CENTRAL EUROPEAN REVIEW
OF ECONOMICS AND MANAGEMENT

ISSN 2543-9472; eISSN 2544-0365

Vol. 3, No.4, 135-147, December 2019

www.cerem-review.eu
www.ojs.wsb.wroclaw.pl

The impact of foreign trade on the Netherlands' real CO_2 emissions

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Abstract:

Aim: CO_2 emissions and the related climate change are a global problem, where the direct impact of actions of individual countries depends on their total share in CO_2 emissions. In order to assess the potential for policy measures, the openness of an economy, and the related import and export and their impacts on emissions should be considered. The aim of this paper is the attempt to show the real CO_2 emissions of the Netherlands as well as the impact of its trade on CO_2 emissions in other countries in the world and in the EU in 2015.

Design / Research methods: This study was conducted on the group of countries that are the major emitters of CO_2 in the world including most of the EU members. Countries with negligible CO_2 emissions were omitted. Actual CO_2 emissions were obtained by applying the actual emission factor. This takes into account the transfer of CO_2 in export products and services as well as those imported by particular countries.

Conclusions / findings: The real CO_2 emissions in the Netherlands are significantly different from the gross values, which represent the CO_2 emissions in the particular countries. It is also important to indicate that isolated actions of a single country within the European Union itself do not deliver the intended global and regional target – significant CO_2 emissions reduction. The approach proposed in this study, when applied, may have serious implications for individual EU member states in implementing their energy policy objectives.

Originality / value of the article: The article shows a different approach to the issue of CO_2 emission, including the importance of international trade in a globalizing world.

Keywords: EU energy policy, CO_2 emissions, exports and imports, the Netherlands, climate policy

JEL: Q37, Q40, Q53, Q56

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Received: 03.10.2018, Revised: 13.12.2018, Accepted: 02.01.2019
doi: http://dx.doi.org/10.29015/cerem.780

1. Introduction

We live in a global world and as a consequence the activities of particular countries directly or indirectly have an impact on other countries. Some countries may contribute significantly to the reduction of global CO_2 emissions in the energy sector, bearing high costs in comparison with other countries; nonetheless this may not have significant effects on real reduction of CO_2 emissions. Policy regarding CO_2 emissions of one country seems not to affect the efforts other countries in this field. Given that CO_2 emissions are a global problem, the impact of the effort of individual countries depends on their share in total global emissions. The real share in emissions depends not only on the direct emissions in a country, but also the emissions "hidden" in imports and exports. In other words, the openness of an economy may significantly influence its factual share in total emissions.

As is shown in this paper, the European Union (the EU) and the Netherlands are in a leading position in terms of the value of international exchange. This means that the Netherlands, regarding economic performance, depends on other countries the similar way these countries depend on the Netherlands (in terms of international trade value). Thus, all actions planned and realized by the EU as well as the Netherlands have an impact on other countries via trade. The Netherlands, as the key economy of EU member state, may use its position in the international exchange by implementation of EU energy policy, encouraging other countries to achieve solutions in similar way. The Netherlands with all members of the EU could achieve that with the use of relevant instruments such as ecological and energy fees.

The main purpose of this paper is to show the real CO_2 emissions in the Netherlands, as well as the impact of trade on CO_2 emissions based on the analysis of the key trade partners of the Netherlands. The analysis does not concern gross value of emissions, but its real volume, accounting for CO_2 transfer in export and import of products and services. For this case study, only the year 2015 is considered, as the aim of the article is to provide a general picture, making clear that isolated actions, like changes in the Dutch energy industry, are unlikely to achieve the intended targets unless other EU members as well other large global players will undertake similar actions.

2. Trade in the Netherlands in 2015

The Netherlands is one of the biggest economies in the EU and one of the world leaders in trade (World GDP Ranking 2015). In 2015 the country was on the eight position regarding world export as well as import (The Observatory of Economic Complexity 2017). The Netherlands total export reached USD 428 billion, and total import USD 454 billion. In this paper, regarding export the largest 64 partners of the Netherlands are considered (Table 1). These countries account for 94.62% (USD 404.993 billion) of total export. Most export goes to EU countries such as Germany, Belgium, Luxembourg, Great Britain, France and Italy (74.18%, USD 317.47 billion). When considering the share in exports, any type of climate policy should consider the interaction with these countries.

Regarding imports, 63-trade partners of the Netherlands, accounting for 95.42% of Dutch import, were considered (Table 2). Turkmenistan was not taken into consideration due to the very low value of trade. During the period considered the Netherlands imported most from the following countries: Germany, Belgium, China, USA and Russia. Dutch imports from the EU countries was at the level of 52.25% (USD 237.72 billion). Regarding import, The Netherlands has a stronger relation with non-EU countries than in the case of export. The economies of the countries considered in this paper, The Netherlands included, accounted for 90.05% of world GDP in 2015 (The World Bank 2017).

Table 1. The Netherlands export in 2015 in USD billion

No.	Country	Export in Billions of USD	No.	Country	Export in Billions of USD
1	Germany	91.3	33	Israel	2.36
2	Belgium	60.1	34	India	2.07
3	United Kingdom	44.4	35	Malaysia	1.93
4	France	26.6	36	Australia	1.66
5	Italy	22.4	37	Egypt	1.55
6	US	16.4	38	Lithuania	1.41
7	Spain	12.6	39	South Africa	1.32
8	Sweden	10.9	40	Slovakia	1.18
9	China	9.2	41	Algeria	1.08
10	Poland	7.6	42	Thailand	1.04
11	Denmark	6.91	43	Bulgaria	1.01
12	Switzerland	5.1	44	Vietnam	0.882
13	Czech Republic	4.51	45	Indonesia	0.783
14	South Korea	4.49	46	Kuwait	0.564
15	Austria	4.15	47	Ukraine	0.553
16	Hungary	3.93	48	Qatar	0.519
17	Singapore	3.77	49	Iran	0.496
18	Russia	3.71	50	Argentina	0.495
19	Finland	3.7	51	Venezuela	0.479
20	Turkey	3.42	52	Philippines	0.467
21	Portugal	3.39	53	Colombia	0.439
22	UAE	3.23	54	Chile	0.402
23	Norway	3.2	55	New Zealand	0.395
24	Mexico	3.05	56	Pakistan	0.395
25	Ireland	2.97	57	Kazakhstan	0.355
26	Japan	2.97	58	Ecuador	0.303
27	Canada	2.82	59	Belarus	0.239
28	Hong Kong	2.79	60	Peru	0.236
29	Romania	2.61	61	Bangladesh	0.201
30	Greece	2.6	62	Azerbaijan	0.164
31	Saudi Arabia	2.57	63	Trinidad & Tobago	0.074
32	Brazil	2.48	64	Turkmenistan	0.072

Source: author's own elaboration based on The Observatory of Economic Complexity.

Table 2. The Netherlands import in USD billions in 2015

No.	Country	Import in Billions of USD	No.	Country	Import in Billions of USD
1	Germany	72.1	33	Portugal	2.14
2	Belgium	43.3	34	Israel	2.03
3	China	41.2	35	Kuwait	1.89
4	USA	34.9	36	Algeria	1.82
5	Russian Federation	32.2	37	Colombia	1.78
6	United Kingdom	23.9	38	South Africa	1.67
7	France	18.5	39	Mexico	1.65
8	Norway	13.4	40	Romania	1.65
9	Italy	10.2	41	Chile	1.58
10	Japan	9.6	42	Slovakia	1.57
11	Poland	8.39	43	Saudi Arabia	1.39
12	Spain	8.06	44	Australia	1.35
13	Brazil	7.76	45	Argentina	1.29
14	Malaysia	7.14	46	Philippines	1.26
15	Sweden	7.01	47	Belarus	1.15
16	Ireland	6	48	Lithuania	1.1
17	Czech Republic	4.98	49	Bangladesh	0.964
18	Vietnam	4.88	50	Ukraine	0.914
19	Hong Kong	4.39	51	UAE	0.893
20	Singapore	4.39	52	Qatar	0.865
21	Denmark	4.11	53	Peru	0.857
22	Finland	3.96	54	Bulgaria	0.632
23	Switzerland	3.66	55	Greece	0.53
24	Kazakhstan	3.55	56	Pakistan	0.453
25	India	3.54	57	New Zealand	0.451
26	South Korea	3.27	58	Ecuador	0.408
27	Turkey	2.96	59	Egypt	0.353
28	Thailand	2.92	60	Trinidad & Tobago	0.158
29	Hungary	2.65	61	Venezuela	0.145
30	Indonesia	2.57	62	Iran	0.033
31	Austria	2.39	63	Azerbaijan	0.016
32	Canada	2.32			

Source: author's own study based on The Observatory of Economic Complexity.

3. The emission of CO_2 in the Netherlands and its 63 main trade partners in 2015

One of the main aims of the European energy policy is to achieve the so-called 3 × 20% by 2020. This involves reduction of CO_2 emissions by 20% compared to the base year 1990, the increase in the share of renewable energy in the energy mix to the level of 20% and improvement in the efficiency of energy use by 20% in comparison to 1990 (European Parliament 2020). These aims are interconnected. The last two goals are determinants of CO_2 emission reduction, in turn influencing other aims of the EU energy policy. As shown in this section, the factual CO_2 emissions depend on the emissions embraced in international trade. As a consequence, policy measures will have limited effects when action is only taken on a national scale and not in the framework of international trade. In this section, the gross the emissions for the Netherlands are calculated, taking into consideration international trade. A rough measure is used, in order to sketch a global picture.

3.1 Gross emission

The gross emission of CO_2 it is the total amount of CO_2 emitted by a country. Table 5 presents the emissions of the Netherlands and its 64 trade partners. The largest CO_2 emitters in 2015 were the following countries: China, USA, India, Russia and Japan. The EU Members States were responsible for 10.17% of world emission of CO_2 emissions, making the EU as a whole the third largest emitter of CO_2 in the world. As an individual country, Netherlands ranks 26^{th}.

As shown in Table 6, if all the guidelines, in accordance with the provisions of the EU energy policy concerning the reduction of CO_2, would be applied to all trade partners of the Netherlands, then only 17 countries would have achieved the objectives concerning the reduction of CO_2 emissions already in 2015. It should be mentioned that total CO_2 emission from all sectors has been considered, not only emissions generated by the power industry.

Table 5. CO_2 emissions in mln Tons and its share in global emission, in the Netherlands and its 64 trade partners

Country	CO_2 emission in MLN T	% of Global emission	Country	CO_2 emission in MLN T	% of Global emission
China	9,153.90	27.32%	Algeria	137.09	0.41%
US	5,485.74	16.37%	Belgium	111.53	0.33%
India	2,218.43	6.62%	Qatar	111.10	0.33%
Russia	1,483.18	4.43%	Kuwait	107.88	0.32%
Japan	1,207.79	3.60%	Philippines	106.52	0.32%
Germany	753.64	2.25%	Czech Republic	98.63	0.29%
South Korea	648.70	1.94%	Colombia	97.27	0.29%
Iran	630.19	1.88%	Turkmenistan	92.62	0.28%
Saudi Arabia	624.53	1.86%	Hong Kong	91.24	0.27%
Indonesia	611.43	1.82%	Chile	90.11	0.27%
Canada	532.47	1.59%	Israel	74.40	0.22%
Brazil	487.84	1.46%	Greece	73.90	0.22%
Mexico	474.22	1.42%	Bangladesh	72.86	0.22%
United Kingdom	436.91	1.30%	Romania	70.67	0.21%
South Africa	436.51	1.30%	Austria	62.82	0.19%
Australia	400.22	1.19%	Belarus	56.34	0.17%
Italy	341.49	1.02%	Portugal	52.54	0.16%
Turkey	336.33	1.00%	Peru	50.77	0.15%
France	309.45	0.92%	Sweden	47.76	0.14%
Thailand	295.85	0.88%	Bulgaria	45.15	0.13%
Poland	295.85	0.88%	Hungary	44.21	0.13%
Spain	291.71	0.87%	Finland	41.31	0.12%
UAE	264.66	0.79%	Switzerland	39.06	0.12%
Malaysia	246.95	0.74%	Ireland	38.63	0.12%
Egypt	212.15	0.63%	Denmark	37.63	0.11%
Netherlands	210.12	0.63%	Ecuador	37.08	0.11%
Singapore	204.99	0.61%	Norway	36.73	0.11%
Ukraine	195.11	0.58%	New Zealand	35.73	0.11%
Argentina	189.99	0.57%	Azerbaijan	32.04	0.10%
Kazakhstan	184.78	0.55%	Slovakia	31.15	0.09%
Pakistan	179.48	0.54%	Trinidad & Tobago	26.67	0.08%
Venezuela	169.15	0.50%	Lithuania	11.16	0.03%
Vietnam	168.97	0.50%			

Source: based on IEA (2016).

Table 6. Fulfilling EU energy policy in the Netherlands and its 63 trading partners in terms of CO_2 emissions in 2015

Country	% of CO_2 emissions from 1990	Country	% of CO_2 emissions from 1990
Ukraine	26.22%	Australia	146.48%
Lithuania	30.94%	Venezuela	155.06%
Romania	40.11%	Mexico	176.68%
Slovakia	56.79%	Argentina	182.79%
Azerbaijan	57.59%	Algeria	197.79%
Belarus	58.74%	Israel	212.55%
Czech Republic	61.02%	Hong Kong	221.06%
Hungary	61.31%	Colombia	225.44%
Russian Federation	65.67%	Egypt	238.11%
Denmark	67.35%	Brazil	247.33%
Bulgaria	68.42%	Turkey	249.84%
United Kingdom	73.67%	Turkmenistan	256.48%
Finland	74.60%	Peru	259.03%
Germany	75.12%	Philippines	266.69%
Sweden	76.75%	South Korea	271.32%
Kazakhstan	77.04%	Trinidad & Tobago	276.40%
Poland	79.09%	Ecuador	281.60%
France	84.08%	Chile	283.64%
Italy	85.41%	Pakistan	289.64%
Belgium	87.79%	Singapore	293.51%
Switzerland	90.23%	Saudi Arabia	299.58%
Greece	94.74%	UAE	312.51%
US	10.29%	Iran	323.15%
Austria	110.44%	Thailand	327.70%
Netherlands	110.61%	India	367.11%
Japan	110.77%	China	394.52%
Canada	115.93%	Malaysia	419.90%
Norway	118.23%	Indonesia	447.31%
Ireland	124.81%	Bangladesh	548.11%
Portugal	128.04%	Kuwait	561.33%
New Zealand	132.11%	Qatar	701.99%
Spain	135.10%	Vietnam	945.38%
South Africa	142.82%		

Source: based on IEA (2016).

3.2 Gross emission – after considering the Netherlands trade

Gross emission of CO_2 was determined as the CO_2 emissions of a particular country diminished by emission "hidden" in exported goods and services of the country, plus the "hidden" emission in imported in goods and services. This means that gross emissions of CO_2 should be adjusted for the emissions balance of CO_2. The following formulas present the method used to calculate net emissions of CO_2 and gross emissions of CO_2 for one country (Fortuński 2016: 115):

$$S_E = \left(\frac{E_X}{PKB}\right)\% \times E_g - \left(\frac{I_m}{PKB}\right)\% \times E_g$$

$$E_a = E_g + S_E$$

S_E – net emissions of CO_2 of a particular country in MT;
Eg– gross CO_2 emissions of a particular country in MT;
Ex – value of export of a particular country in EUR m;
Im – value of import of a particular country in EUR m;
PKB – gross domestic product at constant prices in EUR m;
(Im/PKB)% – value of exports to the EU as a share of GDP of a particular country;
(Ex/PKB)% – value of exports from the EU to a particular country as a share of EU GDP;
(Im/PKB)%*Eb – exported CO_2 in goods and services to the EU (EU CO_2 import);
(Ex/PKB)%*Eb – exported CO_2 of the EU to the particular country in goods and services (EU CO_2 export;
Ea – actual CO_2 emissions

Actual CO_2 emissions of the Netherlands during the period considered was significantly different from gross emission. In 2015, the Netherlands exported in goods and services 113.46 MT CO_2, while importing 183.80 MT CO_2. Thus, the CO_2 balance was positive for the Netherlands, resulting in actual emissions of CO_2 to be 70.34 MT CO_2 higher than gross emissions, reaching the level of 280.5 MT CO_2. The actual CO_2 emissions in Netherlands in 2015, compared to 1990, were 133.48%, being higher that the 110.61% when considering gross emissions.

Table 7. The Netherlands' net CO_2 trade balance

Country	Balance of CO_2 in MT	Country	Balance of CO_2 in MT
Russian Federation	33.95	Pakistan	0.19
China	31.51	Peru	0.16
USA	6.02	Trinidad & Tobago	0.16
Malaysia	5.42	Ecuador	0.07
Vietnam	4.03	Canada	0.01
Kazakhstan	3.47	Ireland	-0.01
India	3.18	New Zealand	-0.02
Poland	3.07	Turkmenistan	-0.02
Singapore	2.03	Azerbaijan	-0.04
South Africa	1.95	Venezuela	-0.04
Thailand	1.90	Australia	-0.06
Ukraine	1.83	Romania	-0.07
Japan	1.81	Iran	-0.09
Kuwait	1.63	Lithuania	-0.10
Indonesia	1.61	Hungary	-0.13
Brazil	1.40	Israel	-0.16
Czech Republic	1.39	Mexico	-0.17
Algeria	1.22	Egypt	-0.21
Belarus	1.13	UAE	-0.27
Saudi Arabia	0.62	Finland	-0.33
Hong Kong	0.51	Portugal	-0.38
Chile	0.48	Greece	-0.53
Colombia	0.47	Austria	-0.76
Qatar	0.44	Switzerland	-1.22
Turkey	0.43	Denmark	-1.42
Norway	0.38	Spain	-1.56
Philippines	0.33	Sweden	-2.38
Bangladesh	0.30	Italy	-4.36
Bulgaria	0.29	France	-5.08
South Korea	0.28	Belgium	-6.22
Argentina	0.28	United Kingdom	-8.79
Slovakia	0.23	Germany	-9.42

Source: author's own elaboration based on The Observatory of Economic Complexity, IEA (2016), The World Bank Data Catalog.

In Table 7, the net CO_2 trade balance is presented for the Netherlands. Russia, China, USA, Malaysia and Vietnam were the main net exporters of CO_2 to the Netherlands in 2015. Germany, Great Britain, Belgium, France and Italy were the main recipients of the Netherlands' net export of CO_2 in 2015. Taking into consideration only the EU countries, the balance of CO_2 emissions was positive for the Netherlands amounting to -36.57 MT CO_2. While Poland, the Czech Republic, Bulgaria and Slovakia were net CO_2 exporters to the Netherlands, Germany, Great Britain, Belgium, France and Italy were net importers.

4. Conclusion

Efforts of The Netherlands, and the whole European Union, to develop and implement policy to deal with global warming and develop clean energy will unlikely be successful without similar actions in other countries. The effectiveness of implementing EU energy policy by member states is limited to its own territory. This is, among other things, the result from the fact that the EU energy policy is not being regarded as a sustainable development policy and is related to high costs (Fortuński 2012, 2013a, 2013b, 2016a, 2016b, 2016c; Bogrocz 2008; Graczyk, Jakubczyk 2005; Kaczmarski 2010; Kryk 2012a, 2012b).

While being able to influence their own emissions, a country's influence on "hidden" emissions is a more complicated issue. The import of CO_2 intensive goods and services negatively influences the actual emission of CO_2 in the Netherlands. As a consequence the planned reduction according to its energy policy in 2015 was not achieved, while the 2020 goals could be jeopardized. The actual emission level of CO_2 for the Netherlands' main trade partners considerably varied from real emissions. The results of the research indicate that CO_2 emission is not only a global problem caused by production and consumption activities within a country, but also strongly related to international trade. As a consequence, new instruments may need to be developed that provide trade partners to undertake effective actions towards the reduction of CO_2 emission. An example is an eco-energy tax, which could be applied by the EU to all trade partners, individual countries or groups of countries

according to the share in the total of a particular country's export to the EU (Bielecki et al. 2016: 43-46). The measure used in this paper for calculation of real emission is a rough one. This measure should be refined and applied to, for example, particular products (e.g., according to the logic of the carbon footprint or environmental footprint of a good or service (https://footprint.wwf.org.uk/#/), in order to create a better picture of the most CO_2 emission intensive goods and services traded, and develop effective policy measures.

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