	13,070	0	3	1	0	1	1	7	14	5	0	26	3
2013	6	46	32	22,859	27,231	13,852	2	0	8	0	2	0	3	27	28	3	19	4
2014	15	21	24	23,064	28,369	15,096	0	0	0	0	3	2	4	11	15	0	13	2
2015	23	21	13	22,641	28,380	14,455	6	0	0	0	1	1	7	17	6	0	7	2
2016	2	6	7	19,525	28,823	13,605	0	0	0	0	2	0	4	14	3	0	3	5
2017	3	4	6	13,565	21,034	8,904	0	0	0	0	0	0		5	4	3	3	0

Appendix G: Random sample of 100 trademarks for precision test

Number	Trademark owner	Year of trademark
1	HALLIBURTON COMPANY	1984
2	MICROSOFT CORPORATION	1997
3	INTERNATIONAL BUSINESS MACHINES CORPORATION	1986
4	PFIZER INC.	1985
5	JOHNSON & JOHNSON	2001
6	TILE COUNCIL OF NORTH AMERICA, INC.	2005
7	GOOGLE INC.	2008
8	JOHNSON & JOHNSON	2011
9	ILLINOIS TOOL WORKS INC.	2001
10	JOHNSON & JOHNSON	1989
11	KDDI CORPORATION	2000
12	HOSPIRA, INC.	1990
13	JOHNSON & JOHNSON	1997
14	GARMIN LTD.	2001
15	WHITETAIL INSTITUTE OF NORTH AMERICA, INC.	1997
16	ELECTRONIC ARTS INC.	1993
17	E. I. DU PONT DE NEMOURS AND COMPANY	1988
18	HITACHI HIGH TECHNOLOGIES AMERICA, INC.	2008
19	JOHNSON & JOHNSON	2014
20	JOHNSON & JOHNSON	2011
21	SUPER STORES OF AMERICA, INC.	2000
22	UNITED PARCEL SERVICE OF AMERICA, INC.	1988
23	FORD MOTOR COMPANY	1983
24	UNITED PARCEL SERVICE OF AMERICA, INC.	1997
25	JOHNSON & JOHNSON	1983
26	VOLUNTARY HOSPITALS OF AMERICA, INC.	1985

27	PANASONIC CORPORATION OF NORTH AMERICA	2002
28	INVESTMENT NETWORK OF AMERICA, INC.	1987
29	APPLE INC.	2008
30	HENKEL AG & CO. KGAA	2006
31	NATIONAL INSTRUMENTS CORPORATION	1987
32	PFIZER INC.	1981
33	3M COMPANY	1993
34	FRITO-LAY NORTH AMERICA, INC.	1992
35	PFIZER INC.	1988
36	JOHNSON & JOHNSON	2005
37	NOVABOTANICA, INC.	2014
38	EASTMAN KODAK COMPANY	2001
39	CORD BLOOD AMERICA, INC.	1997
40	BASF SE	2011
41	HD AMERICA, INC.	1982
42	PFIZER INC.	1985
43	ELF ATOCHEM NORTH AMERICA, INC.	1995
44	MONSANTO COMPANY	1984
45	BRIGHT OF AMERICA, INC.	1987
46	FAMOUS DAVE'S OF AMERICA, INC.	1991
47	BRIDGESTONE CORPORATION	1983
48	ORACLE CORPORATION	1990
49	INTUIT INC.	2007
50	HONEYWELL INTERNATIONAL INC.	2004
51	EMERSON ELECTRIC COMPANY	1992
52	FORD MOTOR COMPANY	1994
53	ORANGE COUNTY YOUTH SPORTS ASSOCIATION	2006
54	ABN-AMRO NORTH AMERICA, INC.	1989
55	FORD MOTOR COMPANY	1995
56	FORD MOTOR COMPANY	1994
57	CAMP AMERICA, INC.	1980
58	EMC CORPORATION	2002
59	JOHNSON & JOHNSON	1985
60	EMERSON ELECTRIC CO.	1987
61	AICHI FOODS AMERICA, INC.	2005
62	INTERNET AMERICA, INC.	1995
63	JOHNSON & JOHNSON	2010
64	MOULEDOUX, BLAND, LEGRAND & BRACKETT, L.L.C.	2009
65	GOOGLE INC.	2008
66	JOHNSON & JOHNSON	2010
67	TEXAS INSTRUMENTS INCORPORATED	1995
68	JOHNSON & JOHNSON	1992

69	AREVA NP, INC.	2009
70	NOVARTIS AG	1998
71	FORD MOTOR COMPANY	1996
72	PFIZER INC.	1989
73	INTERNATIONAL BUSINESS MACHINES CORPORATION	1993
74	JOHNSON & JOHNSON	1995
75	PROVIDERS' NETWORK OF ORANGE & LOS ANGELES, INC.	1983
76	ELECTRONIC ARTS INC.	1989
77	STUDENT TRANSPORTATION OF AMERICA, INC.	1999
78	INTERNATIONAL BUSINESS MACHINES CORPORATION	2004
79	WIRE ROPE CORPORATION OF AMERICA, INCORPORATED	1998
80	FORD MOTOR COMPANY	1995
81	GENERAL ELECTRIC COMPANY	1986
82	JOHNSON & JOHNSON	2005
83	MAKING MEMORIES BREAST CANCER FOUNDATION OF AMERICA, INC.	1997
84	FANUC LTD.	1997
85	NORTHROP GRUMMAN CORPORATION	2000
86	MIZKAN AMERICA, INC.	2006
87	INTERNATIONAL BUSINESS MACHINES CORPORATION	1997
88	FORD MOTOR COMPANY	1993
89	PROCTER & GAMBLE COMPANY, THE	1986
90	ATOCHEM NORTH AMERICA, INC.	1989
91	JOHNSON & JOHNSON	1986
92	AIWA AMERICA, INC.	1990
93	SOCIETE DES PRODUITS NESTLE S.A.	1986
94	INTERNATIONAL BUSINESS MACHINES CORPORATION	1993
95	ABN AMRO NORTH AMERICA, INC.	2000
96	HARRIS CORPORATION	1983
97	EASTMAN KODAK COMPANY	1987
98	KONINKLIJKE PHILIPS N.V.	2010
99	INTERNATIONAL BUSINESS MACHINES CORPORATION	1999
100	EXXON MOBIL CORPORATION	2013

Appendix H: Overview of 51 chosen firms for the recall test

Sectors	Share in top 2000	Firms in recall test	Chosen firms
Aerospace & Defense	2.3%	1	BOMBARDIER INC
Alternative Energy	0.4%	0	
Automobiles & Parts	6.3%	4	VOLKSWAGEN AG, DAIMLER AG, FORD MOTOR CO, RENAULT
Banks	1.4%	1	HSBC HOLDINGS PLC
Beverages	0.5%	0	

Chemicals	5.9%	3	E. I. DU PONT DE NEMOURS AND COMPANY, DOW CHEMICAL COMPANY (THE), AKZO NOBEL NV PPG INDUSTRIES INC.
Construction & Materials	2.6%	1	
Electricity	1.2%	1	KOREA ELECTRIC POWER CORPORATION
Electronic & Electrical Equipment	8.9%	5	SAMSUNG ELECTRONICS CO.LTD., SIEMENS AG, EMERSON ELECTRIC CO., SHARP CORPORATION MITSUBISHI ELECTRIC CORPORATION
Equity Investment Instruments	0.1%	0	
Financial Services	0.7%	0	
Fixed Line Telecommunications	1.0%	1	AT&T INC.
Food & Drug Retailers	0.2%	0	
Food Producers	2.6%	1	MONDELEZ INTERNATIONAL, INC.
Forestry & Paper	0.5%	0	
Gas, Water & Multi-utilities	0.6%	0	
General Industrials	3.5%	2	GENERAL ELECTRIC COMPANY, 3M COMPANY
General Retailers	0.6%	0	
Health Care Equipment & Services	4.2%	2	BAXTER INTERNATIONAL INC., OLYMPUS CORP.
Household Goods & Home Construction	1.7%	1	PROCTER & GAMBLE CO
Industrial Engineering	8.9%	5	CATERPILLAR INC., DEERE & CO., ALSTOM S.A., CUMMINS INC., ISUZU MOTORS LIMITED
Industrial Metals & Mining	1.7%	1	NIPPON STEEL & SUMITOMO METAL CORPORATION
Industrial Transportation	0.5%	0	
Leisure Goods	1.7%	1	SONY CORPORATION
Life Insurance	0.1%	0	
Media	0.8%	0	
Mining	0.5%	0	
Mobile Telecommunications	0.3%	0	
Nonequity Investment Instruments	0.1%	0	
Nonlife Insurance	0.1%	0	
Oil & Gas Producers	1.3%	1	EXXON MOBIL CORP.
Oil Equipment, Services & Distribution	0.7%	1	SCHLUMBERGER N.V.
Personal Goods	1.9%	1	L'OREAL SA
Pharmaceuticals & Biotechnology	10.8%	5	NOVARTIS AG, JOHNSON & JOHNSON, PFIZER INC., MERCK & CO., INC., ABBOTT LABORATORIES
Real Estate Investment & Services	0.1%	0	
Software & Computer Services	9.4%	5	GOOGLE INC., ORACLE CORP., ELECTRONIC ARTS INC., ADOBE SYSTEMS INC FACEBOOK, INC.
Support Services	1.0%	0	
Technology Hardware & Equipment	14.7%	8	INTEL CORP., NOKIA OYJ, QUALCOMM INC., APPLE INC., TEXAS INSTRUMENTS INC., DELL, INC.,

			ASML HOLDING N.V. XEROX CORP
Tobacco	0.3%	0	
Travel & Leisure	0.9%	0	

Appendix I: Results of the recall test for firms

Chosen firms	Serial number	Year	Present in keyword generated list?
3M COMPANY	78408151	2003	no
ABBOTT LABORATORIES	73730887	1988	yes
ADOBE SYSTEMS INC	78481630	2003	yes
AKZO NOBEL NV	78460897	1998	no
ALSTOM S.A.	78502639	2005	no
APPLE INC.	76366151	2002	yes
ASML HOLDING N.V.	75286474	1997	no
AT&T INC.	73730603	1986	no
BAXTER INTERNATIONAL INC	86142468	2014	yes
BOMBARDIER INC	74521971	1995	yes
CATERPILLAR INC	78056213	2000	yes
CUMMINS INC.	75041627	1995	yes
DAIMLER AG	85617532	2011	yes
DEERE & CO	1615649	1993	yes
DELL INC	75237267	1993	yes
DOW CHEMICAL COMPANY (THE)	73689321	1987	no
E. I. DU PONT DE NEMOURS AND COMPANY	73696875	1987	yes
ELECTRONIC ARTS INC	85100275	2011	yes
EMERSON ELECTRIC CO	74233872	1991	yes
EXXON MOBIL CORP	75654432	1997	yes
FACEBOOK INC	77803641	2007	yes
FORD MOTOR CO	74460191	1985	yes
GENERAL ELECTRIC COMPANY	76072048	2000	yes
GOOGLE INC.	85140628	2005	yes
HSBC HOLDINGS PLC	74274068	1992	yes
INTEL CORP	73802059	1989	yes
ISUZU MOTORS LIMITED	78537409	1999	no
JOHNSON & JOHNSON	85147374	2011	yes
KOREA ELECTRIC POWER CORPORATION	N/A	1983	no
L'OREAL SA	73764484	1988	no
MERCK & CO., INC.	73682474	1987	yes

MITSUBISHI ELECTRIC CORPORATION	73552188	1985	yes
MONDELEZ INTERNATIONAL INC.	77978908	2003	no
NIPPON STEEL & SUMITOMO METAL CORPORATION	77882166	2005	yes
NOKIA OYJ	77019945	2006	no
NOVARTIS AG	78225245	1994	yes
OLYMPUS CORP.	73561810	1984	yes
ORACLE CORP	74187591	1992	yes
PFIZER INC	73804940	1989	yes
PPG INDUSTRIES INC	74124852	1990	no
PROCTER & GAMBLE CO	75652465	2001	yes
QUALCOMM INC	75107271	1996	yes
RENAULT	77934675	1989	yes
SAMSUNG ELECTRONICS CO.	76592663	2004	no
SCHLUMBERGER N.V.	74229826	1986	no
SHARP CORPORATION	73519901	1984	yes
SIEMENS AG	75606838	1999	yes
SONY CORPORATION	73605943	1986	yes
TEXAS INSTRUMENTS INC	73786486	1987	yes
VOLKSWAGEN AG	76678754	2006	yes
XEROX CORP	77937682	2010	yes

Appendix J: Precision test for the three service types

Smoothing services				
Serial Number	Nice Class	Owner Name	year	Match?
75407722	36	FORD MOTOR COMPANY	1998	Yes
75829789	36	INSURAMERICA, INC.	1999	Yes
75130246	36	VIEWCALL AMERICA, INC.	1995	No
76345664	36	ORANGE PARTNERS, LLC	2001	yes
77075528	36	MUNICH HEALTH NORTH AMERICA, INC.	2005	no
76097716	36	GENERAL ELECTRIC COMPANY	2001	yes
74680810	36	SUZUKI MOTOR CORPORATION (SUZUKI KABUSHIKI KAISHA)	1994	yes
75505832	36	FORD MOTOR COMPANY	1998	yes
74681064	36	REMCO AMERICA, INC.	1995	no
73816727	36	ABN/LASALLE NORTH AMERICA, INC.	1988	no
78905867	36	PROFESSIONAL LIABILITY MANAGEMENT OF AMERICA, INC.	2005	no
76119816	36	KIA MOTORS AMERICA, INC.	2000	yes
74502268	36	FORD MOTOR COMPANY	1991	yes
73581153	36	NATIONAL AUSTRALIA BANK LIMITED	1982	no
73666629	36	MEDICAL CHARGE CARD OF AMERICA, INC.	1987	no
74125400	36	INDEPENDENT INSURANCE AGENTS OF AMERICA, INCORPORATED	1989	no
75829788	36	INSURAMERICA, INC.	1999	no
75292519	36	FORD MOTOR COMPANY	1997	yes
76712181	36	DANONE SIMPSON INSURANCE SERVICES LLC	2011	no
73820685	36	REALASSIST OF AMERICA, INC.	1988	no
78196920	36	CONOCOPHILLIPS COMPANY	2002	yes
74329422	36	DEERE & COMPANY	1992	yes
75490050	36	LEUKEMIA SOCIETY OF AMERICA, INC.	1993	no
74165392	36	ABB Asea Brown Boveri Ltd.	1988	yes
76709904	36	GEMOLOGICALLABORATORY OFAMERICA, INC.	2003	no
76059470	36	PPM AMERICA, INC.	1990	yes
73837004	36	YACHT CLUB OF AMERICA, INC.	1989	no
73581771	36	INDEPENDENT SMALL BUSINESS EMPLOYERS OFAMERICA, INC.	1984	no
76445639	36	UNICREDIT AMERICA, INC.	2003	no
76006412	36	INTERNATIONAL BUSINESS MACHINES CORPORATION	1999	yes
74023430	36	FIRST TEAM REAL ESTATE-ORANGE COUNTY	1993	no
75394192	36	INTUIT INC.	1997	no
75212436	36	VISION BENEFITS OF AMERICA, INC.	1997	no
73816750	36	ABN/LASALLE NORTH AMERICA, INC.	1988	no
77383067	36	NORTH SHORE ANIMAL LEAGUE AMERICA, INC.	2006	no
86589401	36	VISTAMERICA, INC.	2015	no
78337825	36	FORD MOTOR COMPANY	2000	yes
73585509	36	ORANGE COUNTY POSTAL/FEDERAL EMPLOYEES CREDIT UNION	1984	no

74487521	36	PROPERTY COMPANY OF AMERICA, INC.	1984	yes
73808034	36	HEALTH NETWORKS OF AMERICA, INC.	1988	no
76313289	36	COMMUNICATING FOR AMERICA, INC.	1994	no
73585509	36	ORANGE COUNTY POSTAL/FEDERAL EMPLOYEES CREDIT UNION	1984	no
73709009	36	ADVANCE AMERICA, INC.	1987	no
75361512	36	AG SERVICES OF AMERICA, INC.	1997	yes
78784085	36	MONEY CENTERS OF AMERICA, INC.	2006	yes
74112318	36	MCKESSON CORPORATION	1990	yes
76027230	36	ABN AMRO NORTH AMERICA, INC.	1999	no
76602112	36	RESTORATION GROUP AMERICA, INC.	2004	yes
75370516	36	FORD MOTOR COMPANY	1998	yes
73403303	36	CASH AMERICA, INC.	1982	no
Adapting services				
Serial Number	Nice Class	Owner Name	year	Match?
85428961	28	Middleton Jr., Edward	2010	no
87032637	28	Manta-Ray, Inc.	2016	no
85915217	41	Green Ivy Educational Consulting, LLC	2004	no
75198864	9	HAYES MICROCOMPUTER PRODUCTS, INC.	1996	yes
78188219	35	MarketFeat Inc.	2002	yes
74109123	41	Interior Art Enterprises, Inc.	1990	no
75950725	9	Wave 5, Inc	1999	yes
85945555	35	Yooshu LLC	2015	no
75591245	42	Cogito Economic Systems, Inc.	1996	yes
73756380	42	CHALLENGER GROUP, INC., THE	1988	yes
77923207	35	WOMEN'S REFUGEE COMMISSION, INC.	2009	yes
76380120	41	Avraham Y. Goldratt Institute	2004	no
87780717	41	Rocha, Fernanda	2009	no
74180307	42	Air Solutions, Inc.	1991	yes
78809711	35	Go To Market, Inc.	2006	yes
86348097	35	DASSAULT SYSTEMES	2014	yes
77954858	41	Fabrocini, William D.	2009	no
85860049	37	International Safety Group Inc	2004	no
77033996	35	Dennard Rupp Gray & Easterly, LLC	2006	no
85645725	44	Sizewise Rentals, L.L.C.	2006	no
76368115	36	Advisors, LLC	2002	yes
85362612	42	CHONG TECK CHOY	2004	yes
77378624	41	PARADIGM LEARNING, INC.	2006	yes
86315073	42	Root Services	2014	yes
75128279	41	Argonaut Insurance Company	1995	no
74181996	42	Chathamborough Research Group, Inc.	1982	yes
85673468	42	Elegrity, Inc.	2012	yes
74266528	35	GTE Interactive Services Incorporated	1991	yes

87350321	11	Shen Zhen Shi Yi Bai Wang Luo Ke Ji YouXian Gong Si	2011	no
75525684	41	Hyatt's Graphic Supply Co., Inc.	1998	yes
78970975	16	Concordant Rater Systems, Inc.	2001	no
78673674	35	FeatureSite, LLC	2005	yes
76047544	41	PARTNERS IN LEADERSHIP IP, LLC	1990	yes
76557607	35	Precision Dynamics Corporation	2003	yes
87337644	41	Bad Sector Labs, LLC	2016	yes
86645654	42	Hexanika, Inc.	2015	yes
78596100	41	CHEVRON INTELLECTUAL PROPERTY LLC	2005	yes
87144876	41	DENSO Products & Services Americas, Inc.	2017	yes
73713139	10	ALLIED HEALTHCARE PRODUCTS, INC.	1985	no
75439467	42	Raymond Morris Group Limited	1997	no
77594040	37	MACNICA, Inc.	2008	yes
78508812	35	Nemer, Kirk	2005	no
87322909	42	ARCADIS Corporate Services, Inc.	2015	no
86440556	35	Praxis International, Inc.	2016	yes
76096550	38	Moline Dispatch Publishing Company, LLC	1995	no
75802251	35	Brintnall & Nicolini, Inc.	1999	yes
85630320	20	Cohen, Joseph	2013	no
75328254	37	INTERNATIONAL BUSINESS MACHINES CORPORATION	1989	yes
77520249	20	C&L Marketing, LLC	2011	no
78380530	42	Q2 Learning, LLC	2004	yes
Substituting services				
Serial Number	Nice Class	Owner Name	year	Match?
85855348	42	R2 Innovative Technologies, LLC	1999	yes
85863973	37	My Alarm Center, L.L.C.	2013	no
74658295	42	Traders' Connection, Inc.	1995	yes
85099281	40	Mitsubishi Electric Corporation	2010	yes
85161034	41	NOOK DIGITAL, LLC	2010	no
75323739	35	Premier Consulting, Inc.	1996	yes
77592672	41	Telugu Association of North America	1997	no
87776066	9	Sharecare, Inc.	2016	yes
74155844	9	Lease/PM, Inc.	1990	no
76331136	36	O'Neill Developments, Inc.	1992	yes
87379628	37	CTEC Ag, Inc.	1995	yes
78174659	42	QuestaWeb, Inc.	2002	yes
74534503	35	National Provider Corporation	1994	no
77417890	36	Semper Bison	2007	no
86922916	36	Wells Fargo & Company	2016	no
75318558	7	HUSQVARNA CONSUMER OUTDOOR PRODUCTS N.A., INC.	1997	yes
73575285	42	A. C. NIELSEN COMPANY	1985	yes
73635951	12	ENGINE PARTS WAREHOUSE JACKSON, INC.	1986	no

86964181	42	Clarabridge, Inc.	2015	yes
77359246	35	A Good Used Car Inc.	2007	no
85970394	28	Bally Gaming, Inc.	2012	no
75025283	35	BOCA SUBSIDIARY CORP.	1996	yes
77568336	42	QC Inc	2005	yes
75571539	37	Advanced Foundation Systems, Inc.	1999	no
85852992	9	Yottamine Analytics LLC	2011	yes
85203422	42	IQzone, Inc.	2010	no
86404989	36	Fuery, Charles	2014	no
87050007	42	Galore Inc.	2017	yes
85951531	37	Outlaw Diesel, LC	2009	no
86654815	35	Evexia Care Solutions	2015	yes
73515775	37	IMPORTS UNLIMITED COLLISION REPAIR, INC.	1983	no
77750627	37	Sunworks Solar Systems, Inc.	2009	yes
86893260	35	Cymax Stores Inc.	2016	no
78602897	38	Transportation Technology Center, Inc.	1998	no
77743451	35	National Lease Consulting, LLC	2007	no
74801707	36	500 Texas Avenue Limited Partnership	1992	yes
75762150	42	Evergo, Inc.	1999	yes
77982914	3	Mille, Laurence	2011	no
85626681	9	Dialawg, LLC	2013	yes
87792437	42	Speech-Soft Solutions, LLC	2017	yes
76195779	36	THE SHADY CANYON GOLF CLUB, INC.	2001	no
85236997	42	RIO Holdings, Inc.	2011	yes
86622049	42	CherryPickPrices.com LLC	2015	yes
78480188	35	GOODYEAR TIRE & RUBBER COMPANY, THE	1983	yes
74369952	9	Radian Corporation	1993	no
74165391	36	ABB Asea Brown Boveri Ltd.	1988	yes
87518812	9	Ouyang, Pimin	2017	no
74523997	7	Yale Security Inc.	1985	no
86756417	42	goBalto, Inc.	2011	yes
76011299	9	Santech Industries, Inc.	1998	no

Appendix K: Recall test for the three service types

Smoothing				
Serial number	Nice class	Owner Name	Year	Match?
73810590	36	FORD MOTOR COMPANY	1989	yes
75481408	36	GENERAL ELECTRIC COMPANY	1998	yes
75046374	36	DEERE & COMPANY	1995	yes
76119816	36	KIA MOTORS AMERICA, INC.	2000	yes
75070691	36	DEERE & COMPANY	1991	yes

73488475	36	NISSAN NORTH AMERICA, INC.	1984	yes
75447957	36	HONEYWELL INTERNATIONAL INC.	1988	yes
85907421	36	Tesla Motors, Inc.	2009	yes
77248657	36	Oohrah Motorsports, LLC	2005	yes
77341577	36	Titan Machinery Inc.	2007	yes
85090193	36	International Business Machines Corporation	2010	yes
87495159	36	BELL EQUIPMENT LIMITED	2017	yes
77873987	36	ALTA EQUIPMENT COMPANY, INC.	2010	yes
76193112	36	Mitsubishi Caterpillar Forklift AmericaInc.	1993	yes
87543337	36	Mitsubishi Motors North America, Inc.	2000	yes
77897405	37	Solar Power Partners, Inc.	2007	no
77208622	42	MANHEIM, INC.	2008	no
85980913	36	The Charles Machine Works, Inc.	2013	yes
85324516	36	AGES Aero	2010	yes
77370537	35	CHRYSLER LLC	2005	no

Adapting

Serial number	Nice class	Owner Name	Year	Match?
77873287	42	GENERAL ELECTRIC COMPANY	2009	no
77323711	42	XEROX CORPORATION	2008	no
75462012	42	INTERNATIONAL BUSINESS MACHINES CORPORATION (IBM)	2000	yes
75374397	42	JOHNSON & JOHNSON	1995	yes
77252349	41	ROCKWELL AUTOMATION, INC.	2007	yes
75799752	35	FORD MOTOR COMPANY	1997	yes
78443183	42	SAP AMERICA, INC.	2004	yes
73794977	42	APPLIED MICRO CIRCUITS CORPORATION	1989	yes
75603278	9	APPLE INC.	2000	yes
78136673	16	LOCKHEED MARTIN CORPORATION	2002	yes
85726750	35	DEERE & COMPANY	2011	yes
74238933	37	INTERNATIONAL BUSINESS MACHINES CORPORATION	1992	yes
85460131	9	KLOX, INC.	2011	no
75562953	42	NOVARTIS AG	1998	yes
74409928	42	INTERNATIONAL BUSINESS MACHINES CORPORATION	1991	no
75877147	42	YAMAHA CORPORATION	1999	no
75182820	9	APPLE INC.	2000	no
75694029	41	MICROSOFT CORPORATION	2000	no
76042171	42	Ford Motor Company	2000	yes
74683847	9	CATERPILLAR INC.	1995	yes

Substituting

Serial number	Nice class	Owner Name	Year	Match?
77229714	37	Ford Motor Company	2007	yes
86408848	42	IBMS Global, Inc.	2014	yes
85979641	37	Caterpillar Inc.	2013	yes

86522684	42	Hewlett-Packard Development Company, L.P.	2017	yes
74660117	42	Apple Computer, Inc.	1995	yes
86440438	42	Microsoft Corporation	2013	yes
76979117	37	Rolls-Royce plc	2016	yes
78115871	7	General Electric Company	1988	yes
78816207	36	Olympus America Inc.	2006	yes
75606908	37	DEERE & COMPANY	1996	yes
73467550	42	UNIVERSAL SYSTEMS OF AMERICA, INC.	1983	yes
86524457	42	GOOGLE INC.	2015	yes
76006412	36	INTERNATIONAL BUSINESS MACHINES CORPORATION	1999	yes
74176050	39	MAZDA MOTOR CORPORATION	1987	yes
75286584	36	General Electric Capital Corporation	1996	yes
74484984	9	INTERNATIONAL BUSINESS MACHINES CORPORATION	1993	yes
73796874	37	DEERE & COMPANY	1988	yes
77742542	42	APPLE INC.	2007	yes
85171928	42	EMC CORPORATION	2010	yes
86603559	42	Vesta Corporation	2015	yes

Appendix L: Overview of intercepts and slopes

	Intercept	Slope
Whole dataset (per annum)	0.2771	0.0051
Whole dataset (cumulative)	0.2479	0.0047
Top ranked (per annum)	0.1665	0.003
Top ranked (cumulative)	0.1803	0.0007
Software (per annum)	0.3729	0.0006
Software (cumulative)	0.391	-0.0006
Technology and hardware (per annum)	0.0943	0.0054
Technology and hardware (cumulative)	0.1175	0.0021
Automobiles and parts (per annum)	0.0658	0.003
Automobiles and parts (cumulative)	0.066	0.0009
Aerospace and defense (per annum)	0.0347	0.0046
Aerospace and defense (cumulative)	0.00252	0.0023