RIETI Discussion Paper Series 22-E-025

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RIETI Discussion Paper Series 22-E-025
March 2022

How Does the Reform of Rules of Origin Affect Firm Performance in Importing Countries?

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Abstract: This study empirically examined the economic impacts of reform in Japan's generalized system of preferences regarding firm performance. Specifically, we considered the relaxation of the rules of origin (RoOs) for knitted apparel in 2011 and 2015. We conducted difference-in-differences analysis by defining the knitted apparel industry as a treatment group and the woven apparel industry as a control group. First, we demonstrate that Japan's total imports of knitted apparel products did not experience a greater increase than that of woven apparel products. However, imports of knitted apparel products from least developed countries increased significantly. Second, on average, the two RoO reforms did not significantly change the shipment values of knitted apparel producers. However, we identified significant results for knitted apparel producers in the lower price range. While the first relaxation in 2011 reduced their production quantity and raised their unit prices, the second relaxation in 2015 reduced their shipment value through a reduction in production quantity.

Keywords: Rules of origin (RoOs); Least developed countries (LDCs); Generalized system of preferences
JEL Classification: F15; F53

[§] This study was conducted as part of the Project "Globalization and the Japanese Economy: Firm Adjustment and Global Trade Governance" at the Research Institute of Economy, Trade and Industry (RIETI). This study utilizes the data of the questionnaire information based on "the Census of Manufacture" which is conducted by the Ministry of Economy, Trade and Industry (METI) and "the Economic Census for Business Activity" which is conducted by the Ministry of Internal Affairs and Communications and METI. We also utilize the plant converter for the Census of Manufacture, which is provided by RIETI. We would like to thank Eiichi Tomiura, Masayuki Morikawa, Makoto Yano, Hitoshi Tsuruta, Shujiro Urata, and seminar participants at RIETI for their invaluable comments. This work was supported by JSPS KAKENHI Grant Number 17H02530. All remaining errors are ours.
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1. Introduction

The generalized system of preferences (GSP) program grants preferential market access to products originating from developing countries/territories. Several countries, particularly highly developed countries, have established this system to help developing countries increase their export earnings, advance industrialization, and promote economic development. In particular, some countries have provided duty-free access to almost all products imported from the least developed countries (LDCs). Some empirical studies have found that such non-reciprocal preferential trade agreements (NRPTAs), including the GSP program, increase exports from beneficiary countries (e.g., Frazer and Van Biesebroeck, 2010; Aiello and Demaria, 2010; Herz and Wagner, 2011; Gil-Pareja et al., 2014; Ito and Aoyagi, 2019). Therefore, the GSP program contributes to the enhancement of economic development in developing countries.

The goal of this study was to examine the economic impact of the reform of the GSP program on firm performance in granting countries empirically. Specifically, we explored these impacts in Japan. Under its GSP program, Japan applies reduced tariffs to designated imported products originating from developing countries. Almost all products originating from LDCs are given preferential treatment such as duty-free and quota-free (DFQF) market access. Existing studies have examined the economic impacts of the GSP program on beneficiary economies because this program aims to improve economic performance in beneficiary countries (i.e., developing countries). In contrast, we investigated the impacts on GSP-granting countries. Because the GSP is a voluntary and unilateral preferential regime, unlike regional trade agreements (RTAs), GSP-granting countries may suspend this system if their economies are significantly negatively affected. Therefore, an evaluation of such impacts is important for managing the balance between unilateral liberalization and its economic costs.

In our empirical analysis, we considered the relaxation of the rules of origin (RoOs) in Japan's GSP program. We focused on firms in the apparel industry in Japan from 2010 to 2016. RoOs certify that exported products originate in the target exporting country. To receive preferential treatment regarding tariff payments, exporting firms must comply with the RoOs specified in the GSP program. As explained in the next section, the Japanese government relaxed its RoOs for knitted apparel (harmonized system (HS) 61) in the GSP program from the so-called three-stage processing rule to a two-stage processing rule in 2011 and from a two-stage processing rule to a single-stage processing rule in 2015. These relaxations increased Japan's imports of knitted apparel products from LDC beneficiaries. In contrast, the RoOs for woven apparel products (HS 62) did not change during the study period. By exploiting the fact that these two apparel industries follow similar production processes, we conducted difference-in-differences (DID) analysis. Specifically, by defining the knitted apparel industry as the treatment group and the woven apparel industry as a control group, we examined the impact of rule relaxation on the outputs of knitted apparel producers in Japan.

Our findings can be summarized as follows. First, we demonstrate that Japan's total imports of knitted apparel products did not exhibit a greater increase than that of woven apparel products. However, imports of knitted apparel products from LDCs have dramatically increased compared to those of woven apparel products. Second, our DID analysis suggests that on average, the two RoO reforms did not significantly change shipment values for knitted apparel producers. However, we identified significant results for knitted apparel producers in the low price range. The first relaxation of RoOs in 2011 significantly reduced their production quantity, but raised their unit prices. Additionally, after the second relaxation of RoOs in 2015, they significantly reduced their shipment value through a reduction in production quantity. These results are consistent with our other findings regarding the increase in knitted apparel imports from LDCs. Because apparel products from LDCs are low-quality and low-price products, domestic producers competing with those products from LDCs experience significant impacts on their performance.

Our study contributes to the NRPTA literature by uncovering the impact of such agreements on providers. Additionally, our study is related to the literature on the economic effects of relaxing RoOs.[1] Some studies have investigated this issue by examining RoO reform in the European Union's (EU's) GSP program in 2011. Similar to the case of Japan's 2015 reform, RoOs for apparel products in the EU's GSP program were relaxed from a two-stage processing rule to a single-stage processing rule. Tanaka (2021) found that this reform increased total exports of apparel products from Cambodia to the EU by 112%. In other words, the relaxation of RoOs has a trade-creation effect. This effect was also identified at the firm level (Sytsma, 2022). Sytsma (2021) also demonstrated that this change increased the preference utilization rates of apparel exports from LDCs to the EU. In this study, we examined the economic effects of Japan's relaxed RoOs on the Japanese economy (i.e., the economy of the GSP-granting country).

The remainder of this paper is organized as follows. The next section introduces Japan's GSP program and the reform of its RoOs. After presenting our empirical framework in Section 3, we report our estimation results on the impact of relaxing RoOs on domestic producer performance in Section 4. Finally, Section 5 concludes the study.

[1] Because relaxing RoOs is a form of trade liberalization, this study is also related to the literature on the effects of trade liberalization on domestic producers. Although large numbers of the studies are included in this literature, this study is closely related to those by Eslava et al. (2004), De Loecker et al. (2014), De Loecker et al. (2016), Dhyne et al. (2017), and Kikkawa et al. (2019), who utilized the data on quantity to derive price indexes at the producer level. Although we mainly used data at the plant-product level in this study, plant-level analysis is also presented in Appendix B.

2. Background

In this section, we introduce Japan's GSP program, which has been available since 1971.[2] Japan applies reduced tariffs to designated import products originating from GSP beneficiaries. Among GSP beneficiaries, different preferential tariff rates are applied to imports from non-LDCs and LDCs. In our study period (2010 to 2016), the numbers of non-LDC beneficiaries and LDC beneficiaries were approximately 150 countries and 50 countries, respectively (see Table A1 in Appendix A). Although the GSP tariffs for non-LDCs are set to a limited number of products and are not necessarily zero, those for LDCs are zero for almost all products. Another difference is that LDC beneficiaries can still use the GSP program after signing RTAs with Japan. However, for non-LDC beneficiaries, the GSP program is no longer available if they have RTAs with Japan and GSP tariff rates are not lower than RTA tariff rates. In contrast to these factors, the RoOs in the GSP program are common between non-LDC and LDC beneficiaries.

The GSP program has been implemented worldwide for more than two decades. In June of 1996, the Director General of the World Trade Organization (WTO) advocated a tariff waiver program for all products from LDCs.[3] In May of 2000, this initiative was formally announced by Director General Moore at the WTO General Council. With this background, in December of 2005, the Hong Kong Ministerial Declaration announced that developed members would provide DFQF market access on a long-term basis for all products or at least 97% of all products with difficulty originating from LDCs. For example, in Japan, the share of items with DFQF market access for LDCs rose from 86% to 98% in April of 2007. Furthermore, in the G20 Seoul Summit in 2010, leaders agreed to make progress toward DFQF market access for LDC products in line with Hong Kong's commitments without prejudice to other negotiations, including preferential RoOs.[4]

In line with this movement, the Japanese government relaxed its RoOs for apparel industries in the GSP program in 2011. Before 2011, the single-stage processing rule was adopted for woven apparel products, whereas the three-stage processing rule was adopted for knitted apparel products. The latter rule is known as the yarn-forward rule, which requires the use of yarn originating from GSP beneficiaries to create fabrics. This rule is restrictive because most LDCs do not have sufficient capabilities to produce yarn and fabrics. Therefore, in April of 2011, RoOs for knitted apparel products were relaxed to the two-stage processing rule, which requires the use of fabrics originating from GSP beneficiaries. Specifically, GSP beneficiaries are allowed to use imported yarns to produce fabrics and apparel products. Additionally, in the 2011 reform of Japan's GSP program, two additional rules were introduced for the textile and apparel industries (HS50-63). One is the "donor

[2] See http://www.mofa.go.jp/policy/economy/gsp/explain.html.

[3] The following three paragraphs are based on the discussion in METI (2015, page 420).

[4] https://www.mofa.go.jp/policy/economy/g20_summit/2010-2/annex2.pdf

country content rule," which allows the use of materials imported from Japan,[5] while the other is the "de minimis rule," which allows the use of non-originating materials if the total weight of all those materials is no more than 10% of the total weight of the final product.

The RoOs for knitted apparel in Japan's GSP program were further relaxed in 2015 based on LDC requests to GSP-granting countries. In September of 2013, several proposals regarding preferential RoOs for LDCs were made by LDC, including "for articles of apparel and clothing, substantial transformation shall be recognized when fabrics are assembled into finished garments."[6] Then, at the ninth WTO Ministerial Conference held in Bali, Indonesia in December of 2013, ministers adopted guidelines for preferential RoOs for LDCs. Therefore, "in response to requests from LDCs, Japan simplified preferential RoOs under the Generalized System of Preferences for HS61 (knitted apparel) on April 1, 2015," according to the 2018 Report on Compliance by the Ministry of Economy, Trade, and Industry of Japan.[7] Specifically, in April of 2015, the RoOs for knitted apparel changed from a two-stage to a single-stage process rule, which does not impose any restrictions on the sources of materials for apparel production.

In Japan, as mentioned above, the GSP tariffs for LDCs have been zero for all apparel products since 2000. Among apparel products (HS61-62), only four woven apparel products had zero most favored nation (MFN) rates in Japan during our study period.[8] Therefore, the use of preferential tariffs such as GSP tariffs is a significant advantage for apparel exporters. Although non-LDC GSP beneficiaries can also enjoy the two relaxations of RoOs, preferential tariffs for non-LDCs are available for only seven knitted apparel products out of approximately 280 products (i.e., 2% of all knitted apparel products, see Figure A1 in the Appendix). Furthermore, as mentioned above, GSP tariffs are no longer available to Japan's RTA partners unless they are higher than the RTA tariffs. Based on the availability of RTA tariffs, GSP tariffs are not available when importing knitted apparel products from non-LDC GSP beneficiaries in Southeast Asia, including Indonesia, Malaysia, Thailand, the Philippines, and Vietnam. Therefore, in this study, we consider that the aforementioned RoO reforms mainly affect the exports of knitted apparel from LDCs.[9]

Here, we present an overview of apparel imports in Japan. Figure 1 presents Japan's imports of knitted and woven apparel products by considering those in 2011 as a value of one. Overall, the changes in imports do not exhibit different patterns for knitted and woven

[5] The use of fabrics made in Japan was allowed for woven apparel products before this reform because the RoOs for those products followed a single-process rule.

[6] See https://www.wto.org/english/thewto_e/minist_e/mc9_e/brief_ldc_e.htm.

[7] See https://www.meti.go.jp/english/report/data/2018WTO/pdf/02_05.pdf.

[8] MFN tariffs for apparel products did not change in Japan during our study period. The average, median, minimum, and maximum values of MFN rates in HS 61 were 8.5%, 8.3%, 5%, and 10.9%, respectively. The corresponding statistics for HS 62 are 9.5%, 9.1%, 3.25%, and 13.4%, respectively.

[9] For knitted apparel in 2016, imports from the top three LDC exporters (Bangladesh, Cambodia, and Myanmar) that requested GSP tariffs accounted for more than 99% of total imports that requested GSP tariffs (including GSP tariffs for non-LDCs).

apparel products. Therefore, the relaxation of RoOs for knitted apparel products does not seem to change Japan's total imports. Figure 2 focuses on imports from LDCs (as of 2010). Although the changes in imports do not exhibit different patterns between the two apparel industries until 2011, imports of knitted apparel products exhibit a dramatic increase afterward. The gap between the two industries increases over time. Therefore, the relaxation of RoOs for knitted apparel products seems to increase their imports from LDCs significantly. The share of imports from LDCs among the total imports of knitted apparel increased from 1% in 2010 to 7% in 2016.

=== Figures 1 & 2 ===

3. Empirical Framework

In this section, we discuss our empirical framework designed for detecting the effects of RoO relaxation. We consider three outcome variables, namely shipment value, unit price, and quantity, at the plant-product-year level. Products are defined at a six-digit level and are restricted to apparel products (i.e., knitted or woven apparel products). First, we explore the average treatment effects at the plant-product level by estimating the following equation:

$$\ln Y_{ijt} = \alpha_1 Knitted_j * After2011_t + \alpha_2 Knitted_j * After2015_t + \delta_{ij} + \delta_t + \epsilon_{ijt}, \quad (1)$$

where the dependent variable is one of the logged outcome variables for product j produced by plant i in year t. $Knitted_j$ is a knitted product dummy and takes a value of one if product j is a knitted product and a value of zero for a woven product. $After2011_t$ and $After2015_t$ represent the relaxation of RoOs and take values of one if year t is 2011 or 2015 and after, respectively. δ_{ij} and δ_t denote the plant-product-fixed effect and year-fixed effect, respectively. The plant-product fixed effect represents the time-invariant production capacity and productivity of plant i for product j. The year-fixed effect reflects a common shock to all plants or products in year t such as a financial crisis. ϵ_{ijt} is an error term. The coefficients α_1 and α_2 represent the average treatment effects of the first and second relaxations of RoOs, respectively.

Next, by focusing on the shipment value, we estimate the following equation with a three-way fixed effect to detect the heterogeneous effects of RoO relaxation:

$$\begin{aligned}\ln Y_{ijt} = {} & \beta_1 Knitted_j * After2011_t * LowPrice_{ij} \\ & + \beta_2 Knitted_j * After2015_t * LowPrice_{ij} + \delta_{ij} + \delta_{jt} + \rho_{ij} * \delta_t + \epsilon_{ijt}, \end{aligned} \quad (2)$$

where $LowPrice_{ij}$ is a dummy variable that takes a value of one if the plant-product observation is categorized into the low price range. We classify the plant-product observations ij by their relative prices within product j. Specifically, we consider a plant-product observation to be in the low price range if its price is less than the tenth percentile of the price distribution in 2010.[10] In Equation (2), we include plant-product-fixed effects (δ_{ij}) and product-year-fixed effects (δ_{jt}). The product-year-fixed effect represents a shock specific to product j in year t, controlling for product-specific preferences and demand in Japan. This term also includes the average effects of RoO relaxation on knitted products. Additionally, $\rho_{ij} * \delta_t$ represents the interaction terms of the price range fixed effects ρ_{ij} (low or not) with the year effects δ_t, controlling for the differences in trends between price ranges. These fixed effects allow the coefficients β_1 and β_2 to be interpreted as the heterogeneity of treatment effects.

The estimation of RoO effects using Equations (1) and (2) assumes that the shipment values would be similar between knitted and woven products if the RoOs had not been relaxed. This assumption is justified when the trends are parallel. Figure 3 presents the means of the log value indices for the knitted and woven products. The value indices are calculated as the ratio of the shipment value in each year to the value in 2010 for the plant-product observations. Therefore, the logs of the value indices are normalized to zero in 2010. The shipment values of the knitted products are slightly different from those of the woven products in 2008, but are similar to those in 2009. The value of knitted products is relatively low in 2011, 2014, and 2016, but relatively high in 2015. Overall, both knitted and woven products exhibit declining shipment values. These trends appear similar not only before, but also after the relaxation of RoOs.

=== Figure 3 ===

Figure 4 presents the means of the log differences of the value indices between the knitted and woven products in the price range. The value indices are calculated as the ratio of the shipment value in each year to the value in 2010 for the plant-product observations. The blue and red lines in Figure 4 represent the following expressions:

$$E\left(\ln\left(\frac{Value_{ijt}}{Value_{ij,2010}}\right)\middle|ij \in Knitted\&LowPrice\right) - E\left(\ln\left(\frac{Value_{ijt}}{Value_{ij,2010}}\right)\middle|ij \in Woven\&LowPrice\right),$$

$$E\left(\ln\left(\frac{Value_{ijt}}{Value_{ij,2010}}\right)\middle|ij \in Knitted\&HighPrice\right) - E\left(\ln\left(\frac{Value_{ijt}}{Value_{ij,2010}}\right)\middle|ij \in Woven\&HighPrice\right).$$

[10] We selected 2010 simply because it was the first year in our sample. In some subsample analyses, the first year was 2013. Therefore, we checked the robustness of the main result by classifying plant-product observations according to the prices in both 2013 and 2010.

The relative shipment values of the knitted products were slightly different from those of the woven products before 2010, particularly in 2008. Subsequently, the decline in the value of knitted products was relatively larger for the plants in the low price range in 2012. Although low-price knitted apparel producers expanded their shipment values in 2013 and 2014, those values declined afterward. Although careful interpretation is required for the changes in values in these years because the price range is defined by the price in 2010 and is fixed in other years, a similar trend can be observed when the price range is defined based on the price in 2013, as shown in Figure A2. In summary, the differences in the trends are relatively small before the relaxation of RoOs.

=== Figure 4 ===

If RoO reforms in Japan reduce the trade costs of exporting to Japan and induce tougher competition in Japan's market, then the coefficients α_1 and α_2 are expected to be negative when the dependent variable is value or quantity. The effect on price is ambiguous a priori because although the markups and prices of knitted products under price competition should be lowered, the quality of knitted products may be upgraded to escape from competition with LDCs (Aghion et al., 2001, 2005, 2018; Amiti and Khandelwal, 2013).[11] Additionally, Figure 1 indicates that the total import value of the knitted products moves in a similar manner to that of the woven products, suggesting that the RoO reforms did not induce fiercer import competition on average. In this case, the coefficients α_1 and α_2 are zero, even for the value and quantity. Regardless, Figure 2 indicates that the imports of knitted products from LDCs significantly increased compared to those of woven products. This change in the composition of knitted products may suggest that import competition became tougher only for plants producing low-price knitted products because imports from LDCs are low-quality and low-price products. If this expectation is true, then plants producing low-price knitted products would be affected more severely. This difference in effects appears in the form of negative signs for coefficients β_1 and β_2 in Equation (2).[12]

We obtained the main data used in this study from the Census of Manufacture conducted by the Ministry of Economy, Trade, and Industry (METI). In particular, we used commodity reports to obtain detailed information at the plant-product level. The sample products are listed in Table A2 in Appendix A. The products for which quantity information

[11] Another possibility is that original knitted apparel producers reduced their production of knitted products and increased that of woven products. Among our study plants, the average number of products was 1.7. Only 7% of apparel producers produced both knitted and woven products. Therefore, we consider this possibility to be low. The relevant statistics are available in Table A3 in Appendix A.

[12] If newly imported products are of high quality, then domestic firms can improve their product quality by learning about such products. Some studies have provided empirical evidence that imports can be a source of knowledge (Romer, 1993; Coe and Helpman, 1995; Connolly, 2003). However, because our focus was on imports from LDCs, we did not consider this channel.

was unavailable were excluded from the sample. Our sample covered 2010 to 2016 because the ASEAN-Japan Comprehensive Economic Partnership Agreement (AJCEP) was enacted in December of 2008 by Japan and ASEAN member states, some of which are Japan's GSP beneficiaries. RoOs in AJCEP are two-stage processing rules for both knitted and woven apparel products and did not change during our study period. Therefore, although the RoOs for knitted apparel products in the GSP program were relaxed from the three-stage processing rule to the two-stage processing rule in 2011, GSP beneficiaries in ASEAN have enjoyed the two-stage processing rule since 2008. To avoid including the effects of AJCEP in our estimates, we focused on the post-AJCEP period in our analysis, although this focus forced us to include only one year as a pretreatment period. Table 1 presents summary statistics based on the product types and price ranges.

=== Table 1 ===

One notable caveat is that the Census of Manufacture was replaced by the Economic Census for Business Activity conducted by the Ministry of Internal Affairs and Communications (MIC) and METI in 2011 and 2015. Although all variables required for this study were available for these years, some plants did not participate in the survey and the number of missing values for product quantity was large in these years.[13] In the estimation above, we included observations from these two years in the sample. As a robustness check, we also removed them and specified the following equation as the difference in differences in differences (DDD) form:

$$d\ln Value_{ij} = \gamma Knitted_j * LowPrice_{ij} + \delta_j + \rho_{ij} + \epsilon_{ij}, \qquad (3)$$

where the dependent variable $d\ln Value_{ij}$ is the log difference between shipment values in the first and last years of the study period. If the RoO reforms conducted between the two years negatively affected the plants of low-price knitted products, then coefficient γ should be negatively estimated. We estimated our models using the ordinary least squares (OLS) method. In all estimations, the standard errors were clustered at the product level.

4. Empirical Results

[13] Table A4 in Appendix A presents the raw numbers of plant-product observations, entries, and exits before dropping some observations with missing variables. One can see that the numbers of entries and exits exhibit much higher values during these years compared to the years before and after. The differences between surveys can be a severe confounding factor for the analysis of some variables such as the exit rate. In this study, we mainly focused on the shipment value because it could be observed for almost all plant-product observations.

This section reports our estimation results. Before calculating the heterogeneity of RoO effects, we investigate the average treatment effects. Table 2 reports the empirical results of Equation (1) with two-way fixed effects. In columns (1), (2), and (3), the dependent variables are the logs of value, quantity, and unit price, respectively. Most of the coefficients are statistically insignificant and the effects of RoO relaxation are almost negligible. However, column (2) weakly suggests that the average price rose after the second relaxation.[14] Specifically, the second RoO reform increased the prices of knitted products by 3.8%. Because this effect is visible within the plant-product observations, the quality of the knitted products may have been upgraded by the second relaxation of RoOs.

=== Table 2 ===

Next, we evaluate Equation (2) and present the results of the shipment values in Table 3. In column (1), the sample covers all years. The coefficients for both dummy variables are negatively estimated, but significant only for the second reform of RoOs, indicating that the second reform largely reduced shipment values for low-price knitted apparel producers. We conducted various estimations to check the robustness of this result. First, columns (2) and (3) present the results of subsample estimation by period (i.e., 2010 to 2013 and 2013 to 2016, respectively).[15] Specifically, we focus on the effects of the first relaxation of RoOs in the estimation for the former period and on those of the second relaxation in the estimation for the latter period. The coefficient is negative and statistically significant only in column (3), which represents the latter period. These columns indicate that the second relaxation had a negative impact on the production of low-price knitted products, whereas the first relaxation had no significant impact. The coefficient of −0.276 in column (3) indicates that the second relaxation reduced shipment values for low-price knitted apparel producers by 27.6%. This result suggests that the relaxation of RoOs in the GSP program for LDCs affected plants in the low price range more severely, perhaps because of fiercer competition with low-quality and low-price products imported from LDCs.

=== Table 3 ===

Second, in columns (1) to (3), whether a plant-product observation is categorized into a low price range is determined by its price in 2010. To check the robustness of the selection for this year, we classified the plant-product observations by their relative prices in 2013 and performed estimation using the same equation represented in column (3). Classification by

[14] We obtained similar results when the sample was aggregated at the product level. These estimation results are reported in Table A5 in Appendix A.

[15] The observations from 2013 are included into both subsamples so that they contain the same numbers of years.

price for 2013 is more appropriate if some knitted producers in the low price range in 2010 upgraded their products following the first relaxation of RoOs and moved out of the low price range in 2013. Another practical advantage of using the prices in 2013 is the expansion of the number of observations because observations appearing only after 2011 are dropped from the sample when the classification of the price range is performed based on the price in 2010. Column (4) in Table 3 presents the results of this estimation. Again, the coefficients of the dummy variables are negative and do not change quantitatively.

Third, we classified the low-price observations as those with prices lower than the tenth percentile among all plants within a product in a specific year. We adopted this criterion for the estimation results presented in Table 4. Column (2) shows a replication of column (3) in Table 3. Column (1) uses the cutoff of the fifth percentile. The coefficient is statistically negative and its magnitude is comparable to that of column (2). More observations are classified into the low price range in columns (3) and (4). Column (3) reports the estimation results for the case in which the low-price dummy takes a value of one for a quarter of the plant-product observations in terms of product prices. In column (4), we divide the sample into two halves and consider one half as the lower-price group. In these two columns, the coefficient of the dummy variable is estimated to be insignificant. In summary, RoO relaxation has a negative impact on the lower tenth percentile in the distribution of the relative prices within a product.

=== Table 4 ===

Fourth, in Tables 2 to 4, we present estimations of various specifications for plant-product observations in all years. However, the use of observations from 2011 and 2015 may be problematic because the data from these two years were collected as part of the Economic Census for Business Activity instead of the Census of Manufacture. Therefore, we employed the DDD framework specified in Equation (3) to avoid using data from 2011 and 2015. The estimation results are presented in Table 5. The dependent variables are the log differences in shipment values between the two years shown in the column titles. For example, in column (1), the log shipment value in 2010 was subtracted from the corresponding value in 2016 and the values from 2011 to 2015 were not used in this estimation. Columns (1) to (4) in Table 5 are comparable to the corresponding numbers of columns in Table 3. In columns (3) and (4), the coefficients of the dummy variables for the plants of low-price knitted products are negative and statistically significant. These results again suggest that the shipment values of low-price-knitted products were severely reduced by the second RoO relaxation. In summary, we confirmed that our main results hold, even when the DDD framework is employed.[16]

[16] Appendix B provides evidence at the plant level. For example, although one may expect that knitted

=== Table 5 ===

Finally, we examined the effects of RoO relaxation on unit prices and quantity using Equation (2). We repeated similar estimations to those reported in Table 3. The results for the unit prices are listed in Table 6. Unlike the case of shipment values, one can see significant results for the first relaxation of RoOs, which indicates a significant increase in prices. Therefore, after the first relaxation period, low-price apparel producers switched to or concentrated on the production of higher-priced products. However, one cannot observe a significant change in unit prices for low-price apparel producers following the second relaxation. The results for these quantities are listed in Table 7. The first relaxation again exhibits significant effects on low-price apparel producers, reducing their production quantities. Therefore, they transitioned to producing higher-priced products, but reduced their production volumes. These contrasting signs between unit prices and quantities yield insignificant results for shipment values. Similarly, the second relaxation of RoOs significantly reduced the production quantity of low-price apparel producers, although column (1) indicates an insignificant result. Therefore, the significant decrease in shipment values is driven simply by the reduction of production volumes, perhaps as a result of fiercer competition with imported products.

=== Tables 6 & 7 ===

The different effects of the two RoO relaxations are worth discussing. One of the sources of these differences may be the average quality of knitted apparel products imported from LDCs. LDCs cannot produce fabrics domestically, so they must be imported from other countries. As mentioned in Section 2, the first reform of RoOs in 2011 not only changed the PSR to a two-stage processing rule, but also allowed the use of materials imported from Japan (i.e., the donor country content rule). Therefore, this reform may have increased the imports of knitted apparel produced using high-quality fabrics imported from Japan, inducing domestic firms to upgrade their products.[17] However, the second reform in 2015 changed the PSR to a single-stage processing rule, which allowed the use of fabrics

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apparel producers in the low price range would upgrade their products to escape from competition with imported products, we did not observe significant changes in their labor productivity. Furthermore, in Appendix C, we present the plant-product level exits by evaluating the Probit model. We could not observe any robust results suggesting that the reforms of RoOs induced knitted apparel producers to stop the production of those products.

[17] To check the increase in Japan's exports of fabrics to LDCs, we regressed those exports on the interaction term between the dummy variables indicating LDCs and the years after 2010. Our study observations include exports to 184 countries from 2009 to 2018. We observed a significantly positive coefficient for that interaction term, which implies that Japan increased their fabric exports to LDCs following the first reform of RoOs.

imported from any country, including China.[18] Chinese fabrics are of lower quality, but much cheaper than Japanese fabrics. Therefore, the second reform may have triggered price competition in Japan's market, which drove out Japanese low-price knitted products.[19]

5. Concluding Remarks

In this study, we examined the two relaxations of RoOs for knitted products in Japan's GSP program in 2011 and 2015. Specifically, by using plant-product level data from 2010 to 2016, we investigated how these relaxations changed Japanese firm performance. We first demonstrated that these relaxations increased Japan's imports of knitted apparel products from LDC beneficiaries. Second, our DID analysis suggested that on average, the two RoO relaxations did not significantly change shipment values for knitted apparel producers. However, we found that after the first relaxation of RoOs in 2011, knitted apparel producers in the low price range significantly reduced their production quantity, but increased their unit prices. Additionally, following the second relaxation in 2015, low-price knitted apparel producers significantly reduced their shipment values through a reduction in production quantity. These results may indicate an improvement in economic efficiency in liberalizing countries by allocating resources more intensively to the production of higher-quality products. In other words, unilateral liberalization, particularly for LDCs, may serve as an industrial policy that encourages domestic firms to upgrade their products.

[18] When exporting with MFN tariffs, exporters do not need to comply with RoOs, so they could use Chinese fabrics, even before the relaxations of RoOs.

[19] Hayakawa (2018) demonstrated that Japanese affiliates in the apparel industry who exported from Cambodia, Laos, or Myanmar to Japan increased their input share from China following the second reform. Furthermore, Hayakawa (2018) demonstrated that the unit prices of knitted apparel products in Japan imported using GSP tariffs declined after the second reform compared to the prices of products imported using AJCEP tariffs.

References

Aghion, P., Bechtold, S., Cassar, L., and Herz, H., 2018, The Causal Effects of Competition on Innovation: Experimental Evidence, *Journal of Law, Economics, and Organization*, 34(2): 162–195.

Aghion, P., Bloom, N., Blundell, R., Griffith, R., and Howitt, P., 2005, Competition and Innovation: An Inverted-U Relationship, *Quarterly Journal of Economics*, 120(2): 701–728.

Aghion, P., Harris, C., Howitt, P., and Vickers, J., 2001, Competition, Imitation and Growth with Step-by-Step Innovation, *Review of Economic Studies*, 68(3): 467-492.

Aiello, F. and Demaria, F., 2010, Do Trade Preferential Agreements Enhance the Exports of Developing Countries? Evidence from the Eu Gsp, Working Papers 201002, Università della Calabria, Dipartimento di Economia, Statistica e Finanza "Giovanni Anania" - DESF.

Amiti, M. and Khandelwal, A., 2013, Import Competition and Quality Upgrading, *Review of Economics and Statistics*, 95 (2): 476–490.

Coe, D.T. and Helpman, E., 1995, International R&D Spillovers, *European Economic Review*, 39(5): 859–887.

Connolly, M., 2003, The Dual Nature of Trade: Measuring Its Impact on Imitation and Growth, *Journal of Development Economics*, 72(1): 31–55.

De Loecker, J., Fuss, C., and Van Biesebroeck, J., 2014, International competition and firm performance: Evidence from Belgium, Working Paper, No. 269, National Bank of Belgium.

De Loecker, J., Goldberg, P. K., Khandelwal, A. K., and Pavcnik, N., 2016, Prices, markups, and trade reform, *Econometrica*, 84(2): 445-510.

Dhyne, E., Petrin, A., Smeets, V., and Warzynski, F., 2017, Multi product firms, import competition, and the evolution of firm-product technical efficiencies, NBER Working Paper, No. w23637, National Bureau of Economic Research.

Eslava, M., Haltiwanger, J., Kugler, A., and Kugler, M., 2004, The effects of structural reforms on productivity and profitability enhancing reallocation: evidence from Colombia, *Journal of Development Economics*, 75(2), 333-371.

Frazer, G. and Van Biesebroeck, J., 2010, Trade Growth under the African Growth and Opportunity Act, *Review of Economics and Statistics*, 92(1): 128-144.

Gil-Pareja, S., Llorca-Vivero, R., and Martínez-Serrano, J., 2014, Do Nonreciprocal Preferential Trade Agreements Increase Beneficiaries' Exports?, *Journal of Development Economics*, 107(C): 291-304.

Hayakawa, K., 2019, Multiple Preference Regimes and Rules of Origin, IDE Discussion Papers 738, Institute of Developing Economies, Japan External Trade Organization.

Herz, B. and Wagner, M., 2011, The Dark Side of the Generalized System of Preferences, *Review of International Economics*, 19: 763–775.

Ito, T. and Aoyagi, T., 2019, Did the Least Developed Countries Benefit from Duty-free Quota-free Access to the Japanese Market?, *Japan and the World Economy*, 49: 32-39.

Kikkawa, A. K., Mei, Y., and Robles Santamarina, P., 2019, The Impact of NAFTA on Prices and Competition: Evidence from Mexican Manufacturing Plants, mimeo.

Romer, P., 1993, Idea Gaps and Object Gaps in Economic Development, *Journal of Monetary Economics*, 32(3): 543–573.

Sytsma, T., 2021, Rules of Origin and Trade Preference Utilization Among Least Developed Countries, *Contemporary Economic Policy*, 39(4): 701-718.

Sytsma, T., 2022, Improving Preferential Market Access through Rules of Origin: Firm-Level Evidence from Bangladesh, *American Economic Journal: Economic Policy*, 14(1): 440-472.

Tanaka, K., 2021, The European Union's Reform in Rules of Origin and International Trade: Evidence from Cambodia, *The World Economy*, 44(10): 3025-3050.

Table 1. Summary Statistics

Variable	Total	Knitted products		Woven products	
		Low price	High price	Low price	High price
Number of observations	11,337	339	3,475	421	4,546
Shipment value	18,351	22,231	20,934	14,143	20,397
	(56,165)	(35,529)	(39,411)	(30,595)	(77,739)
Unit price	1.85	1.51	2.92	0.47	1.25
	(5.99)	(1.48)	(9.85)	(0.72)	(2.25)
Quantity	27,301	45,868	13,671	70,807	37,676
	(95,582)	(152,096)	(39,545)	(192,709)	(121,135)

Notes: This table reports the summary statistics used in the regression analysis at a plant-product level. The first row shows the numbers of plant-product observations according to the product types and price ranges in the sample. The second, fourth, and sixth rows show the means of shipment value, unit price, and quantity before natural logarithms are taken, respectively. The standard deviations are also reported in the parenthesis.

Source: Authors' calculation, using the Census of Manufacture (METI) and the Economic Census for Business Activity (MIC and METI).

Table 2. Average Treatment Effects at a Plant-product Level

Dependent variable	(1) ln (Value)	(2) ln (Price)	(3) ln (Quantity)
Knitted*After2011	-0.0259	-0.0272	0.00135
	[0.0301]	[0.0290]	[0.0436]
Knitted*After2015	0.00202	0.0381	-0.0361
	[0.0392]	[0.0204]*	[0.0352]
Number of observations	11,312	11,312	11,312
R-squared	0.931	0.875	0.913

Notes: This table reports the estimation result at a plant-product level by the OLS. The dependent variable is a log of the shipment value in column (1), a log of the unit price in column (2), and a log of the quantity in column (3). ***, **, and * represent significance at the 1%, 5%, and 10% statistical levels, respectively. Brackets contain the standard errors clustered by products. All specifications include plant-product fixed effect and year fixed effect. "Knitted" takes the value of one for knitted products and zero for woven products. "After2011" and "After2015" take the value of one for years of 2011 or 2015 and after, respectively. The study years include 2010-2016 in all specifications.

Source: Authors' estimation, using the Census of Manufacture (METI) and the Economic Census for Business Activity (MIC and METI).

Table 3. Heterogeneous Treatment Effects at a Plant-product Level by Price

	(1)	(2)	(3)	(4)
Sample year	2010-2016	2010-2013	2013-2016	2013-2016
Knitted*After2011*LowPrice	-0.052	-0.094		
	[0.0726]	[0.0629]		
Knitted*After2015*LowPrice	-0.186		-0.307	-0.213
	[0.0996]*		[0.0714]***	[0.0976]**
Low-price criterion	p10 in 2010	p10 in 2010	p10 in 2010	p10 in 2013
Number of observations	8,777	5,672	4,185	5,364
R-squared	0.932	0.95	0.956	0.954

Notes: This table reports the estimation result at a plant-product level by the OLS. The dependent variable is a log of the shipment value in all specifications. ***, **, and * represent significance at the 1%, 5%, and 10% statistical levels, respectively. Brackets contain the standard errors clustered by products. All specifications control for plant-product fixed effects, product-year fixed effects, and price range-year fixed effects. "Knitted" takes the value of one for knitted products and zero for woven products. "After2011" and "After2015" take the value of one for years of 2011 or 2015 and after, respectively. "LowPrice" takes the value of one if the price of a plant-product observation is lower than ten percentiles of the price distribution for the product. The price is measured in 2010 for columns (1)-(3) and in 2013 for column (4). The study years are described in the column titles.

Source: Authors' estimation, using the Census of Manufacture (METI) and the Economic Census for Business Activity (MIC and METI).

Table 4. Other Criteria in Price Range

	(1)	(2)	(3)	(4)
Knitted*After2015*LowPrice	-0.264	-0.307	-0.121	0.0178
	[0.147]*	[0.0714]***	[0.0713]	[0.0825]
Low-price criterion	p5 in 2010	p10 in 2010	p25 in 2010	p50 in 2010
Number of observations	4,185	4,185	4,185	4,185
R-squared	0.956	0.956	0.956	0.956

Notes: This table reports the estimation result at a plant-product level by the OLS. The dependent variable is a log of the shipment value in all specifications. ***, **, and * represent significance at the 1%, 5%, and 10% statistical levels, respectively. Brackets contain the standard errors clustered by products. All specifications include plant-product fixed effect, product-year fixed effect, and price range-year fixed effect. "Knitted" takes the value of one for knitted products and zero for woven products. "After2015" takes the value of one for 2015 and after. "LowPrice" takes the value of one if the price of a plant-product observation in 2010 is lower than a specific percentile of the price distribution for the product. The percentiles of criteria are 5 in column (1), 10 in column (2), 25 in column (3), and 50 in column (4), respectively. The study years include 2013-2016 in all specifications.

Source: Authors' estimation, using the Census of Manufacture (METI) and the Economic Census for Business Activity (MIC and METI).

Table 5. DDD Estimation

Difference	(1) 2010-2016	(2) 2010-2013	(3) 2013-2016	(4) 2013-2016
Knitted*LowPrice	-0.191	-0.093	-0.272	-0.244
	[0.227]	[0.106]	[0.111]**	[0.115]**
Low-price criterion	p10 in 2010	p10 in 2010	p10 in 2010	p10 in 2013
Number of observations	982	1,292	1,181	1,181
R-squared	0.029	0.024	0.030	0.032

Notes: This table reports the estimation result at a plant-product level by the OLS. The dependent variable is the log difference of the shipment value between two years described in the column titles. ***, **, and * represent significance at the 1%, 5%, and 10% statistical levels, respectively. Brackets contain the standard errors clustered by products. All specifications include product fixed effects and price range fixed effects. Columns (1)-(3) and (5) include product fixed effect. "Knitted" takes the value of one for knitted products and zero for woven products. "LowPrice" takes the value of one if the price of a plant-product observation is lower than ten percentiles of the price distribution for the product. The price is measured in 2010 for columns (1)-(3) and in 2013 for column (4).

Source: Authors' estimation, using the Census of Manufacture (METI).

Table 6. Heterogeneous Treatment Effects on Unit Prices

ln (Price)	(1)	(2)	(3)	(4)
Sample year	2010-2016	2010-2013	2013-2016	2013-2016
Knitted*After2011*LowPrice	0.553	0.543		
	[0.125]***	[0.120]***		
Knitted*After2015*LowPrice	-0.001		-0.021	0.111
	[0.124]		[0.163]	[0.172]
Low-price criterion	p10 in 2010	p10 in 2010	p10 in 2010	p10 in 2013
Number of observations	8,777	5,672	4,185	5,364
R-squared	0.900	0.918	0.929	0.920

Notes: This table reports the estimation result at a plant-product level by the OLS. The dependent variable is a log of unit prices in all specifications. ***, **, and * represent significance at the 1%, 5%, and 10% statistical levels, respectively. Brackets contain the standard errors clustered by products. All specifications control for plant-product fixed effects, product-year fixed effects, and price range-year fixed effects. "Knitted" takes the value of one for knitted products and zero for woven products. "After2011" and "After2015" take the value of one for years of 2011 or 2015 and after, respectively. "LowPrice" takes the value of one if the price of a plant-product observation is lower than ten percentiles of the price distribution for the product. The price is measured in 2010 for columns (1)-(4) and in 2013 for column (5). The study years are described in the column titles.

Source: Authors' estimation, using the Census of Manufacture (METI) and the Economic Census for Business Activity (MIC and METI).

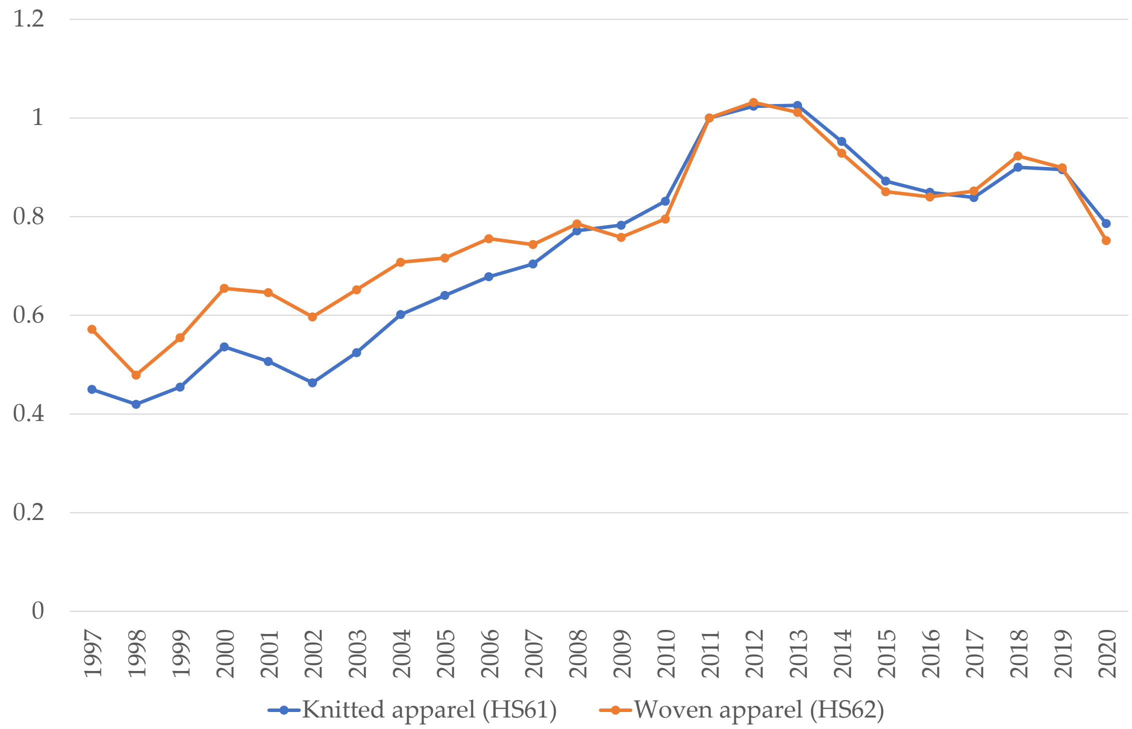
Table 7. Heterogeneous Treatment Effects on Production Quantities

ln (Quantity)	(1)	(2)	(3)	(4)
Sample year	2010-2016	2010-2013	2013-2016	2013-2016
Knitted*After2011*LowPrice	-0.605	-0.637		
	[0.154]***	[0.135]***		
Knitted*After2015*LowPrice	-0.185		-0.286	-0.325
	[0.137]		[0.166]*	[0.188]*
Low-price criterion	p10 in 2010	p10 in 2010	p10 in 2010	p10 in 2013
Number of observations	8,777	5,672	4,185	5,364
R-squared	0.920	0.938	0.950	0.943

Notes: This table reports the estimation result at a plant-product level by the OLS. The dependent variable is a log of production quantities in all specifications. ***, **, and * represent significance at the 1%, 5%, and 10% statistical levels, respectively. Brackets contain the standard errors clustered by products. All specifications control for plant-product fixed effects, product-year fixed effects, and price range-year fixed effects. "Knitted" takes the value of one for knitted products and zero for woven products. "After2011" and "After2015" take the value of one for years of 2011 or 2015 and after, respectively. "LowPrice" takes the value of one if the price of a plant-product observation is lower than ten percentiles of the price distribution for the product. The price is measured in 2010 for columns (1)-(4) and in 2013 for column (5). The study years are described in the column titles.

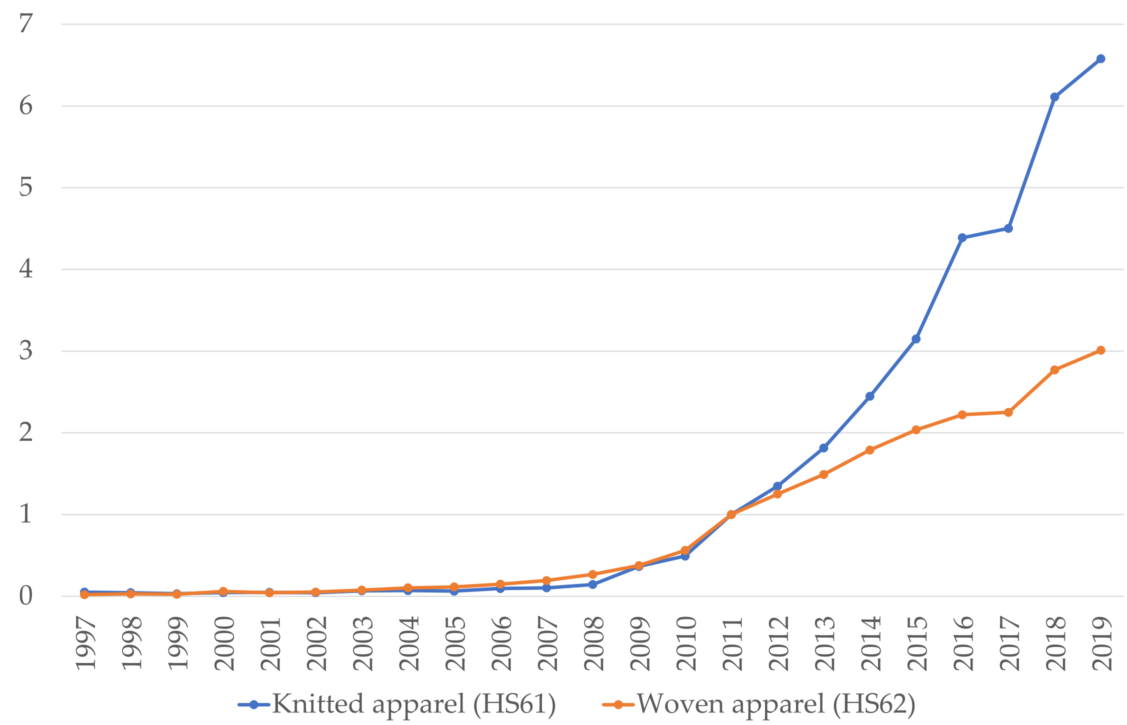
Source: Authors' estimation, using the Census of Manufacture (METI) and the Economic Census for Business Activity (MIC and METI).

Figure 1. Japan's Imports of Apparel Products from the World (2011 = 1)



Source: Global Trade Atlas

Figure 2. Japan's Imports of Apparel Products from the LDC (2011 = 1)



Source: Global Trade Atlas

Figure 3. Mean of Log Shipment Values (2010 = 0)

Notes: This figure shows the mean of logged value indices in knitted and woven products. The value indices are calculated by the ratio of the shipment value in each year to the value in 2010 for the plant-product observations. The logs of value indices, therefore, are normalized to zero in 2010.

Source: Authors' calculation, using the Census of Manufacture (METI) and the Economic Census for Business Activity (MIC and METI).

Figure 4. Log-difference of Shipment Values (2010 = 0)

Notes: This figure shows the mean of log differences of value indices between knitted and woven products by the price range. The value indices are calculated by the ratio of the shipment value in each year to the value in 2010 for the plant-product observations. The logs of value indices and the differences of the logged indices, therefore, are normalized to zero in 2010. The price range is also decided by the price of plant-product observations in 2010.

Source: Authors' calculation, using the Census of Manufacture (METI) and the Economic Census for Business Activity (MIC and METI).

Appendix A. Other Tables and Figures

Table A1. The Number of Japan's GSP Beneficiaries

	GSP	LDC
1994	163	
1995	163	
1996	178	
1997	178	
1998	178	45
1999	176	42
2000	177	42
2004	160	
2005	154	46
2006	154	
2007	152	50
2010	153	49
2014	144	47
2015	149	48
2017	140	
2018	138	
2019	133	46

Sources: Database on Preferential Trade Arrangements developed by the WTO; Generalized System of Preferences: List of Beneficiaries prepared by the UNCTAD.

Table A2. List of Products in Sample

	Description
<u>Woven</u>	
116111	Men's and boy's textile suit coats, including blazers, jackets, etc.
116112	Men's and boy's textile suit trousers, including spare trousers
116113	Men's and boy's textile overcoats
116114	Men's and boy's textile uniform coats and overcoats
116115	Men's and boy's textile uniform pants
116116	Men's and boy'stextile rubber-coated raincoats and vinyl raincoats
116211	Women's and girl's textile dressing and suit coats, including blazers, jackets, etc.
116212	Women's and girl's textile skirts and trousers
116213	Women's and girl's textile blouses
116214	Women's and girl's textile overcoats and raincoats
116215	Women's and girl's textile uniforms
116311	Infant's textile outer garments
116411	Textile shirts
116419	Miscellaneous textile shirts
116513	Men's and boy's textile school uniform coats and overcoats
116514	Men's and boy's textile school uniform trousers
116515	Women's and girl's textile school uniform coats and overcoats
116516	Women's and girl's textile school uniform skirts and trousers
<u>Knitted</u>	
116611	Knitted coats and overcoats, including blazers, jackets, etc.
116612	Knitted pants and skirts
116711	Knitted outer shirts
116811	Men's and boy's knitted sweaters, cardigans and vests
116812	Women's and girl's knitted sweaters, cardigans and vests
116911	Knitted sport coats
116912	Knitted sport pants and skirts
116913	Knitted swimming wear, swimming pants and beachwear

Note: The original Census of Manufacture contains apparel products not listed above because the sample of this study and the table above do not include the products if the quantity is not reported. The commodity code is based on the one in 2014.

Source: Website of METI (https://www.meti.go.jp/statistics/tyo/kougyo/result-4.html)

Table A3. Numbers of Plants' Products

	Statistics	Plant classification			
		All	Sample	Woven	Knitted
Apparel	N	3,899	3,017	1,446	1,571
	Mean	1.74	1.74	2.07	1.44
	S.D.	(1.19)	(1.22)	(1.44)	(0.86)
Woven	N	2,095	1,510	1,446	64
	Mean	1.02	0.97	1.94	0.07
	S.D.	(1.32)	(1.33)	(1.31)	(0.38)
Knitted	N	2,092	1,714	143	1,571
	Mean	0.72	0.78	0.13	1.37
	S.D.	(0.82)	(0.85)	(0.42)	(0.69)

Notes: In this table, we use the data during 2013-2016. "N" refers to the number of plants. For example, there are 1,446 plants that are categorized as "Woven" plants. They produce 2.07 apparel products on average. Furthermore, among them, 143 plants also produce knitted apparel products. A plant is classified as knitted if the shipment value of the knitted products accounts for more than half of all revenue for the plant. Other apparel plants are classified as woven. Similarly, the apparel plant is defined as the plants for which the shipment value of the apparel products, sum of the knitted and woven products, accounts for more than half of all revenue.

Source: Authors' calculation, using the Census of Manufacture (METI) and the Economic Census for Business Activity (MIC and METI).

Table A4. Numbers of Plant-product Observations, Entry, and Exit

Year	Total			Knitted products			Woven products		
	N	Entry	Exit	N	Entry	Exit	N	Entry	Exit
1994	6,212		1,168	2,872		461	3,340		707
1995	6,244	1,626	1,159	2,825	596	466	3,419	1,030	693
1996	5,904	1,033	1,071	2,669	377	407	3,235	656	664
1997	5,647	888	1,131	2,576	336	438	3,071	552	693
1998	5,748	1,281	1,444	2,538	421	532	3,210	860	912
1999	5,097	918	1,168	2,335	363	512	2,762	555	656
2000	4,667	708	1,112	2,073	237	461	2,594	471	651
2001	4,108	575	985	1,807	206	412	2,301	369	573
2002	3,612	488	739	1,570	180	288	2,042	308	451
2003	3,422	399	650	1,455	120	230	1,967	279	420
2004	3,081	320	521	1,325	98	248	1,756	222	273
2005	2,939	313	553	1,207	106	209	1,732	207	344
2006	2,615	215	501	1,064	80	181	1,551	135	320
2007	2,542	410	553	1,017	122	189	1,525	288	364
2008	2,503	398	468	1,044	124	160	1,459	274	308
2009	2,237	211	326	936	67	129	1,301	144	197
2010	2,106	191	392	873	60	144	1,233	131	248
2011	2,285	810	899	881	269	293	1,404	541	606
2012	2,032	290	343	811	93	115	1,221	197	228
2013	1,870	147	272	762	53	93	1,108	94	179
2014	1,814	153	332	760	64	115	1,054	89	217
2015	2,251	854	1,206	829	229	350	1,422	625	856
2016	1,613	166		694	54		919	112	

Notes: This table reports the raw numbers of plant-product observations in the data in 1994-2016. The numbers are different from the sample used in the regression analysis because the plant-product observations are dropped from the sample if the quantity is not reported or the plant-product observation is available in only one year in 2010-2016. Entry and exit are decided by the first and final years observed in the raw data. Note that the plants with less than four employees are not subject to the survey.

Source: Authors' calculation, using the Census of Manufacture (METI) and the Economic Census for Business Activity (MIC and METI).

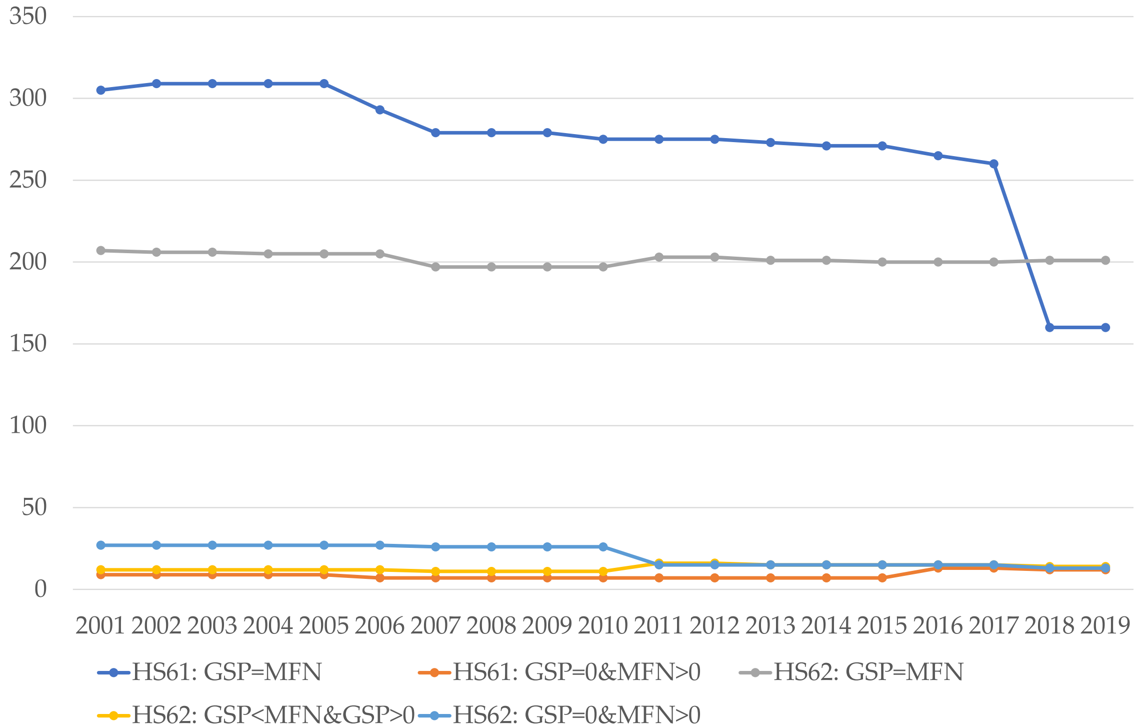
Table A5. Average Treatment Effects at a Product Level

	(1)	(2)	(3)
Dependent variable	ln (Value)	ln (Price)	ln (Quantity)
Knitted*After2011	0.0597	-0.150	0.210
	[0.106]	[0.102]	[0.175]
Knitted*After2015	-0.0122	0.126	-0.138
	[0.0658]	[0.0725]*	[0.0829]
Number of observations	182	182	182
R-squared	0.981	0.971	0.971

Notes: This table reports the estimation result at a product level by the OLS. The dependent variable is a log of the shipment value in column (1), a log of the unit price in column (2), and a log of the quantity in column (3). The value and quantity at a product level are calculated as the sums of value and quantity at the plant-product level in our sample. The price at a product level is the ratio of aggregate value to aggregate quantity. ***, **, and * represent significance at the 1%, 5%, and 10% statistical levels, respectively. Brackets contain the standard errors clustered by products. All specifications include product fixed effect and year fixed effect. "Knitted" takes the value of one for knitted products and zero for woven products. "After2011" and "After2015" take the value of one for years of 2011 or 2015 and after, respectively. The study years include 2010-2016 in all specifications.

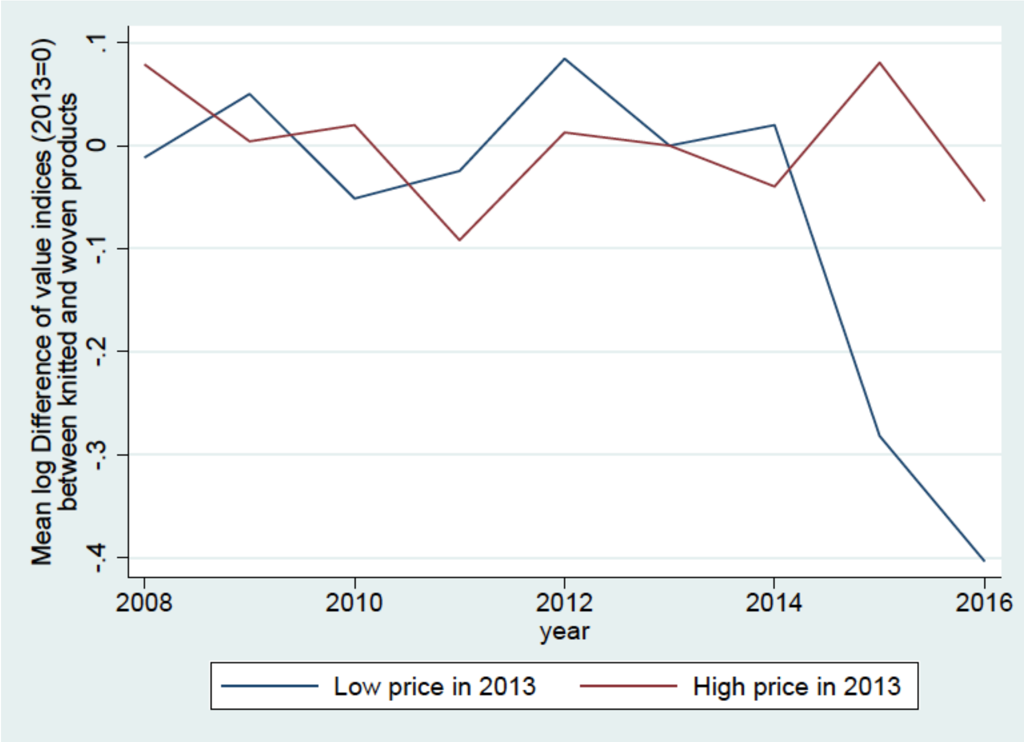
Source: Authors' estimation, using the Census of Manufacture (METI) and the Economic Census for Business Activity (MIC and METI).

Figure A1. The Number of Apparel Products Eligible to the Non-LDC GSP Regime



Source: Tariff Analysis Online facility provided by WTO.

Figure A2. Log-difference of Shipment Values (2013 = 0)



Notes: This figure shows the mean of log differences of value indices between knitted and woven products by the price range. The value indices are calculated by the ratio of the shipment value in each year to the value in 2013 for the plant-product observations. The logs of value indices and the differences of the logged indices, therefore, are normalized to zero in 2013. The price range is also decided by the price of plant-product observations in 2013.

Source: Authors' calculation, using the Census of Manufacture (METI) and the Economic Census for Business Activity (MIC and METI).

Appendix B. Estimation Results at a Plant Level

In this Appendix, we provide the evidence at a plant level. We first estimate the average effects of RoOs on the plants producing knitted products and then proceed with the heterogeneous effects across the price range. The study years include 2013-2016 to focus on the second relaxation of RoOs. We include a plant into the sample if the shipment value of the apparel products, knitted or woven products, accounts for more than half of all revenue for the plant.

We examine three types of outcome variables, i.e., output, input, productivity, and markup indicators. Output is measured by shipment value or value-added. The value at a plant level is defined as the sum of all revenues from the plant activities, including activities other than manufacturing. The value added is measured by subtracting the material expenditure from the total revenue. The type of input includes the number of employees, wage bill, and material expenditure. Capital stock or tangible fixed asset is not used in this estimation because it is available only for plants with more than 29 employees. Due to the same reason, we measure only labor productivity, defined by the ratio of total revenue or value added to the number of employees, as the indicator of productivity instead of total factor productivity. Markup indicator is defined by the ratio of total revenue to material expenditure or wage bill and the ratio of value-added to the wage bill.

We first estimate the average effects of RoOs on the plants producing knitted products. The estimating equation is as follows:

$$\ln Y_{it} = \alpha Knitted_i * After2015_t + \delta_i + \delta_t + \epsilon_{it}, \tag{B1}$$

where the dependent variable is one of the logged outcome variables of plant i in year t. $Knitted_i$ is a knitted plant dummy and takes a value of one if the shipment value of the knitted products accounts for more than half of all revenue for the plant i and zero otherwise. δ_i and δ_t denote the plant fixed effect and year fixed effect, respectively. Equation (B1) is estimated by the OLS method, and the standard errors are clustered by plants. The coefficient α shows the average treatment effect of the second relaxation of RoOs. Table B1 reports the empirical results of equation (B1) with a two-way fixed effect. In all columns, the coefficients on the treatment dummy are statistically insignificant, and the effects of RoO relaxations are almost null at a plant level. It is similar to the results shown in Table 2. The relaxation of RoOs had no impacts at the plant level on average.

=== Table B1 ===

Next, we estimate the following equation to detect the heterogeneous effects of the RoO relaxation at a plant level:

$$\ln Y_{it} = \beta Knitted_i * After2015_t * LowPrice_i + \delta_i + \delta_{st} + \rho_i * \delta_t + \epsilon_{it}, \qquad \text{(B2)}$$

where $LowPrice_i$ is a dummy variable taking a value of one if the plant is categorized into the low-price range. Specifically, we regard the plant as the low-price range if the price index of the plant in 2010 is lower than a ten percentile of the price index distribution within an industry. The price index is defined as the weighted mean of the deviation of the prices at a plant-product level from the mean price of the product. The industry is defined at a four-digit level. In equation (B2), we include plant fixed effect δ_i and industry-year δ_{st} fixed effects. In addition, $\rho_i * \delta_t$ show the interaction terms of the price range effect ρ_i with year effects δ_t, controlling for year effects by price range. The standard errors are clustered by plant, industry-year, and price range-year. After all, these fixed effects allow the coefficient β to be interpreted as the heterogeneity of treatment effects. The estimation results of equation (B2) are reported in Table 2B. In all columns except for column (9), the point estimates of the dummy variable are negative. The negative coefficients suggest that the plants of low-priced knitted products decreased output and input, and the productivity also deteriorated. However, they are all statistically insignificant from zero, except for column (3), and therefore we should not interpret the negative coefficients. Only column (3) weakly suggests that the plants of low-priced knitted products decreased their employment after the second relaxation of RoOs.

=== Table B2 ===

Table B1. Average Treatment Effects at a Plant Level

	(1)	(2)	(3)	(4)
Dependent variable	ln (Value)	ln (VA)	ln (L)	ln (Wage bill)
Knitted*After2015	0.0222	0.0211	0.0121	-0.0012
	[0.0257]	[0.0416]	[0.0194]	[0.0252]
Number of observations	2,790	2,732	2,790	2,790
R-squared	0.970	0.919	0.976	0.966

	(5)	(6)	(7)
Dependent variable	ln (Materials)	ln (Value/L)	ln (VA/L)
Knitted*After2015	0.0086	0.0101	0.0087
	[0.0385]	[0.0281]	[0.0433]
Number of observations	2,790	2,790	2,732
R-squared	0.947	0.918	0.773

	(8)	(9)	(10)
Dependent variable	ln (Value/Materials)	ln (Value/Wage bill)	ln (VA/Wage bill)
Knitted*After2015	0.0136	0.0234	0.0233
	[0.0336]	[0.0280]	[0.0427]
Number of observations	2,790	2,790	2,732
R-squared	0.734	0.858	0.672

Notes: This table reports the estimation result at plant level by the OLS. The dependent variable is described in the column titles. The value at a plant level is defined as the sum of all revenues from the plant activities, including activities other than manufacturing. "VA" denotes value-added and is measured by subtracting the material expenditure from the total revenue. "L" denotes employment and is measured as the number of employees. Brackets contain the standard errors clustered by plants. All specifications include plant fixed effect and year fixed effect. "Knitted" takes the value of one if the shipment value of the knitted products accounts for more than half of all revenue for the plant and zero otherwise. "After2015" takes the value of one for 2015 and after. The study years include 2013-2016 in all specifications.

Source: Authors' estimation, using the Census of Manufacture (METI) and the Economic Census for Business Activity (MIC and METI).

Table B2. Heterogeneous Treatment Effects at a Plant Level

	(1)	(2)	(3)	(4)
Dependent variable	ln (Value)	ln (VA)	ln (L)	ln (Wage bill)
Knitted*After2015*LowPrice	-0.338	-0.455	-0.147	-0.395
	[0.230]	[0.309]	[0.0726]*	[0.307]
Number of observations	2,790	2,732	2,790	2,790
R-squared	0.971	0.921	0.977	0.967

	(5)	(6)	(7)
Dependent variable	ln (Materials)	ln (Value/L)	ln (VA/L)
Knitted*After2015*LowPrice	-0.187	-0.191	-0.31
	[0.231]	[0.222]	[0.303]
Number of observations	2,790	2,790	2,732
R-squared	0.948	0.92	0.778

	(8)	(9)	(10)
Dependent variable	ln (Value/Materials)	ln (Value/Wage bill)	ln (VA/Wage bill)
Knitted*After2015*LowPrice	-0.151	0.0565	-0.0624
	[0.0906]	[0.0942]	[0.0534]
Number of observations	2,790	2,790	2,732
R-squared	0.738	0.859	0.677

Notes: This table reports the estimation result at plant level by the OLS. The dependent variable is described in the column titles. The value at a plant level is defined as the sum of all revenues from the plant activities, including activities other than manufacturing. "VA" denotes value-added and is measured by subtracting the material expenditure from the total revenue. "L" denotes employment and is measured as the number of employees. ***, **, and * represent significance at the 1%, 5%, and 10% statistical levels, respectively. Brackets contain the standard errors clustered by plants, price range-year, and industry-year. The industry is defined at a four-digit level. All specifications include plant fixed effect, price range-year fixed effect, and industry-year fixed effect. "Knitted" takes the value of one if the shipment value of the knitted products accounts for more than half of all revenue for the plant and zero otherwise. "After2015" takes the value of one for 2015 and after. "LowPrice" takes the value of one if the price index of a plant in 2010 is lower than a ten percentile of the price index distribution within an industry. The price index is defined as the weighted mean of the deviation of the prices at a plant-product level from the mean price of the product. The study years include 2013-2016 in all specifications.
Source: Authors' estimation, using the Census of Manufacture (METI) and the Economic Census for Business Activity (MIC and METI).

Appendix C. Estimation Results of Plant-Product Exit

In this Appendix, we examine the exit from the production at a plant-product level. We estimate the average effects of RoOs on the knitted products and the heterogeneous effects across the price range. As noted in footnote 13, our data are not suitable for the panel estimation. We, therefore, conduct the cross-section analysis by limiting the sample. The sample consists of the plant-product observations that existed in the start year, 2010 or 2013. The dependent variable is an exit dummy and takes a value of one if a concerned plant-product observation does not exist in the end year, 2013 or 2016. All estimations are conducted by the Probit model. The standard errors are clustered by products.

We first estimate the average effects of RoOs on the exit from the production of knitted products. The treatment is captured by a knitted-product dummy. The dummy variable takes a value of one for knitted products and a value of zero for woven products. Table C1 reports the estimation results of the average RoO effects on the production of knitted products. In columns (1)-(3), control variables are not included. In columns (4)-(6), we introduce some control variables, which are a log of shipment value and some plant-level variables in the start year. The plant-level control variables include the other category dummy, a log of the other category value, a non-apparel dummy, and a log of the non-apparel value. The other category dummy takes a value of one if a concerned woven product is produced by "knitted plants" or a concerned knitted product is produced by "woven plants" (see Table A3). The non-apparel dummy takes a value of one if a concerned plant produces non-apparel products. The log of the other category value and the log of non-apparel value are the logs of corresponding shipment values. In all columns except for (3), the coefficients on the treatment dummy are statistically insignificant. Relaxations of the RoOs did not raise the probability of withdrawal from producing knitted products on average. This result is consistent with our DID analysis on shipment values because it suggests that, on average, the two relaxations of RoOs did not significantly change shipment values in knitted apparel producers.

=== Table C1 ===

Next, we investigate the heterogeneous effects of RoO relaxations on the exit. The treatment is captured by the interaction term of the knitted-product dummy with the low-price dummy. The low-price dummy takes a value of one if the price of a plant-product observation is lower than ten percentiles of the price distribution for the product. The price is measured in 2010 or 2013. Table C2 reports the estimation results. In all specifications, we include the product dummy variables and the low-price dummy variable into a set of explanatory variables. In columns (1)-(4), control variables are not included. In columns (5)-

(8), we control for the same variables as the above estimation of average effects, though the control variables are evaluated in the year when the price range is determined instead of the start year. The coefficient for the treatment dummy can be interpreted as the heterogeneous effects of RoO relaxations. In all columns except for column (6), the coefficients of the treatment dummy are statistically insignificant. The positive coefficient in column (6) implies that plants were more likely to stop producing the low-priced knitted products after the first relaxation of RoOs. Namely, Table C2 only weakly suggests that the first relaxation of RoOs drove some plants to withdraw from the production of low-priced knitted products. While we found the negative effect of the second RoO relaxation on the shipment value of the low-price knitted apparel producers, the negative effect on the exit from the production is limited.

=== Table C2 ===

Table C1. Average Treatment Effects on Plant-Product Exit

Dependent variable: Exit = 1	(1)	(2)	(3)	(4)	(5)	(6)
Start year	2010	2010	2013	2010	2010	2013
End year	2016	2013	2016	2016	2013	2016
Knitted	-0.164	-0.0537	-0.187	-0.0847	0.00687	-0.0744
	[0.105]	[0.0951]	[0.0995]*	[0.115]	[0.0951]	[0.117]
Controls	no	no	no	yes	yes	yes
Number of observations	1,714	1,714	1,793	1,714	1,714	1,792
Pseudo R squared	0.003	0.000	0.004	0.038	0.022	0.047
Log likelihood	-1,166	-955	-1,146	-1,125	-934	-1,096

Notes: This table reports the estimation result at a plant-product level by Probit. The sample consists of the plant-product observations that existed in the start year. The dependent variable is an exit dummy and takes a value of one if a concerned plant-product observation does not exist in the end year. ***, **, and * represent significance at the 1%, 5%, and 10% statistical levels, respectively. Brackets contain the standard errors clustered by products. "Knitted" takes a value of one for knitted products and a value of zero for woven products. In columns (1)-(3), control variables are not included. In columns (4)-(6), we introduce some control variables, which are a log of shipment value and some plant-level variables in the start year.

Source: Authors' estimation, using the Census of Manufacture (METI).

Table C2. Heterogeneous Treatment Effects on Plant-Product Exit

Dependent variable: Exit = 1	(1)	(2)	(3)	(4)
Start year	2010	2010	2013	2013
End year	2016	2013	2016	2016
Knitted*LowPrice	-0.0275	0.244	-0.0674	-0.268
	[0.182]	[0.243]	[0.196]	[0.227]
Controls	no	no	no	no
Low-price criterion	p10 in 2010	p10 in 2010	p10 in 2010	p10 in 2013
Number of observations	1,714	1,714	1,286	1,792
Pseudo R squared	0.022	0.011	0.031	0.023
Log likelihood	-1,144	-945	-745	-1,123

Dependent variable: Exit = 1	(5)	(6)	(7)	(8)
Start year	2010	2010	2013	2013
End year	2016	2013	2016	2016
Knitted*LowPrice	0.135	0.373	0.117	-0.256
	[0.184]	[0.222]*	[0.245]	[0.217]
Controls	yes	yes	yes	yes
Low-price criterion	p10 in 2010	p10 in 2010	p10 in 2010	p10 in 2013
Number of observations	1,714	1,714	1,286	1,792
Pseudo R squared	0.055	0.036	0.068	0.065
Log likelihood	-1,105	-921	-716	-1,076

Notes: This table reports the estimation result at a plant-product level by Probit. The sample consists of the plant-product observations that existed in the start year. The dependent variable is an exit dummy and takes a value of one if a concerned plant-product observation does not exist in the end year. ***, **, and * represent significance at the 1%, 5%, and 10% statistical levels, respectively. Brackets contain the standard errors clustered by products. “Knitted” takes a value of one for knitted products and a value of zero for woven products. “LowPrice” takes a value of one if the price of a plant-product observation is lower than ten percentiles of the price distribution for the product. The price is measured in 2010 for columns (1)-(3) and (5)-(7), and in 2013 for columns (4) and (8). In all specifications, the product dummies and the low-price dummy are included into a set of explanatory variables. In columns (1)-(4), control variables are not included. In columns (5)-(8), we introduce some control variables are log of shipment value and some plant-level variables in the year when the price range is decided.

Source: Authors’ estimation, using the Census of Manufacture (METI).