Impact of National Standards Development on Imports Performance in Indonesia - International Standards Adoption as Variable Control

Author's Details:
[(1)] Biatna Dulbert Tampubolon [(2)]Febrian Isharyadi
[(1)] Chair of Innovation Economics, VWS2, TU Berlin, Marchstraße 23, D-10587 Berlin, Germany
[(2)]National Standardization Agency of Indonesia (BSN), Jl Thamrin 8, Jakarta Pusat, 10340, Indonesia

Abstract: *The increase of the trade value between countries indicates that economic activities in the world are dynamic since global recession. Indonesia as a developing country has a policy to develop national standards to protect their citizens and market from inferior import products and to produce more competitive products of Indonesian origin. In this article, the effect of the national standards development and the adoption of international standards on import value has been analysed. The results show that the imports in some sectors are strongly correlated and significant with national standards development. It was also found that a strong and significant correlation of the adoption of international standards with the import value performance exists in agriculture product (ICS 65) and mining and minerals product (ICS 73).*
Keywords: national standard, adoption of international standard, coefficient correlation, import value, economic benefit, variable control.

1. Introduction

Economic activities in the world are very dynamic since global recession, which we can see from the increasing value of trade in goods and services between countries. In international trade, products of export and import have significantly increased and almost without limit, because policies regarding quota are almost disappearing (Beghin et al., 2013). The demands of people as consumers in a country should be met by domestic production and through import from abroad. This trading condition gives rise to competition in terms of technology (Pack and Saggi, 1997) and market failures (Raith, 2001, Beghin et al., 2013) between domestic products and imported products in the market (Blind and Mangelsdorf, 2016, Fischer and Serra, 2000, Marette and Beghin, 2010). Import activities have been present in Indonesia since a long time, and the import value has increased significantly in the last decade (see Figure 1). From the figure, it can be seen that the demand of imported products has significantly increased after the economic crisis, which is due to the increase in domestic needs that could not be met by domestic producers.

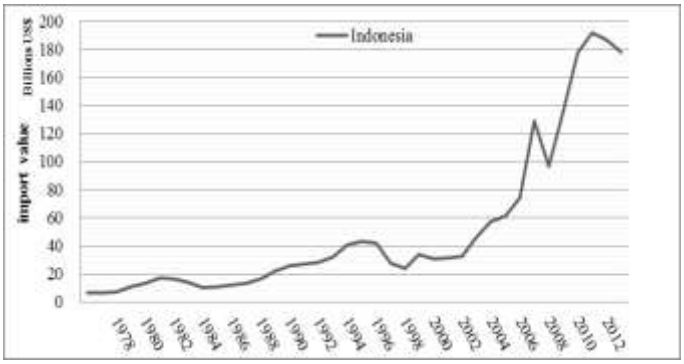

Figure 1: Indonesia's national worldwide import from 1977–2014 (source: BPS, processed)

2. Scope of The Study

2.1. Indonesia national standard (SNI)

In order to guarantee the enforcement of the formulation of national standard, BSN has set the National Standardization System (SSN) and National Standard Guide (PSN) 01: 2007 on the Indonesian national standard development, which serves as a guide in formulating national standards. This document has several normative references as follows: PSN 02: 2007, technical committee and sub-technical committee of national standard formulation; PSN 03.1: 2007, adoption methods of international standards into national standard; PSN 04: 2006, polls and voting; PSN 05: 2006, expert of standardization; PSN 07: 2011, general terms of standardization and related activities; and PSN 10: 2011, adoption methods of ASTM standards into national standard. This guide serves as the reference for the technical committee or sub-technical committee to formulate the national standard based on their scope.

The number average of the growth of national standards from 1987–2015 reaches 16.36 percent per year. The stock of Indonesian national standard can be seen from the graph (Tampubolon, 2016). From the total 8,558 Indonesia national standards, the average number of standards per ICS is 219 standards, the highest number is 946 standards, small number is 1 standard (ICS 49, aircraft and space vehicle), and the standard deviation for the all the ICS groups is 208 standards. This shows that each group of the national standard development is very diverse, and the gap between each group of national standards is very high.

2.2. Adoption of international standards

If the products are found containing hazardous substances, which is confirmed by the testing results in the laboratory, the regulator immediately notifies the findings to the manufacturer or importer and orders to withdraw and destroy all such products. In terms of consumer protection, it is the right of consumers to obtain secure and safe products from the market. Therefore, the consumers should have correct and clear information about the ingredients of such products, especially food products (Tran et al., 2013).

Law enforcement continues to be encouraged, especially against the producers who are found to violate the provisions in the pre-market and post-market surveillance. The researchers sometimes face the problem of traceability information on the product in the field survey, often failing to get confirmation from the importer or manufacturer. Regulators often conduct monitoring among other National Food and Drug Agency (BPOM), Department of Trade, Ministry of Industry, Department of Agriculture, and Director General of Customs. The sanction is still relatively weak (Amelia, 2015). Therefore, it does not deter importers from cheating and taking advantage (Tambunan, 2008). Importers often take advantage in situations like religious holidays, such as a New Year, Eid Al-Fitr, etc.,

when people's needs increase highly, so that the product is less supervised. Importers often ignore the obligations for the sake of gaining profit (Utomo, 2015).

Based on the report of BPOM performance 2014 and the results of monitoring by the Ministry of Trade 2012, many dangerous products were found in the post-market surveillance, mainly imported products, reported through feedback by community consumers through unit consumer protection service or through a non-governmental organization (NGO) such as the Indonesian Consumers Foundation (YLKI). They found that 621 varieties of products in the market did not comply with the provision, whereby 31% of products did not comply with the technical requirements and national standards. These violations are dominated by import products with around 61%, whereas the share of local products is only around 39% (Ministry of Trade, 2012). The tendency of the regulators is to protect the market by enforcing standards for products into the regulation (Fischer and Serra, 2000, Marette and Beghin, 2010). When national standards are inserted into the regulations, it becomes mandatory for the imported products to meet the standards in order to enter the Indonesian market. In case the products are not according to the national standards, national policy of standardization in Indonesia, the Center of Formulation – BSN – needs to develop national standards. Therefore, BSN tends to seek and adopt international standards into national standards. This approach is more practical and requires lesser time (through fast track as shown in the figure below).

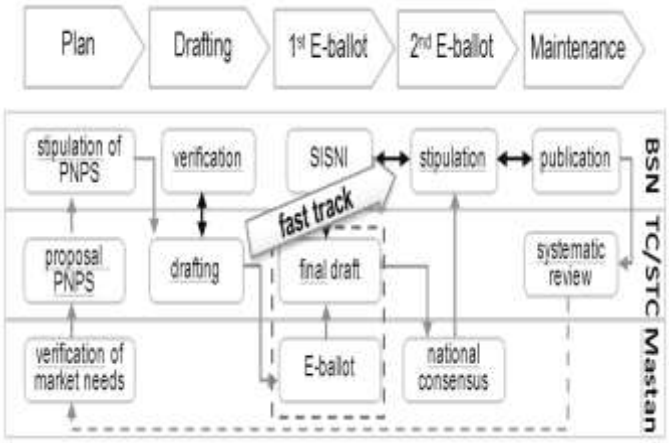

Figure 2: Stages of national standard development – fast track (source: BSN, 2015)

From Figure 2, it can be seen that the process of formulating the standards includes various stages: planning, drafting, collecting of first votes, collecting of second votes, and publications. However, it is possible to perform the full adoption of international standards through a fast-tracked process, especially for products which fulfil international standards.

The national standardization guidelines (PSN) No. 3.1-2007 describes the procedures to adopt the International Organization for Standardization (ISO) or International Electrotechnical Commission (IEC) standards into SNI, including a system to harmonize procedures for the BSN in adoption and maintaining the level of equality of liaison with the international standards. The level of equality of liaison between national standards and the international standards can be divided into three: identical, modifiable, and not equivalent. SNI is declared as identical if SNI contains technical substances, structure, and the same description (translation only) and the possibility for minor editorial changes, whereas SNI is declared as modifiable when it contains a modification of the standard ISO/IEC and can be identified and explained clearly. However, the structure of the standard is still the same with standard ISO/IEC. If there are changes in the structure, they should be compared easily. At the level of the national standard body, the adoption of standards based on the type of source is divided into three groups: international standards, other national standards, and society/association of professional standards or professional institute standards (PSN No. 3.1-2007).

A company can be active in national and international standardization activities. Advantages of the company being involved in international standardization includes a shorter time to market or customize an existing product in the market and thus to a competitive advantage for those who know these international standards prior to adoption into the national standards. Another advantage is that it can help reduce the risk of technology and sharing of information about how to solve problems when applying the standards in the company (Blind and Mangelsdorf, 2016).

In this paper, the authors used a definition of international standards based on Australia's documents, Standardization Guide 007, on the adoption of international standards and mentioned the international standards among others – ISO, IEC (which is published by international organizations), ITU, CIE, IWTO (which is published by international agency), CEN, CENELEC (which is published by regional European standards), and ASME (which is published by organizations that have a level of acceptance in many parts of the world) (SA, 2001). In this document, the scope of international standards is very clearly outlined.

The authors reviewed the standard reference for all the national standards by the definition and found that most adopt international standards (1,545 standards) dominated by ISO (56.12%), IEC (43.17%), and CISPR (0.39%) and very less by ASME, CAC, and ITU. The adoption of other national standards to SNI is dominated by several national standards such as JIS (68%), AS (16%), BS, ANSI, and NZS. The rest of the adoption of standards to SNI (109 standards) is from association or professional society standards such as ASTM (61.47%), API (18.35%), NACE (5.50%), TAPPI (4.59), NFPA (2.75%), ASME, AWS, MHFV, ASCE, GL, and AWEA.

When viewed in more detail in relation to the overall average age of the adopted international standards, the year of publication of international standards when it becomes the national standard is around 8.64 years, while the overall average age of the national standards for excluding the adoption of international standards until 2014 is 15.98 years. The role of standards also depends on the age and size of standards stock (Temple et al., 2005).

According to some references, international standards were seen to have a significant and positive impact on the performance of imports. However, almost all of these references were conducted in developed countries (Blind, 2004, Blind and Jungmittag, 2001, Grajek, 2004, Moenius, 2004, Moenius, 2006, Swann et al., 1996, Clougherty and Grajek, 2008), and it cannot be said whether these will apply for developing countries such as Indonesia to adopt international standards. Moreover, many observers from consumer organizations and standard societies (Mastan) in Indonesia argued that the adoption of international standards has led to flooding of import products in the domestic market and increased low-quality products (survey of BSN in 2008).

The main aim of this paper is to answer the question

whether national standards established as a result of adoption from international standards or other national standards has an impact on the import value of products in Indonesia. The authors will analyse the national standards development's overall effects on the performance of the import value and per commodity sector. The authors will also analyse whether the national standards development is influenced by the adoption of international standards.

2.3. Development of import performance

In general, the provision of importation, distribution, and supervision of products in the market is set in the Ministry of Trade regulation No. 48/M-DAG/PER/7/2015. It starts from the examination of documents and products at the destination port by customs officers. For example, for food products and processed food, it is mandatory to pass the testing of the product, and the results of analysis must be proven through certification from an accredited laboratory in the country of origin. According to a survey conducted in 2008 by a collaboration between R&D BSN and Statistics Bureau of Indonesia, many imported products in the market do not meet the standard requirements and are even harmful to the consumers. This was found in the product monitoring at pre-market and post-market surveillance. Surveillance market program in Indonesia is the same as the provisions of EU member at the national level in the Blue Guide on the implementation of EU rules for products in 2016, with more focus on high-risk products more frequently traded, using the risk assessment procedures. In addition, the provisions of the standard requirements and established regulations have been violated, such as the presence of food additives harmful to human health, forbidden by Article 21 of Law No. 23 of 1992 on health and the Regulation of the Minister of Health No. 722/Menkes/Per/IX/1988. The effectiveness of supervision on imported products in the market requires a large budget and comprehensive supporting infrastructure.

In the last 15 years (1999–2014), an average growth rate of 17.20%–31.33% per year was seen in a group of imported products such as mineral fuels, oils, waxes and bituminous (HS 27); nuclear reactors, boilers, machinery and mechanical appliances, computers (HS 84); electrical machinery and equipment and parts, telecommunication equipment, sound recorders, television recorders (HS 85); iron and steel (HS 72); vehicles other than railway or tramway rolling stock (HS 87); and plastics and articles thereof (HS 39). Mostly, products are imported in Indonesia from Singapore, China, Japan, USA, and Malaysia, as shown in Figure 3 below.

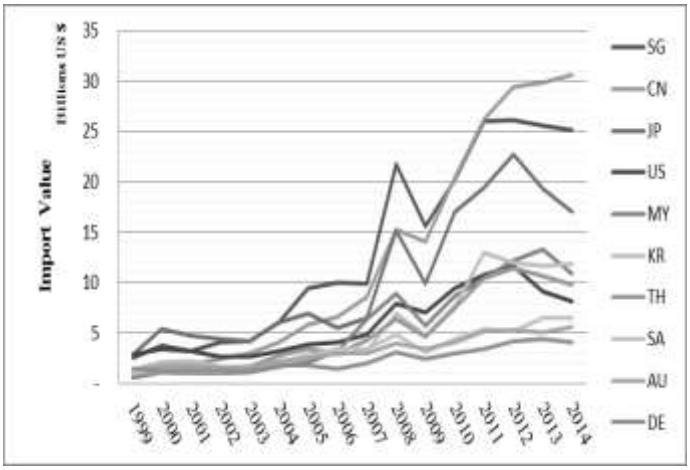

Figure 3: Indonesia imports by country of origin, 1998–2014 (source: BPS, processed)

3. Methodology

In this paper, the authors used correlation analysis with control variable, which has two objectives, namely, the results of the analysis will explain the phenomenon optimally wherein the variables are analysed, and the variables used as control variables certainly affect each other; in this case, the correlation will be released, and the results of the analysis will have the highest statistical power. We will check the value of the correlation variables involved in the analysis according to the common understanding (Sarwono, 2006, Kufs C., 2011).

Data of national standards development (SNI) and the adoption of international standards used in this study are based on May 2015 data obtained by the authors from Center of Documentation and Information, BSN. According to some references, the standard will open up new markets, and thus, it can be said that adoption of international standards will also increase the import value (Blind and Jungmittag, 2001, Swann, 2010). Analysis of the data per sector of commodities in this paper is used in concordance with the trade value (harmonized system, HS), with standard (International Classification Standard, ICS) based on Concordance Table between ICS 6 Ed., ISIC Rev. 4, and HS 2012 (Tampubolon, 2016).

Adoption of standards is a part of the standards development program, both at the national and international levels (ISO/IEC Guide 21-1:2005). In this research, the control variable is the adoption of international standards. As explained above, the adoption of international standards is a part of the adoption standards, and the adoption standard program is a part of the national standards development; therefore, the performance of the adoption of international standards is a part of the performance of standards development. It is interesting to study further whether the performance development of national standards against imports is influenced by the adoption of international standards. This correlation will be explained on the assumption based on the general perception among practitioners and stakeholders involved in standardization. Based on the calculation results of Pearson's correlation values between national standards development, adoption of international standards in Indonesia was 0.255 **. This showed that the correlation is weak, because it is less than 0.3. However, there are two asterisks involved, which means that the correlation is significant at the 0.01 level (two-tailed), as shown in the figure below. The N (304) indicates the number of data analysed by sector in the last 17 years (1998-2014). This is similar to the result by the correlation coefficient of Kendall's tau_b and Spearman's rho, with different values.

Table 1: Correlation coefficient between national standard and adoption of international standard

Correlations

		National standard	Adoption SI
National standard	Pearson Correlation	1	.255**
	Sig. (2-tailed)		.000
	N	304	304
Adoption SI	Pearson Correlation	.255**	1
	Sig. (2-tailed)	.000	
	N	304	304

**. Correlation is significant at the 0.01 level (2-tailed).

4. Result and Analysis

According to consumer associations, importation of products has two kinds of impacts: positive impact, where the market becomes more competitive in price, quality, and variety of products so that the consumers can buy the products according to their needs and budget; and negative impact, where domestic small businesses are unable to compete with foreign products, and in addition lack more efficiency to produce large quantities supported by high technology (Acs et al., 1997, Marette and Beghin, 2010, Pack and Saggi, 1997).

Description of data: the average of import value per sector per year is US$4.57 billion and standard deviation of US$8.59 billion; the average of a number of national standards developments per sector is 213.17 standards and standard deviation of 178.067 standards; the average of the adoption of international standards is 7.25 standards and standard deviation of 16.782 standards. These data show that three types of variables have a very large variety of data between sectors for each year. This can be seen from the number of standard deviations.

4.1 General model

The results of data processing using Pearson's correlation analysis without control variables shows that the correlation between national standards development and adoption of international standards by the performance of the import value is not strong, only 0.163 and 0.151. However, both national standards development and adoption of international standards have a significant correlation with the import value. This means that the national standards development and adoption of international standards have a small, but significant correlation with the import value performance. This result is also supported by some literature, a positive (Clougherty and Grajek, 2008) and significant impact of international standards on the import value (Blind, 2004, Blind and Jungmittag, 2001, Grajek, 2004, Moenius, 2004, Moenius, 2006). In this study, we would expect the same impact once adopted as a national standard.

When researchers analysed the data using control variables, it was observed that the correlation between the national standards development and import value became smaller compared to without control variables. The correlation value using a variable control was only 0.130, which means that the growing adoption of international standards contributes to the national standards development to correlate with the performance of the import value. When we calculated impairment correlation directly, it was only 0.033 (0.163–0.130). However, the national standards development still significantly influences import performance without getting affected by the adoption of international standards. According to some literature, national standards development has a positive correlation with, (Blind, 2004, Fontagné et al., 2005) and a significant impact on, import value (Moenius, 2004, Moenius, 2006, Swann, 1996). The results of data processing can be seen in the table below.

Table 2: Correlation coefficient (for all sectors) without and with control variable

Control Variables		Import value	National standard	Adoption SI
Import value	Correlation	1.000	.163	.151
	Sign (2-tailed)	.	.004	.008
	df	0	302	302
National standard	Correlation	.163	1.000	.255
	Sign (2-tailed)	.004	.	.000
	df	302	0	302
Adoption SI	Correlation	.151	.255	1.000
	Sign (2-tailed)	.008	.000	.
	df	302	302	0
Import value	Correlation	1.000	.130	
	Sign (2-tailed)	.	.024	
	df	0	301	
National standard	Correlation	.130	1.000	
	Sign (2-tailed)	.024	.	
	df	301	0	

a. Cells contain zero-order (Pearson) correlations.

When the authors explored the effect of the growing adoption of international standards on the import value performance, from the results of the analysis, it was found that the value of the correlation coefficient with the adoption of international standards on the import value performance decreased from the previous value and was insignificant (0.046). This means that the significant contribution previously between the adoptions of international standards for the import value performance was affected by the variable of national standard development.

The authors also analysed the effect of national standards development and adoption of international standards on the import value, and the overall result on the total imports showed little effect, simultaneously around 3.9%. However, the influence among independent variables, influence on national standards of 13.3% and the adoption of international standards by 11.7% in effect on import value. When the analysis was done partially for each product sector, it was seen that the development of national standards and adoption of international standards influenced each other. This is evidenced by correlation coefficient among the independent variables entirely having a value above 0.7, which suggests that if high adoption of international standards is carried out, it will increase the number of national standards (Wardana, 2007). This is the reason why the authors decided to use control variables in this paper.

The authors also analysed the commodity sector partially, in terms of having strong and significant correlation values and small and insignificant values. The analysis associated with various research references related to the development of standards and the value of imports will be seen. In this paper, we have only displayed some interesting figures of the results obtained by the analysis, and the rest is only a brief explanation.

4.2 Significant model with variable control

4.2.1 Adoption of international standards as variable control

Following are the model sectors in which national standards development has a strong and significant correlation with the performance of imports; the value will be calculated with R square value of each sector as the degree of influence factor to import value.

Paper technology products

The paper technology products sector is different from the timber sector, where all the correlation coefficients show a strong and highly significant correlation. When we carried out the correlation analysis without the control variable, the correlation coefficient was 0.947 and 0.821, and with the use of control variable, for national standards development, it was 0.938. However, the difference lies in the correlation of the adoption of international standards on the import value, which is negative (−0.787). Therefore, for this sector, the development of national standards has a strong, positive, and significant contribution (R Square = 0.947) on the import value, while the adoption of standards has a strong and significant impact, but negative to the performance of the import value of paper technology products.

Chemical technology, paint, and colour products

This sector has the same condition as the textile and leather technology products sector. The national standards development and adoption of international standards had strong and significant correlation with the import value (0.958 and 0.735). However, when we analysed the adoption of international standards with the control variables, the correlation was still observed as strong (0.907) and significant. The correlation coefficient for adoption of international standards using control variable national standards development became lower and negative (−0.038) and showed very insignificant (0.892) effect on the import value. Therefore, in this sector, only national standards development has strong and significant impact on the import value of chemical technology, paint, and colour products.

Clothing industry products

Same as the previous product sector, national standards development and adoption of international standards have a very strong and significant correlation with the import value (0.963 and 0.866). When we analysed the adoption of international standards using the control variables, the correlation was still observed as strong (0.856) and highly significant. In the clothing industry sector, adoption of international standards had small (0.267) and insignificant (0.336) correlation with the import value performance. Therefore, in this sector, only national standards development shows strong correlation and significant impact on the import value.

Rubber and plastic products

The rubber and plastic sector is almost the same as the previous sector (chemical technology, paint, and colour product); the difference is only in the value of the correlation of adoption of international standards with the import value – still negative, but stronger (−0.511). Therefore, in this sector, only national standards development has strong correlation and significant contribution (R Square = 0.945) on the import value of rubber and plastic products.

Food technology products

In the sector of food technology, the correlation between national standards development and import value performance with and without the control variable, adoption of international standards, showed no significant changes; the correlation coefficient was from 0.966 to 0.800 and still significant to import value. However, when we analysed the correlation between the adoption of international standards and import value with and without the control variables, a great change was observed, a significant correlation, with the coefficient value from 0.907 to −0.215 (negative), and an insignificant effect was observed on the import value performance. This showed that national standards development has a strong and significant correlation with the import value (contribution value, R Square = 0.966), but not for adoption of international standards.

Petroleum technologies products

For this sector, national standards development has a strong and significant correlation (0.764) with the import value performance. When we did not use control variables, both of them showed a strong and significant correlation with the import value. When we analysed the correlation between the adoption of international standards and import value performance in petroleum technology sector, a small and insignificant correlation (0.449) was found. Therefore, in this sector, only national standards development showed a strong and significant correlation (R Square = 0.939) with the import value and not adoption of international standards; this is depicted in the figure below.

Table 3: Correlation coefficient of adoption SI for petroleum technology products using control variable

Correlations

Control Variables			Import Value	adoption SI
National standard	Import Value	Correlation	1.000	.449
		Sign (2-tailed)	.	.093
		df	0	13
	Adoption SI	Correlation	.449	1.000
		Sign (2-tailed)	.093	.
		df	13	0

Glass and ceramic products

In the glass and ceramics sector, the national standards development and import value performance with and without variable control as adoption of international standard had no significant changes; the correlation coefficient was from 0.956 to 0.749 and had significant correlation with the import value. However, when we analysed the correlation between the adoption of international standard and import value with and without control variable, a great change was observed; the correlation coefficient was significant and from 0.897 to −0.096 (negative) and had a very insignificant effect on the import value performance. Therefore, this means that national standards development has a strong and significant correlation with the import value of glass and ceramic products.

Metallurgy products

For metallurgy products, all the correlation coefficients showed a strong correlation. When we used no control variable in the correlation analysis, the correlation coefficient was 0.900 and 0.862 and after the use, the correlation coefficient for national standards development was

0.730, and for adoption of international standard, it was 0.605. In this sector, both the variables have a significant correlation with the import value performance. Therefore, for the metallurgy sector, the development of national standards and adoption of international standards have a strong and significant correlation with the import value of metallurgical products. The average age of adoption of international standards in this sector is 4.67 years; only one adoption of international standard is more than 15 years – this standard is about a visual method for assessing the porosity.

Road vehicle products

In the road vehicles sector, the correlation between national standards development and import value performance with and without the control variable adoption of international standards showed no significant changes; the correlation coefficient was between 0.878 and 0.760 and had a significant correlation with the import value. However, when we analysed the correlation between the adoption of international standards and import value with and without control variable, a great change was observed; the correlation coefficient was between 0.907 and −0.368 (negative) and significant and insignificant effect was seen on import value performance. Therefore, this means that national standards development has a strong and significant correlation with the import value of road vehicle products, but not for adoption of international standards.

Domestic and commercial equipment

Same as the previous sector, only the national standards development has a strong correlation (0.729) and contributes significantly (R Square = 0.970) towards the import value performance, and its correlation is highly significant (0.002). On the other hand, the adoption of international standards does not contribute strongly (−0.372) and is insignificant (0.173) for the import value of domestic and commercial equipment.

Construction and building materials, civil engineering products

In this sector, all the correlation coefficients were strong. When we used correlation analysis without the control variable, the correlation coefficient was 0.913 and 0.958; after using the control variable, for national standards development, it was 0.749, and for adoption of international standard, it was 0.862. In this sector, both the variables had a significant correlation with the import value performance. Therefore, for the metallurgy sector, the development of national standards and adoption of international standards have a strong correlation and contribute significantly towards the import value of construction and building materials, and civil engineering products.

Table 4: Correlation coefficient for construction and civil engineering sector without and with control variable

Correlations

Control variables			Import value	National standard	Adoption SI
-none-[a]	Import value	Correlation	1.000	.913	.958
		Sign (2-tailed)	.	.000	.000
		df	0	14	14
	National standard	Correlation	.913	1.000	.948
		Sign (2-tailed)	.000	.	.000
		df	14	0	14
	Adoption SI	Correlation	.958	.948	1.000
		Sign (2-tailed)	.000	.000	.
		df	14	14	0
Adoption SI	Import value	Correlation	1.000	.693	
		Sign (2-tailed)	.	.004	
		df	0	13	
	National standard	Correlation	.693	1.000	
		Sign (2-tailed)	.004	.	
		df	13	0	

a. Cells contain zero-order (Pearson) correlations.

Correlations

Control variables			Import value	Adoption SI
National standard	Import value	Correlation	1.000	-.096
		Sign (2-tailed)	.	.734
		df	0	13
	Adoption SI	Correlation	-.096	1.000
		Sign (2-tailed)	.734	.
		df	13	0

Mechanical, fluid for general use, materials handling equipment

In this sector, the correlation between national standards development and import value performance with and without control variable adoption of international standards showed no significant changes; the correlation coefficient was from 0.939 to 0.627 and had a significant correlation with the import value. However, when we analysed the correlation between the adoption of international standards and import value with and without the control variable, the change was high; correlation coefficient was significant and from 0.898 to −0.086 (negative), and very insignificant (0.761) effect was observed on the import value performance. Therefore, this means that only national standards development has a strong and significant correlation with the import value of mechanical and fluid for general use products and materials handling equipment.

Textile and leather technology products

Condition of this sector is the same as food technology products. The national standards development and adoption of international standards have a very strong correlation with the import value (0.955 and 0.925) and a significant correlation. However, when we analysed the adoption of international standards with the control variables, the correlation was still strong (0.626) and significant. The correlation coefficient for adoption of international standards using control variable national standards development became lower and negative (−0.072) and had a very insignificant (0.798) effect on the import value. Therefore, in this sector, only national standards development has a strong and

significant correlation with the import value of textile and leather technology products.

4.2.2 National standards as the variable control

In other linear model, adoption of international standard have a strong and significant correlation to the performance of imports, national standard as the variable control and the value will be calculated as R square of each sector.

Agricultural products

In the agriculture sector, national standards development and adoption of international standards have a very strong correlation with the import value (0.912 and 0.958), and the correlation is very significant. However, when we analysed the adoption of international standards with the control variables, only a small correlation value of 0.366 was clearly seen, which was not significant. When the authors looked more into the correlation between the adoption of international standards and the import value performance without the national standards development, a strong correlation (0.759) was seen with a significant impact on the import value performance. This proves a strong and significant contribution to the performance of import value for the agricultural products sector in case of adoption of international standards, and not in the case of development of national standards, while developing their own national standards contributes only slightly, insignificant to the value of imports. For this sector, we have showed the correlation coefficient in the figure below. Calculation of the value of contribution by the adoption of international standards on the import value through value of R square showed an enormous contribution (R Square = 0.917) in this sector.

Table 5: Correlation coefficient for agriculture products

Correlations

Control variables			Import value	National standard	Adoption SI
-none-[a]	Import value	Correlation	1.000	.912	.958
		Sign (2-tailed)	.	.000	.000
		df	0	14	14
	National standard	Correlation	.912	1.000	.905
		Sign (2-tailed)	.000	.	.000
		df	14	0	14
	Adoption SI	Correlation	.958	.905	1.000
		Sign (2-tailed)	.000	.000	.
		df	14	14	0
Adoption SI	Import value	Correlation	1.000	.366	
		Sign (2-tailed)	.	.180	
		df	0	13	
	National standard	Correlation	.366	1.000	
		Sign (2-tailed)	.180	.	
		df	13	0	

a. Cells contain zero-order (Pearson) correlations.

Correlations

Control variables			Import value	Adoption SI
National standard	Import value	Correlation	1.000	.759
		Sign (2-tailed)	.	.001
		df	0	13
	Adoption SI	Correlation	.759	1.000
		Sign (2-tailed)	.001	.
		df	13	0

Mining and mineral products

The correlation coefficient between national standards development and adoption of international standards for the import value performance in the mining and mineral commodities showed a strong and significant correlation (0.618 and 0.658), more than 0.5. However, when we analysed adoption of international standards with the control variables, a strong correlation was again observed (0.527), but insignificant. We then analysed the correlation between the adoption of international standards and import value, which showed a strong correlation (0.617) and significant impact on the import value. In mining and mineral sector, although the development of national standards contributes strongly to the import value performance, it is not significant. And the adoption of international standards in this sector shows a strong and significant influence (R Square = 0.786) on the import value.

4.3 Significant model without control variable

Along with control variable that influences the performance of the import value, there is another linear model that has two factors affecting the import value simultaneously. When these two factors are separated or one of the factors is eliminated, the correlation becomes smaller and insignificant. Following is the model of sector that has strong values and significant correlation.

Wood technology products

The wood technology sector is very different than the previously mentioned sectors; the correlation between the two variables with the import value was strong (0.894 and 0.884) and highly significant. However, when the researchers analysed the relationship with one of the variables with the value of import without being influenced by other variables, the results obtained were very different and showed that none of the two variables had a strong and significant correlation. This means that both the variables (the development of national standards and adoption of international standards in this sector) do not have a strong correlation and significant effect (R Square = 0.906) on the import value performance. This can be seen in the following figure.

Table 6: Correlation coefficient for wood technology sector

Correlations

Control variables			Import value	National standard	Adoption SI
-none-[a]	Import value	Correlation	1.000	.894	.884
		Sign (2-tailed)	.	.000	.000
		df	0	14	14
	National standard	Correlation	.894	1.000	.927
		Sign (2-tailed)	.000	.	.000
		df	14	0	14
	Adoption SI	Correlation	.884	.927	1.000
		Sign (2-tailed)	.000	.000	.
		df	14	14	0
Adoption SI	Import value	Correlation	1.000	.425	
		Sign (2-tailed)	.	.114	
		df	0	13	
	National standard	Correlation	.425	1.000	
		Sign (2-tailed)	.114	.	
		df	13	0	

a. Cells contain zero-order (Pearson) correlations.

Correlations

Control variables			Import value	Adoption SI
National standard	Import value	Correlation	1.000	.327
		Sign (2-tailed)	.	.233
		df	0	13
	Adoption SI	Correlation	.327	1.000
		Sign (2-tailed)	.233	.
		df	13	0

Shipbuilding and marine structure products

Similar to the railway sector, the development of national standards or adoption of international standards do not have a strong and significant correlation with the import value of the shipbuilding and marine structure products (0.495 or −0.338). Therefore, none of the variables in this sector can contribute (R Square = 0.666) towards the value of import.

4.4 Underdeveloped model

There is also a model that is underdeveloped, for both national standards development and adoption of international standards. Although the model is not yet developed, the transaction of the import value is significant.

Railway products

In the railway sector, for 15 years, only one standard was adopted from international standards; therefore, this variable cannot be used as a control variable. Correlation coefficient between national standard development and the import value of railway product was not high (0.417), and the correlation was not significant (0.108). Therefore, in this sector, national standards development does not have a strong and significant correlation with the import value of railway products.

Aircraft and space vehicle products

In this sector, the national standard development or adoption of international standards cannot be analysed, because there is only one national standard. Although an average of the import value of aircraft and space vehicle products is large enough, around US$121.8 million per year, a national standard cannot become a reference in the product import transactions yet.

5. Discussion

In this paper, many questions are still unanswered, such as number of contribution by imported products resulting from the adoption of international standards and national standards. Domestic companies are increasingly experiencing difficulties in marketing their products in the domestic market, as small and medium enterprises (SME) are generally still using traditional equipment in production. The authors recognized the bias that caused the composition of the standard type in every sector, because this type of testing standards contribute more comprehensively on several import and export products, than standard products itself. However, due to the lack of data access and high time to check the standard documents one by one, the authors could not provide more detailed analysis.

Another question is whether the adoption of international standards into national standards should consider the interests of small and medium businesses and regional agreement, in accordance with the provisions of PNS 01: 2007. Standard adoption is also expected to meet the needs and objectives in accordance with factors like climatic, environmental, geological, geographical, and technological capabilities as well as other specific national conditions. Another thing is that the cost and time needed is not least given the number of products produced is not a lot. Therefore, the result is that the adoption of national standards is very difficult and requires no small cost in the application and conformity to assessment products.

Is the availability of conformity assessment infrastructure in accordance with national standards adoption resulting in the covered area enough? The cost of conformity assessment infrastructure development is quite large, ranging from the assay laboratory, calibration laboratory, and inspection body. These three things need to be studied further, so that issues in the country to realize fair trade for domestic companies and companies abroad can be addressed.

Another thing that needs to be discussed is how the negative correlation value obtained in the analysis can be explained if related to the way the international standards are adopted, and the factor of speed changes of international standard also can affect.

6. Conclusion

The analysis of overall data about correlation between the national standards development and the import value performance by using adoption of international standards as a control variable can be summed up as follows: the correlation coefficient becomes smaller (0.130) with control variables compared to the correlation coefficient value without control variables (0.163). Although the correlation coefficient is small, it is significant. This means that the national standards in overall sector have a small correlation with the import value performance, but are still influenced by the adoption of international standards. The value of contribution to the value of import value performance from the two independent variables is approximately 3.9% (this number of R Square = 0.039). This finding is supported by several references that have a positive and significant impact on the national standards development and international standards on import performance (Swann, 1996, Blind and Jungmittag, 2001, Blind, 2004, Moenius, 2004, Grajek, 2004, Fontagné et al., 2005, Moenius, 2006, Clougherty and Grajek, 2008).

The authors also analysed the national standards development and/or adoption of international standards on import value for each sector or commodity group by partial correlation, with and without the control variable, and obtained some interesting results:

- In general, some commodity sectors have a strong correlation value, and significant correlation of program development with national standards is seen in the following product sectors: **petroleum technologies products, food technology products, textile and leather technology products, clothing industry products, paper technology products, chemical technology; paint and colour products, rubber and plastic products, metallurgy products, road vehicles products, mechanical; fluid for general use; materials handling equipment, construction materials and building products; civil**

engineering products; glass and ceramic products, and domestic and commercial equipment. Moenius also found that international standards contributed negatively to the value of imports for the food sector, beverages, crude materials, and mineral fuels (Moenius, 2004). And the correlation coefficient is small and insignificant in the following product sectors: **agriculture products, wood technology products, railway products, and shipbuilding and marine structures products.**

- A strong correlation value and a significant correlation of the adoption of international standards on the performance value of imports was also found in some commodity sectors: **agricultural products, mining and mineral products, metallurgy products, and civil engineering products.** And the adoption of international standards in several commodity sectors only had a small correlation and insignificant effect on the import value performance: **petroleum technologies products, food technology products, textile and leather technology products, clothing industry products, wood technology products, chemical technology; paint and colour products, rubber and plastic products, road vehicles products, shipbuilding and marine structures products, mechanical; fluid for general use; materials handling equipment, glass and ceramic products, and domestic and commercial equipment**. The adoption of international standards should be a part of influencing the development of national standards in the same sector. However, some sectors have a negative coefficient correlation: **food technology products, textile and leather technology products, paper technology products, chemical technology; paint and colour products, rubber and plastic products, road vehicle products, shipbuilding and marine structure products, mechanical; fluid for general use; materials handling equipment, glass and ceramic products,** and **domestic and commercial equipment.** It weakens the performance of the development of national standards.
- There is one commodity sector where the adoption of international standards has a strong correlation coefficient, significant with import value in comparison to the national standards development. The adoption of international standards in the **agricultural sector** has a strong and significant influence on the import value performance. The authors also found interesting leads in this sector, where in the beginning, national standards development and adoption of international standards had a strong correlation with the value of the import value of commodities (0.912 and 0.958) and also a significant correlation. However, when analysed by the control variable adoption of international standards, it was clear that national standards development on the import value performance showed that the correlation value became small (0.366) and the correlation became insignificant. This sector was also found by Fontagné et al., where national standards contributed negatively, but were significant to import value for agriculture products (Fontagné et al., 2005). In contrast to the adoption of international standards on the import performance without being influenced by the development of national standards, a strong correlation was seen (0.759) along with a significant impact on the performance of the import value. It can be concluded that a significant contribution (R Square = 0.917) in the sector of agricultural products is through the activity of adoption of international standards.
- There are two product sectors – **metallurgy product** and **construction and building materials; civil engineering products** – where both the development of national standards or adoption of international standards has a strong correlation value and significant impact on the performance of the import value. Therefore, in this sector, both the factors contributed strongly and had significant impact on the value of imports.
- In case of two product sectors, it was also found that there was no strong correlation and significant effect on the export value, both by national standards development and adoption of international standards. These sectors are **wood technology products and shipbuilding and marine structure products**.
- Among other findings, two product sectors were found in which the national standards development had a strong correlation and significant effect on the export value, and adoption of international standards had a weak correlation and insignificant effect on the export value performance. These sectors are the **petroleum technology products and clothing industry products**.

Some research literatures indicate that international standards can help reduce the barriers to entry (Swann, 2010b) – this means significantly positive for the imports by country or contrariwise (Anders and Caswell, 2009). From the results, it can be observed that the impact of differences and similarities on some sectors has a positive effect and significant correlation, while for other sectors, negative impact and insignificant correlation. However, the authors found some important points to consider before adopting the international standards, although most are not discussed in this paper. The first point is that the age of international standards adopted is not too long, because the international standards will be updated or revised.

The author argues that it should be less than 3 years, given that the time it takes is one year to get adopted into national standards and disseminate to stakeholders as well as the required minimum of one year for preparation of supporting infrastructure such as scope extension of laboratories and other conformity assessment development. In addition, it should be considered that a national program to educate businesses and the public sector about the benefits of the standard (Swann, 2010b) is in line with the program of standards development as the result of adoption or new standard. Another factor to consider is the manufacturer's or companies' condition

domestically and abroad, which one uses the standards, and gap in the technology in general to apply the standard. This is like a planning of BSN to propose a new standard program in the future. All the factors should be prepared well in a scientific paper proposal before setting out a new title of new standard in the formulation of national standards program. It is expected that the standards that have been set can be applied by all stakeholders, especially strengthening the competitiveness of domestic industries.

References

[1] Acs, Z. J., Morck, R., Shaver, J. M. & Yeung, B. (1997). The internationalization of small and medium-sized enterprises: A policy perspective. *Small business economics*, *9*, 7–20.

[2] Anders, S. M. & Caswell, J. A. (2009). Standards as barriers versus standards as catalysts: Assessing the impact of HACCP implementation on US seafood imports. *American Journal of Agricultural Economics*, *91*, 310–321.

[3] Beghin, J. C., Beladi, H., & Choi, E. K. (2013). *Non tariff measures with market imperfections: Trade and welfare implications*. Bradford, UK: Emerald Group Publishing.

[4] Blind, K. (2004). *The economics of standards: Theory, evidence, policy*. Cheltenham, UK: Edward Elgar.

[5] Blind, K., & Jungmittag, A. (2001). The impacts of innovation and standards on German trade in general and on trade with the UK in particular: A step further on Swann, Temple and Shurmer. *Fraunhofer Institute for Systems and Innovation Research, Karlsruhe*.

[6] Blind, K., & Mangelsdorf, A. (2016). Motives to standardize: Empirical evidence from Germany. *Technovation*.

[7] CEBR (2015). *The economic contribution of standards to the UK economy*. London: BSI.

[8] Clougherty, J. A., & Grajek, M. (2008). The impact of ISO 9000 diffusion on trade and FDI: A new institutional analysis. *Journal of International Business Studies*, *39*, 613–633.

[9] Cummins, R. A. (1998). The second approximation to an international standard for life satisfaction. *Social Indicators Research*, *43*, 307–334.

[10] Fischer, R. & Serra, P. (2000). Standards and protection. *Journal of International Economics*, *52*, 377–400.

[11] Fontagné, L., Mimouni, M., & Pasteels, J. M. (2005). Estimating the impact of environmental SPS and TBT on international trade. *Integration and Trade Journal*, *22*, 7–37.

[12] Grajek, M. (2004). Diffusion of ISO 9000 standards and international trade. WZB, Markets and Political Economy Working Paper No. SP II, 16.

[13] Kufs, C. (2011). *Stats with Cats: The Domesticated Guide to Statistics, Models, Graphs, and Other Breeds of Data Analysis*. Tucson, US: Wheatmark, Inc.

[14] Marette, S. & Beghin, J. (2010). Are standards always protectionist? *Review of International Economics*, *18*, 179–192.

[15] Mclinden, G. (2011). *Border management modernization*. World Bank Publications.

[16] Moenius, J. (2004). Information versus product adaptation: The role of standards in trade. Retrived from SSRN 608022.

[17] Moenius, J. (2006). Do national standards hinder or promote trade in electrical products. *Commended Paper, IEC Centenary Challenge.* Retrived from http://www.iecchallenge.org/papers.

[18] Pack, H. & Saggi, K. (1997). Inflows of foreign technology and indigenous technological development. *Review of development economics*, *1*, 81–98.

[19] Raith, M. (2001). Competition, risk and managerial incentives. Retrived from SSRN 262648.

[20] Swann, G. P., P., Temple, & Shurmer, M., (1996). Standards and trade performance: The British experience. *Economic Journal*, *10*, 124–145.

[21] Swann, G. P. (2010a). International standards and trade.

[22] Swann, P. (2010b). The economics of standardization: An update. Report for the UK Department of Business, Innovation and Skills (BIS).

[23] Tambunan, T. (2008). SME development, economic growth, and government intervention in a developing country: The Indonesian story. *Journal of international entrepreneurship*, *6*, 147–167.

[24] Tampubolon, B. D. (2016). Why still develop national standards for export? An Indonesia case study. *International Journal of Economics, Commerce and Management*, IV, 18.

[25] Temple, P., Blind, K., Jungmittag, A., Spencer, C., Swann, G. & Witt, R. (2005). *The empirical economics of standards*. DTI economics paper, 12, 123.

[26] Tran, N., Wilson, N., & Hite, D. (2013). Choosing the best model in the presence of zero trade: A fish product analysis. *Frontiers of Economics and Globalization*, 12, 127-148

[27] Van Tongeren, J. B., Marette, S., Van Tongeren, F., Beghin, J. & Marette, S. (2009), A Cost-Benefit Framework for the Assessment of Non-Tariff Measures. in Agro-Food Trade, OECD Food, Agriculture and Fisheries Working Papers. Citeseer.

[28] Vandenbussche, H., Konings, J. & Springael, L. (1999). Import diversion under European antidumping policy. National bureau of economic research.

[29] Watts, T. P., Swann, G. P. & Pearson, A. W. (2000). Virtual reality? When visualization needs vision. Engineering Management Society, 2000. Proceedings of the 2000 IEEE, , 426-430.

Author Profile

Biatna Dulbert Tampubolon received the B.Sc. degrees in Statistics from Padjadjaran University, Bandung in 2000 and M.Sc. degrees in Bio-system Sustainability from Hokkaido University, Japan in 2012, respectively. Since 2002, working at the National Standardization Agency of Indonesia as a researcher. From 2015 continue study the innovation of economics and management at TU Berlin, Germany.

Febrian Isharyadi received the B.Sc degrees in Chemistry from Nusa Bangsa University, Bogor in 2004 and since 2011 working at the National Standardization Agency of Indonesia as Researcher