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"International Standards, Product Substitutability, and Global Trade Network"

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International Standards, Product substitutability, and Global Trade Network

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Abstract

This study examines the role of internationally harmonised standards on goods in determining potential trade partners across countries in the context of deepening economic globalisation. The analysis classifies traded products into three groups-homogeneous (organised market), internationally standardised and non-standardised differentiated products-by considering the degree of product comparability and substitutability to potential partners in GVCs in order to examine recent international specialisation patterns across countries. For this analysis we have developed alternative product-type classification, which is in HS 6-digit products, to widely used Rauch's classification (1999).

KEYWORDS: International trade, International standards, WTO/TBT, Product-type classification

1 Introduction

Economic impacts of International standards on international trade have not drawn much attention yet, although it is one of the important aspects of technical barriers to trade (TBT) defined by WTO/TBT. One of the reason of limited number of studies on international standards is that we don't have well organised international standards database which can work with other economic data, such as international trade, macroeconomic data,

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industry production data. This data limitation stems mainly from a lack of official concordance between international classification of standards (ICS) and other economic data. International standards are currently classified with ICS codes provided by ISO.[1] However, no international standards bodies, such as ISO, IEC and ITU, has provided official concordance with other economic data yet. It is the key for researchers who wish to analyse the effects of standardisation that develop the concordance between ICS and other economic data. For example, World Bank has developed a concordance between EU standards and HS products in some HS chapters using Perinorm database, and the results are partially published in its series of publications-for textiles, clothing, and footwear sector (Shepherd,2007) ,(Czubala et al., 2007), for electronics sector (Perez et al., 2009),(Reyes,2011).

We may point out that economic impacts of standardisation are increasing in deepening globalisation, since international vertical production linkage increasingly and continuingly spreads across countries and regions. It is becoming more important for producers to manage their globalised supply-chain activities efficiently in terms of costs of production and quality of their products. It has been documented by some OECD projects, such as Bo,Yamano and Webb(2010), that import contents of production (ICP) and export (ICE) are increasing in developed countries in the last two decades. This indicates increasing import value of intermediates respect to production or export size of developed countries in manufacturing sectors. It is said that globalised supply-chains tend to require the producer or manager more coordination activities between production stages located in foreign countries. As discussed in Butter et al. (2007), standardisation is more important to global value-chains, since standardisation possibly reduces the costs of coordination in remote facilities across countries.

Similarly, other papers discuss the importance of standardisation in current globalised economies, since it may reduce transaction costs and trade costs, and therefore increase international trade. Consequently, it also increase competition among suppliers and compatibility (or alternative suppliers) for buyers. Such increasing compatibility is important in that buyers can have alternative (potential) suppliers. If any crackdown would happen in current global value chains, high compatibility of products may help to absorb falling supply capacity in one region by shifting suppliers in the other regions and increasing procurement from them. If standardisation of products increases its compatibility, then internationally standardised products may have higher degree of compatibility/substitutability than non-standardised products. In order to examine this hypothesis we have developed new product-type classification[2] , which categorises HS 6-digit products into the following three product-types, based on potential differences in degree of product differentiation:

Organised exchange (O) homogeneous products
Internationally Standardised differentiated (S) products

[1] From ISO website, one can download ICS codebook.

[2] The results and explanation of this new product-type classification is documented in Ijiri, Haneda and Yamano(2012).

Non-Standardised differentiated (D) products

This paper has two research purposes. One is to verify the premise of our new product-type classification. As mentioned above, O, S, and D products have different degree of substitutability each other. We expect that O products have the highest degree of substitutability since it is consider to be homogeneous products, whereas D products are expected to have the lowest degree of substitutability. In comparison with O and D products, S products are expected to have a moderate degree of substitutability. Second is that we will measure the shares of internationally standardised products' international trade flow among selected 57 countries in the period between 1996 and 2010 in HS 6-digit product level trade data using our new concordance with ICS 7-digit and HS 6-digit products. We consider that the standardisation is the results of international standards published by international standards organisations, such as ISO, IEC, and ITU. Our hypothesis is that more standardised products have higher degree of substitutability than less standardised, i.e., more differentiated, products. We will empirically examine this hypothesis with gravity model.

This paper is structured as follows. Section 2 reviews both theoretical and empirical preceding papers which examines the effects of standardisation on international trade flows. In Section 3, we present results of the degree of standardisation by industry based on our concordance between ICS and HS 6-digit products[3] . Section 4 explains our analytical models and estimation strategy. We choose Heckman Tobit and PPML (Poisson pseudo-maximum-likelihood) as our estimation methods, considering a critique of the missing zero trade values addressed by Santos and Tenreyro (2006) . Finally, in section 5 we will conclude our results.

2 Preceding studies in International standards and international trade

We will review the results of previous studies related to the effects of standardisation on international trade flows in both theoretical and empirical works. As summarised in Blind(2004), the theoretical discussions of standardisation can be linked with broad range of economics topics. Similarly, for the empirical results, as seen in Swann (2010 a) and Swann (2010 b) , the empirical studies are conducted from a board set of perspectives. In this section, we will focus on the discussions which can be related to international trade.

The economic effects of standardisation have been pointed out broadly from a microeconomics point of view. Blind (2004) and Swann(2010 a,b) provide the summary of previous studies. Blind(2004) suggested that standardisation may affect international trade flow positively in that it would reduce transaction costs, such as search costs and information costs,

[3] The explanation of this concordance between ICS and HS 6-digit products is documented in Ijiri and Haneda (2012)

between trading partners. For example, Jones and Hudson (1996) theoretically explained that standardisation of products may reduce the costs of uncertainty which attributes to buyers' product quality examination. They pointed out that one of the important effects of standardisation is to reduce a variation in product quality among varieties. For instance, if standardisation imposes a lower bound on product quality, then buyer can search out its suitable product within narrower range of product quality, compared with the range before the standardisation. Hence, standardisation will enhance the reduction of buyers' search costs. Similarly, Butter et al. (2007) also discussed that standards have a function to reduce transaction costs, especially related to value-chains, since it tends to require more coordination activities between production stages located in foreign countries. According to them, when buyers and sellers deal with standardised products, they only need to bargain the price and delivery conditions each other. It means they can complete their transaction with smaller transaction costs compared with the transaction costs of non-standardised products. Another theoretical issues in standardisation[4] are also documented in Blind (2004) and Swann (2010 a).

Some papers empirically examined the effects of standardisation in international trade flows. There are two groups in previous papers, judging from its focus on what characteristics of standards it concerns. One is focusing on the role of national standards as a deterrent factor to imports. The other is focusing on the role of international standards as a driving force of imports. In most of the previous papers national standards are considered to be a trade deterrent factor, whereas international standards are considered to be a trade facilitating factor.

Data of Standards is the most differentiating factor in those empirical works, since it constrains the target countries, industry and year of each study. Most of previous papers use standards data from Perinorm database. As documented in Swann (2010) and a series of World Bank papers on international standards and international trade flows, such as Shepherd (2007),Portugal-Perez (2009), Perinorm database[5] contains varieties of useful information related to standards, such as number of national standards for 23 countries, number of national standards harmonised with international standards or trading partner's national standards. These records are registered with ICS codes. Since there is no official concordance with ICS and trade data, researchers have to develop their own concordance between ISC and trade data classification for their empirical analysis of standardisation. Such concordance is the one put high limitation on this research topic.

For examples of importer country analysis, Swann et al. (1996) examined UK international trade. Blind and Jungmittag (2001) examines international trade flows in Germany. A series of World bank papers examine mainly international trade flows in EU countries. And Moenius examines OECD countries. Unlike with other studies, Shepherd (2007) covers

[4]For example, Economies of Scale, Free rider problem, Network externalities, Bandwagon effects, Innovation and standards

[5]Perinorm database is the largest standards commercial database, which contains more than 1,400,000 records. These records are collected from more than 200 standards publishing organisations in 23 countries.

both developing and developing countries, in total around 200 countries, in his analysis. However it contains relatively small number of manufacturing sectors, such as textiles (HS chapters 50-60), clothing (HS chapters 61-63), and footwear (HS chapter 64). He studies the effects of standardisation on extensive margins of international trade using EU standards database and Eurostat 8-digit trade data. He uses highly disaggregate trade data compared with the other papers. In comparison with the preceding studies we will examine the effects of international standards on international trade in wider range of countries and HS 6-digit disaggregate product level in this paper.

3 Concordance with ICS and HS

International standards are published mainly by three international organisation, namely ISO, IEC, and ITU. In this subsection we show basic statistics of the international standards based on ISO and IEC data. Unfortunately,the data of ITU standards is currently not available for us. Figure 1 shows the number of published international standards in each year from the first published international standards to the latest available one, in the period between 1925 and 2010. Table 1 shows the stock of the numbers of international standards by ICS 2-digit category (group) since the first international standards published, 1925. As seen in both Figure 1 and Table 1 the number of international standards published have drastically increased and the international standards bodies have been very active for developing international standards in the last decades among international society. The number of the standards published has been doubled in this period. Such a drastic increase of international standards publication should be related to the issue of the WTO/TBT, which came into effect in 1995. It has required that national standards of member countries should be harmonised internationally in order to reduce or eliminate international trade barriers stemmed from exclusive national standards.

As for EU standards published by the European Committee for Standardisation (CEN), which is the world largest national standards body, the World Bank EU Standards Database (EUSDB) provides the information of results of their mapping, such as number of standards counts in selected HS 2- and 4-digit from 1992 to 2007.

Since there is no official concordance with ICS and trade data, researchers have to develop their own concordance between ISC and trade data Classification for the analysis of standardisation effects. Therefore, as documented in Ijiri and Haneda (2012) we have developed our own concordance between HS 6-digit and ICS 5-or 7-digit codes. Our mapping method is very simple. We developed it manually, based on the verbal definition of each HS 6-digit product and each 5-or 7-digit ICS code. Compared with other manually mapped concordance between ICS and other trade products classification, such as SITC, one advantage of our concordance is that it covers all HS 6-digit products in HS classification, from HS1988 to HS2007. Therefore, we can analyse the impact of standardisation by publishing standards on international trade flows by 6-digit product level.

3.1 The HS-ICS concordance

Based on our HS-ICS concordance, we developed the industry trade value dataset for each ISIC 2-digit category using OECD BTDIxE Database. We can measure trade values by the product-types - namely O, S, and D products - in each ISIC 2-digit category. Figure 3-1 and 3-2 show the import share of each product-type in our target 57 countries in 1995 and 2009, respectively. As shown in Figure 3 and 4, the import shares of standardised products in each category are quite different across the ISIC 2-digit industries. However, there is not so much difference over time in each ISIC category in comparison with the results of year 1995 and 2009. It implies that we need to take into consideration such industry specific characteristics, i.e. fixed effect, when we run econometric regression with this dataset.

We aggregate the number of published standards to each HS 6-digit product within each ISIC 2-digit category. Then, we count the number of published standards to the HS 6-digit products which belong to each ISIC 2-digit category. We consider this aggregate number of published standards in each industry as the degree of standardisation for each ISIC 2-digit industry[6].

Figure 4 shows the average number of published standards for each ISIC industry from 1988 to 2010. It indicates that there are several differences across industries. First, the degrees of standardisation in terms of concentration of standards publication in each ISIC industry are different across industry. ISIC 17 (Manufacture of textiles) has the highest average of standards publication in 2010, followed by ISIC 10 (Manufacture of coal and lignite), ISIC 25 (Manufacture of rubber and plastic products), and ISIC 16 (Manufacture of tobacco products). For instance, we should note that these high standardised industry tend to be categorised as low-technology or natural resource related industries. Second, the deepening of standardisation by industry from 1988 to 2010 is also seen in the highly standardised ISIC industries. Further international standards publication has been toward to the already highly standardised products.

Our concordance also allows us to analyse changes in standards publication by end-use categories. We can sum up the number of published standards to each HS 6-digit products in each end-use category. Same way as the ISIC industry counts, we take average of the number of standards with number of HS 6-digit products in each end-use category. Figure 5 shows the variation in average number of international standards in each end-use in the same period as the above Figure 4. According to Figure 5 in 2010 Household Consumption products has the highest number of average standards publication among 9 end-use categories. Personal Computers and Mobile phones are the second and third highest in this rank. However, these two end-use categories have small number of HS 6-digit products based on its definitions (OECD, 2011). This might cause certain bias in the average counts. Therefore, we will focus on the other large end-use categories, such as Intermediates and

[6]The definition of average number of standards publication in ISIC 2-digit category K is the following: The average standards publication in category K = the number of standards published in category K / the number of HS 6-digit products in category k

Capital. Intermediates and Capital have almost same degree of standardisation each other. Intermediates are slightly more standardised, but the difference is very small. Household Consumption, Intermediates, and Capital products show same trends in time series, and their trends are consistently upward. However, Household consumption product is standardised about twofold than Intermediates and Capital. These difference in the degree of standardisation across industries and end-use category has not been considered in the previous papers which analyse the impacts of standardisation on international trade flows.

4 Empirical model

As Rauch (1999) found the differentiated products, which is in his definition of product types, requires ethnic network supports to trade between countries. He explained that a transaction of differentiated products requires buyer and seller to incur higher search costs in order to close its transaction than the search costs arisen from transactions of homogeneous products.

We will examine the difference in degree of substitutability among our new product-types using augmented gravity model developed by Anderson and van Wincoop (2003). In their gravity model, shown as equation (1) below, the elasticity of substitution σ among varieties is fixed in the economy. However, the elasticity of substitution of differentiated products is smaller than less differentiated products. Hence, we expect to have smaller coefficient of σ for non-standardised differentiated products than other less differentiated products, namely standardised products and organised market products, in the estimation results of the gravity model. The equation (2) as specified below is our estimation model. The estimated coefficients of the explanatory variable for trade costs, from β_3 to β_6 are our concern, and will be compared with these coefficients estimated for each product-types. We will test PPML and Heckman estimation methods, since import value for a country in a product contains zero. It is known that PPML and Heckman models are relatively less bias in the case of many zero dependent variable in the dataset. The dataset we use in the following estimation contains import values among 57 countries in year 2000.

$$Import^{ks}_{ij,t} = \frac{GDP_{i,t}\ GDP_{j,t}}{GDP_{w,t}} (\frac{\tau_{ij}}{\pi_{i,t}\ P_{j,t}})^{1-\sigma} \tag{1}$$

$Import^{ks}_{ij,t}$: Import values of HS 6-digit product, which are grouped as either O, S, or D products, in country j from county i in year t[7]

GDP: GDP of country i, j or w in year t (i is import country, j is export country and w is world)

[7]We drop this subscript for time, t, since we use one year trade data, year 2000, in the estimation.

$\pi_{i,t}$: Multilateral resistance term (MRT) or Remoteness[8] of country i
$P_{j,t}$: Multilateral resistance term (MRT) or Remoteness of country j

τ_{ij} is bilateral trade resistance term for the trade between country i and j. Since the τ_{ij} is not observable, we arrange this term as follow:

$$\tau_{ij} = Distance_{ij}\ Gravity\_dummies_j \tag{2}$$

$Distance_{ij}$: great circle distance between the largest cities in country i and j
Gravity dummies for country j :

Common language (Comlang_ethn):
If country i and j use same language, then the dummy equals to 1.
Otherwise, it equals to 0.
Contiguity(Contig):
If country i and j share the border, then the dummy equals to 1.
Otherwise, it equals to 0.
Past colonial relationship (Colony):
If country i and j have colonial relationship in the past, then the dummy equals to 1.
Otherwise, it equals to 0.

Substitute this equation (2) into (1), then taking logarithms of equation (1) with an error term, ϵ_{ij}, we can rewrite our estimation model as below.

$$\begin{aligned} \ln Import_{ij}^{ks} = -\beta_0 + \beta_1 \ln GDP_i + \beta_2 \ln GDP_j - \beta_3(\sigma-1)\ln dist_{ij} + \beta_4(\sigma-1)\pi_i \\ +\beta_5(\sigma-1)P_j - \beta_6(\sigma-1)Dummies_j + \epsilon_{ij} \end{aligned} \tag{3}$$

$$\beta_0 = \ln GDP_w$$

We will estimate this model for each product-type, O, S and D, respectively, in order to test our hypothesis that the substitutability of internationally traded products are different among our product types. We expect that size of the coefficients, β, of distance in the estimation results may vary among product types, and O product may have the largest one, because it is expected to have the largest elasticity of substitution[9] among them.

[8]Following Carrère (2006), we use "Remoteness" as a proxy variable for the MRT.

[9]Our product-type category is based on the assumption that O products is most homogeneous, and S and D products are differentiated. In addition, S product is less differentiated than D product, because S product is considered to be standardised by publication of International standards. The size order of

4.1 Estimation results

Our estimation results of the equation (3) for each product-type, O, S, and D products, are shown in Table 2. In far left of Table 2 the model 1, ALL, is the estimation results of the model using Heckman which includes all three product-types. Heckman and PPML in the top of the table denote that the three models shown under each of them employ Heckman and PPML estimation method, respectively.

The estimation results of the economic mass explanatory variables, GDP of both trade partners, and Distance in these seven models are statistically significant and these variables have expected sign, positive for GDP and negative for Distance. Similarly, Remoteness for both trade partners are statistically significant and have an expected positive sign. Constant term also has an expected negative sign and is statistically significant. These results are consistent across the product-types in the results of Heckman and PPML

Comparing the size of estimated coefficients in absolute term, which include the elasticity of substitution, of Distance among O, S, and D products, O products have the largest coefficient, while S products have the second largest and D products have smallest one in both Heckman and PPML estimation results.

Rest of the explanatory variables are the traditional gravity dummies in order to control several country-pair fixed effects which may increase or decrease the volume of international trade flows. Compared with the estimated coefficients of O, S, and D products in the gravity dummies, O products have larger coefficients than other product-types in Contiguity and Common language dummies with the Heckman estimation. On the other hands, the estimation results of PPML models are less significant and slightly different results from our expectation. Our results indicate that both estimation methods, Heckman and PPML, produce almost consistent results each other for non-dummy variables in year 2000.

5 Conclusion

As shown in the above of this paper, most of the International standards have been published since 1995. This indicates that harmonisation of national standards, as WTO/TBT requires, among member countries has proceeded substantially in the last two decades. However, the effects of standardisation on international trade flows have not been examined by many papers so far. We have developed new concordance with ICS 7-digit categories and HS 6-digit products in order to analyse the effects of standardisation on international trade flows more precisely than previous studies. This concordance will open the door of a new line of research in international standardisation.

Based on our concordance for disaggregate traded products, we have estimated Anderson and van Wincoop type's gravity model for each product-type, O, S, and D products

the elasticity of substitution for each product-type is as follow: $\sigma_O > \sigma_S > \sigma_D$. The subscript denote the product-type, respectively.

respectively among 57 target countries in 2000. The estimation results indicate, as expected, each product-type has slightly different impacts from gravity variables, such as distance, contingency, and past colonial relationship. The results can be summarised as follows. Because of high trade substitutability, O products tend to be imported from the nearest possible trade partner countries in order to save transport costs. On the contrary, D products tend to be imported from relatively further partners. Because importers have to buy a D product from a specific producer wherever it locates. Compared with these two products, S products fall into intermediate category in terms of trade substitutability.

References

Anderson, J. E and E. van Wincoop (2003), " Gravity with Gravitus: A Solution to the Border Puzzle," *American Economic Review* 93: 170-192.

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

Blind, K. (2009)," Standardisation: A Catalyst for Innovation", Inaugural Address, Rotterdam School of Management, Erasmus Universiteit Rotterdam (August).

Butter, F.A.G., S.P.T. Groot and F. Lazrak (2007), "The transaction costs perspective on standards as a source of trade and productivity growth," *Tinbergen Institute Discussion Paper*.

Bo, M. , Yamano, N. and C. Webb (2010), "Vertical specialisation indicator based on supply-driven input-output model," *IDE Discussion Papers* 270, Institute of Developing Economies, Japan External Trade Organisation(JETRO).

Carrère, C. (2006), "Revisiting the Effects of Regional Trading Agreements on trade flows with Proper Specification of the Gravity Model," *European Economic Review*, Volume 50, Issue 2, pp. 223-247.

Ijiri, N. , Haneda, S. and N. Yamano (2012), " International standards and the product-type classification," forthcoming.

Ijiri, N. and S. Haneda (2012), " The concordance between the International Classification for Standards (ICS) and the Harmonized Commodity Description and Coding System (HS)," forthcoming.

Moenius, J. (2006),"Do national standards hinder or promote trade in electrical products?" Commended Paper, *IEC Centenary Challenge*, Geneva.

Portugal-Perez, A. Reyes, J. and Wilson, J. S. (2009), "Beyond the Information Technology Agreement : Harmonization of Standards and Trade in Electronics," *Policy Research Working Paper* No. 4916, The Worldbank.

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

Reyes, J-D. (2011), " International harmonization of product standards and firm heterogeneity in international trade," *Policy Research working paper* No. 5677, The Worldbank.

Santos Silva, J. and S. Tenreyro (2006), "The log of gravity," *The Review of Economics and Statistics*, 88:361-5.

Shepherd, B. (2006), "The EU Standards Database: Overview and User Guide," mimeo, available at http://go.worldbank.org/6OEYNCYSD0

Shepherd, B. (2007), "Product Standards, Harmonization, and Trade: Evidence from the Extensive Margin," *Policy Research Working Paper* No. 4390, The World Bank.

Swann, G. P. (2010 a), "Economics of Standardization: An Update," Report for the UK Department of Business, Innovation and Skills (BIS), Complete Draft Version 2.2, Innovative Economics Limited.

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

10.1787/5kmdbg9xktwg-e.

Appendix

A1.Data Source
(1)International Standards

- International Organisation for Standardisation, ISO
- International Electrotechnical Commission, IEC
- WTO/TBT
- Ministry of Economy,Trade and Industry, Japan

(2)Trade data

OECD, BTDIxE Database (2011)
Period: From 1996 to 2010

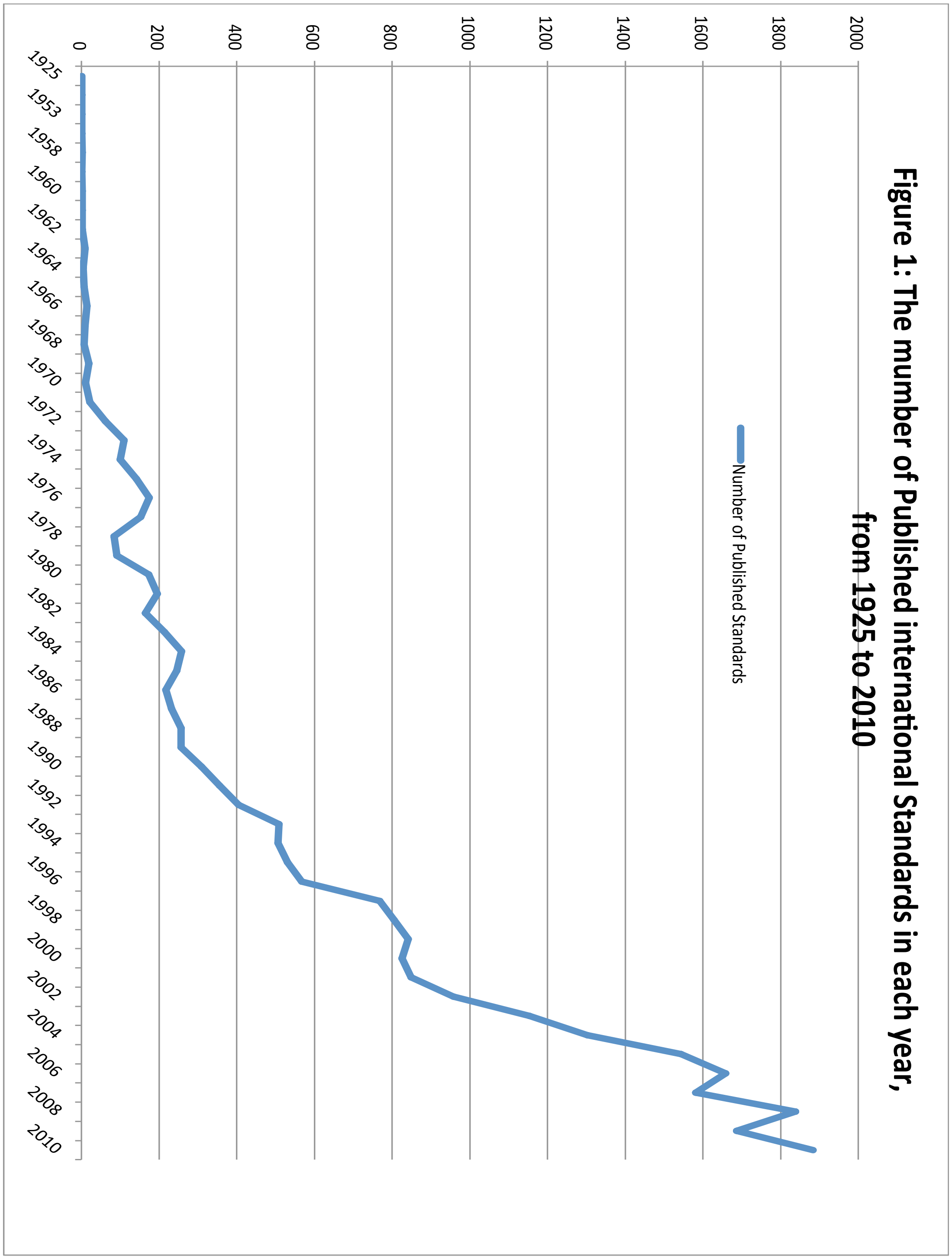
(3) Distance and other gravity variables

Cepii's home page: http://www.cepii.fr/anglaisgraph/bdd/distances.htm

A2.List of Country

Australia, Austria, Belgium, Luxembourg, Canada, Czech Rep., Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, South Korea, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovakia, Spain, Sweden, Switzerland, Turkey, United Kingdom, USA, Argentina, Brazil, China, Chinese Taipei, India ,Indonesia, Israel, Russian Federation, Singapore, South Africa, Hong Kong, Chile, Slovenia, Malaysia, Philippines, Thailand, Romania, Viet Nam, Saudi Arabia, Brunei Darussalam, Bulgaria, Cyprus, Latvia, Lithuania, Malta, Cambodia

Figure 1: The number of published international standards in each year, from 1925 to 2010



Source: Authors' calculation based on ISO standards data

Table 1: The stock of the numbers of published international standards by ICS 2-digit category (group)

Table 1: The stock of the numbers of publshed international standards by ICS 2-digit category(group)

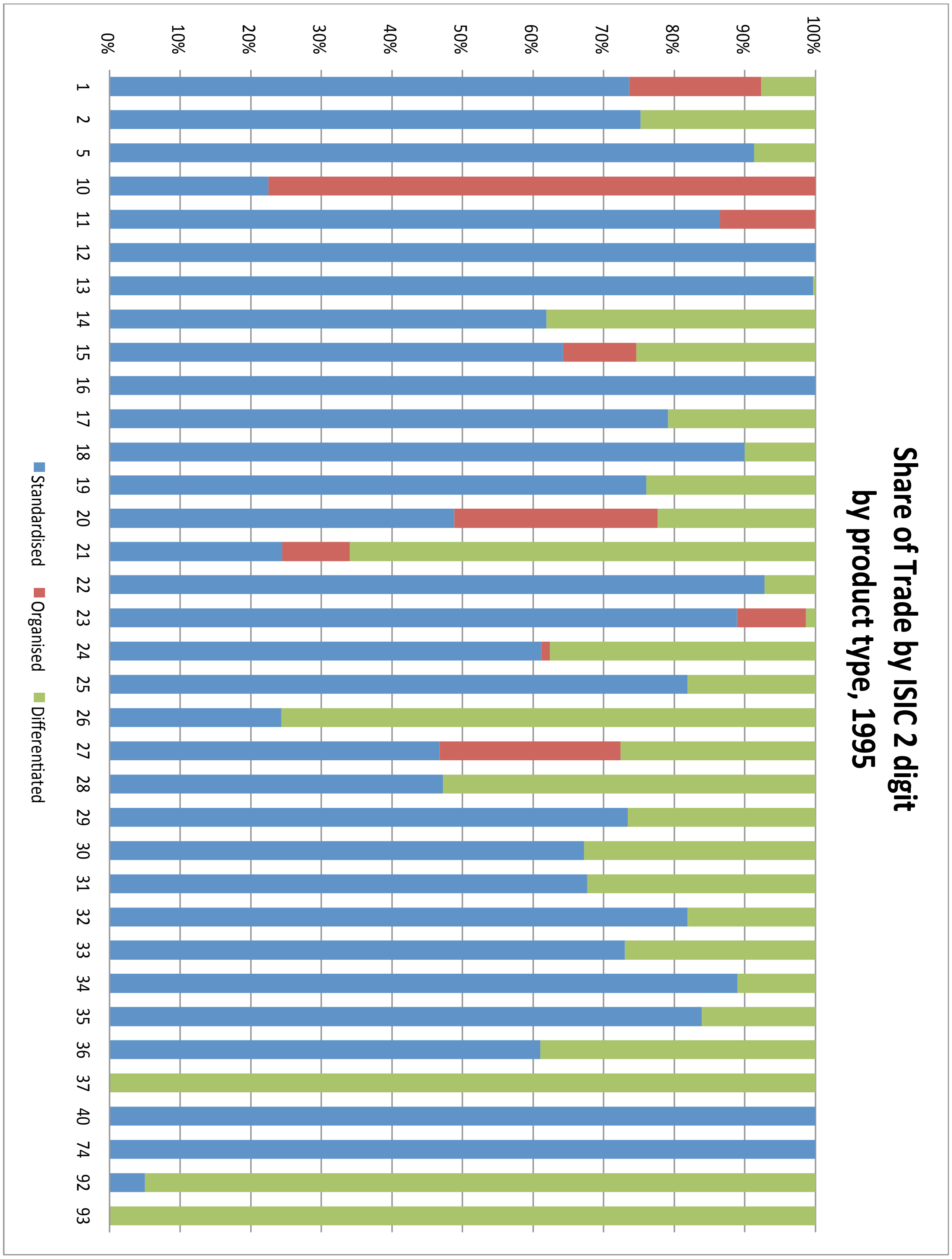
ICS 2-digit category

Year	01	03	07	11	13	17	19	21	23	25	27	29	31	33	35	37	39	43	45
1925-1989	285	11	6	29	79	124	30	52	87	182	33	169	137	144	134	68	4	86	10
1990	32	2	1	2	15	11	5	5	4	10	10	31	6	9	20	0	0	15	0
1991	19	3	1	10	13	16	4	6	13	20	6	22	22	23	37	2	2	17	0
1992	28	0	0	6	17	19	7	9	9	11	9	33	34	27	31	16	1	14	0
1993	36	4	0	17	22	28	3	11	8	53	5	31	21	29	48	13	1	14	0
1994	25	6	0	21	28	19	8	4	15	20	10	36	15	22	56	35	2	12	3
1995	26	3	1	14	25	30	7	20	13	14	10	34	19	39	80	4	3	8	0
1996	36	3	3	23	40	35	7	5	10	27	7	56	16	41	107	10	1	14	0
1997	37	3	2	25	37	42	7	29	40	17	16	75	25	55	56	19	3	18	0
1998	56	4	5	26	51	45	7	26	9	43	18	32	18	42	116	18	2	16	0
1999	54	8	4	24	60	22	6	32	23	81	10	61	22	54	103	8	1	22	1
2000	41	7	7	44	57	33	4	30	26	80	6	42	24	32	67	38	3	18	1
2001	47	14	7	34	68	44	16	23	22	62	6	68	33	73	54	22	1	51	0
2002	50	12	5	27	77	30	17	22	30	32	11	95	72	36	102	27	2	22	8
2003	33	21	18	42	81	34	20	16	23	79	8	107	72	88	86	17	4	35	4
2004	58	28	20	45	106	37	12	16	29	174	22	81	53	41	111	22	1	37	1
2005	55	35	16	63	92	47	6	15	46	162	33	125	52	93	166	31		44	1
2006	52	34	17	92	143	37	8	30	66	139	19	125	86	84	165	20	1	72	14
2007	52	38	13	75	130	47	19	28	79	113	35	144	53	72	175	21	1	34	6
2008	73	45	4	67	92	63	18	16	44	164	20	135	86	102	315	14	5	33	1
2009	67	60	9	100	91	55	7	27	57	54	29	155	53	146	248	23	2	44	7
2010	51	37	12	68	107	51	7	12	62	374	25	139	85	118	281	18	1	40	17
2011	41	29	9	64	65	29	6	44	40	66	17	123	60	66	187	12	3	30	4
SubTotal	1254	410	160	918	1496	898	231	478	755	1977	365	1919	1064	1436	2745	458	44	696	78

Year	47	49	53	55	59	61	65	67	71	73	75	77	79	81	83	85	87	91	93	97	Total
1925-1989	91	99	86	21	107	16	75	167	255	82	37	231	57	29	63	18	42	65	0	31	3242
1990	7	7	8	4	7	6	8	10	4	5	4	12	2	3	16	13	11	3	0	1	309
1991	3	3	4	9	6	2	13	14	4	17	4	19	1	2	10	2	0	3	0	4	356
1992	4	5	7	6	2	0	13	7	1	13	5	26	1	3	19	3	9	4	0	6	405
1993	3	10	6	9	34	0	13	17	6	1	16	13	1	1	18	1	5	5	0	5	508
1994	7	13	7	7	36	0	8	12	1	7	12	14	1	3	16	10	3	7	0	5	506
1995	5	6	9	7	33	0	11	18	4	2	10	12	2	1	33	5	3	16	0	3	530
1996	1	11	7	2	9	0	13	11	5	9	13	5	0	4	19	2	6	8	0	1	567
1997	7	15	11	7	16	0	20	26	19	7	29	19	1	4	38	6	12	10	0	15	768
1998	7	57	8	1	25	0	12	22	18	5	14	18	4	2	39	1	23	8	0	7	805
1999	9	13	4	3	28	0	16	17	21	7	23	20	2	2	56	5	10	5	1	3	841
2000	10	30	5	13	24	0	18	16	25	6	28	12	5	1	36	2	24	8	0	2	825
2001	13	3	7	3	17	12	12	15	11	7	23	10	3	4	38	8	4	11	0	3	849
2002	25	24	4	8	33	5	20	23	23	1	34	15	0	2	28	3	8	18	3	4	958
2003	19	25	14	6	21	13	14	21	30	5	32	21	12	15	68	2	15	13	1	18	1153
2004	22	25	26	6	23	17	25	42	37	9	27	21	6	9	47	8	12	24	2	21	1303
2005	15	21	23	23	35	3	19	31	29	4	20	45	3	15	62	20	9	43	5	36	1543
2006	12	22	13	11	53	3	30	46	18	30	35	37	1	6	67	8	11	22	2	27	1658
2007	24	26	21	15	24	7	20	23	15	22	32	23	5	15	69	12	28	32	0	34	1582
2008	20	23	45	7	23	0	36	39	15	12	27	34	6	25	59	13	6	61	0	90	1838
2009	22	13	20	13	51	1	33	46	25	12	36	27	5	7	48	9	11	39	2	33	1687
2010	20	23	13	3	31	5	8	23	25	8	31	25	4	8	58	9	6	48	0	30	1883
2011	9	26	6	4	19	3	14	18	8	1	26	46	5	14	29	9	10	34	2	28	1206
SubTotal	355	500	354	188	657	93	451	664	599	272	518	705	127	175	936	169	268	487	18	407	25325

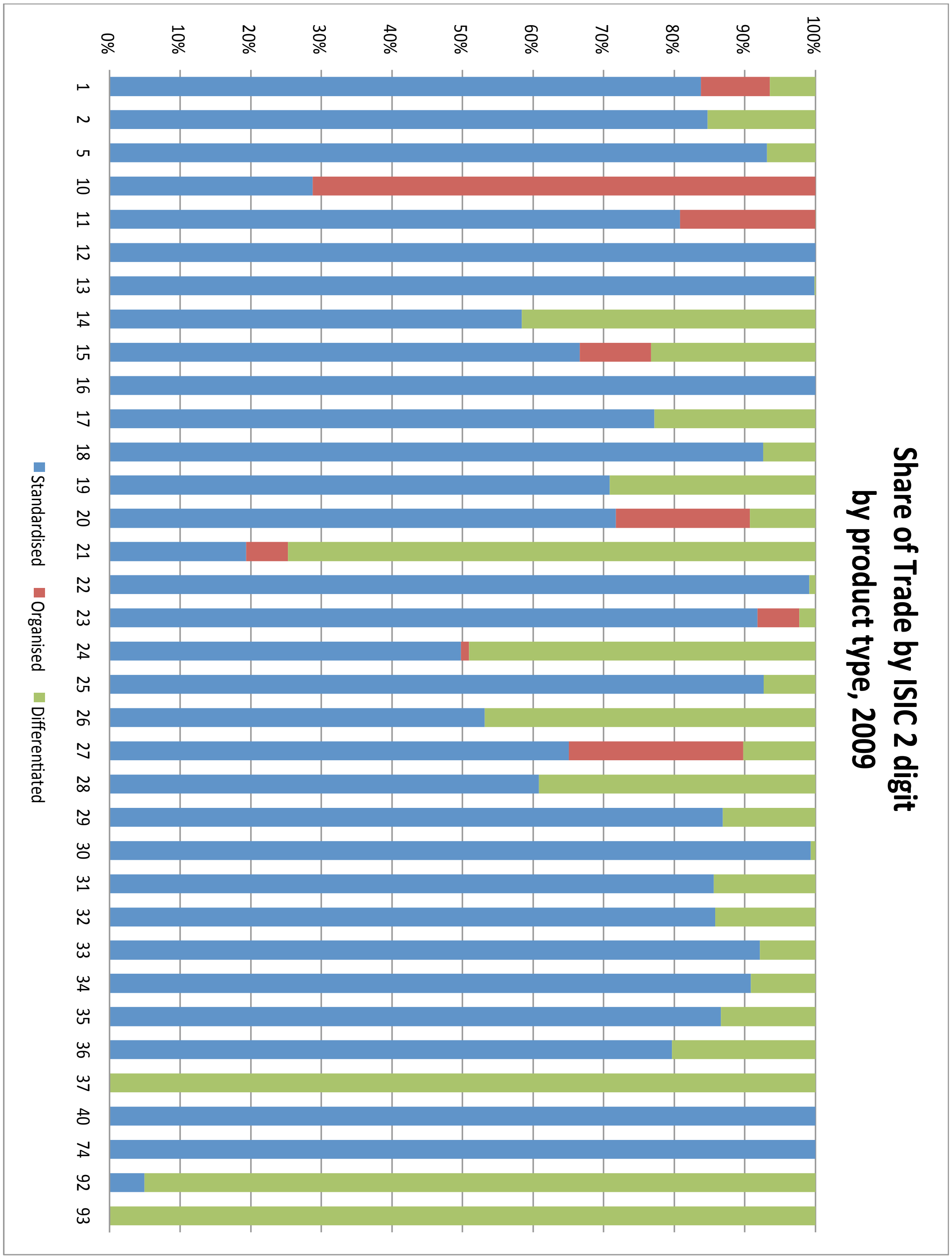
Source: Authors' calculation based on ISO standards data

Figure 2: The import share of standards products in each ISIC in 1995



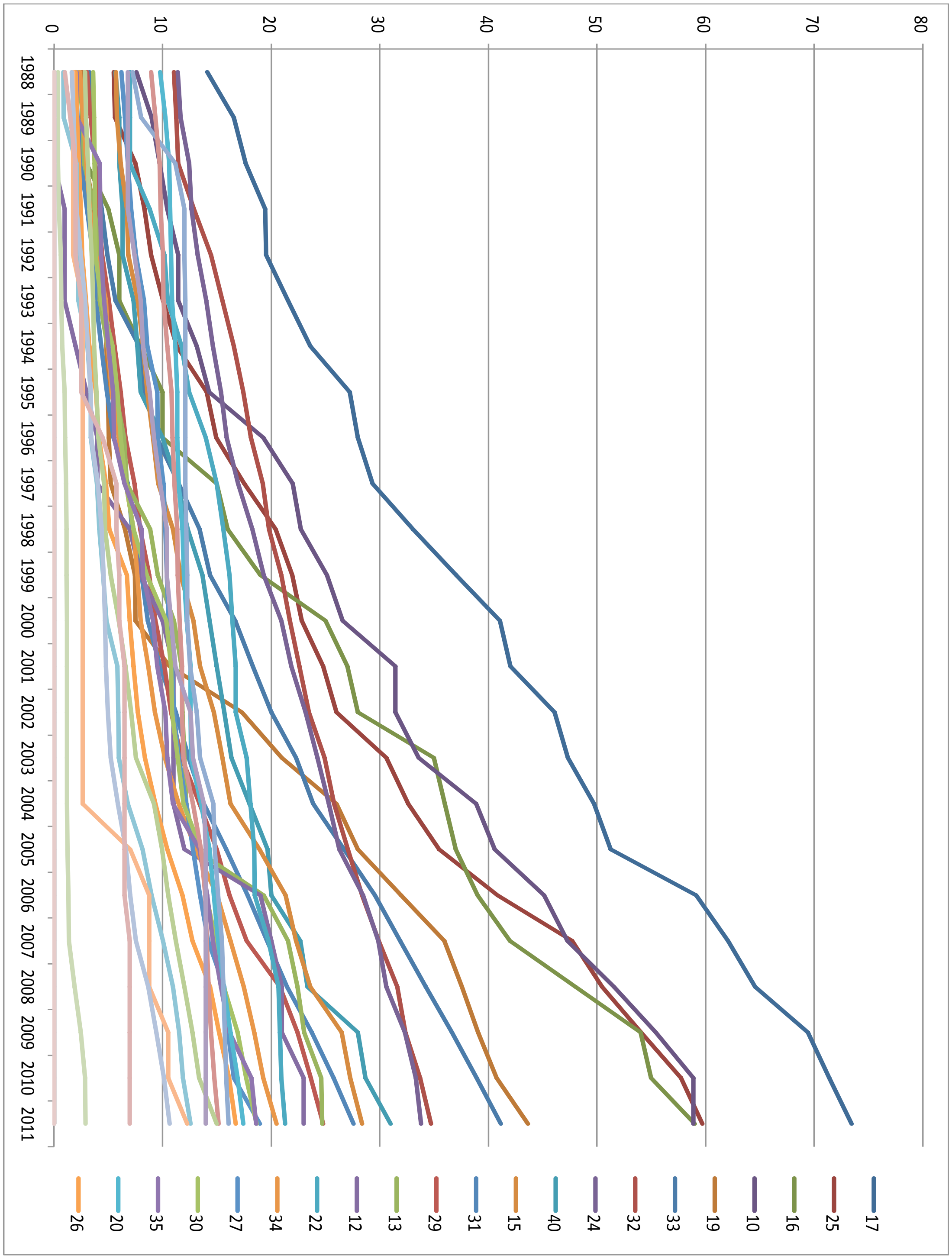
Source: Authors' calculation based on BTDIxE and the HS-ICS concordance

Figure 3: The import share of standards products in each ISIC in 2009



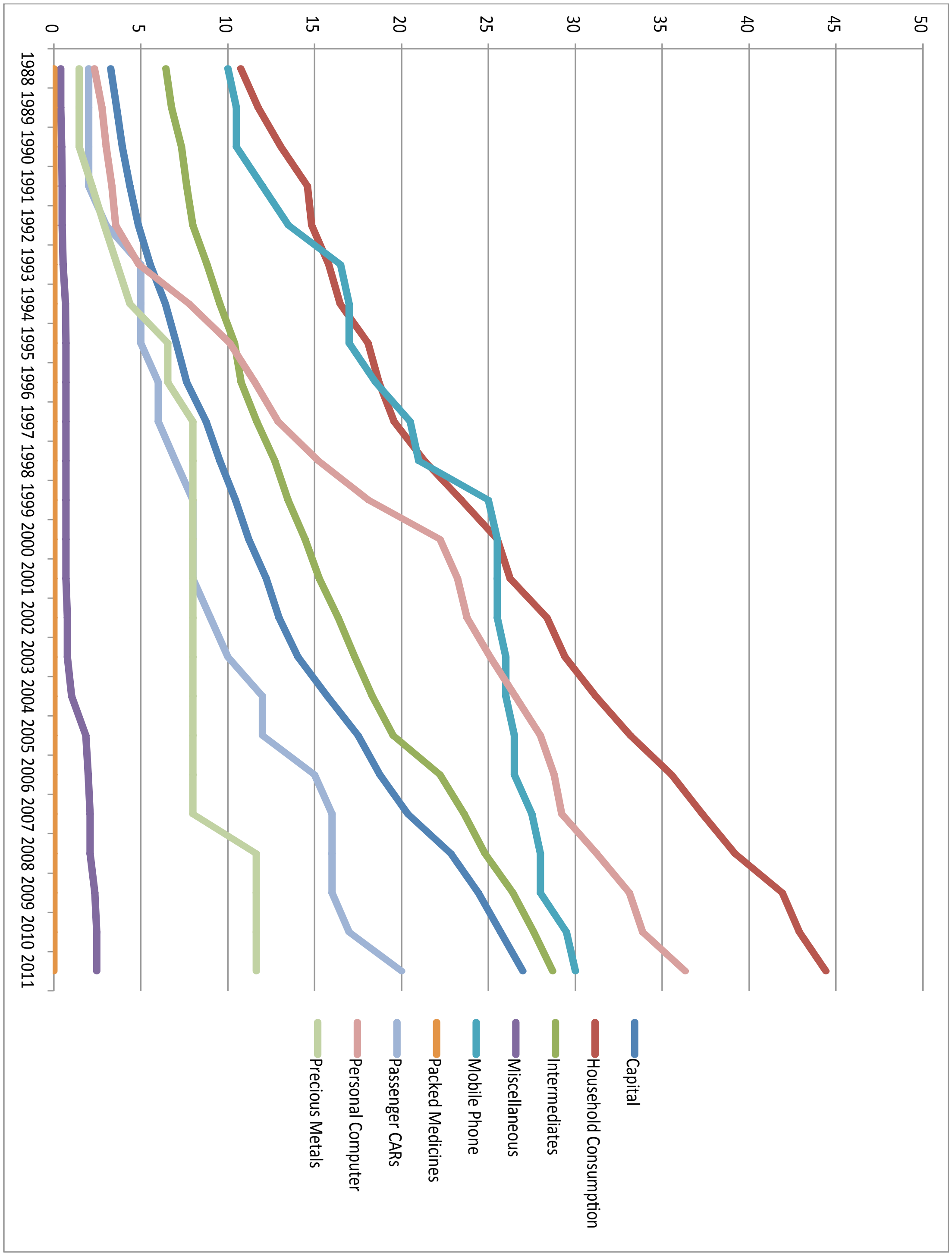
Source: Authors' calculation based on BTDIxE and the HS-ICS concordance

Figure 4: The average number of published standards for ISIC industries from 1988 to 2010



Source: Authors' calculation based on ISO standards data and the HS-ICS concordance

Figure 5: The average numbers of published international standards by end-use category



Source: Authors' calculation based on BTDIxE and the HS-ICS concordance

Table 2: The estimation results for O, S, and D products, Year 2000, Heckman and PPML

Year:2000		Heckman	Heckman	Heckman	PPML	PPML	PPML
	ALL	O	S	D	O	S	D
	1	2	3	4	5	6	7
	Import	Import	Import	LnImport	Import	Import	Import
GDP_i	0.773***	1.074***	0.776***	0.758***	0.851***	0.783***	0.770***
	(241.90)	(19.76)	(202.26)	(132.74)	(12.98)	(3614.12)	(51.48)
GDP_j	0.989***	1.145***	0.995***	0.970***	0.460***	0.764***	0.791***
	(149.41)	(11.86)	(124.92)	(82.15)	(19.42)	(3525.35)	(87.79)
Distance	-1.050***	-1.697***	-1.055***	-1.016***	-0.798***	-0.631***	-0.587***
	(-156.39)	(-13.91)	(-129.57)	(-87.11)	(-11.75)	(-1565.14)	(-31.40)
Remoteness_i	0.525***	0.490***	0.516***	0.535***	1.112***	0.591***	0.618***
	(74.94)	(4.84)	(61.87)	(41.55)	(5.13)	(371.75)	(9.75)
Remoteness_j	0.423***	1.282***	0.511***	0.173***	2.035***	1.014***	0.206***
	(56.28)	(13.76)	(57.00)	(12.42)	(6.70)	(645.34)	(3.48)
Contig	0.590***	1.563***	0.586***	0.575***	0.674***	0.596***	0.676***
	(78.56)	(12.05)	(65.21)	(42.12)	(5.05)	(525.59)	(14.03)
Comlang_ethn	0.484***	0.823***	0.460***	0.537***	0.216	0.326***	0.336***
	(70.79)	(7.79)	(56.59)	(42.67)	(1.36)	(384.84)	(8.81)
Colony	0.264***	-0.0313	0.258***	0.285***	-0.615***	-0.159***	-0.00203
	(32.37)	(-0.27)	(26.51)	(19.06)	(-3.36)	(-125.42)	(-0.04)
_cons	-19.70***	-32.14***	-20.15***	-18.17***	-12.14***	-15.49***	-13.81***
	(-83.34)	(-8.99)	(-70.99)	(-43.01)	(-4.58)	(-1377.09)	(-23.47)
mills	1.840***	4.266***	1.865***	1.717***			
lambda	(73.88)	(11.16)	(61.77)	(39.51)			
Sample	13795824	169176	9824976	3801672	169176	9824976	3801672

t statistics
* p<0.05, ** p<0.05, *** p<0.001