Did the LDC countries benefit from Duty-free Quota-free access to the Japanese market?

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Abstract:

This paper evaluates the impact of the Duty-free Quota-free access given to the Least Developed Countries (LDCs) by Japan. The construction of concordance tables for Japan's 9 digit tariff line codes enables analyses at tariff line level and thereby overcomes a possible aggregation bias. The exogenous nature of the DFQF access attenuates the endogeneity problem. Various estimation models, including the triple difference in difference estimator show that in general the LDCs did not benefit from DFQF access to the Japanese market. The tariff lines which were granted zero tariffs and substantial preference margins over non-LDC countries did not succeed to be imported into the Japanese market, although the total import values of Japan from the LDCs have shown an increasing trend. These findings suggest that for the LDCs the tariff barrier is a relatively small obstacle for trade compared with the other trade costs, such as infrastructure, non-tariff barriers, distance, or cultural differences.

Key words: LDCs, Japan, Tariff liberalisation, Duty free quota free access, WTO Doha round

JEL Classification: F13, F14

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1. INTRODUCTION

Doha round of the WTO negotiation is stymied due to conflicts of interests among WTO member countries on major issues such as agriculture, industrial tariffs and non-tariff barriers, services, and trade remedies. Started in 2001 at Doha, the round has failed to yield major agreements. The impasse has even come to the point where in April 2011, director-general Pascal Lamy "asked members to think hard about 'the consequences of throwing away ten years of solid multilateral work'". Despite the spotlight on major issues, especially on the agricultural issue, one of the focuses of the Doha round is development issue, as its name “Doha Development Round” reveals. Indeed, one of the few achievements of the Doha round is so called Duty-free Quota-free (DFQF) market access to products from the least developed countries granted mainly by developed countries. Hong Kong Ministerial Declaration, 18 December 2005, says:

“… developed-country Members, and developing-country Members declaring themselves in a position to do so, agree to implement duty-free and quota-free market access for products originating from LDCs …”

The European Union already began granting preferential tariffs to LDC countries under Everything But Arms (EBA) initiatives, while the US has been doing similar treatment to Sub-saharan African countries under African Growth and Opportunity Act (AGOA). Japan started to grant zero tariffs to the LDC countries from around 2000 and accelerated the pace at around 2005.

This paper studies whether Japan's Duty-free Quota-free access has affected favourably the LDC's exports to Japan. Constructing concordance tables at 9 digit tariff line codes, it carries out analyses at tariff line level. While most of the program evaluation studies on trade liberalisation, notably of Preferential trade agreement, need to struggle to tackle the endogeneity issues, the evaluation of the

QFDF has a nice feature of being almost free from the endogeneity issues because of its exogeneous nature.[1]

Literature

Previous literature almost exclusively deals with the possible preference erosion for the LDCs. When Doha round started in 2001, aiming across-the-board trade liberalisation, the LDCs were afraid that the preference they had been enjoying would be eroded as the tariffs for the other countries would be decreased by Doha round negotiation. In response to this fear, some economists studied potential effects of the preference erosion using the Computable General Equilibrium model. Such studies include Low, Piermartini, and Richtering (2006), Carrère and de Melo (2009). However, as Doha round stalled, complete tariff liberalisation is far from being achieved. On the other hand, the Duty-free Quota-free access was granted to the LDCs.[2] Since the developed countries' DFQF coverage reached 95% by 2008, sufficient data for ex-post analysis have been accumulated. To the best of my knowledge, this paper is the first attempt to do an ex-post assessment of the DFQF treatment agreed in Hong Kong Ministerial Declaration.[3] One ex-post analysis close to the effect of QFDF is the study by Frazer and Van Biesebroeck (2010), which studies the effect of African Growth Opportunity Act by the US. However, AGOA's tariff elimination is different from that under DFQF

[1] See Baier and Bergstrand (2007) for example for the endogeneity issues related to the evaluation study of Preferential Trade Agreement. Various attempts to address the endogeneity issues are neatly and well explained in Egger, Egger and Greenaway (2008).

[2] An ex-ante analysis on potential benefits from preferential tariffs given to the LDCs by EU under EBA are studied by Hoekman, Ng and Olarreaga (2002), using partial equilibrium simulation. They showed that EBA would induce larger exports of the LDCs to EU market at the expense of other developing countries.

[3] One ex-post analysis close to the effect of QFDF is the study by Frazer and Van Biesebroeck (2010), which studies the effect of African Growth Opportunity Act by the US. However, AGOA's tariff elimination is different from that under QFDF in that AGOA is selective both on countries and products. AGOA eligibility requires a basic level of political and democratic freedom within the country. In terms of eligible products, "the AGOA legislation explicitly allows the president only to grant duty-free treatment for non apparel articles "after the U.S. Trade Representative and the U.S. International Trade Commission have determined that the article is not import sensitive when imported from African countries,.."" (Frazer and Van Biesebroeck (2010))

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2. DATA

This paper uses Japan's tariff data at tariff lines (HS 9 digit code) and the corresponding trade (import) data on yearly basis. The tariff data at the 9-digit tariff lines are from WITS (World Integrated Trade Solutions). The trade (import) data are from Japan's customs office. The period of study is from 1996 to 2011. The year 1996 is taken as the starting year because Japan began to grant zero tariffs to the LDCs from around the year 2000. More reasons for this choice of period are mentioned later.

Tariff data

It is important to include not only advalorem tariffs but also advalorem equivalent tariffs estimated for non-advalorem tariffs. Developed countries have been reducing the number of non-advalorem tariffs, the majority of which are specific tariffs, by changing them to advalorem tariff in accordance with the WTO members' consensus. However, many non-advalorem tariffs still remain. Given that the DFQF covers essentially all the tariff line codes, there are many tariff line codes for which tariffs have been eliminated for the LDCs while non-advalorem tariffs for the other countries still remain.

Thus, to evaluate the effects of the DFQF, it is primordial to include advalorem equivalent tariffs. For non-advalorem tariffs, advarolem equivalent tariffs computed by UNCTAD method 1 are used.[4]

Concordance

A major challenge arises when one attempts to do analyses at highly disaggregated levels such as 9-digit of this study. Since Internationally Harmonised System (HS) (at 6-digit) changes almost every five years[5], Japan's codes at 9-digit also change in conformity of the changes of the HS.[6] Thus, in order to track the same product (tariff line), we need concordance between the codes of different years. While the concordance tables of different HS codes (6-digit) prepared by the United Nations are available, the concordance tales of Japan's 9-digit codes are unavailable. An easy way to deal with this challenge is to use only the trade and tariff data of the 9-digit code numbers which do not change over the period of study. However, this way of dealing with the challenge substantially reduces the number of tariff codes available for the study. Thus, I have made concordance tables for Japan's 9-digit code lines by checking descriptions one by one, almost certainly the first such attempt. The details for the need of concordance tables and the procedures are in the appendix. If the tariff line codes which are consistent through 1996 to 2011 in its code number are kept, only 6289 codes remain out of the total maximum number of about 8400 tariff lines. By using the concordance tables I have made, we can keep 7079 codes. About 1400 codes are still dropped because many codes are intrinsically unable to be concorded due to the reasons such as new goods, merged goods.

Trade data

[4] UNCTAD method 1 is chosen among the four alternative methods to calculate advalorem equivalent tariffs because the method 1 produces the largest number of advalorem equivalent tariffs.

[5] To be precise, the HS codes changed in 1992, 1996, 2002, 2007 and 2012.

[6] The first 6 digits are common across all the countries (internationally harmonised) and further disaggregation are done by each country. Japan adds three more digits, thus 9-digit.

Japan's trade data cover all the trade at 9-digit, whose amounts exceed 1000 yen (approximately 150 dollars) for all the partner countries, thus features a comprehensive coverage of almost all trades of Japan. While UN COMTRADE data do not cover Taiwan, a major trade partner of Japan, Japan's data covers Taiwan. These data at 9-digit are available from 1988. In the analyses to follow below, the whole available period of 1988-2011 are used for the analyses when the use of consistent tariff lines are not required, while the period of 1996-2011 is used when the use of consistent tariff lines are required. The concordance further back to HS 1992 or HS 1988 has not been done because the benefit gained from extending the period far over-weights the cost of the extension. The costs for the extension of the period are construction of concordance tables for HS 1996 - HS 1992 and HS 1992 - HS1988, and further decrease of the number of tariff lines to be studied, which is unavoidable due to intrinsically un-concordable lines between different HS versions. Or in other words, longer the study period, the smaller the number of tariff line codes left. Whereas, there is very little benefit from the extension because the change of the zero tariff lines took place well within 1996 – 2011.

3. DESCRIPTIVE ANALYSIS

This section descriptively studies the evolution of the number of zero tariff lines by country groups (according to tariff types), the evolution of the import values by country groups, the preference margins, the evolution of the import values by the preference margins, and the incidence of imports from the LDCs.

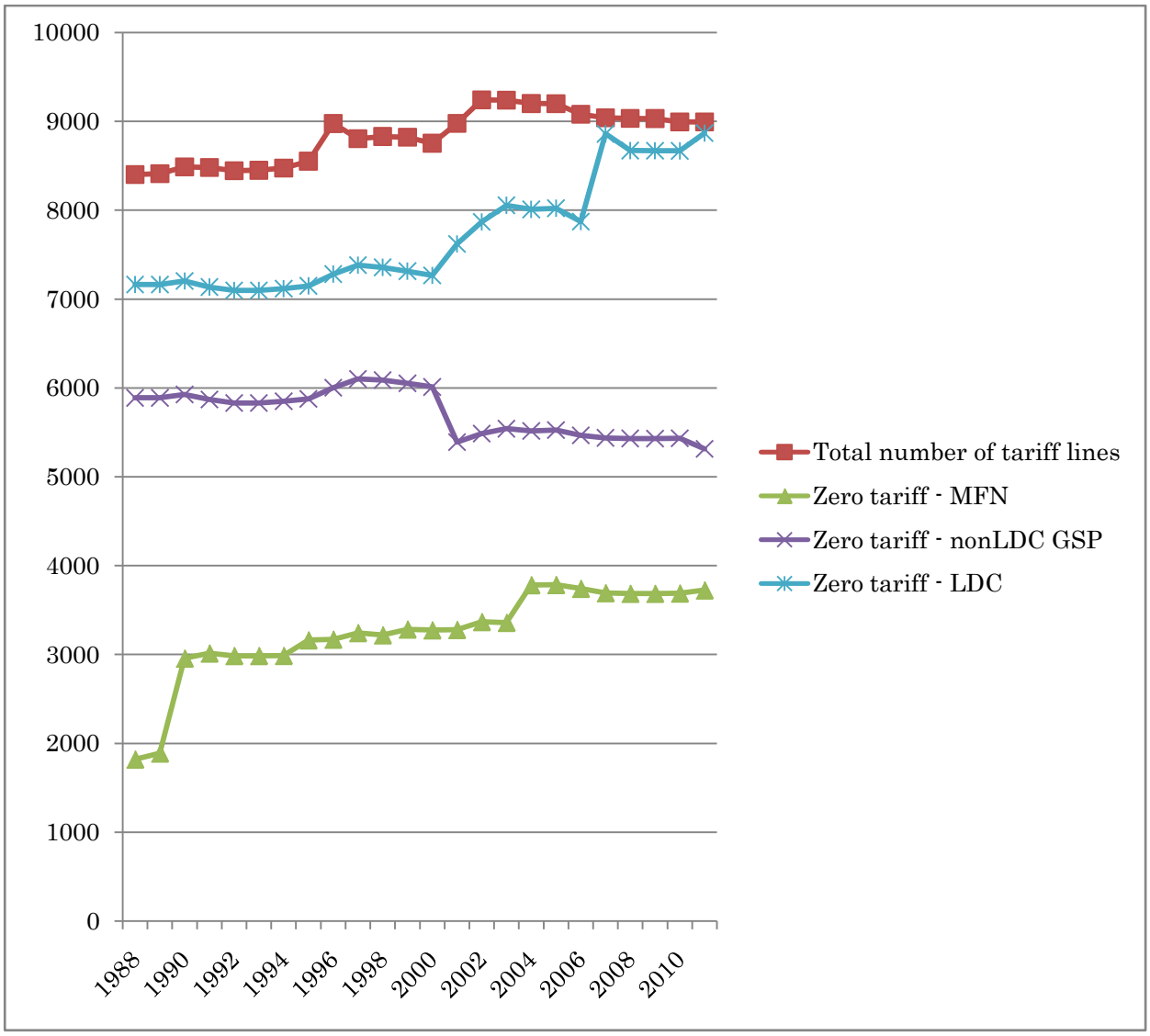
3.1. Evolution of zero tariffs

Figure 1 shows the evolution of the total number of tariff lines whose tariffs are zero. Japan's tariff can be grouped into four large categories. These four are the Most Favoured Nations (MFN) tariffs, Generalized System of Preferences (GSP) tariffs, GSP tariffs applied to the LDCs (LDC-GSP) and tariffs for the partners of Free Trade Agreement (FTA). MFN tariffs are imposed on most of Japan's imports. For the developing WTO members, Japan (and other developed countries) granted

preferential tariffs under the Generalized System of Preference. Among the major trade partners of Japan, China is a notable example of GSP beneficiaries. The LDCs enjoy further preference over the other countries under DFQF.[7] The evolution of zero tariff lines for Free Trade Agreement (FTA) is not shown in the figure. This is because, although Japan signed Free trade agreement with several countries, the tariff elimination with FTA partners have been completed only recently or still in the process and moreover Japan's trade with its FTA partners is still not large. From the figure, it is observed that Japan accelerated the elimination of tariffs for the LDCs shortly before 2000 and substantially in 2001 and then steadily increased the zero tariff lines for the LDC to reach almost 100 % in 2007. Consequently, the LDC countries are enjoying about 3500 more zero tariff lines than GSP beneficiaries, and about 5000 more zero tariff lines than MFN countries. Given the total number of tariff lines of about 9000, this preference is substantial.

Figure 1: Evolution of zero tariff lines

[7] The lists of GSP beneficiary countries and LDCs are in the Appendix.



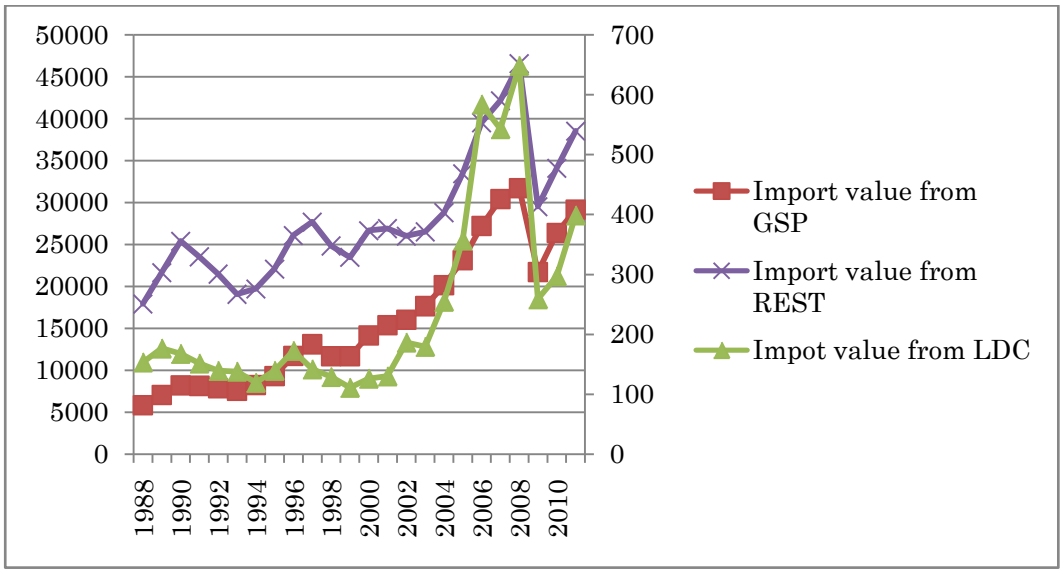
Source: Author's computation from the tariff data.

3.2. Import value by country groups

The import values by country groups are shown in Figure 2. The three main country groups are LDCs, GSP beneficiary countries, and the REST of the world. REST is almost identical to MFN because almost all the trade partners of Japan are WTO members. Russia is an exception. However, Russia ranks only in 20th as Japan's import partner and represents only 1.37% in average import values in the period of study. Since the level of import values from LDCs is substantially smaller than those from REST (almost identical to MFN) or GSP groups, the values from LDCs are shown in the right axis with much smaller scale than the scale of the left axis corresponding to MFN and GSP groups. The

import values from all the country groups have steadily increased up to 2008 and decreased in 2009 due to the trade collapse caused by the depression of the world economy. It is notable that the growth of import values from the LDCs from around 2003 to 2008 is higher than those from MFN or GSP groups. Since GSP group includes large and rapidly expanding countries, such as China, India, or Brazil, Figure 3 shows the import values with those from BRICs apart. It shows a qualitatively similar picture to Figure 2.

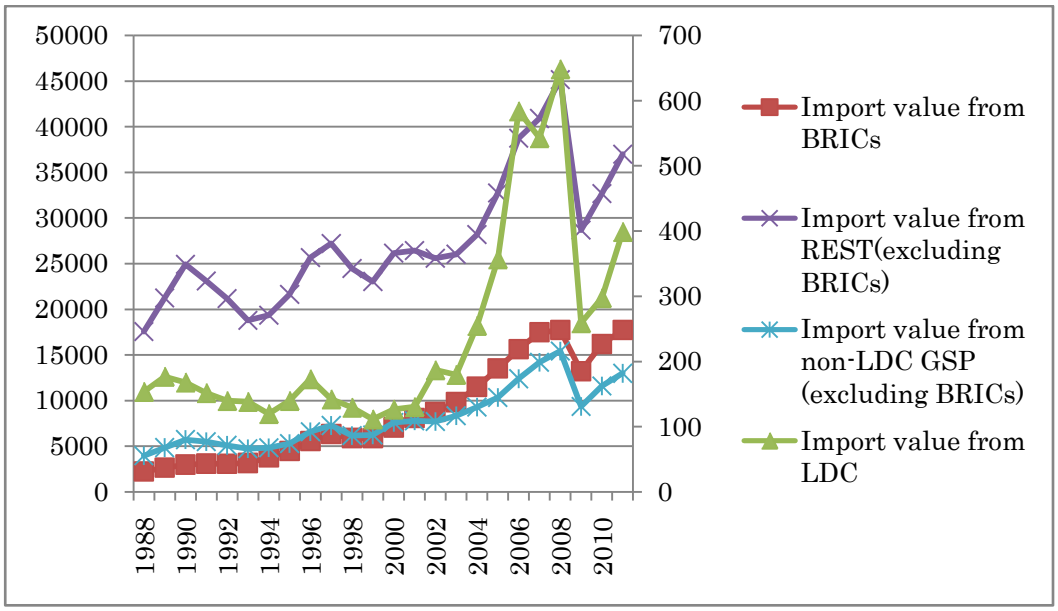
Figure 2: Evolution of the import values by country groups



Source: Author's computation from the tariff and trade data. Unit: 1 billion yen.

Right axis for LDCs. Left axis for GSP and REST.

Figure 3: Evolution of the import values by country groups (BRICs apart)



Source: Author's computation from the tariff and trade data. Unit: 1 billion yen.

Right axis for LDCs. Left axis for GSP and REST.

3.3. Preference margins

While the LDCs enjoy a substantially large number of zero tariff lines over the other countries as is shown above, it is also important to see the magnitude of the preference margins. The 9-digit tariff code which has the largest preference margin over MFN and GSP is the code number: 121299190, "Tubers of konnyaku (Amorphophalus, whether or not cut, dried or powdered)" with the preference margin of 5537.27%. One hundred (which happens to be an exact number) 9-digit tariff lines have the preference margins exceeding 100%. These extremely large preferences may well enable the LDCs to start exporting to the Japanese market. The list of the tariff line codes with the 50 largest preference margins is in the Appendix. Table 1 shows the number of tariff line codes of which preference margins exceed 10 % and 20 % respectively. For example, 918 tariff line codes have more than 10% preference margins vis-à-vis GSP beneficiary countries. This is a large number, considering the total number of 3500 tariff lines which enjoy preference margins (whatever the magnitude is) vis-à-vis GSP.

Since the LDCs' produces are limited in its scope, i.e. they do not produce sophisticated industrial goods, it is worth investigating which industries are enjoying preference margins. As Table 2 shows, most products are in Food industry or Apparel and Textiles industry, in which the LDCs are likely to have comparative advantages. Thus, DFQF may have potentially large impacts on the LDCs' export to the Japanese market.

Table 1: Number of tariff lines with more than 10 % and 20% preference margins.

Total 7079 tariff lines		
	Over MFN tariff	Over GSP tariff
Margin > 20%	470	451
Margin > 10%	1013	918

Table 2: Number of tariff lines with more than 10% preference margins by industry

HS 2-digit code	HS 2-digit description	Number of tariff lines with preference margin of more than 10% over GSP tariff
20	Preparations of vegetables, fruit, nuts or other parts of plants	125
61	Articles of apparel and clothing accessories, knitted or crocheted	113
62	Articles of apparel and clothing accessories, not knitted or crocheted	84
04	Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere specified or included	81
19	Preparations of cereals, flour, starch or milk; pastrycooks' products	77
21	Miscellaneous edible preparations	62
16	Preparations of meat, of fish or of crustaceans, molluscs or other aquatic invertebrates	34
11	Products of the milling industry; malt; starches; inulin; wheat gluten	29
02	Meat and edible meat offal	22
18	Cocoa and cocoa preparations	19
50	Silk	18
41	Raw hides and skins(other than furskins) and leather	16
07	Edible vegetables and certain roots and tubers	16
64	Footwear, gaiters and the like; parts of such articles	16
08	Edible fruit and nuts; peel of citrus fruit or melons	14
03	Fish and crustaceans, molluscs and other acquatic invertebrates	13
17	Sugars and sugar confectionery	9

22	Beverages, spirits and vinegar	7
42	Articles of leather; saddlery and harness; travel goods, handbags and similar containers; articles of animal gut (other than silk-worm gut)	7
09	Coffee, tea, matT and spices	7
43	Furskins and artificial fur; manufactures thereof	7
63	Other made up textile articles; sets; worn clothing and worn textile articles; rags	6
12	Oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruit; industrial or medicinal plants; straw and fodder	4
13	Lac; gums, resins and other vegetable saps and extracts	3
15	Animal or vegetable fats and oils and their cleavage products; prepared edible fats; animal or vegetable waxes	3
24	Tobacco and manufactured tobacco substitutes	2
23	Residues and waste from the food industries; prepared animal fodder	1
10	Cereals	1
58	Special woven fabrics; tufted textile fabrics; lace; tapestries; trimmings; embroidery	1

3.4. Import value by country group and product group

To identify the effect of DFQF, the tariff line codes are divided into two groups. One is the codes for which tariffs existed in 1996 but were eliminated by the year 2008, which I call “Treated group”.[8] The other group is the codes for which tariffs were already zero in 1996, which I call “Untreated group” or ¨Control group”. By comparing the import values of these two groups across country groups, we can see if DFQF had a positive impact on the LDC´s exports to the Japanese market. While the import value of non-treated (control) group is in upward trend for all the country groups (Figure **4**), that of treated group shows no increasing trend (Figure 5). The preference margins granted by DFQF seem to have no impact on the LDCs exports to Japan.

Figure 4: Import values of the non-treated (control) group tariff lines

[8] The year 2008 was chosen because Japan's zero tariffication was almost completed by that year. We have also studied the case for which we take 2011 as the end year, but the results have been very similar to the case here.

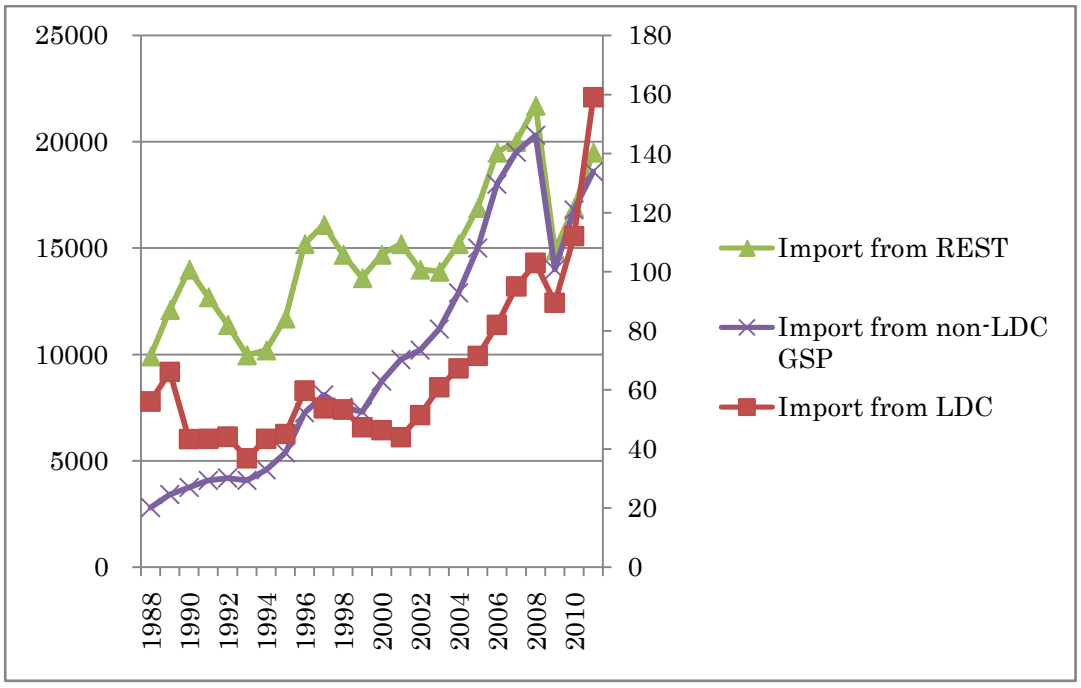
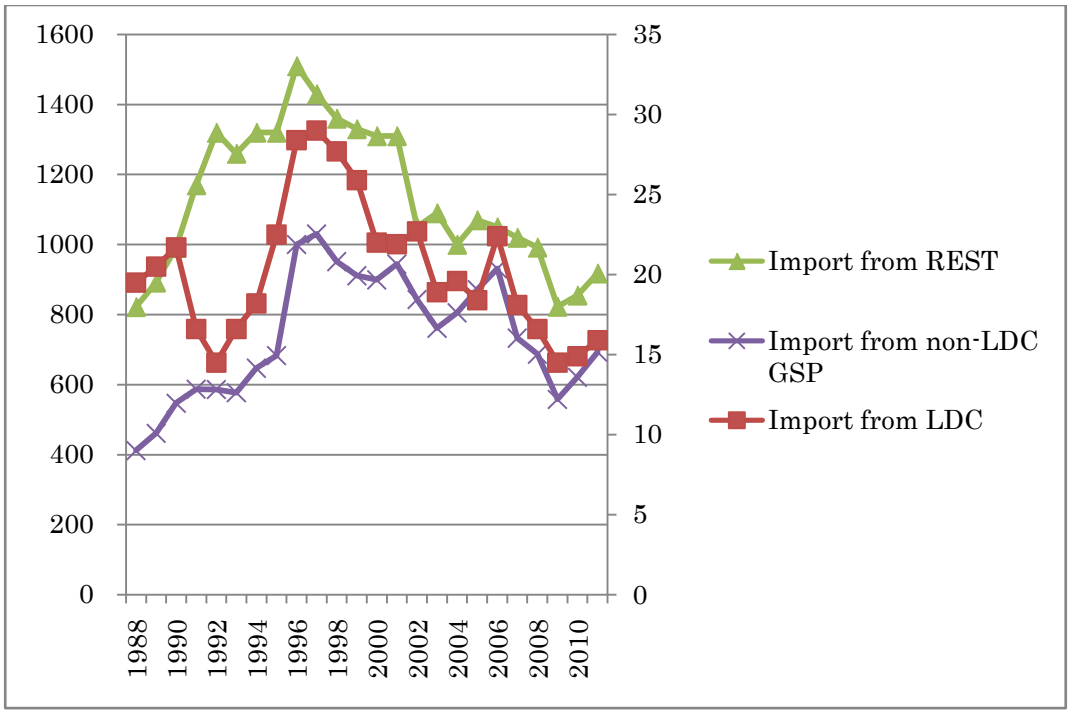


Figure 5: Import values of treated group tariff lines



3.5. Incidence of imports

While the previous section shows that the import value of the treated group has shown no increasing trend while the non-treated group has shown clear upward trend, DFQF might have induced new goods' exports no matter what the value is. As each of the LDCs is a tiny and very poor (GDP per

capita of less than 905 US dollars) country, even a small amount of export is important especially when the product is exported for the first time. Table 3 shows the running number of tariff lines imported into the Japanese market by country groups and by tariff line groups. If two products are imported into Japan from two countries each, the number is four (2 times 2), i.e., the running numbers. If each of 116 products is imported only from one country, the number is 116. As the first and second columns show, the number is in an increasing trend for the untreated (control) group while it is slightly decreasing for the treated group. A similar tendency is observed for non-LDC GSP. For the REST of the trade partners, the numbers decrease both for the treated group and the untreated group. It is clear that even in the incidence of imports the LDCs did not succeed to benefit from DFQF access to the Japanese market, while it is notable that the total numbers are in an increasing trend for the LDCs. As is shown above, there are 100 tariff lines which enjoy more than 100 % of tariff margins. Out of these 100 tariff lines, only one product was imported from LDC(s) to Japan - Tariff line code: 071339227, a kind of bean.[9]

Table 3: Number (running number) of tariff lines imported into Japan

How many tariff lines were imported (running number)

	LDC		non-LDC GSP beneficiaries		REST	
Years	Treated lines	Untreated lines	Treated lines	Untreated lines	Treated lines	Untreated lines
1996	116	622	1739	16680	3553	47926
1997	114	684	1752	17531	3508	48354
1998	105	717	1697	17157	3389	47281
1999	99	805	1714	17443	3473	46530
2000	113	844	1809	18581	3578	47523
2001	102	873	1896	19203	3630	48598
2002	93	872	1802	18988	3289	47143
2003	90	825	1779	19444	3264	47198
2004	91	917	1854	20074	3234	47624
2005	100	963	1880	20715	3220	47918
2006	95	1001	1850	21037	3196	47971
2007	85	970	1647	20219	2895	45473
2008	92	1008	1616	20155	2773	44047

[9] The exact description is not shown since it is incomprehensible without showing the descriptions from 4 digit down to 9 digit.

4. ECONOMETRIC ANALYSES

This section statistically analyses what the above descriptive studies indicate. The focus of this study is a case of the program evaluation. The program evaluation is usually expressed in the following equation.

$$E\left(Y_1 - Y_0 \middle| D=1\right) = E\left(Y_1 \middle| D=1\right) - E\left(Y_0 \middle| D=1\right)$$

The left hand side is the Average Treatment effect on the Treated (ATT). The first term in the right hand side is the mean values (import values in our study) of the countries and/or products selected, while the second term is the mean values of the countries and/or products selected if they had not been selected. Namely, the second term is the counterfactual. The first term in the right hand side is observable while the second term is not. If $E\left(Y_0 \middle| D=1\right) = E\left(Y_0 \middle| D=0\right)$ holds, the ordinary least squares estimation yields unbiased estimates. If this does not hold, the endogeneity problem caused by selection arises. Then, tactful dealings with the endogeneity issue are called on. However, a complete solution of the endogeneity issue is always a difficult task, due to unavailability of good instrumental variables which satisfies various conditions for good IVs, such as high correlation with the variables to be instrumented or the exclusion restrictions.

Contrary to usual program evaluation studies, such as impact studies of Preferential Trade Agreements, the status of the LDCs are exogeneously given. Namely, Japan did not choose some countries as eligible for its program of DFQF. Japan is required to grant DFQF treatment to all LDCs. Tariff lines to be liberalized are also not selected. Thus, the study of DFQF has a virtue of being almost free from the endogeneity issue. Consequently, OLS is an appropriate estimation method for this study.

We estimate the following equation by OLS.

$$\text{Im } portValue_{ijt} = \alpha_0 + \alpha_1 TARIFF_{ijt} + \alpha_2 TARIFF_{ijt} * LDC + X\beta + \varepsilon_{ijt}$$

Im $portValue_{ijt}$ represents the import value from country i of tariff line code j at time t. $TARIFF_{ijt}$ is a advalorem tariff rate that Japan imposes for tariff line j imported from country i at time t. $TARIFF_{ijt} * LDC$ is the cross term of tariff rate and LDC dummies. These two explanatory variables are variables of our interest. X is a vector of control variables. The control variables include GDP and dummies for years, countries and products. Table 4 shows the estimation results by OLS. Log of tariff have the coefficient estimates of the expected sign with high statistical significance. What draws our attention is the coefficient estimates of the interaction term between LDC dummy and tariffs. In the first and second columns, they are positive and statistically significant while it is positive with statistical insignificance in the third column. More importantly, the sum of the coefficients on Log of tariff and LDC*Log of tariff are close to zero (-0.465+0.404=-0.061 in the column (2)) or even positive (-0.225+0.417=0.192). Namely, these results show that tariffs reduction by DFQF have not favoured the LDCs exports to Japan.

Table 4: Estimation results

Dependent variable: Log of Import value	(1)	(2)	(3)
	OLS1	OLS2	OLS3
Log of GDP	0.434***	0.556***	0.556***
	(28.40)	(378.38)	(42.21)
Log of tariff	-0.225***	-0.465***	-0.0488***
	(-98.10)	(-92.35)	(-8.78)
LDC*Log of tariff	0.417***	0.404***	0.0468
	(9.99)	(11.35)	(1.27)
Year dummy	Yes	Yes	Yes
Country dummy	Yes	No	Yes
Product dummy	No	Yes	Yes
R-squared	0.141	0.282	0.370
Number of observations	1016447	1016447	1016447

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Since the tariff preferences are concentrated in some sectors as shown above, estimations are performed for each of the five HS 2-digit category with the highest number of tariff lines whose

preference margins exceed 10 percent. The estimation results are in Table 5. Similar results to the case using the whole data above are observed. Namely, while the coefficient estimates for the tariffs have negative signs with statistical significance, the coefficients for the LDC cross-terms of the tariffs are mostly statistically insignificant or have positive signs with statistical significance, which makes the total effect of tariff for LDCs close to zero or even positive.

Table 5: Estimation results for the five important HS 2 digit categories

	Log of tariff		Log of tariff * LDC	
hs2	Coefficient estimate	t-value	Coefficient estimate	t-value
04	0.041	0.529	34.757	0.417
19	−0.720	−4.708	0.794	2.608
20	−0.170	−2.227	0.311	0.869
21	−0.816	−10.478	1.300	4.275
61	0.163	9.307	−0.339	−0.581

Zeros

There are many zeros in Japan's imports. Thus, the estimations which take the zeros into account are required because OLS estimates are biased under the presence of zeros. Tobit model, Two-part model , Heckman selection model and Poisson Pseudo Maximum Likelihood (due to Santos and Tenreyro (2006)) are employed. For Heckit model, variables which satisfy the exclusion restriction condition are required. For such variables, a dummy variable which captures whether or not a partner country exported a particular HS 6-digit code to countries other than Japan is constructed. This variable may satisfy the exclusion restriction condition: it affects the selection (export to Japan or not) but not the outcome (export values).[10] The data being analysed in this paper is Japan's imports of HS 9 digit code from all potential trade partners. Thus, if a partner of Japan's imports has exported a particular HS 9-digit code to countries other than Japan, that will likely affect the probability of

[10] I thank Kazunobu Hayakawa for suggesting this.

exports to Japan (selection) but unlikely to affect the values of exports to Japan (outcome).[11] Although such dummy variable at HS 9-digit is ideal, I had to use HS 6-digit data because the most disaggregated data available for the partners' exports to various destinations is only at HS 6-digit level.

[11] Evenett and Venables (2002) finds that importing a product from a certain country is more likely if the origin country is exporting the same product to some other countries. Alvarez et al. (2011), using Chilean firm level data, finds that exporting a product to a country increases the probability of exporting the same product to another country.

Table 6 shows the estimation results for these models. The coefficient estimates and t-values (or z-values) of all the estimation models show that Tariff variables are negative and statistically significant while Tariff*LDC variables are positive and statistically significant (although only the selection effect by Heckit has negative signs for both tariff variables). This suggests that DFQF did not help the LDCs to export to the Japanese market.

Table 6: Tobit, Two-part, Heckit, Poisson Pseudo MLE

	Tobit		Two-part		Heckman		Poisson Pseudo Maximum Likelihood	
	Coefficient	t-value	Coefficient	t-value	Coefficient	z-value	Coefficient	z-value
Selection								
Log of GDP			**0.218**	55.17	**0.195**	40.02		
Log of Tariff			**-0.113**	-192.28	**-0.134**	-192.61		
Log of Tariff * LDC			**0.025**	5.23	**-0.021**	-2.98		
Exports to other countries dummy (Excl. Rest.)					**0.678**	259.23		
Number of observations			18133084		11952041			
R-squared			0.391					
Outcome								
Log of GDP	**2.609**	56.62	**0.433**	28.4	**0.493**	25.92	**0.738**	12.78
Log of Tariff	**-1.362**	-196.79	**-0.224**	-98.1	**-0.218**	-35.4	**-0.468**	-43.64
Log of Tariff * LDC	**0.287**	4.99	**0.416**	9.99	**0.267**	4.94	**0.314**	7.92
Number of observations	18133084		1016447		759302		18133084	
R-squared	0.225		0.141				0.379	
Year dummy	yes		yes		yes		yes	
Country dummy	yes		yes		yes		yes	
Product dummy	no		no		no		no	
Log likelihood	-5532313.20		-4711069.2		-3430040		-1.683E+12	
Likelihood ratio test of independence of equations					Prob>chi-squared=0.3459			

Difference-in-difference-in-difference

As a further robustness check, the difference-in-difference-in-difference (Triple diff-in-diff) estimator is considered following Frazer and Van Biesebroeck (2010). The estimation model is:

$$\text{Im}\, portValue_{ijt} = \beta_0 + \beta_1 Ineffect_t * LDC_i * Treated\,\text{Pr}oduct_j + \tilde{\beta}_2 CountryPeriod_{it} + \tilde{\beta}_3\,\text{Pr}oductPeriod_{jt} + \tilde{\beta}_4 Country\,\text{Pr}oduct_{ij} + \varepsilon_{ijt}$$

For the triple difference-in-difference analysis, the time dimension (year) is collapsed into two periods, one for the years from 1996 to 2000 and the other for the years from 2001 to 2011 to fully exploit the exogeneous nature of Japan's DFQF, because the zero tariffication was gradually done from 2001 onward. The variable of our interest is the triple interaction term, $Ineffect_t * LDC_i * Treated\,\text{Pr}oduct_j$. $Ineffect_t$ represents a dummy variable which switches from 0 to 1 for all countries and products after 2001. LDC_i represents a dummy which takes 1 if the importer is an LDC country and 0 otherwise. $Treated\,\text{Pr}oduct_j$ is a dummy variable which takes 1 for those products that are "treated" in the sense that a positive tariff was imposed in the year 1996 but eliminated by the year 2007, otherwise (i.e., those products which were already enjoying zero tariffs in the year 1996.) 0. Three interactive fixed effects, allow for (a) the base level of imports of any product from any country ($Country\,\text{Pr}oduct_{ij}$), (b) the overall imports from any country into Japan in any period ($CountryPeriod_{it}$), and (c) the overall imports of any product into Japan in any period ($\text{Pr}oductPeriod_{jt}$). There is no need to include uninteracted variables because those effects are absorbed into the three interactive fixed effects. The estimation result is in Table 7. A qualitatively equivalent result from the previous estimations is obtained. Note that the expected signs here are opposite from the previous estimations because the variables this time is LDC treated dummy while the variable of interest for the previous estimation has been tariffs. Thus, the sign would be positive if DFQF had positive impacts on LDCs' exports to Japan.

Since Japan is far away from most of LDC countries, the effect of Japan's DFQF might be different between Asian LDCs and the other LDCs, which are almost exclusively located in Subsaharan Africa. Thus, the estimation is performed with Asian LDC dummy, of which result is reported in the second column of Table 7. The coefficient estimate for Asian LDCs' treatment is positive and statistically significant at 10 % level. However, the total effect for Asian LDCs is still negative (-0.448+0.168=-0.28).

Table 7: Estimation result of Triple difference in difference

	(1)	(2)
Ineffect_LDC_Treated	-0.373**	-0.448**
	(-8.31)	(-8.21)
lneffect_AsianLDC_Treated		0.168+
		(1.76)
R-squared	0.955	0.955
Number of observations	1134071	1134071

t statistics in parentheses
+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

5. CONCLUSION

This paper evaluates the impact of the Duty-free Quota-free access given to the Least Developed Countries (LDCs) by Japan. The construction of concordance tables for Japan's 9 digit tariff line codes over 16 years makes feasible analyses at tariff line level and thereby overcomes a possible aggregation bias. Exogenous nature of the DFQF access enables us not to worry much about the endogeneity issues. Various estimation models, including the triple difference in difference estimator show that in general the LDCs did not benefit from DFQF access to the Japanese market. The tariff lines which were granted zero tariffs and substantial preference margins over other countries did not succeed to be imported into the Japanese market, although the total import values of Japan from the LDCs have shown an increasing trend. These findings suggest that the tariff barrier is a relatively small obstacle for trade compared with the other trade costs, such as infrastructures or non-tariff

barriers, supporting Collier and Gunning (1999)'s argument that developed-country tariffs are not significant impediments to growth in Africa or Limão and Venables (2001)'s argument that the relatively low level of African trade flows "is largely due to poor infrastructure" (p. 451).

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APPENDIX

9-digit code concordance

Japan's 9-digit tariff codes change every year. But major changes take place when HS code changes. As the following table shows, when we keep the tariff codes which are consistent over the period of 1988-2011, the number of remaining tariff codes drops to 5219 from the total number of tariff lines ranging from around 8300 to around 8800. On the other hand, if we limit our analysis to the period within the same HS version, such as HS 2002, which covers 2002 – 2006, or HS 2007, which covers 2007 – 2011, more than 8000 tariff line codes remain. Our investigation on the number of consistent tariff line codes between two subsequent years has shown that within the same HS version, the matching rate is about 95% while it drops to about 75-80% between years which belong to two different HS versions, e.g., 2001 and 2002. To strike a balance between the benefits and costs of concordance (to comply with the economics' most important rule of the marginal benefit equals the marginal cost), this paper has made concordance tables between 2001 (which belong to HS 1996 version) and 2002 (which belong to HS 2002 version) and between 2006 (which belong to HS 2002 version) and 2007 (which belong to HS 2007 version). Between the years within the same HS versions, the matched codes are only kept.

Appendix table 1: Number of consistent 9-digit tariff lines

Year	Total number of tariff lines	Consistent tariff lines 1988–2011	Consistent tariff lines 2002–2006 (Note1)	Consistent tariff lines 2007–2011 (Note2)
1988	8238	5219		
1989	8247	5219		
1990	8330	5219		
1991	8330	5219		
1992	8293	5219		
1993	8298	5219		
1994	8321	5219		
1995	8276	5219		
1996	8707	5219		
1997	8487	5219		
1998	8481	5219		
1999	8453	5219		
2000	8409	5219		
2001	8417	5219		
2002	8656	5219	8091	
2003	8650	5219	8091	
2004	8625	5219	8091	
2005	8637	5219	8091	
2006	8755	5219	8091	
2007	8752	5219		8298
2008	8588	5219		8298
2009	8392	5219		8298
2010	8672	5219		8298
2011	8453	5219		8298

Note1: for the period of HS2002
Note2: for the period of HS2007

Preference margin list

Tariff line code	Year	Preference margin over MFN	Preference margin over GSP
121299190	2008	5537.27	5537.27
500100090	2008	941.7	941.7
71310229	2008	906.51	906.51
71350229	2008	802.8	802.8
40410169	2008	684.62	684.62
40410179	2008	684.62	684.62
40410189	2008	684.62	684.62
20630093	2008	637.75	637.75
40390133	2008	611.02	611.02
40390138	2008	611.02	611.02
190190137	2008	595.37	595.37
190120117	2008	574.89	574.89
40130129	2008	570.04	570.04
40310190	2008	562.5	562.5
210120237	2008	552.45	552.45
71390229	2008	510.88	510.88
120220099	2008	477.83	477.83
210610140	2008	468.08	468.08
20649093	2008	451.48	451.48
40410129	2008	434.9	434.9
40410139	2008	434.9	434.9
40410149	2008	434.9	434.9
71339222	2008	422.58	422.58
71339227	2008	422.58	422.58
71332090	2008	414.15	414.15
120210099	2008	413.06	413.06
40229129	2008	408.3	408.3
40490132	2008	371.3	371.3
40490138	2008	371.3	371.3
190190132	2008	361.14	361.14
40390123	2008	360.47	360.47
40390128	2008	360.47	360.47
71333229	2008	359.69	359.69
190120112	2008	346.66	346.66
210120232	2008	335.99	335.99
40291129	2008	335.82	335.82
40520090	2008	312.94	312.94
40130119	2008	311.92	311.92
40510229	2008	290.49	290.49
40221129	2008	289.93	289.93
40590229	2008	276.95	276.95
110329490	2008	267.75	267.75
40490122	2008	256.47	256.47
40490128	2008	256.47	256.47
40390113	2008	254.79	254.79
40390118	2008	254.79	254.79
40229119	2008	254.51	254.51
180620319	2008	253.88	253.88
210690123	2008	253.1	253.1
210690129	2008	253.1	253.1

List of LDC countries

Angola	Mali
Bangladesh	Mauritania
Benin	Mozambique
Bhutan	Myanmar
Burkina Faso	Nepal
Burundi	Niger
Cambodia	Rwanda
Central African Republic	Samoa
Chad	Sao Tome and Principe
Union of Comoros	Senegal
Democratic Republic of Congo	Sierra Leone
Djibouti Commonwealth of Dominica	Solomon Islands
Equatorial Guinea	Somalia
Eritrea	Sudan
Ethiopia	Tanzania
Gambia	Timor Leste
Guinea	Togo
Guinea-Bissau	Tuvalu
Haiti	Uganda
Kiribati	Vanuatu
Laos	Yemen
Lesotho	Zambia
Liberia	
Madagascar	
Malawi	

List of GSP beneficiary countries

Afghanistan
Albania
Algeria
American Samoa
Angola
Antigua and Barbuda
Argentina
Armenia
Azerbaijan
Bangladesh
Belarus
Belize
Benin
Bhutan
Bolivia
Bosnia and Herzegovina
Botswana
Brazil
British Anguila
British Virgin Islands
Burkina Faso
Burundi
Cambodia
Cameroon
Canary Islands
Cape Verde
Central African Republic
Ceuta and Melilla
Chad
China (except for Hong Kong and Macao)
Chile
Colombia
Union of Comoros
Democratic Republic of Congo
Republic of Congo
Cook Islands
Costa Rica
Cuba
Croatia
Djibouti Commonwealth of Dominica
Dominican Republic
Ecuador
Egypt
El Salvador
Equatorial Guinea
Eritrea
Ethiopia
Falkland Islands and Dependencies
Fiji
Gabon
Gambia
Georgia
Ghana
Gibraltar
Grenada
Guatemala
Guinea
Guinea-Bissau
Guyana
Haiti
Honduras
India
Indonesia
Iran
Iraq
Côte d'Ivoire
Jamaica
Jordan
Kazakhstan
Kenya
Kiribati
Kyrgyz
Laos
Lebanon
Lesotho
Liberia
Libya
Macedonia (former Yugoslavia)
Madagascar
Malawi
Malaysia
Maldives
Mali
Marshall Islands
Mauritania
Mauritius
Mexico
Micronesia
Moldova
Mongolia
Montenegro
Montserrat
Morocco
Mozambique
Myanmar
Namibia
Nepal
Nicaragua
Niger
Nigeria
Niue
Pakistan
Palau
Panama
Papua New Guinea
Paraguay
Peru
Philippines
Rwanda
Samoa
Sao Tome and Principe
Senegal
Serbia
Seychelles
Sierra Leone
Solomon Islands
Somalia
South Africa
Sri Lanka
St. Christopher and Nevis
St. Helena and Dependencies
St. Lucia
St. Vincent
Sudan
Suriname
Swaziland
Syria
Tajikistan
Tanzania
Thailand
Timor Leste
Togo
Tokelau Islands
Tonga
Tunisia
Turkey
Turkmenista
Turks and Caicos Islands
Tuvalu
Uganda
Ukraine
Uruguay
Uzbekistan
Vanuatu
Venezuela
Viet-Nam
West Bank and Gaza Strip
Yemen
Zambia
Zimbabwe