Chapter 5
The Effects of Brexit on Prices Under the EU–Japan EPA

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Abstract The EU–Japan Economic Partnership Agreement (EPA) came into force in February 2019. However, the United Kingdom left the European Union in January 2020, and is currently negotiating new tariff regimes (as in February 2020). If negotiations fail, trade tariffs from the Most Favourable Nations (MFN) agreement will be imposed between the United Kingdom and European Union. In addition, every free trade agreement (FTA) that the United Kingdom agreed through the European Union, including the EU–Japan EPA, will need to be renegotiated. We investigate the effects of the withdrawal of the United Kingdom from the European Union, colloquially known as Brexit, on prices under the EU–Japan EPA. The EPA allowed reduced tariffs between Japan and EU-28 countries. Failed negotiations will increase the tariff rates between EU-27 countries and the United Kingdom. We analyse the change in prices of traded goods and services by sector using an inter-country input-output table compiled by the OECD.

Keywords EU-japan economic partnership agreement · Tariff reduction · Brexit · Inter-country input-output table

5.1 Introduction

The EU–Japan Economic Partnership Agreement (EPA) came into force in February 2019. However, the United Kingdom left the European Union in January 2020, and is currently negotiating new tariff regimes (as in February 2020). If negotiations fail, trade tariffs from the Most Favourable Nations (MFN) agreement will be imposed between the United Kingdom and European Union. In addition, every free trade agreement (FTA) that the United Kingdom agreed through the European Union, including the EU–Japan EPA, will need to be renegotiated.

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We investigate the effects of the withdrawal of the United Kingdom from the European Union, colloquially known as Brexit, on prices under the EU–Japan EPA. The EPA allowed reduced tariffs between Japan and EU-28 countries. Failed negotiations will increase the tariff rates between EU-27 countries and the United Kingdom. Although the change in tariff rates and, by extension, prices will affect trade directions, we do not analyse this circular effect because of the ambiguity in the price elasticity of imports of similar products produced in different countries (the Armington elasticity). We simply analyse the change in prices of traded goods and services by sector using an inter-country input-output table compiled by the OECD. We assume fixed input coefficients, including the import coefficients. Therefore, we assume the change in prices will be greater, and the change in outputs smaller (close to zero), than when an import substitution policy is implemented.

5.2 Model

The inter-country input-output (ICIO) table contains r countries and n sectors in each country. Each sector inputs goods and services from various countries proportionate to its output level. That is, the unit production of the sector j in country s requires a_{ij}^{rs} units of commodity i made by the sector in country r. The input coefficient a_{ij}^{rs} is constant and independent from change in the relative price. Country s levies tariffs on commodity i imported from country r at an *ad valorem* tariff rate:

$$t_i^{rs} \begin{cases} \geq 0, r \neq s \\ = 0, r = s \end{cases}.$$

Furthermore, the labour input coefficient l_j^s, nominal wage rate w^s, and profit per output π_j^s are constant. The latter two are measured by a common currency, the US Dollar. Thus, the value-added coefficient $v_j^s = w^s l_j^s + \pi_j^s$ is constant. The prices of sector j in country s are:

$$p_j^s = v_j^s + \sum_r \sum_i p_i^r \left(1 + t_i^{rs}\right) a_{ij}^{rs}$$

The price equation can be rewritten in matrix form:

$$p = v + pA$$

where

$$p \equiv \left(\begin{array}{cccccccc} p_1^1 & \cdots & p_N^1 & \cdots & p_1^R & \cdots & p_N^R \end{array} \right)$$

$$v \equiv \left(\begin{array}{cccccccc} v_1^1 & \cdots & v_N^1 & \cdots & v_1^R & \cdots & v_N^R \end{array} \right)$$

$$A = \begin{pmatrix} a_{11}^{11} & \cdots & a_{1N}^{11} & \left(1+t_1^{1R}\right)a_{11}^{1R} & \cdots & \left(1+t_1^{1R}\right)a_{1N}^{1R} \\ \vdots & \ddots & \vdots & \cdots & \vdots & \ddots & \vdots \\ a_{N1}^{11} & \cdots & a_{NN}^{11} & \left(1+t_N^{1R}\right)a_{N1}^{1R} & \cdots & \left(1+t_N^{1R}\right)a_{NN}^{1R} \\ \vdots & & \vdots & \ddots & & \vdots \\ \left(1+t_1^{R1}\right)a_{11}^{R1} & \cdots & \left(1+t_1^{R1}\right)a_{1N}^{R1} & a_{11}^{RR} & \cdots & a_{1N}^{RR} \\ \vdots & \ddots & \vdots & \cdots & \vdots & \ddots & \vdots \\ \left(1+t_N^{R1}\right)a_{N1}^{R1} & \cdots & \left(1+t_N^{R1}\right)a_{NN}^{R1} & a_{N1}^{RR} & \cdots & a_{NN}^{RR} \end{pmatrix}$$

Matrix A represents the multiplication of input coefficients a_{ij}^{rs} and tariff rates t_i^{rs}. Since tariffs are not levied on domestic inputs, $t_i^{ss}=0$, and the coefficients for own country are simply the input coefficient a_{ij}^{ss}.

If a country changes a tariff rate $t_i^{rs'}$ with fixed input coefficient a_{ij}^{rs} and value added coefficient v_j^s, the new prices $p_j^{s'}$ will be:

$$p_j^{s'} = v_j^s + \sum_r \sum_i p_i^{r'}\left(1+t_i^{rs'}\right)a_{ij}^{rs}$$

Taking the difference:

$$p_j^{s'} - p_j^s = \sum_r \sum_i \left(p_i^{r'} - p_i^r\right)\left(1+t_i^{rs'}\right)a_{ij}^{rs} + \sum_r \sum_i p_i^r\left(t_i^{rs'} - t_i^{rs}\right)a_{ij}^{rs}$$

$$\Delta p_j^s = \sum_r \sum_i \Delta p_i^r\left(1+t_i^{rs'}\right)a_{ij}^{rs} + \sum_r \sum_i p_i^r \Delta t_i^{rs} a_{ij}^{rs}$$

$$\Delta p_j^s = \sum_r \sum_i \left(p_i^r \Delta t_i^{rs} a_{ij}^{rs}\right)b_{ij}^{rs}$$

where b_{ij}^{rs} is $((r-1)N+i, (s-1)N+j)$ is the factor of the Leontief inverse matrix:

$$p' = v + p'A$$

$$p' - p = (p' - p)A + p'(A' - A)$$

$$\Delta p = \Delta p + p'\Delta A = p'\Delta A(I - A)^{-1} = p'\Delta AB \cong p\Delta AB$$

Tariff rate changes are reflected in the change in A.

5.3 Data

The main data used are: (1) the ICIO table; (2) the tariff rates of the current MFN and the tariff reduction schedule of the EU–Japan EPA; and (3) the import data, as shown below.

We use the ICIO table from the 2018 edition[1] compiled by OECD. It contains 65 countries, including EU-28 countries and Japan, and 36 sectors. The detailed sector list is shown in the Appendix Table.

MFN rates can be obtained from the WTO homepage[2]; they were downloaded by HS code at the 6-digit level. The tariff reduction schedule of the EU–Japan EPA is from Annex 2-A, 'Tariff elimination and reduction', of the EU–Japan EPA.[3] In Japan, 9-digit codes are used to classify commodities, and represent approximately 7,200 items. In the European Union, 8-digit codes can be used to classify commodities.

Tariff rates were aggregated against the classifications in the OECD ICIO table, and weighted by the amount of the import.[4] Although EU countries forming customs union and tariff rates at detailed levels are common, the aggregated tariff rates imposed by EU countries on Japan, and the tariff rate imposed by Japan on EU countries, are different between EU countries because of the different weights. The calculated tariff rates are shown in Table 5.1. Columns X and Z represent the average weights by output and intermediate input, respectively.

Among the EU tariff rates imposed on Japanese products, the highest MFN rate was for 05 Food, Beverage and Tobacco (9%), followed by 06 Textiles and 18 Motor Vehicle (7%), then 11 Rubber and Plastics and 19 Other Transport Equipment (4%). The tariff rates for 07 Wood and 17 Machinery in column Z are higher than those in column X, which means that these sectors are used to produce intermediate products rather than final products. After the EPA came into force in 2019, almost all tariffs were reduced to zero. Although tariffs in several sectors remain positive, though less than 1%, they are expected to reduce to zero by 2036.

In the case of Japan's tariff rates imposed on EU products, the highest MFN rate was 05 Food, Beverage and Tobacco (36% in weighted output, and 40% in intermediated input). The second highest MFN rate was 06 Textiles and Apparels (10%). Under the EPA, 06 Textiles and Apparel (4%), 05 Food, Beverage and Tobacco (3%), 07 Wood (3%) and 01 Agriculture (2%) remain positive. Though, they are expected to diminish.

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[1]Data is downloadable from OECD. https://www.oecd.org/sti/ind/inter-country-input-output-tables.htm.

[2]https://data.wto.org. MFN by detailed HS code in 'Tariff indicators—Applied'.

[3]EU-Japan Economic Partnership Agreement. https://trade.ec.europa.eu/doclib/press/index.cfm?id=1684.

[4]For Japanese import, Trade Statistics Data for Japan (https://www.e-stat.go.jp). For EU import data, Comext in Eurostat (https://ec.europa.eu/eurostat). Aggregation is based on Bilateral Trade in Goods by Industry and End-use Category (https://oe.cd/btd) and OECD ICIO Tables (https:oe.cd/icio).

Table 5.1 Tariff rates

Sector	EU tariff on Japanese products				Japan's tariff on EU products			
	MFN 2017		EPA 2019		MFN 2017		EPA 2019	
	X (%)	Z (%)	X (%)	Z (%)	X (%)	Z (%)	X (%)	Z (%)
01 Agriculture	1.64	1.61	0.00	0.00	4.92	4.96	2.65	2.77
02 Mining energy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
03 Mining non-energy	0.31	0.32	0.00	0.00	0.00	0.00	0.00	0.00
04 Mining services	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
05 Food, beverages	9.26	9.19	0.06	0.06	36.62	40.08	3.71	3.88
06 Textiles, apparel	7.43	7.29	0.00	0.00	10.11	10.03	4.38	4.36
07 Wood	1.31	1.37	0.00	0.00	3.07	3.18	3.07	3.18
08 Paper and printing	0.05	0.05	0.00	0.00	0.01	0.01	0.00	0.00
09 Coke and petroleum	0.21	0.26	0.00	0.00	0.15	0.19	0.00	0.00
10 Chemicals	2.84	2.83	0.03	0.03	0.66	0.72	0.02	0.03
11 Rubber and plastic	4.71	4.70	0.07	0.07	2.21	2.19	0.00	0.00
12 Other non-metals	2.87	2.86	0.01	0.01	1.38	1.39	0.17	0.16
13 Basic metals	0.88	0.87	0.03	0.03	1.11	1.10	0.00	0.00
14 Fabricated metals	3.00	3.00	0.02	0.02	1.04	1.01	0.00	0.00
15 Computer, electronics	1.10	1.09	0.03	0.03	0.00	0.00	0.00	0.00
16 Electric equipment	2.46	2.44	0.01	0.01	0.03	0.03	0.00	0.00
17 Machinery	1.63	1.71	0.03	0.04	0.00	0.00	0.00	0.00
18 Motor vehicles	7.11	6.94	0.55	0.51	0.00	0.00	0.00	0.00
19 Other transport equipment	4.36	4.33	0.31	0.30	0.00	0.00	0.00	0.00
20 Other manufacturing	1.58	1.55	0.00	0.00	1.44	1.39	0.08	0.07

Note X represents the average tariff weighted by output, and Z represents the average tariff weighted by intermediate input

5.4 Simulation Results

Instead of simply listing headings of different levels we recommend to let every heading be followed by at least a short passage of text. Further on please use the LATEX automatism for all your cross-references and citations as has already been described in Sect. 2.

5.4.1 Scenario 1: EU–Japan EPA

The results of the EU–Japan EPA is shown in Table 5.2. In all sectors in the European Union and Japan, prices decrease. Since the absolute magnitude of the changes is small, we focus on relative magnitude. In the European Union, 18 Motor Vehicles showed the largest decrease in price (−0.034% in 2019 and -0.036% in 2036). The greatest decrease in prices was observed in Belgium (−0.212%), Estonia (-0.159%), Cyprus (-0.137%), and Malta (−0.097%). Apart from Belgium (which has an esti-mated production value of 16 billion US$), these countries have relatively small Motor Vehicle production. Among the largest countries in Motor Vehicle production are Germany (424 billion US$, −0.026%), the United Kingdom (80 billion US$, -0.028%), Spain (71 billion US$, −0.057%), Italy (65 billion US$, -0.028%), and France (60 billion US$, -0.032%). Spain clearly has the largest production value. Eastern European countries declined on average (−0.034%): Hungary by −0.040%, Slovakia by −0.037%, Czech by −0.036%, and Poland by −0.029%.

In Japan, the sectors with the greatest price decreases are 25 Accommodation and Food Services (−0.083%), 05 Food Products, Beverages and Tobacco (−0.070%), 01 Agriculture, Forestry and Fishing (-0.056%), and 06 Textiles, Wearing Apparel, Leather and Related Products (−0.047%). The price decrease in 25 Accommodation and Food Services was caused by a tariff reduction in 05 Food Products, Beverages and Tobacco.

Because of the gradual reduction of tariffs, prices are expected to gradually decrease until 2036. However, few changes are expected between 2019 and 2036 in the European Union. The greatest reductions were in 18 Motor Vehicles and 19 Other Transport Equipment, by 0.002% and 0.001%, respectively. On the other hand, almost all sectors in Japan experienced a decrease in their prices by more than 0.001%. The largest decreasing sector is 06 Textiles (0.030%), followed by 07 Wood and Wood Products (0.020%).

5.4.2 Scenario 2: EU–Japan EPA but hard Brexit with EU-27

Next, we consider what happens if the United Kingdom fails to agree new FTAs with EU-27 (i.e. hard Brexit) and Japan. Although the United Kingdom is renegotiating

Table 5.2 Price changes under the EU–Japan EPA

Sector	EU28		Japan	
	2019 (%)	2036 (%)	2019 (%)	2036 (%)
01 Agriculture	0.00	0.00	−0.06	−0.06
02 Mining energy	0.00	0.00	−0.01	−0.01
03 Mining non-energy	0.00	0.00	−0.01	−0.01
04 Mining services	0.00	0.00	−0.01	−0.01
05 Food, beverages	0.00	0.00	−0.07	−0.08
06 Textiles, apparel	−0.01	−0.01	−0.05	−0.08
07 Wood	0.00	0.00	−0.02	−0.04
08 Paper and printing	0.00	0.00	−0.01	−0.02
09 Coke and petroleum	0.00	0.00	−0.01	−0.01
10 Chemicals	−0.01	−0.01	−0.03	−0.03
11 Rubber and plastic	−0.01	−0.01	−0.02	−0.03
12 Other non-metals	-0.01	−0.01	−0.01	−0.01
13 Basic metals	−0.01	−0.01	−0.01	−0.01
14 Fabricated metals	−0.01	−0.01	−0.01	−0.01
15 Computer, electronics	−0.01	−0.01	−0.01	−0.01
16 Electric equipment	−0.01	−0.01	−0.01	−0.01
17 Machinery	−0.01	−0.01	−0.01	−0.01
18 Motor vehicles	−0.03	−0.04	−0.01	−0.01
19 Other transport equipment	−0.02	−0.02	−0.01	−0.02
20 Other manufacturing	−0.01	−0.01	−0.02	−0.03
21 Electricity, gas	0.00	0.00	−0.01	−0.01
22 Construction	0.00	0.00	−0.01	−0.01
23 Wholesale & retail	0.00	0.00	−0.01	−0.01
24 Transportation	0.00	0.00	−0.01	−0.01
25 Accommodation	0.00	0.00	−0.08	−0.10
26 Publishing	0.00	0.00	−0.01	−0.01
27 Telecommunications	0.00	0.00	0.00	−0.01
28 IT & IT services	0.00	0.00	0.00	−0.01
29 Finance and insurance	0.00	0.00	0.00	−0.01
30 Real estate	0.00	0.00	0.00	0.00
31 Other business services	0.00	0.00	−0.01	−0.01
32 Public administration	0.00	0.00	−0.01	−0.01
33 Education	0.00	0.00	−0.01	−0.01
34 Health and social works	0.00	0.00	−0.02	−0.02
35 Entertainment	0.00	0.00	−0.01	−0.02
36 Private household	0.00	0.00	0.00	0.00

Table 5.3 Price changes under hard brexit

Sector	EU27	UK	Japan
	2021 (%)	2021 (%)	2021 (%)
01 Agriculture	0.04	0.57	−0.06
02 Mining energy	0.01	0.08	−0.01
03 Mining non-energy	0.01	0.14	−0.01
04 Mining services	0.01	0.11	−0.01
05 Food, beverages	0.07	0.88	−0.07
06 Textiles, apparel	0.03	0.30	−0.05
07 Wood	0.02	0.40	−0.02
08 Paper and printing	0.02	0.16	−0.01
09 Coke and petroleum	0.01	0.07	−0.01
10 Chemicals	0.04	0.30	−0.03
11 Rubber and plastic	0.04	0.33	−0.02
12 Other non-metals	0.02	0.20	−0.01
13 Basic metals	0.02	0.23	−0.01
14 Fabricated metals	0.02	0.19	−0.01
15 Computer, electronics	0.02	0.21	−0.01
16 Electric equipment	0.02	0.30	−0.01
17 Machinery	0.02	0.28	−0.01
18 Motor vehicles	0.05	0.78	−0.01
19 Other transport equipment	0.05	0.34	−0.01
20 Other manufacturing	0.02	0.18	−0.02
21 Electricity, gas	0.01	0.07	−0.01
22 Construction	0.02	0.16	−0.01
23 Wholesale & retail	0.01	0.15	−0.01
24 Transportation	0.01	0.11	0.00
25 Accommodation	0.04	0.56	−0.09
26 Publishing	0.01	0.06 ara>	−0.01
27 Telecommunications	0.01	0.11	0.00
28 IT & IT services	0.01	0.06	0.00
29 Finance and insurance	0.01	0.06	0.00
30 Real estate	0.00	0.02	0.00
31 Other business services	0.01	0.08	−0.01
32 Public administration	0.01	0.11	−0.01
33 Education	0.00	0.05	−0.01
34 Health and social works	0.01	0.10	−0.02
35 Entertainment	0.01	0.11	−0.01
36 Private household	0.00	0.00	0.00

international agreements that were made when it was a member of the European Union, it may not have a trade agreement with EU-27 and Japan. If this were to happen, the MFN tariff rates will be imposed on trade between the United Kingdom, and EU-27 and Japan. Thus, 2017 MFN tariff rates were imposed on UK trade with EU-27 and Japan, while the 2021 EPA tariff rates were imposed on trade between EU-27 and Japan. The results are shown in Table 5.3.

The prices in both EU-27 and the United Kingdom increase, while the prices in Japan decrease. The magnitude of the price increases in the United Kingdom is larger than those in EU-27. The highest increase was observed in 05 Food (0.879% in the United Kingdom, 0.067% in EU-27), followed by 18 Motor Vehicle (0.782% in the United Kingdom, 0.050% in EU-27), 01 Agriculture (0.782% in the United Kingdom, 0.050% in EU-27), and 25 Accommodation and Food Services (0.557% in the United Kingdom, 0.037% in EU-27).

5.5   Conclusion

In this chapter, we evaluate the price effects of the EU–Japan EPA and Brexit. Although the magnitude of the decrease in prices is small, EU-27 and Japan enjoy cost reductions. However, if renegotiations for a new FTA between the United Kingdom and EU-27 fail, costs will increase and international competitiveness of the United Kingdom will be low.

5.6   Appendix: Sector List

Sector	Description
01 Agriculture	Agriculture, forestry and fishing
02 Mining energy	Mining and extraction of energy producing products
03 Mining non-energy	Mining and quarrying of non-energy producing products
04 Mining services	Mining support service activities
05 Food, beverages	Food products, beverages and tobacco
06 Textiles, apparel	Textiles, wearing apparel, leather and related products
07 Wood	Wood and products of wood and cork
08 Paper and printing	Paper products and printing
09 Coke and petroleum	Coke and refined petroleum products
10 Chemicals	Chemicals and pharmaceutical products
11 Rubber and plastic	Rubber and plastic products
12 Other non-metals	Other non-metallic mineral products

(continued)

(continued)

Sector	Description
13 Basic metals	Basic metals
14 Fabricated metals	Fabricated metal products
15 Computer, electronics	Computer, electronic and optical products
16 Electric equipment	Electrical equipment
17 Machinery	Machinery and equipment, nec
18 Motor vehicles	Motor vehicles, trailers and semi-trailers
19 Other transport equipment	Other transport equipment
20 Other manufacturing	Other manufacturing; repair and installation of machinery and equipment
21 Electricity, gas	Electricity, gas, water supply, sewerage, waste and remediation services
22 Construction	Construction
23 Wholesale & retail	Wholesale and retail trade; repair of motor vehicles
24 Transportation	Transportation and storage
25 Accommodation	Accommodation and food services
26 Publishing	Publishing, audiovisual and broadcasting activities
27 Telecommunications	Telecommunications
28 IT & IT services	IT and other information services
29 Finance and insurance	Financial and insurance activities
30 Real estate	Real estate activities
31 Other business services	Other business sector services
32 Public administration	Public admin. and defense; compulsory social security
33 Education	Education
34 Health and social works	Human health and social work
35 Entertainment	Arts, entertainment, recreation and other service activities
36 Private household	Private households with employed persons