RIIT 貿易障壁研究所

# RIIT Working Paper Series

RWP-2022-001

## A Note on the Concordance between the International Classification for Standards and the Harmonised Commodity Description and Coding System

**Naohiko IJIRI**

(RIIT, College of Economics, Nihon University)

**Sho HANEDA**

(RIIT, College of Law, Nihon University)

March 2022

Research Institute of Impediments to Trade

Tokyo, Japan

HP: https://riit.or.jp

# A Note on the Concordance between the International Classification for Standards and the Harmonised Commodity Description and Coding System*

**Naohiko IJIRI**†
(RIIT, College of Economics, Nihon University)

**Sho HANEDA**‡
(RIIT, College of Law, Nihon University)

**This version: April 2021**

**Abstract:** This study presents two concordance types: (1) the mapping database between the International Classification for Standards (ICS) and the Harmonized Commodity Description and Coding System (HS), and (2) between the HS and the International Standard Organisation (ISO). The database includes information on codes for the HS, ICS, International Standard Industry Classification (ISIC), ISO (published year), and Bilateral Trade in Goods by Industry and End-use (BTDIxE). It covers the period from 1925 to 2010. Additionally, this study explains the methodology for constructing concordances and a new classification of internationally trade goods, i.e., Ijiri, Haneda and Yamano's classification of products. The database shows that the number of international standards has increased over the past few decades. Furthermore, the share of trade value for standardized products appears to vary across industries, but does not appear to change over time.

**Keywords: International trade, technical barrier to trade (TBT), international standards, harmonization of standards.**
**JEL Codes: F13; F14**

## 1. Introduction

Since tariff levels have been declining gradually over the past few decades, it is widely accepted that non-tariff barriers (NTBs) are one of the key determinants of trade volumes (UNCTAD 2013: vii). The World Trade Organization (WTO, 2013) states that more than 350 agreements have been signed. In recent years, most countries have focused on mega regional trade agreements, such as

* The views contained in this paper are those of the authors and not necessarily those of the College of Economics, Nihon University and College of Law, Nihon University.
† Email: naohiko.ijiri@riit.or.jp
‡ Email: sho.haneda@riit.or.jp

the European Union (EU), the Trans-Pacific Partnership (TPP), and RCEP (Regional Comprehensive Economic Partnership Agreement). In the discussion of NTBs, the harmonization of international standards has been recognized as one of the main features of the WTO and Technical Barriers to Trade (TBT). International standards can increase the value of world trade by reducing trade and transaction costs (Ijiri et al. 2013). However, there is no official concordance that connects key economic variables to standard data.

Several studies have attempted to quantify the impact of product standardization on international trade. Quantitative analyses have been conducted using country- or sector-level trade data with the gravity model of international trade (Portugal-Perez et al 2009) or firm-level export data (Blind, 2004; Reyes, 2011). Nevertheless, unlike tariffs, measuring the degree of NTBs tends to be difficult for economists. This is because there are no official mapping tools to connect international standards and other economic data, although there are some non-official concordances (Blind 2004, Shepherd 2006, Portugal-Perez et al 2009). If the problem of concordance availability is solved, the impact of international standards on many economic activities can be explored, such as international trade, foreign direct investment (FDI), and research and development (R&D).

As abovementioned, some studies provide concordances between the Harmonized Commodity Description and Coding System (HS) or the Standard International Trade Classification (SITC) and the International Classification for Standards (ICS) at different disaggregation levels. Moenius (2000) developed a non-official concordance between ICS and SITC 2-digit codes. However, this database may require revision because each ICS code has multiple SITC 2-digit codes. Blind (2004) uniquely constructs a concordance that connects SITC 2-digit codes to ICS 2-digit groups, to examine the impact of product standardisation on international trade. This analysis indicates that product standardisation has a positive effect on international trade. This effect is explained by the reduction in search and transaction costs in the international trade of standardized products.

Shepherd (2006) introduced a mapping method between European standards and HS in selected industries such as agriculture and textiles, from 1995 to 2003. This database was constructed manually by the author. There are two key findings from this database. First, according to results from the European standards and HS database, nearly 50% of EU standards are identical to the ISO standards during this period. Second, although this share does not seem to be high, it does vary across sectors. Furthermore, Portugal-Perez et al. (2010) used the World Bank's EU standards database to investigate the effect of "internationally-harmonized European standards" on EU countries' imports for the electronics sector. Their hypothesis is that internationally harmonized standards decrease the cost of quality control for products (i.e., search costs). Their results show that harmonization has a positive impact on imports.

Using the concordance from Portugal-Perez et al. (2010), Reyes (2011) conducted an empirical analysis on the effect of harmonization for EU standards with international standards on U.S. manufacturing firms' trade. He states that exporters should pay additional costs when product standards are specific to destinations. This should be an NTB. The main findings of his study were twofold. First, the harmonization of the standards increases the extensive margin of exports by U.S. firms that have already exported to developing countries. Second, harmonization has a negative impact on the intensive margin of trade in such cases. As a policy implication, the harmonization of national standards with international standards can reduce trade costs, especially for small- and medium-sized firms.

However, as explained, the number of products in the SITC classification were significantly lower than that of the HS classification. This fact indicates that the HS is more appropriate for product-level analysis in international trade. Although some concordances use the HS classification, they do not cover all sectors. This implies that a person can enlarge the target sectors. The purpose of this study is to fill these gaps by developing the ICS-HS concordance to conduct an econometric analysis for the effect of international standards on international trade using a disaggregate product-level dataset, (i.e., HS 6-digit data).

The remainder of this paper is organized as follows. Section 2 introduces the methodology for developing concordance between the HS 6-digit and ICS 5- or 7-digit categories. Section 3 describes the study's data. The stylized facts are summarized in Section 4, and Section 5 concludes this paper.

## 2. HS and ICS

The ICS is provided as a classification code for international, regional, and national standards by ISO. The classification was organized into three levels: Level 1, Level 2, and Level 3. First, Level 1 includes 40 categories, which are labelled by a 2-digit number (e.g., 43 road vehicle engineering). Second, the categories are divided into 392 subgroups and denoted by a five-digit notation, which is Level 2 (e.g., 43.040 road vehicle systems). Finally, 144 of the 392 subgroups are subdivided into 909 groups labelled by a 7-digit group number, which is Level 3 (e.g., 43.040.20 lighting, signalling, and warning devices). The standards are then classified according to these three ICS levels. For instance, the appropriate field in Level 1 for ISO 3412:1992, road vehicles screened, and waterproof sparkplugs and their connections (Types 1A and 1 B) is 43 road vehicle engineering. The appropriate group for Level 2 was 43.060 internal combustion engines for road vehicles, and the subgroup of Level 3 is 43.060.50 electrical equipment and control systems. All 2-digit categories in Level 1 are reported in Table 1 (see the Appendix).

The HS classification was developed by the World Customs Organization (WCO) to construct a system for import statistical scheduling. The HS agreements were revised in 1992,

1996, 2002, 2007, and 2012, and are known as H0, H1, H2, H3, and H4, respectively. Thus, there are currently five versions of the HS classification. Therefore, one should be careful not to mix them together. The HS classifications are organized by four levels, which are known as the section, chapter, heading and subheading. The section is the highest aggregation level, whereas the subheading is the lowest. Each subheading has a unique 6-digit number, consisting of a chapter (the first 2-digit number) and heading (the next 2-digit number). For example, motor vehicles for the transport of ten or more people (including the driver) with compression-ignition internal combustion piston engine (diesel or semi-diesel), are registered as 870210 in H4. It should be noted that the HS 6-digit classification is internationally common, while each country has its own codes beyond 6-digits. For instance, Japan has its own 9-digit code and China has an 8-digit code, which is based on the HS 6-digit classification (Kumakura, 2011).

Another classification for international trade is the United Nations (UN)'s Comtrade database, which is the SITC. The SITC classification is divided into five levels: section, division, group, subgroup, and basic heading. The main difference between the HS and SITC is the number of IDs in the system. The number of subheadings in HS is over 5,000, whereas those of the basic heading in SITC is around 3,000. It is obvious that HS is a more detailed classification than SITC and is appropriate for product-level analysis.

## 3. Mapping methodology

### 3.1 Database 1: The concordance between ICS and HS 6-digit products

In this section, we explain the methodology for constructing concordance between the HS and ICS. In addition, we introduce the content of the datasets. There is no official concordance between HS and ICS; hence, we must develop a method that can connect HS and ICS codes. It should be noted that, according to Moenius (2000), there is a difference between the scheme for classifying standards (ICS in this case) and those for products (i.e., the HS and International Standard Industry Classification (ISIC)). To build the database and solve problems caused by this difference, we followed two main steps.

First, we collected the classification of both HS 6-digits and ICS 5- or 7-digits. The HS 6-digit classification is common across countries, but its definition changes almost every five years. However, our database is available for most versions of the HS classification (i.e., HS 0-3). We use information on classification from the UN, which includes short and long descriptions. This enables us to compare the two classifications more precisely, so we employ a long definition of each HS code. At this point, we exclude the ICS codes for service activities, country names, and so forth, as our main interest is to investigate the trade in goods, not in services. Furthermore, we omit HS codes that are defined as organized products. These products are defined as commodities

that have an international market and are traded physically (e.g., gold, silver, milk, orange juice, etc.).

Second, we check the description of every code of HS and ICS and compare them manually to evaluate the similarity of each ID for both HS and ICS. Our database was based on HS codes. In other words, the main ID is the HS classification, and we put the appropriate ICS codes into each HS code. For this step, we checked the definition of each HS and ICS code in English, Japanese, and sometimes in French. This is because in certain cases, we could not directly transfer English to Japanese. To understand the definitions of these codes, it is more accurate to use our first language. Therefore, we needed an alternative language to connect English and Japanese. After checking the descriptions, we combined the ICS codes with the proper HS codes.

The database contains five categories. First, we used the HS codes as the main ID. As abovementioned, the definition of each HS code can be changed every five years. For this reason, the database covers the H0-H3 versions of the HS classification. Second, there is information on the ISIC for all the HS codes. Although our main interest is to examine the impact of standardization on trade at a product level, it is also important to conduct industry-level analyses. This is because the characteristics of standardization may vary across industries. Third, our database includes data regarding the end-use category, which is obtained from the Bilateral Trade in Goods by Industry and End-use (BTDIxE). This explains the stage in which a product is used or traded. For example, if a product is an intermediate good, it is produced by some firms and traded with other suppliers. However, if it is the final product, then the goods are assembled by the final manufacturers and sold to consumers. Fourth, there is an ICS code in the concordance. Finally, we obtained information on the ISO codes and their publication year.

In further studies, five factors should be considered. First, one HS code can have more than one ICS code in our database (there is the possibility of a double-count error). Second, as with the first issue, one ICS code can have more than one HS code. Third, there may be no ICS codes for some HS codes. Fourth, it is quite difficult to specify ICS codes for chemicals and medicine, as we might not be able to read their definitions as precisely. Finally, we should consider a method with new technology, such as AI and deep learning. These issues require further attention.

### 3.2 New Classification of internationally traded products: Ijiri, Haneda and Yamano's Classification

Rauch (1999) provides a well-known classification of internationally trade products based on the differences in the elasticity of substitution among varieties for trade goods. He has grouped trade goods into three categories: Organised market products, reference price products, and differentiated products. The first two categories are considered as homogeneous products. This Rauch's product classification has been used by many empirical research papers so far. There are

some drawbacks in Rauch's classification. For example, it uses SITC 5-digit codes, not HS 6-digit codes, as a product classification. Most of the papers which utilize this classification use HS 6-digit trade data. It indicates researchers converted Rauch's SITC codes to HS 6-digit codes, even though there would be mismatches between these two codes. It must be more precise to make Rauch's classification for HS 6-digit products. However, the definition of the reference price products is not traceable. As Rauch explained, he categorizes the products which he can have price information from the industrial specific trade magazines as reference price products. But he did not clarify how we can get that information. This is another drawback in Rauch classification.

We shall make a new product type classification for HS 6-digit products which can overcome the drawbacks. Ijiri, Haneda and Yamano (2012) groups HS 6-digit products into three categories, in the similar manner as Rauch classification: Organized market products, standardised differentiated products, and non-standardised differentiated products. Only the first one is homogeneous products. This classification (hereafter, IHY classification) utilizes the above database 1, the concordance between ICS and HS 6-digit products. The definitions of the three categories in the IHY Classification are the followings.

Organized market products:

In the same way as Rauch (1999), IHY has homogeneous products, which are organised market products (hereafter, O products). The HS 6-digit products which are considered to be same as the commodities listed in international commodity markets, such as the Chicago Mercantile Exchange (CME), New York Mercantile Exchange (NYMEX) and London Metal Exchange (LME). And, these commodities must be transacted under the condition of a physical settlement, not a cash settlement. We have identified 54 HS 6-digit products as O products in this manner. As shown in Table 2, most of O products are agricultural products, metals, and natural resources.

Standardised differentiated products:

The commodity markets require a very precise product specification to the commodities in the market. Therefore, we can consider these commodities as homogeneous product. Not as strict as the commodity markets, international standards also require a certain product specification, such as size, quality, safety, etc. We have identified HS 6-digit products if they have corresponding international standards, based on the above concordance between ICS and HS. We have categorised such products as standardised differentiated products (hereafter, S products).

Non-standardised differentiated products:

The HS 6-digit products excluding O products and S products are categorised as non-standardised differentiated products (hereafter D products). In short, D products are not required to satisfy any apparent product specifications.

One of the important features of IHY classification is the following: IHY product type classification is time variant since D products shall turn into S products if corresponding international standards are published for them by international standards authorities, such as ISO, IEC, while Rauch classification is time invariant. Therefore, IHY classification should be updated year by year.

### 3.3 Database 2: The concordance between ISO/IEC standards and HS 6-digit products

Ijiri, Yamano and Miao (2013) use the previous concordance between ICS and HS 6-digit products, i.e., database 1, for its analysis on the effects of international standardisation on bilateral trade flows between 57 countries including both OECD and selected non-OECD countries. As explained above the concordance covers all HS 6-digit products and shows the matched results between HS 6-digit product and 5 or 7-digit ICS codes. This is the only existing concordance between full HS 6-digit products and ICS. However, it is not the concordance between HS 6-digit products and each ISO/IEC standard. This is one of the shortcomings of their concordance.

We have tried to make up for the shortcoming of Ijiri and Haneda's concordance by developing a new concordance between each HS 6-digit product and ISO/IEC standard. It does not cover all HS products but covers HS products in ISIC Rev.3. 29 to 35 industries. The industries in ISIC29 to 35 contain relatively mid- or high-tech manufacturing products as shown in Table 3.

For database 2, we employ the definition of HS 6-digit codes that belong to the ISIC classification 29-35 and the description of all Japanese national standards published by the Japanese Industrial Standards (JIS). By developing the mapping method, we can use the information regarding the degree of harmonization between national and international standards in Japan. The data can be applied to both descriptive statistics and quantitative analyses of NTBs regarding their standards. There are three types of international harmonization in this dataset. The first is “Identical (IDT),” which means that a national standard is identical to an international standard. The second is “Modified (MOD),” which indicates that a national standard is a modified version of international standard. The final type explains that a national standard is not equal to an international standard and is known as “Not equalized (NEQ).” These characteristics can be viewed as an indicator of the NTB degree.

Using the name, short explanation and ICS code of each ISO/IEC standard, we have judged relevancy of each ISO/IEC standard and one or more HS 6-digit products, and then mapped the most relevant HS 6-digit products with ISO/IEC standards. We also identify the year

of product type switch from non-standardised products to standardised product by considering the publication year of each international standard. If more than two international standards are mapped with a HS 6-digit product, we use the publication year of the first international standards. We can identify the year of becoming a standardised product using our new concordance. The concordance covers 1196 HS 6-digit products in the industries from ISIC 29 to ISIC 35. We also collect End-use category for those products from The OECD STAN Bilateral Trade Database by Industry and End-Use (BTDIxE).

Based on the JSA[§] database, the Japanese Industrial Standards (JIS) is possibly to be categorised into the following group by using our concordance between ISO/IEC standards and HS, since the JSA data contains the corresponding ISO/IEC standards codes to each JIS if available (unfortunately not all JIS have its corresponding ISO/IEC standards codes). The results of mapped JIS with ISO/IEC standards are reported in Table 4.

As shown in Table 4, the degrees of harmonisation of JIS with international standards are complicated. The JSA categories the degrees of harmonisation of JIS into three groups: IDT, MOD, and NEQ. IDT indicates that the JIS and its corresponding international standards are identical (i.e., harmonised). MOD indicates that the JIS is modified from its corresponding international standards and is not fully harmonised with it. And, NEQ indicates that the JIS and its corresponding international standards are not identical with each other. In addition, there should be some JIS that do not have any corresponding international standards. We consider such a JIS as non-harmonised national standard in this paper.

Table 4 shows a summary of the degrees of the harmonisation of the JIS. The classification code for the JIS is organised with one alphabet and 4-digit numerical number. The total number of JIS published by 2014 is 18110, which includes branch standards. According to the JSA database, IDT is 14.5% of JIS, while MOD and NEQ are 20.5% and 1.2% of JIS, respectively. Accordingly, the reminder is also considered as non-harmonised JIS because of absence of corresponding international standards.

Based on these categories, we decide a degree of harmonisation of each HS 6-digit product in ISIC 29 to 35 industries. In fact, most of JIS have multiple corresponding international standards. Hence, it is not straightforward for us to decide each HS 6-digit product's degree of harmonisation. In this paper we use the following definitions to decide each product's degree of harmonisation: A harmonised standardised product has only corresponding JIS standards which are categorised as IDT, while a non-harmonised standardised product has a combination of some

[§] Japanese Standards Association (JSA) is the national standards body in Japan. They develop national standards, Japanese Industrial Standards (JIS). They have kindly provided the database of JIS to us.

corresponding JIS standards which are categorised as at least two of these three categories; IDT, MOD and NEQ.

Table 5 shows, in the upper part of the table, the total number of the published international standards up to the year from 1997 to 2011 by each mapped ISIC 2-digit industry and the number of HS 6-digit products in the industry. In the middle part of the table, the average number of published international standards is shown. The bottom of the table shows that the number of the published intentional standards in each year. According to Table 5, the total number of the published international standard in ISIC 29 is the largest among the other industries in 2011. However, the largest average number of the published standards - the number of published standards per product- is in ISIC 33 in 2011.

## 4. Stylised facts

We explain the characteristics of our database by summarizing and editing trade data. To achieve this, we follow three steps. First, we compare the share of trade values for standardized goods in each industry in 1995 to those of 2009, to check the features of each sector. Second, the variation in the number of international standards during the period 1925 to 2010 is reported. Third, the average numbers of international standards by industry and end-use category from 1988 to 2011 are summarized.

The differences in trade share of standardized products across industries for 1995 and 2009 are reported in Figures 1 and 2. The value varies among all sectors, which implies that there may be industry-specific characteristics regarding international standards and trade. Thus, it should be noted that industry fixed effects must be considered when we conduct the empirical analysis.

Figure 3 summarizes the number of international standards from 1925 to 2010. It indicates the number of international standards has increased over the past few decades. This means that it is important for researchers to consider these facts when studying policy-related issues, such as NTBs and the harmonization of international standards.

Finally, it is essential to check the variation in the number of international standards using panel data. We focus on aspects of both industry and end-use, from 1988 to 2011. Figures 4 and 5 show the average number of international standards by industry and end-use category. Figure 3 illustrates the two key differences across industries. First, low-technology or natural-resource industries tend to have a higher degree of standardization. Second, highly standardised sectors are more likely to increase the average number of international standards compared to less standardized sectors. Figure 4 indicates that there are certain differences among the nine end-use classifications. Therefore, we must consider the bias caused by omissions of these industries and end-use properties when examining the effect of international standards on trade.

## 5. Concluding remarks

Many studies have investigated and quantified the degree of NTBs, but few have tried to develop the database that measures NTBs for both national and international standards. This study attempts to construct two types of mapping methods to allow trade and standard data to converse. Using these datasets, researchers and policymakers can conduct studies on this topic, including both descriptive statistics and econometric analyses.

In this study, we used information on the HS system, ICS, and JIS to construct the concordances manually. However, this is nothing more than the first challenge and step in developing research infrastructure for this field. Thus, further studies that improve mapping tools and employ other approaches, such as machine learning, should also be conducted.

In addition, we provide a new classification of traded products in HS 6-digit, i.e., IHY classification, which may have better ground than Rauch's classification.

**References**

Blind, K. (2004). *The Economics of Standards*. Edward Elgar Publishing, Williston.

Ijiri, N., Yamano, N. and Miao, G. (2013). International Standards, Product Substitutability, and Global Trade Network. *EURAS Proceedings 2013*, pp. 187-200.

International Organization for Standardization (2005). International Classification for Standards, 6th edition. International Organization for Standardization.

Kumakura, M. (2011). The Characteristics and Usage of UN Comtrade. *IDE JETRO research report.* 2010-2-03.

Moenius, J. (2006). Do National Standards Hinder or Promote Trade in Electrical Products? Commended Paper, *IEC Centenary Challenge*, Geneva.

Portugal-Perez, A., Reyes, J. D. and Wilson, J. S. (2010). Beyond the Information Technology Agreement: Harmonisation of Standards and Trade in Electronics. *The World Economy*, 33 (12), 1870-1897.

Rauch, J. E. (1999). Networks versus Markets in International Trade. *Journal of International Economics*, 48(1), pp.7-35.

Reyes, J. D. (2011). International Harmonization of Product Standards and Firm Heterogeneity in International Trade. *Policy Research Working Paper,* No. 5677. The World Bank.

Shepherd, B. (2006). The EU Standards Database: Overview and User Guide. Mimeo.

Swann, G. P. (2010). International Standards and Trade: A Review of the Empirical Literature. *OECD* trade policy *Working Papers*, No. 97. OECD Publishing.

UNCTAD (2013). NON-TARIFF Measures TO TRADE: Economic and Policy Issues for Developing Countries. United Nations.
available at http://go.worldbank.org/6OEYNCYSD0.

WTO (2013). Annual Report. World Trade Organization, Geneva, Switzerland.

## Appendix

Table 1: ICS 2-digit classification

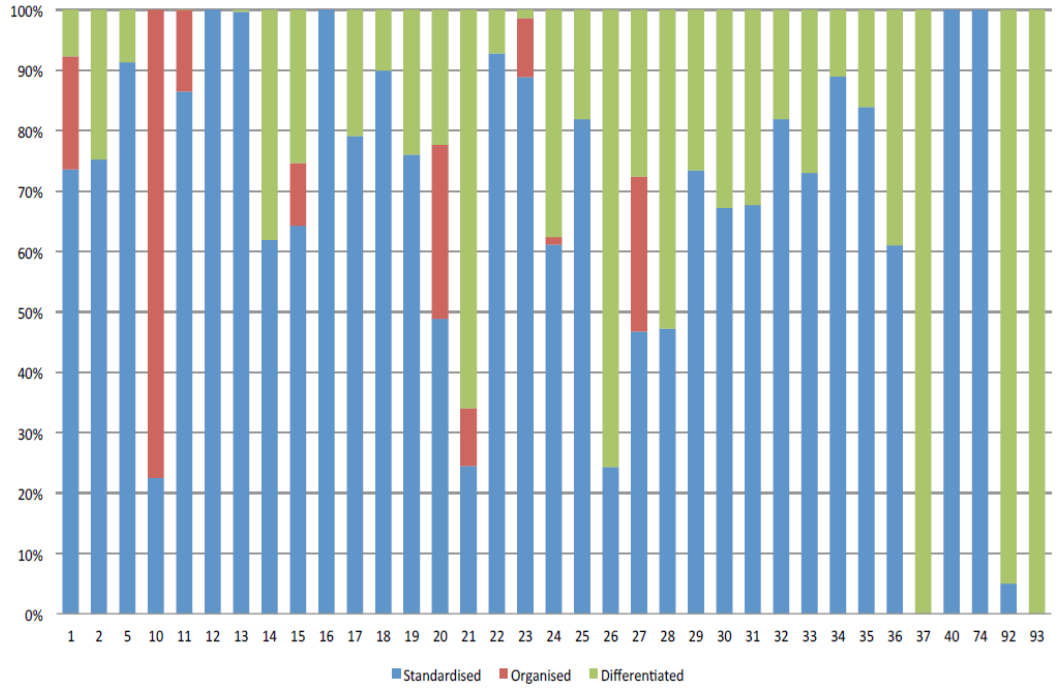
| ID | Description |
|---|---|
| 01 | GENERALITIES. TERMINOLOGY. STANDARDIZATION. DOCUMENTATION |
| 03 | SERVICES. COMPANY ORGANIZATION, MANAGEMENT AND QUALITY. ADMINISTRATION.TRANSPORT. SOCIOLOGY |
| 07 | MATHEMATICS. NATURAL SCIENCES |
| 11 | HEALTH CARE TECHNOLOGY |
| 13 | ENVIRONMENT. HEALTH PROTECTION. SAFETY |
| 17 | METROLOGY AND MEASUREMENT. PHYSICAL PHENOMENA |
| 19 | TESTING |
| 21 | MECHANICAL SYSTEMS AND COMPONENTS FOR GENERAL USE |
| 23 | FLUID SYSTEMS AND COMPONENTS FOR GENERAL USE |
| 25 | MANUFACTURINGENGINEERING |
| 27 | ENERGY AND HEAT TRANSFER ENGINEERING |
| 29 | ELECTRICAL ENGINEERING |
| 31 | ELECTRONICS |
| 33 | TELECOMMUNICATIONS. AUDIO AND VIDEO ENGINEERING |
| 35 | INFORMATION TECHNOLOGY. OFFICE MACHINES |
| 37 | IMAGETECHNOLOGY |
| 39 | PRECISION MECHANICS. JEWELLERY |
| 43 | ROAD VEHICLES ENGINEERING |
| 45 | RAILWAYENGINEERING |
| 47 | SHIPBUILDING AND MARINE STRUCTURES |
| 49 | AIRCRAFT AND SPACE VEHICLE ENGINEERING |
| 53 | MATERIALS HANDLING EQUIPMENT |
| 55 | PACKAGING AND DISTRIBUTION OF GOODS |
| 59 | TEXTILE AND LEATHER TECHNOLOGY |
| 61 | CLOTHINGINDUSTRY |
| 65 | AGRICULTURE |
| 67 | FOOD TECHNOLOGY |
| 71 | CHEMICAL TECHNOLOGY |
| 73 | MINING AND MINERALS |
| 75 | PETROLEUM AND RELATED TECHNOLOGIES |
| 77 | METALLURGY |
| 79 | WOODTECHNOLOGY |
| 81 | GLASS AND CERAMICS INDUSTRIES |
| 83 | RUBBER AND PLASTIC INDUSTRIES |
| 85 | PAPER TECHNOLOGY |
| 87 | PAINT AND COLOUR INDUSTRIES |
| 91 | CONSTRUCTION MATERIALS AND BUILDING |
| 93 | CIVILENGINEERING |
| 95 | MILITARYENGINEERING |
| 97 | DOMESTIC AND COMMERCIAL EQUIPMENT. ENTERTAINMENT. SPORTS |
| 99 | This field is reserved for internal miscellaneous purposes |

Source: International Organization for Standardization (2005).

Table 2: the list of O products in HS 6-digit (H1)

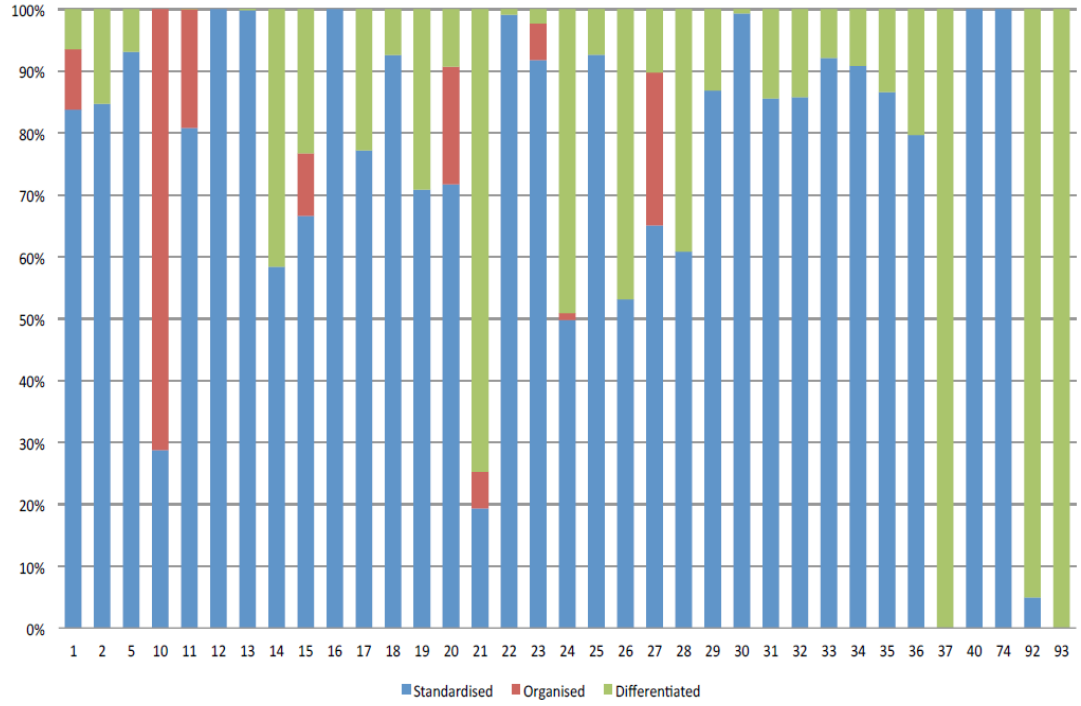
| HS (6-digit) | Description |
|---|---|
| 010210 | Bovine animals; live, pure-bred breeding animals |
| 010290 | Bovine animals; live, other than pure-bred breeding animals |
| 020311 | Meat; of swine, carcasses and half-carcasses, fresh or chilled |
| 020312 | Meat; of swine, hams, shoulders and cuts thereof, with bone in, fresh or chilled |
| 020319 | Meat; of swine, n.e.s. in item no. 0203.1, fresh or chilled |
| 020321 | Meat; of swine, carcasses and half-carcasses, frozen |
| 020322 | Meat; of swine, hams, shoulders and cuts thereof, with bone in, frozen |
| 020329 | Meat; of swine, n.e.s. in item no. 0203.2, frozen |
| 020630 | Offal, edible; of swine, fresh or chilled |
| 020649 | Offal, edible; of swine, (other than livers), frozen |
| 020900 | Fat; pig fat, free of lean meat, and poultry fat, (not rendered or otherwise extracted), fresh, chilled, frozen, salted, in brine, dried or smoked |
| 021011 | Meat, preserved; of swine, hams, shoulders and cuts thereof, with bone in, salted, in brine, dried or smoked |
| 021019 | Meat, preserved; of swine, salted, in brine, dried or smoked, n.e.s. in item no. 0210.1 |
| 040210 | Dairy produce; milk and cream, concentrated or containing added sugar or other sweetening matter, in powder, granules or other solid forms, of a fat content not exceeding 1.5% (by weight) |
| 040410 | Dairy produce; whey, whether or not concentrated or containing added sugar or other sweetening matter |
| 090111 | Coffee; not roasted or decaffeinated |
| 090112 | Coffee; decaffeinated, not roasted |
| 090121 | Coffee; roasted, not decaffeinated |
| 090122 | Coffee; roasted, decaffeinated |
| 100400 | Cereals; oats |
| 100510 | Cereals; maize (corn), seed |
| 100610 | Cereals; rice in the husk (paddy or rough) |
| 120100 | Soya beans; seed, whether or not broken |
| 120810 | Flours and meals; of soya beans |
| 150710 | Vegetable oils; soya-bean oil and its fractions, crude, whether or not degummed, not chemically modified |
| 151110 | Vegetable oils; palm oil and its fractions, crude, not chemically modified |
| 170111 | Sugars; cane sugar, raw, in solid form, not containing added flavouring or colouring matter |
| 200911 | Juice; orange, frozen, unfermented, (not containing added spirit), whether or not containing added sugar or other sweetening matter |
| 220720 | Ethyl alcohol and other spirits; denatured, of any strength |
| 270112 | Coal; bituminous, whether or not pulverised, but not agglomerated |
| 271111 | Petroleum gases and other gaseous hydrocarbons; liquefied, natural gas |
| 271112 | Petroleum gases and other gaseous hydrocarbons; liquefied, propane |
| 271113 | Petroleum gases and other gaseous hydrocarbons; liquefied, butanes |
| 271121 | Petroleum gases and other gaseous hydrocarbons; in gaseous state, natural gas |
| 390210 | Propylene, other olefin polymers; polypropylene in primary forms |
| 440710 | Wood, coniferous; sawn or chipped lengthwise, sliced or peeled, whether or not planed, sanded or finger-jointed, of a thickness exceeding 6mm |
| 470321 | Wood pulp; chemical wood pulp, soda or sulphate, (other than dissolving grades), semi-bleached or bleached, of coniferous wood |
| 520100 | Cotton; not carded or combed |
| 710692 | Metals; silver, semi-manufactured |
| 710812 | Metals; gold, non-monetary, unwrought (but not powder) |
| 711019 | Metals; platinum, semi-manufactured |
| 711029 | Metals; palladium, semi-manufactured |
| 720711 | Iron or non-alloy steel; semi-finished products of iron or non-alloy steel; containing by weight less than 0.25% of carbon, of rectangular (including square) cross-section, width less than twice thickness |
| 720719 | Iron or non-alloy steel; semi-finished products of iron or non-alloy steel, containing by weight less than 0.25% of carbon, other than rectangular or square cross-section |
| 740311 | Copper; refined, unwrought, cathodes and sections of cathodes |
| 750210 | Nickel; unwrought, not alloyed |
| 760110 | Aluminium; unwrought, (not alloyed) |
| 760120 | Aluminium; unwrought, alloys |
| 780110 | Lead; unwrought, refined |
| 790111 | Zinc; unwrought, (not alloyed), containing by weight 99.99% or more of zinc |
| 790120 | Zinc; unwrought, alloys |
| 800110 | Tin; unwrought, not alloyed |
| 800120 | Tin; unwrought, alloys |
| 810210 | Molybdenum; articles thereof, including waste and scrap, powders |

Figure 1: The import share of standards for products in each ISIC for 1995



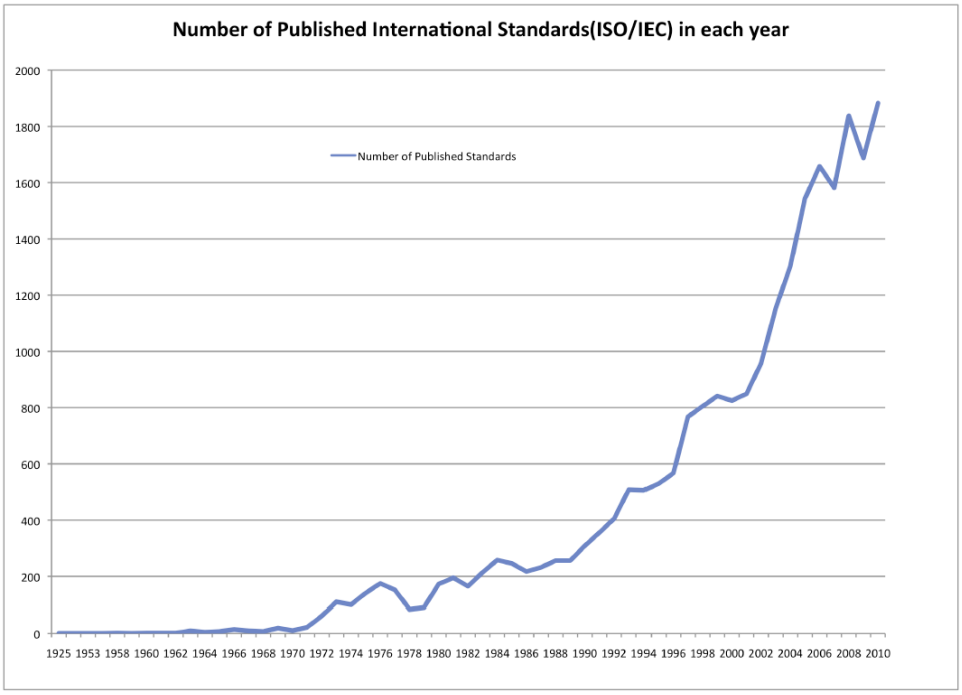

Source: Ijiri et al. (2013).

Figure 2: The import share of standards for products in each ISIC for 2009



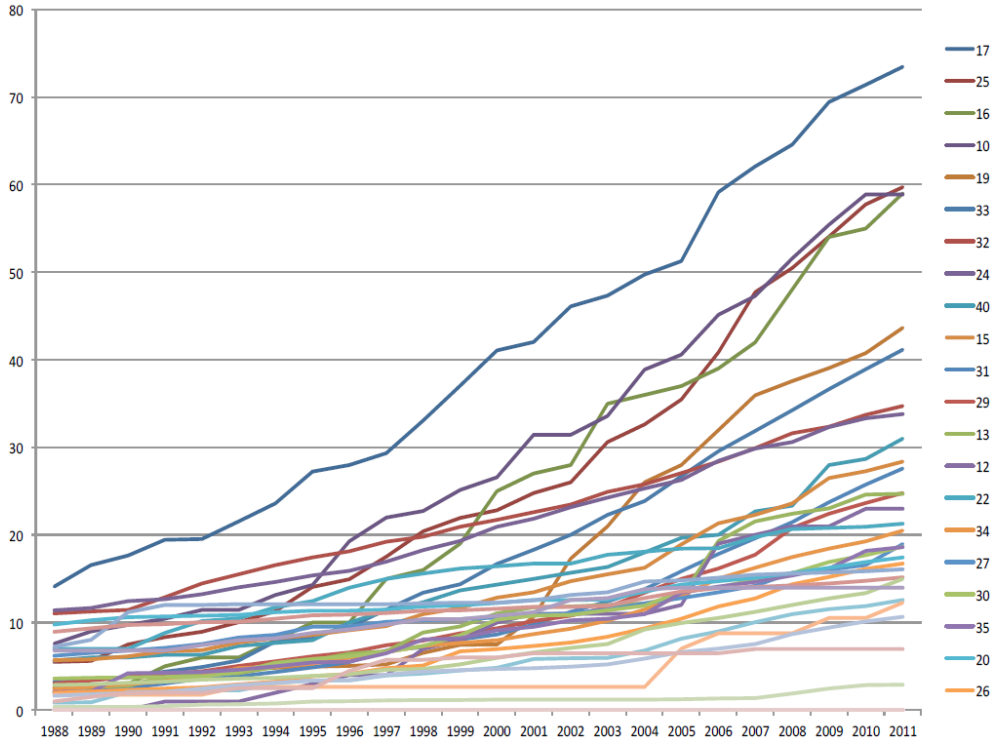

Source: Ijiri et al. (2013).

Figure 3: The number of published international standards annually, from 1925 to 2010




Source: Ijiri et al. (2013).

Figure 4: The average number of published standards for ISIC industries from 1988 to 2011




Source: Ijiri et al. (2013).

Table 3:

| ISIC Rev3. 29-35 industries |
|---|
| ISIC29 - Manufacture of machinery and equipment n.e.c., |
| ISIC30 - Manufacture of office, accounting, and computing machinery, |
| ISIC31 - Manufacture of electrical machinery and apparatus n.e.c., |
| ISIC32 - Manufacture of radio, television and communication equipment and apparatus, |
| ISIC33 - Manufacture of medical, precision, and optical instruments, watches, and clocks, |
| ISIC34 - Manufacture of motor vehicles, trailers, and semi-trailers, |
| ISIC35 - Manufacture of other transport equipment. |

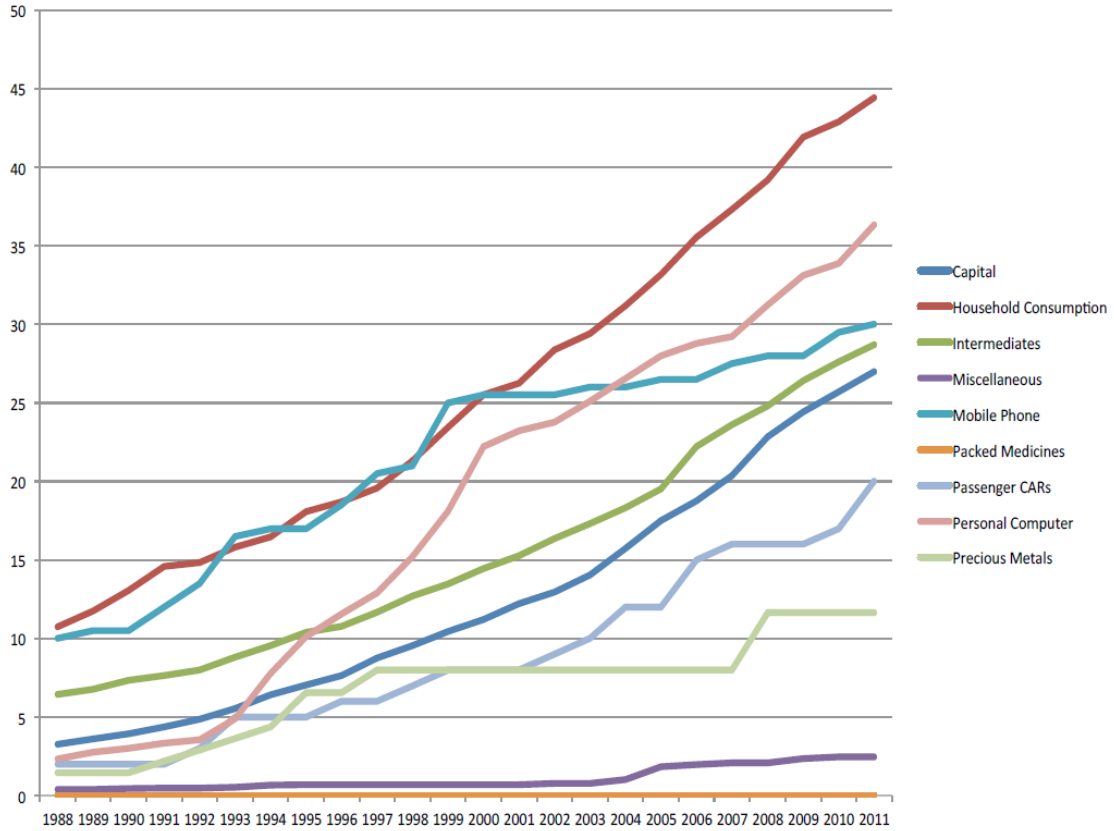
Source: https://unstats.un.org/unsd/classifications/Family/Detail/17

Table 4:

| | | Number | | | | Share | | |
|---|---|---|---|---|---|---|---|---|
| Code | Description | Total | IDT | MOD | NEQ | IDT | MOD | NEQ |
| A | Civll Engineering and Architecture | 920 | 72 | 127 | 1 | 8% | 14% | 0% |
| B | Mechanical Engineering | 2613 | 466 | 638 | 40 | 18% | 24% | 2% |
| C | Electronic and Electorical Engineering | 2664 | 650 | 698 | 71 | 24% | 26% | 3% |
| D | Automotive Engineering | 555 | 37 | 151 | 5 | 7% | 27% | 1% |
| E | Railway Engineering | 319 | 2 | 41 | 1 | 1% | 13% | 0% |
| F | Shipbuilding | 873 | 65 | 56 | 14 | 7% | 6% | 2% |
| G | Ferrous Materials and Metallurgy | 628 | 54 | 184 | 7 | 9% | 29% | 1% |
| H | Nonferrous Materials anf Metallurgy | 723 | 18 | 135 | 4 | 2% | 19% | 1% |
| K | Chemical Engineering | 3269 | 340 | 651 | 15 | 10% | 20% | 0% |
| L | Textile Engineering | 654 | 8 | 114 | 9 | 1% | 17% | 1% |
| M | Mining | 295 | 6 | 70 | 4 | 2% | 24% | 1% |
| P | Pulp and Paper | 145 | 17 | 54 | 0 | 12% | 37% | 0% |
| Q | Management System | 99 | 79 | 6 | 0 | 80% | 6% | 0% |
| R | Ceramics | 548 | 6 | 106 | 0 | 1% | 19% | 0% |
| S | Domestic Wares | 489 | 13 | 16 | 3 | 3% | 3% | 1% |
| T | Medical Equipment and Safety Appliances | 710 | 68 | 250 | 16 | 10% | 35% | 2% |
| W | Aircraft and Aviation | 403 | 60 | 1 | 0 | 15% | 0% | 0% |
| X | Information Processing | 771 | 460 | 145 | 4 | 60% | 19% | 1% |
| Z | Miscellaneous | 1432 | 199 | 278 | 19 | 14% | 19% | 1% |

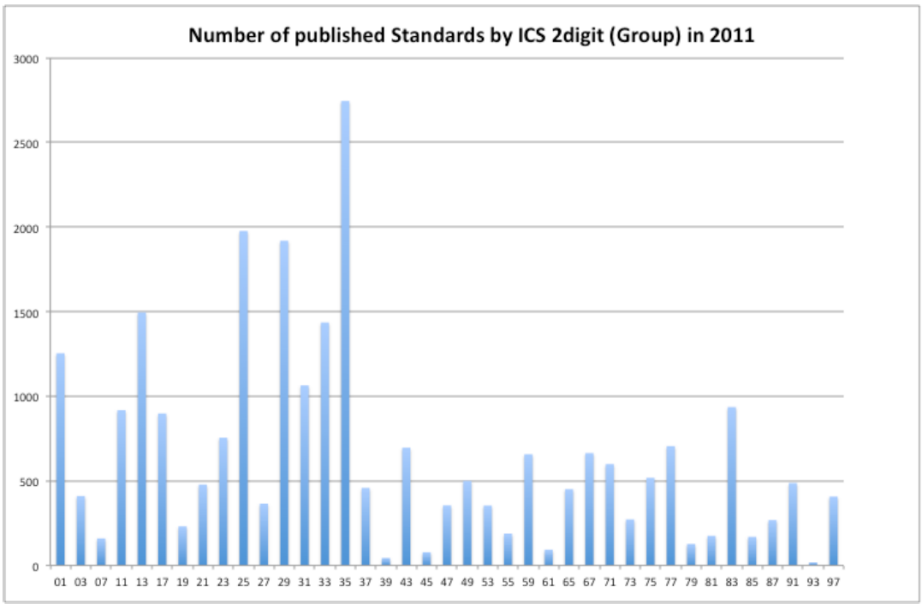
Source: JSA Database (2014)

Figure 5: The average number of internationally published standards by end-use category



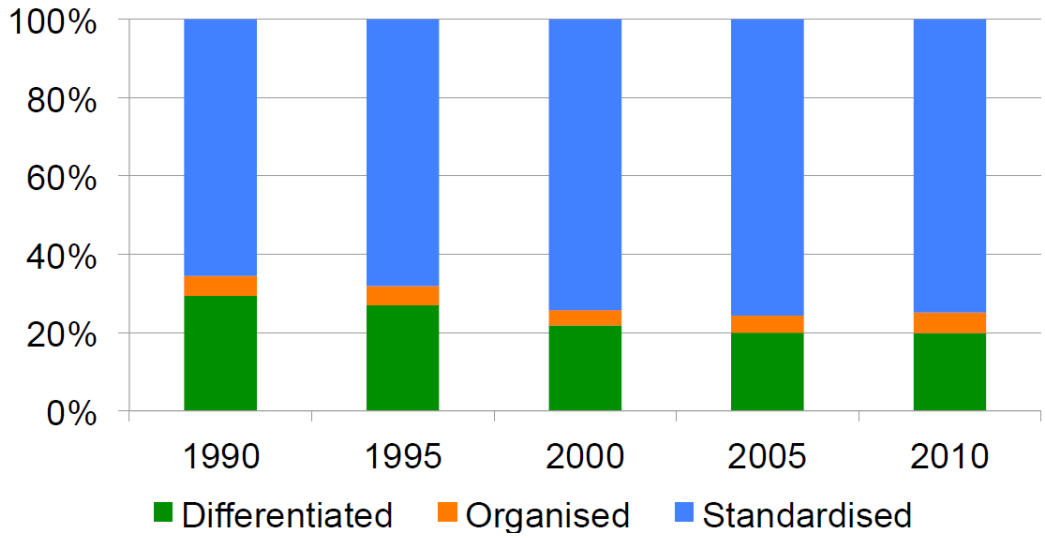

Source: Ijiri et al. (2013).

Figure 6: The number of published standards by ICS 2-digits classification in 2011




Source: Ijiri et al. (2013).

Figure 7: Share of trade volume by product type




Source: OECD ITCS / Comtrade, World Imports.

Table 5: The degree of the standardisation of the HS products in ISIC29 to 35 industries from 1997 to 2011

Stock of ISO/IEC standards

| | | ISO/IEC | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ISIC | #HS | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
| 29 | 541 | 3,893 | 4,272 | 4,668 | 5,029 | 5,461 | 6,019 | 6,623 | 7,549 | 8,332 | 9,145 | 9,924 | 11,464 | 12,480 | 13,308 | 14,164 |
| 30 | 47 | 364 | 382 | 434 | 511 | 532 | 535 | 547 | 564 | 610 | 630 | 654 | 677 | 714 | 744 | 782 |
| 31 | 134 | 1,191 | 1,262 | 1,411 | 1,507 | 1,647 | 1,829 | 1,980 | 2,152 | 2,450 | 2,682 | 2,921 | 3,162 | 3,483 | 3,748 | 4,058 |
| 32 | 101 | 2,015 | 2,074 | 2,190 | 2,272 | 2,360 | 2,463 | 2,613 | 2,693 | 2,809 | 2,946 | 3,096 | 3,266 | 3,339 | 3,481 | 3,666 |
| 33 | 226 | 2,439 | 2,792 | 2,989 | 3,423 | 3,773 | 4,176 | 4,658 | 5,002 | 5,625 | 6,214 | 6,755 | 7,334 | 7,885 | 8,379 | 8,956 |
| 34 | 61 | 409 | 454 | 479 | 508 | 565 | 606 | 673 | 736 | 841 | 976 | 1,056 | 1,134 | 1,196 | 1,260 | 1,351 |
| 35 | 86 | 928 | 1,102 | 1,124 | 1,217 | 1,305 | 1,377 | 1,396 | 1,431 | 1,688 | 1,794 | 1,894 | 1,985 | 2,076 | 2,268 | 2,370 |

Average of ISO/IEC standards

| | | ISO/IEC | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ISIC | #HS | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
| 29 | 541 | 7.20 | 7.90 | 8.63 | 9.30 | 10.09 | 11.13 | 12.24 | 13.95 | 15.40 | 16.90 | 18.34 | 21.19 | 23.07 | 24.60 | 26.18 |
| 30 | 47 | 7.74 | 8.13 | 9.23 | 10.87 | 11.32 | 11.38 | 11.64 | 12.00 | 12.98 | 13.40 | 13.91 | 14.40 | 15.19 | 15.83 | 16.64 |
| 31 | 134 | 8.89 | 9.42 | 10.53 | 11.25 | 12.29 | 13.65 | 14.78 | 16.06 | 18.28 | 20.01 | 21.80 | 23.60 | 25.99 | 27.97 | 30.28 |
| 32 | 101 | 19.95 | 20.53 | 21.68 | 22.50 | 23.37 | 24.39 | 25.87 | 26.66 | 27.81 | 29.17 | 30.65 | 32.34 | 33.06 | 34.47 | 36.30 |
| 33 | 226 | 10.79 | 12.35 | 13.23 | 15.15 | 16.69 | 18.48 | 20.61 | 22.13 | 24.89 | 27.50 | 29.89 | 32.45 | 34.89 | 37.08 | 39.63 |
| 34 | 61 | 6.70 | 7.44 | 7.85 | 8.33 | 9.26 | 9.93 | 11.03 | 12.07 | 13.79 | 16.00 | 17.31 | 18.59 | 19.61 | 20.66 | 22.15 |
| 35 | 86 | 10.79 | 12.81 | 13.07 | 14.15 | 15.17 | 16.01 | 16.23 | 16.64 | 19.63 | 20.86 | 22.02 | 23.08 | 24.14 | 26.37 | 27.56 |

Flow of ISO/IEC standards

| | | ISO/IEC | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ISIC | #HS | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
| 29 | 541 | 456 | 379 | 396 | 361 | 432 | 558 | 604 | 926 | 783 | 813 | 779 | 1,540 | 1,016 | 828 | 856 |
| 30 | 47 | 23 | 18 | 52 | 77 | 21 | 3 | 12 | 17 | 46 | 20 | 24 | 23 | 37 | 30 | 38 |
| 31 | 134 | 194 | 71 | 149 | 96 | 140 | 182 | 151 | 172 | 298 | 232 | 239 | 241 | 321 | 265 | 310 |
| 32 | 101 | 138 | 59 | 116 | 82 | 88 | 103 | 150 | 80 | 116 | 137 | 150 | 170 | 73 | 142 | 185 |
| 33 | 226 | 427 | 353 | 197 | 434 | 350 | 403 | 482 | 344 | 623 | 589 | 541 | 579 | 551 | 494 | 577 |
| 34 | 61 | 44 | 45 | 25 | 29 | 57 | 41 | 67 | 63 | 105 | 135 | 80 | 78 | 62 | 64 | 91 |
| 35 | 86 | 113 | 174 | 22 | 93 | 88 | 72 | 19 | 35 | 257 | 106 | 100 | 91 | 91 | 192 | 102 |

Source: Author's calculation using the above concordance, database2, and JSA Database