



THE ECONOMIC IMPACT OF THE RUSSIAN IMPORT BAN: A CGE ANALYSIS

Issue 3

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December
2015

ABSTRACT

The aim of this paper is to assess the economic impact of the Russian embargo from 7 August 2014 on certain agricultural food products from the EU, the USA, Norway, Canada and Australia. The effects of this economic sanction are analysed in the framework of a computable general equilibrium (CGE) model with a particular focus on bilateral and total exports, production and welfare. The detailed, based on real trade data, calibration of the model allows for an exact identification of the sectoral shares and prohibitive tariffs aggregated to match the CGE model's sectoral level of aggregation. In addition, the paper carries on a validation exercise to compare the model's predictions with real trade data developments. The modelling simulation results show that the impact of the ban on total exports of the EU, the USA, Norway, Canada and Australia is limited. Total extra-EU exports decline by merely 0.12%. Nevertheless at a disaggregate level there are sectors – 'vegetables and fruits', 'other meat' and 'dairy products' – which experience two digit percentage change declines.

For further
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ISSN 2034-9815

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The opinions expressed in this paper are the authors' own and do not necessarily reflect the views and opinions of the European Commission.



1. Introduction

On 7 August 2014 the Russian government imposed an import ban on agricultural and processed food exports from the European Union (EU), the United States of America (USA), Norway, Canada and Australia.² The imposition of the ban was a retaliatory measure by the Russian government in response to the sanctions previously imposed by Western economies.³ The products banned include dairy, most of the meat products, fruits and vegetables as well as fish products. In terms of export flows, the most affected countries are EU Member States whose exports based on data from 2013 amount to 73% of the total agricultural food products affected by the ban (European Parliament 2014). In comparison to 2011⁴, the extra-EU share of the affected product lines stands at 71% showing that the EU share of these products in relation to exports from the USA, Norway, Canada and Australia has been relatively stable with a moderate increase of 2 percentage points.

Compared to total Extra-EU exports to Russia, however, the share of the affected lines amounts to 4.4%.⁵ Moreover, the share of Extra-EU exports to Russia in total Extra-EU exports is 7% and hence the share of the affected lines by the ban in total Extra-EU exports stands at 0.3%.

The products banned include dairy, most of the meat products, fruits and vegetables as well as fish.

Among economists there is consensus that economic sanctions such as an import ban provide for suboptimal resource allocation and create welfare loss in aggregate. Moreover, an import embargo has a redistributive impact on both sanctioning and target country (Kaempfer and Lowenberg 2007). An analysis of these redistributive effects is crucial in determining the economic impact on the target and sanctioning country (for more detail see Section 3). The ultimate impact on prices and quantities will depend on the import demand and supply elasticities, the quantity affected by the ban as well as the substitutability of imported versus domestic production and of imports from different sources.

² See Russian government (2014), a decree from 20 August 2014.

³ For more information on the type of sanctions imposed by the EU see European Council (2014).

⁴ Detailed calculations by the author for 2011 for modelling purposes have been performed as the latest GTAP database is based on the year 2011.

⁵ Own calculations based on the COMEXT database, date of the extraction 27.11.2014.



The economic literature on the effectiveness of economic sanctions shows that sanctions may not be very effective instruments to achieve the desired goals i.e. inducing some ‘pain’ and welfare losses on the target country Kirshner (1997), Pape (1997), Mack and Khan (2000). Especially in the case of an import ban, the effectiveness of the measure is doubtful as the target country may redirect exports to third countries and/or also engage in triangular activities to bypass custom controls Drezner (2000).

In line with the conclusions on the impact of quantitative restrictions on welfare from the economic theory these are as a rule prohibited under the WTO GATT agreement. Exceptions to this rule are allowed only in very few narrowly defined exceptional circumstances.⁶ In a similar context, the EU initiated a dispute settlement procedure in the framework of the WTO in April 2014⁷ against the Russian embargo on fresh and frozen pork from the EU of 1 February 2014.⁸

Along these lines, this paper aims at assessing the economic impact of the Russian embargo on agricultural goods exports from the EU and four other trading partners on bilateral and total export flows, production and welfare. Therefore, a multi-region computable general equilibrium (CGE) modelling approach is chosen for simulating the impact of the Russian embargo of 7 August 2014.⁹ This type of approach has been repeatedly deployed for assessing the impact of economic sanctions in numerous papers such as the ones by Antimiani et al. (2014), Oprunenco (2012), Henseler et al. (2013), Kitous (2013), Philippidis (2010), Rodriguez et al. (2007), Anderson and Jackson (2005), etc.

In comparison to the modelling literature, the novelty of current work consists inter alia in the following: The paper relies on the most recent GTAP database version 9 released in May 2015 (Narayanan et al. 2015). The calibration of the modelling exercise is

⁶ See GATT, Article XI for further reference.

⁷ See WTO (2014).

⁸ A decision on the WTO compliance of the import ban is expected in the beginning of 2016, see WTO (2015).

⁹ It should be noted that the general equilibrium model chosen for the assessment of the Russian import ban is like most economic models a ‘ceteris paribus’ model which compares the difference between situation where the Russian ban is imposed vs. the hypothetical one where the ban was not imposed. Along this line, erratic/stochastic events like the sharp drop in the oil/gas prices and the outbreaks of pig epidemics in North America as well as other events are not taken into account in the analysis. These factors and their possible interactions have most likely altered the ‘real’ economic impact of the ban. This however cannot be quantified here.



complemented by insights from most recent COMEXT trade data in terms of precisely determining the share of the GTAP sectors affected by the ban and to that extend the calibration of the prohibitive tariff. The modelling assessment covers all countries affected by the ban, i.e. the EU, the USA, Canada, Australia and Norway and the precise calibration of the sectoral shares and the shocks is carried out for all these countries. Further on, the modelling results are complemented by a validation exercise based on most recent insights from trade statistics in order to test/validate the model's results when confronted with real trade developments following the imposition of the ban.

Finally, the paper provides a review of theoretical, empirical and modelling literature underpinning the methodological choice and identifies future research needs and likely developments.

The value of the EU exports affected by the ban is €5.2 billion based on 2013 data products.

This paper is structured as follows: Section 2 offers background information of the embargo inter alia in terms of the export value of the banned products at an aggregate and sectoral level and the HS chapters' coverage. Section 3 provides a literature review of theoretical, empirical and modelling research of economic sanctions in general and import embargos in particular and elaborates in more detail on the novelty of the paper. Section 4 discusses the results from the CGE modelling in terms of exports, production and welfare for all directly affected countries. Section 5 analyses recent official statistics in order to examine the relative impact of the ban and importance of extra-EU destination markets of the banned products. Finally, section 6 provides conclusions and some recommendation for future research in this area.

2. International trade flows affected by the import ban

The Russian import embargo on agri-products from the EU, the USA, Canada, Australia and Norway was initially imposed for one year, however, this period has been extended by another year, which makes it difficult to foresee how long the ban will be in place.

The value of the EU exports affected by the ban is €5.2 billion based on 2013 data (see also Table 1). Total Extra-EU exports of the HS lines subject to the ban amount to €30.5 billion which corresponds to a share of 17% of the lines affected by the embargo.

In terms of categorisation of the products affected, the embargo has impact on more than twenty HS4 codes mainly in the sectors vegetables and fruits, dairy, meat and processed food. In this respect, Table 1 provides information on the importance of the affected products in terms of Extra-EU exports at HS chapter level.



The most important HS chapter in terms of Extra-EU exports is the 04 Dairy produce. Banned exports in this chapter amount to more €1.3 billion representing 26% of total exports affected by the ban. The other three HS2 chapters significantly impacted by the embargo are 08 Edible fruits & nuts, 02 Meat and edible meat offal and 07 Edible vegetables, roots & tubers. Prohibited exports in these HS2 chapters are worth almost €1.3 billion, €1.2 billion and more than €700 million respectively. The corresponding shares in total exports banned are 24%, 22% and 14% (see Table 1).

The impact of the Russian embargo on the rest of the countries mentioned in the decree i.e. the USA, Norway, Canada and Australia is less strong in terms of trade value. The most affected country in export values banned besides the EU is Norway followed by the USA, Canada and Australia.

Table 1: Ranking of HS2 chapters affected by the Russian import ban in 2013

HS chapter	Exports affected	Shares
04 Dairy produce	1,347,072	26%
08 Edible fruits & nuts	1,257,557	24%
02 Meat and edible meat offal	1,168,346	22%
07 Edible vegetables, roots & tubers	734,158	14%
21 Miscellaneous edible preparations	472,532	9%
03 Fish and fishery products	152,899	3%
16 Preparations of meat	55,000	1%
19 Preps. of cereals, flour, starch, etc.	15,060	0%
Total	€5,202,625	100%

Source: COMEXT, own calculations, data extracted on 27 of November 2014

3. Literature review

In trade theory measures restricting import and export flows can be divided into price-targeting and quantity-targeting measures or a mixture thereof such as tariff quotas. An import ban is a quantitative restriction which aims at a partial or a total prohibition of



imports from a given county or set of countries in the country imposing the ban. Bans or embargos¹⁰ are economic sanctions aiming at lowering the demand for particular good and hereby creating welfare losses for the target country. One of the mechanisms for achieving this is by impacting on the foreign currency earnings and the capacity of the target country to purchase goods and services (David and Engerman 2003).

Among economists there is consensus that economic sanctions such as an import ban provide for suboptimal resource allocation and create a welfare loss in aggregate. Moreover, an import embargo has, like any other quantitative restriction of trade flows, a redistributive impact on both sanctioning and target country (Kaempfer and Lowenberg 2007). An analysis of these redistributive effects is crucial in determining the economic impact on the target and sanctioning country as price and quantity effect will differ. For the sanctioning country, the imposition of an import ban lead to a rise in domestic prices and a decline in the demanded quantity. For the target country on the other side the imposition of the import embargo lowers the price of the export good as total demand for the banned product decreases causing a decline in the terms of trade and export revenue (Eyler 2007). As a consequence the import embargo lowers welfare in both countries. The ultimate impact on prices and quantities will depend on the import demand and supply elasticities, the quantity affected by the ban as well as the substitutability of imported versus domestic production and of imports from different sources.

The literature on the effectiveness of economic sanctions shows that sanctions may not be very effective instrument to achieve the desired goals i.e. inducing some 'pain' and welfare losses on the target country Kirshner (1997), Pape (1997), Mack and Khan (2000). Especially in the case of an import ban, the effectiveness of the measure is doubtful as the target country may redirect exports to third countries and/or also engage in triangular activities to bypass custom controls Drezner (2000).

The econometric literature also evolved estimating primarily the impact of economic sanctions on trade flows and their effectiveness¹¹. Hufbauer et al. (1997) provides first evidence of the hypothesis that competitors of the sanctioning country (in their analysis it

¹⁰ In this paper ban and embargo are used as synonyms as they are conceptually the same. The embargo, however, is in general imposed for political reasons (the USA-CUBA embargo for example) whereas a ban in response to health, environmental or health concerns, see also Panagiotou (2008).

¹¹ For an overview of econometric methods and importance of key explanatory variables in the econometric analysis of sanctions see Hufbauer et al. (2007).



was the USA) will engage in trade activities with the target country in the period the sanction is imposed unilaterally. An evidence supporting the same hypothesis as well as on the negative impact of economic sanctions on third countries is found in Caruso (2003) and Hufbauer and Oegg (2003). However, an important point is made by Askari et al. (2002) who claim that the directly measured impact on bilateral trade is an underestimation of the real cost of an economic sanction due to a lost in FDI and joint venture opportunities.

The above presented econometric papers estimate the impact of economic sanctions in a gravity modelling framework. In trade gravity modelling the impact of an embargo is in general modelled through an estimation of dummies coefficients proxying the economic sanction, i.e. import or export embargo, etc. on merchandise trade and in some cases on export sector employment Askari et al. (2003). Although these gravity based models are useful in providing insights in respect to aggregate trade costs, they often fails to distinguish between simple foreign exchange rate losses and a deadweight loss due to the fact that the resources have not been allocated to domestic production or alternative third countries markets.

Along these lines the purpose of this paper is to assess the impact of the Russian agricultural goods embargo not only on bilateral but also on total export flows, production and welfare of the affected countries. Therefore, in this paper a multi-region computable general equilibrium modelling approach is chosen for assessing the impact of the Russian embargo of 7 August 2014.

This type of approach has been repeatedly deployed for assessing the impact of economic sanctions in numerous papers such as the ones by Antimiani et al. (2014), Oprunenco (2012), Henseler et al. (2013), Kitous (2013), Philippidis (2010), Rodriguez et al. (2007), Anderson and Jackson (2005), etc. The paper by Antimiani et al. (2014) is a CGE analysis which assesses the impact of the Russian import ban in the framework of the GTAP model. The current paper follows a novel approach in assessing the impact of the import ban in a number of ways.

Firstly, although Antimiani et al. (2014) model the Russian embargo in a similar way as in the current paper, i.e. by identifying the prohibitive tariff rates corresponding to zero import flows of the affected lines the authors' approach differs from the one followed in the current paper. The calibration of the prohibitive tariff rates of Animiani et al. (2014) does not take into account the fact that the GTAP sectors affected by the ban are not entirely banned (see also Section 4). Secondly, the current analysis is based on the most recent GTAP 9 database. Thirdly, our paper provides a validation exercise based on real



trade data comparing the simulation results from the modelling with actual exports statistics and finally, a review of relevant theoretical, empirical and modelling literature.

4. Modelling design

The modelling simulations of the economic effect of the Russian import ban on exports, production and welfare are carried out with the comparative-static version of the CGE model GTAP. This general equilibrium model is micro-founded multi-country, multi-sector macro-economic model tailor-made for trade policy analysis. The model is used world-wide for economic impact assessment of trade policy measures and also in various Commission's impact assessments. The GTAP model is based on neo-classical behavioural relations and equilibrium quantity and prices are determined through constrained optimisation process.¹² The behavioural (functional) side of the model is complemented by accounting relationships ensuring consistence with expenditures, income and production flows. The model is based on the GTAP database which relies on input-output tables contributions ultimately founded in the system of national accounts. Trade flows are modelled following an Armington approach with a constant elasticity of substitution functional form. The database version used for the modelling simulations of the Russian import ban is the most recent GTAP 9 database (Narayanan et al. 2015).

4.1. Sectoral, regional aggregation and calibration

The sectoral aggregation of the model includes the sectors mentioned in Table 1 mapped to match the GTAP sectoral classification and the sectors 'rest of agriculture', 'manufacturing' and 'services' (see Table 2). The regional aggregation of the modelling simulations comprises the EU, the USA, Norway, Canada, Australia, Russia and rest of the world.

The import ban is modelled by letting the model find the prohibitive tariff corresponding to a close to zero or zero imports of the affected GTAP sectors. The notion behind this is that an import ban is simply a quota with a zero (or close to zero) trade value associated with it. Well knowing that tariffs and quotas are dual to each other, there is a tariff corresponding to any quota. In modelling terms, the import ban is modelled by performing a swap of the import tariff variable with the export quantity variable. Endogenising the import tariff and exogenising the export quantity allows the model to

¹² For more detailed description of the standard GTAP model see Hertel, T-W. (1997)



find the prohibitive tariff, i.e. the one which corresponds to zero import flows. This modelling approach has been used in the modelling literature (see Section 3) and is the obvious methodological approach as any other method should lead to the same outcome otherwise it will not be the right choice for an import embargo assessment.

Table 2: Regional and sectoral aggregation

GTAP sectors directly affected by the ban	Country/regions
Rest of agriculture	EU
Fishing	USA
Vegetables and fruits	Canada
Manufacturing	Australia
Cattle meat	Norway
Dairy products	Russian Federation
Other meat	Rest of the world
Other food	
Services	

Source: Own aggregation of the GTAP model

The novelty here is how the sectoral shares and the corresponding shocks are calibrated. In comparison to Antimiani et al. (2014), the shares of the GTAP sectors affected by the ban are precisely determined by using COMEXT data for the year corresponding to the GTAP 9 database namely 2011. In this respect, Table 3 provides the share of the sectors affected by the ban and at the same time the corresponding tariff change. The latter is precisely determined by the model on the base of the swap approach described above.

The sectoral shares in Table 3 show clearly that the tariffs which would be subject to a shock without accounting for the share of trade affected per GTAP sector would be higher leading to a different assessment of the size of the tariff and the modelling results accordingly.

In addition, a calculation of the final trade data was performed to verify and ensure that the trade values of the shocks imposed correspond to the trade values which were calculated based on COMEXT trade data. The outcome of this comparison shows that the above described calibration procedure lead to a data fit between 98%-100%.



Table 3: Affected exports by the ban as a share of a GTAP sector¹³

GTAP Nr.	Sector	Australia	Canada	Norway	USA	EU
4	Vegetables and fruits	100%	100%	100%	81%	100%
14	Fishing	100%	100%	100%	100%	81%
19	Cattle meat	77%	29%	100%	93%	31%
20	Other meat	100%	100%	100%	84%	81%
22	Dairy products	66%	100%	63%	100%	100%
25	Other food	3%	80%	90%	29%	20%

Source: Own calculations based on COMEXT and the GTAP 9 database.

4.2. Impact of the import ban on external trade

Impact on Extra-EU exports

Table 4 provides the CGE modelling simulations results of the Russian import ban. The impact of the embargo on total extra-EU exports is marginal amounting to a decline of 0.12%. In absolute terms exports flows from the EU to Russia decrease by \$3.2 billion. Table 4 further on depicts the impact of the ban on aggregate extra-EU exports per sector. ‘Vegetables and fruits’ is the most affected sector in relative terms; aggregate extra-EU exports of this sector decline by almost 30% or by more than \$1.8 billion.

The impact of the embargo on total extra-EU exports is marginal amounting to a decline of 0.12%.

There are significant reductions in extra-EU exports also in the ‘other meat’ (14%), ‘dairy products’ (11%) and ‘cattle meat’ (9%) sectors. This corresponds to an absolute decrease in extra-EU exports by 1.2 billion, 1.4 billion and 309 million respectively (Table 4). The fact the decline in extra-EU exports predicted by the model is less than the amount of trade banned suggests that European companies succeed in redirecting non-negligible part of their exports to third countries and to other EU Member States. Moreover, total EU exports, including intra-EU trade, decline by only 0.02% or nearly \$1.6 billion indicating strong cushioning of the import ban impact through redirecting exports of the affected lines to EU Single Market countries.

¹³ Note that for some of these country-product combinations there are zero or close to export flows. So, for example, dairy exports from Canada to Russia amount to \$0.1 million in the GTAP database 9.



The modelling results also suggest that there are sectors which exhibit an increase in total extra-EU exports. The manufacturing sector’s exports pick up negligibly by 0.1%, however, given the share of manufacturing sectors exports in total exports this leads to an increase in absolute terms of almost \$2 billion. There is also a positive change in aggregate exports of the sectors ‘rest of agriculture (1%) and services (0.03%).

The fact that there are sectors gaining from the import ban is not surprising as the ban causes in line with theoretical literature an overall price decrease in the EU which comprises of a decrease of endowment prices and prices of intermediate inputs for firms likewise. This leads to a relative boost in exports of goods and services which are not affected by the ban.

Table 4: CGE results of the ban impact on aggregate Extra-EU exports per sector

GTAP sectors	Extra –EU exports changes	
	Absolute change	% change
Rest of agriculture	213	1%
Fishing	-34	-4%
Vegetables and fruits	-1,821	-29%
Manufacturing	1,917	0.10%
Cattle meat	-309	-9%
Dairy products	-1,385	-11%
Other meat	-1,207	-14%
Other food	-761	-2%
Services	224	0.03%
Total	-3,162	-0.12%

Source: CGE simulation results, *values are in \$ millions.

To sum up, the general equilibrium model used for this simulations suggest that there is a negative impact of the import ban on total extra-EU exports, this impact however is negligible and stands at 0.12%. Nevertheless at more disaggregate level there are sectors strongly hit by the embargo. The discussion of the sectoral results in this section displayed the most affected sectors and the magnitude of the impact on sectoral extra-EU exports.

***Impact of the ban on total exports of the USA, Canada, Norway and Australia***

The Russian import ban of the 7th of August affected also external trade of Australia, Canada, Norway, and the USA in addition to the impact on Russia. The CGE modelling results presented in Table 5 quantify the impact of the embargo on external total and sectoral trade. In comparison with the EU and with the exception of Norway the impact on total exports of the target countries is fairly limited as results are visible only at two digit percent change levels. In relative terms, the most affected country is Norway where total aggregate exports decrease by 0.14%. The reason for this pronounced decline is driven by the fishing and other food sector. Total exports of these sectors decrease by more than 15% and 5% respectively. Moreover, in comparison to the total Norwegian exports banned the fishing sector accounts for nearly 68% and the other food sector for 31%.¹⁴

Table 5: Impact of the ban on total exports of the USA, NOR, CAN and AUS, in %

GTAP sector	Australia	Canada	Norway	Russia	USA
Rest of agriculture	0.48	0.30	0.20	-4.25	0.32
Fishing	0.35	0.04	-15.11	-15.68	-0.56
Vegetables and fruits	0.01	-0.05	-1.73	-5.16	-0.95
Manufacturing	0.03	0.07	0.37	-0.12	0.01
Cattle meat	-3.07	-0.71	-3.13	-3.64	-3.04
dairy products	-0.29	0.18	-2.75	-7.54	0.18
Other meat	0.08	-10.02	0.48	-7.31	-3.87
Other food	0.18	-0.85	-4.55	-4.24	-0.23
Services	-0.01	0.02	0.05	-0.11	-0.02
Total	-0.03	-0.03	-0.14	-0.29	-0.03

Source: CGE simulation results

The decline of 0.03% of the USA is driven by a decrease in exports of the other meat and cattle meat sectors. Our simulations results show that Canada's and Australia's total exports are also negligibly affected by the ban. Aggregate exports of these two countries

¹⁴ COMEXT database, date of extraction 27 November 2014.



decline by 0.03%. Further on, the aggregate ‘rest of the world’ is expected to experience a negligible increase in total exports due to trade diversion effects of the import ban. The impact of the ban on Russian exports is negative, relatively large and amounts to 0.29%. This negative impact is driven by the increase in prices of imports along the value chain, i.e. of intermediate inputs in the Russian production process. This leads to a loss in competitiveness on international markets.

4.3. Impact of the import ban on production

This section discusses the CGE analysis of the Russian embargo on production in the EU and rest of the affected countries including Russia. The simulation results presented in Table 6 suggest that changes at aggregate level are negligible for all countries but somewhat more pronounced for Russia and Norway as production measured in quantity terms declines by 0.03%. In the case of Norway this change in production is mainly due to the decrease in the production of the sectors fishing and other food which decline by nearly 6% and 2% respectively. Fishing accounts after all for 1% of the domestic production and other food for 2%.¹⁵

Table 6: Impact of the Russian import ban on production

GTAP sectors	CGE GTAP model					
	AUS	CAN	NOR	RUS	USA	EU
Rest of agriculture	-0.11	-0.07	-0.03	-0.72	-0.01	-0.02
Fishing	0.07	-0.07	-5.78	24.66	-0.06	-0.38
Vegetables and fruits	0.03	-0.01	-0.27	3.50	-0.11	-1.87
Manufacturing	0.02	0.05	0.28	-0.17	0.01	0.06
Cattle meat	-1.88	-0.19	0.02	1.02	-0.24	-0.38
dairy products	-0.05	-0.01	0.19	3.11	0.01	-0.68
Other meat	0.02	-3.81	0.10	18.14	-0.49	-0.67
Other food	0.02	-0.24	-1.76	0.45	-0.02	-0.15
Services	0.00	0.00	-0.02	-0.19	0.00	0.01
Total	0.00	0.00	-0.03	-0.03	0.00	0.00

Source: CGE and simulation results

¹⁵ GTAP database version 9.



In the case of Russia, domestic production declines although some sectors directly benefiting from being sheltered by the ban expand their production substantially. These are the fishing sector, the other meat sector whose production increases by 25% and 18% respectively. However, the share of the fishing and meat sector in domestic production is merely 0.2% and 0.4% so that these are not important drivers of the overall results. The total decline in Russian production is driven by the decline in manufacturing and services sectors output. Although negligible in relative terms, these sectors account together for

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92% of domestic production which is the cause of substantial changes in absolute terms.¹⁶ The reason for the decline in these sectors lies in the fact that the imposition of the ban lead to a significant loss in consumer welfare (see Section 4.4) which in turn leads to a decrease in private demand and in demand for intermediate purchases.

For the rest of the countries the logic is different. In the EU for example all sectors affected by the ban experience an expected decrease in production. The manufacturing and services sectors however see a minor increase in production as prices of intermediate inputs and production factors decrease. In total, the decrease in production of the sectors affected by the ban is offset by the manufacturing and services sectors' production increase, leaving total production unchanged.

4.4. Impact of the import ban on welfare

This section deals with assessing the impact of the ban on welfare of the affected countries and Russia. The measurement of changes to welfare in the GTAP CGE model is done using the concept of equivalent variation (EV). EV measures by how much the average consumer will have to be compensated to be equally well-off as before the trade policy measures have been implemented.

Table 7 provides an overview of the expected changes in equivalent variation in absolute terms for the countries affected by the ban and Russia. The change in EV for the EU is moderate also due to the fact that the Single Market is considerably smoothening the impact of the ban on the EU. As mentioned above total exports of the EU (intra plus extra) decline by only \$1.6 billion whereas extra-EU exports decline by almost \$3.2

¹⁶ GTAP database version 9.



billion. As somehow expected on the base of the discussion of the impact of the ban on Norway's exports and production, it is the country loosing most from the import ban in terms of changes in consumer welfare. Norway's equivalent variation declines by \$184 million. The rest of the world experiences an increase in EV due to classical trade diversion effect as now these countries trade less with Russia but more with the rest of the world.

Table 7: Impact of the ban on equivalent variation

EV	CGE GTAP model
Australia	-13
Canada	-59
Norway	-184
Russia	-5,777
USA	-129
EU	-73
ROW	697
Total	-5,538

Source: CGE simulation results, *values are in \$ millions.

Russia, however, is without doubt the largest loser from imposing the import ban as the average consumer would have to receive nearly \$5.8 billion to become as equally well off as before the embargo. The decomposition of the welfare effects in the GTAP model shows that the total equivalent variation gains and losses presented in Table 7 are mainly due to allocation efficiency and terms of trade impacts. For Russia, the welfare loss is driven to 95% by the allocative efficiency loss. In this case the reason for this tremendous decline in welfare is mainly the tariff revenue forgone as the import ban is a pure quantitative restriction with zero revenue collection. There is a positive welfare impact due to a slight improvement in the Terms of trade of Russia vis-à-vis the rest of the world as the ratio of export to import price indices augments. This impact is, however, limited amounting to slightly more than \$340 million.

5. Inferring the import ban impact from official statistics

This Section analyses the import ban impact on the basis of official trade statistics in order to examine what happened in the months after the ban with imposed and compare the model's predictions with the direction and magnitude of 'real' trade flows. For this purpose an analysis based on descriptive data was carried out to track the impact of the



ban on extra-EU exports of the affected lines. The data used for this analysis is monthly COMEXT trade data of total extra-EU exports, total extra-EU exports with the exclusion of exports to Russia and extra-EU exports to Russia. As shown in Figure 1 there is a sharp decline in extra-EU exports of the banned products to Russia starting in August 2014. The decline amounts to 85%¹⁷ and is calculated as a percent change between July 2014 (the month before the import ban was imposed) and September 2014.¹⁸ Further on, total extra-EU exports of the affected products decrease by 9.4% in the time period July-September 2014.¹⁹ Interestingly, extra-EU exports of these lines to rest of the world minus Russia increased by almost 2% in the period September-July 2014 (Figure 1).

As this could to a large extent be due to seasonal effects it is important to look at the same changes in extra-EU exports in respect to the previous year. Trade statistics for the months July-September 2013 show that there has been, however, a decline in extra-EU exports of these lines in this period. Numerically this decline amounted to 2.8% for total extra-EU exports of these lines, 2.2% for extra-EU minus Russia. Consequently, we adjust the 2014 impact of the ban to arrive at a decline of 6.6% for total EU exports of the affected products and an increase of 4.2% in extra-EU exports to rest of the world minus Russia.²⁰ As a consequence the increase in extra-EU exports to the rest of the world minus Russia of the affected products indicates that European companies succeeded in redirecting part of the exports of the banned products to third countries' markets and to the EU Single Market countries.

¹⁷ The fact that that extra-EU exports to Russia of the affected lines did not decline by 100% is most likely due to the fact that the whole month August is included in the calculations above (as there is no daily COMEXT data) but the embargo was put in place on 7th August.

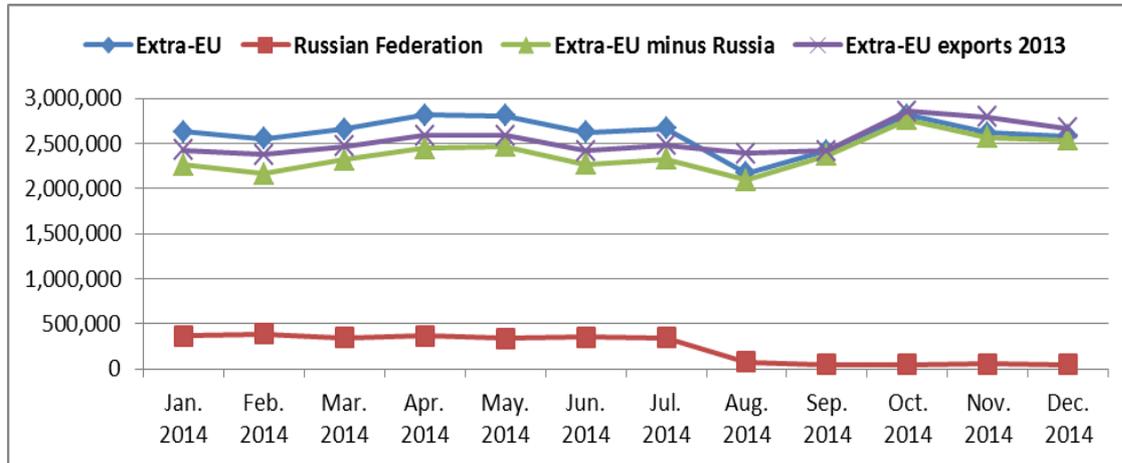
¹⁸ As shown in Figure 1 extra-EU exports of the affected lines with and without exports to Russia surpassed pre-ban levels already in October 2014. Hence, this can be thought of as indication that the effect of the ban has faded away. Moreover, levels of the same exports values were smaller in October 2013 than in August 2013 providing an insight that is development is not due to seasonal effects.

¹⁹ Note that it cannot be excluded that other factors such as a decrease in oil prices, shift in trade preferences etc. have impacted on EU exports of the affected products as well. Nonetheless, on the base of these monthly statistics it can be concluded that this decline is driven to a large extent by the Russian embargo.

²⁰ This back of the envelope calculation should be regarded only as an approximation as first much larger time series data is needed for disentangling the seasonal effect and second in order to more precisely estimate to impact of the ban on total exports of these lines the application of econometric technics such as the difference-in-difference approach is required.



Figure 1: Extra-EU exports affected by the Russian import ban in €1000



Source: own calculations based on COMEXT, date of the extraction 13 February 2015.

Another interesting observation is gained by using these results for inferring the impact on total exports knowing the share of these lines in total Extra-EU exports. Simple transposition of the observed and seasonally adjusted changes in total EU-exports of the affected lines of 9.4% and 6.6% calculated above causes a decline of 0.16% and 0.11% in total Extra-EU exports respectively. Both changes are very close to the predicted change in total Extra-EU exports simulated in the CGE modelling exercise of 0.12%.

Extra EU-exports increased also significantly to Switzerland, by almost 30%, to Korea and Canada by nearly 42% and to Taiwan by 73%.

Official trade statistics also reveals the exports' destination markets to which EU exporters redirected their exports of the products affected by the import ban. Table 8 provides a ranking of these markets based on the percent change in bilateral extra-EU exports and the absolute change in total extra-EU exports of the same lines.²¹ The highest surge in

bilateral extra-EU exports, in relative in absolute terms, took place in Nigeria. EU exports of the banned products increased by more than 174% or €55 million in the period July-December 2014. This large effect is also due to the fact that the share of Nigeria in total extra-EU exports of the banned products is relatively large and stands at 1.7%.²² Extra

²¹ Only the extra-EU exports were taken into account which showed a development exceeding what one would expect looking at the same destination markets in the year preceding the ban i.e. 2013.

²² Own calculations based on COMEXT 2013 data, date of extraction 13 February 2015.



EU-exports increased also significantly to Switzerland, by almost 30%, to Korea and Canada by nearly 42% and to Taiwan by 73%. This corresponds to a boost in extra-EU exports of the products affected by the ban by €43, €27, €12 and €11 million respectively (Table 8).

Table 8: Extra-EU exports' destination markets of the banned products

Country	Absolute change	% change July-Dec 2014
Nigeria	55	174%
Switzerland	43	29%
Korea	27	42%
Canada	12	42%
Taiwan	11	73%
Norway	11	16%
Vietnam	10	38%
Australia	9	18%
South Africa	7	24%

Source: COMEXT, date of the extraction 27 November 2014. *Values are in € million.

The fact that exports to Armenia increased by almost 300% right after the ban was imposed shows that most likely there is some effort devoted to smuggling. In a case of an import ban there are large gains from evading border controls as domestic market prices increase.

6. Conclusions and remarks

This paper analyses the economic impact of the Russian embargo from the 7 August 2014 on exports from the EU, USA, Canada, Australia and Norway. The impact of the ban on total extra-EU exports is negligible in relative and absolute terms; the results of the CGE modelling point to a decrease of 0.12% in total extra-EU exports corresponding to almost \$3.2 billion. The impact of the Russian embargo on total EU exports is even less pronounced; EU total exports would decrease by merely 0.02% providing an evidence for a strong cushioning effect of the EU Internal market. Total export changes are also very limited for 3 of the 4 remaining countries affected by the ban; exports of the US, Canada and Australia decline by 0.03%. Norwegian total exports on the other side are more severely impacted as there is a decline of 0.14% mainly driven by the losses the fishing sector is experiencing.



Nevertheless at a disaggregate level there are sectors which are affected by the ban more severely. Total extra EU-exports of ‘vegetables and fruits’, ‘other meat’ and ‘dairy products’ experience a sizable decline of almost 30%, 14% and 11% respectively.

In terms of production impact, the results of the CGE model used for this analysis are in line with the impact on total exports. There are no changes in production for the countries affected by the ban with the exception of Russia and Norway where production declines by 0.03%. In the case of Russia, this decline occurs in spite of the increase in domestic production in the fishing and other meat sector driven by the contraction in production activities in the manufacturing and services sectors. In the case of Norway it is the fishing sector whose production contracts by almost 6%.

The welfare of the countries directly affected by the import ban declines negligibly. The most affected country is Norway in line with total trade and production decreases. However, even this decline is negligible and amounts to nearly \$190 million. The welfare loss for Russia on the other side is substantial. Russian consumers suffer a decrease in welfare of almost \$5.8 billion.

The CGE model suggests that adjustment processes are to be expected in two ways. In the first place structural adjustments towards the machinery and services sectors are expected in the medium term for the countries affected by the ban. In the EU, this effect is induced through the overall price decrease which comprises of a decrease of endowment prices and prices of intermediate inputs for firms likewise. This leads to a boost in exports of manufacturing goods and services which are not affected by the ban and which now profit from lower production cost.

The welfare loss for Russia on the other side is substantial. Russian consumers suffer a decrease in welfare of almost \$5.8 billion.

Secondly the model suggests a redirection of extra-EU exports of these lines towards third countries and EU Single Market countries. The validation exercise carried out in Section 5 on the base of official statistics shows that redirection of extra-EU exports of the banned products towards third countries is already taking place only few months after the embargo was imposed. Sizable destination markets are Nigeria, Switzerland, Korea and Canada.

Further on, the data driven analysis of the import ban shows that the impact of the ban predicted by the model depending on the time horizon taken is very close to the total extra-EU export changes occurring in reality. Although this is not an econometric



estimation, these back of the envelop calculations show that modelling results are in the same order of magnitude as real trade data developments.

Future research in this area may include partial equilibrium modelling at best in a general equilibrium setting as the Russian import ban decree affects exports mainly at HS4 level whereas the CGE modelling aggregation is less detailed. Hence, an analysis of cross-products substitution as well as of downstream- and upstream effects within the GTAP sector is not possible. Further on, a sensitivity analysis in terms of sluggishness of production factors would complement the validation exercise based on real trade data and provide further insights into short to medium terms modelling results.



Reference list

Anderson, K. and Jackson, L. (2005), Standards, Trade and Protection: The Case of GM Crops, revision of a paper prepared for the 41st Panel Meeting of Economic Policy in Luxembourg, 15-16 April.

Antimiani, A., Castellotti, T., and Solazzo, R. (2014), L'impatto dell'embargo russo sull'agroalimentare italiano, INEA.

Askari, H., Forrer, J., Teegen, H. and Yang, J. (2002), Economic sanctions and US international business interests, BNL Quarterly Review 220.

Askari, H., Forrer, J., Teegen, H. and Yang, J. (2003), Case Studies of U.S. Economic Sanctions: The Chinese, Cuban, and Iranian Experiences.

Caruso, P. (2003), The Impact of International Economic Sanctions on Trade: An Empirical Analysis.

Davis, L. and Engerman, S. (2003), History Lessons. Sanctions: Neither War nor Peace, Journal of Economic Perspectives 17, p. 187-197.

Drezner, D. W. (2000), Bargaining, Enforcement and Multilateral Sanctions: When Is Cooperation Counterproductive?, International Organization 54, p.73-102.

European Council (2014), EU Restrictive Measures, a factsheet from 29 April 2014, available at http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/EN/foraff/135804.pdf.

European Parliament (2014), The Russian Embargo: Impact on the Economic and Employment Situation in the EU, European Parliament's employment and social affairs briefing.

Eyler, R. (2007), Economic Sanctions: International Policy and Political Economy at Work, Palgrave Macmillan.

Henseler, M., Pio-Lepetit, I., Ferrari, E., Gonzalez Mellado, A., Banse, M., Grethe, H., Parisi, C. and Helaine, S. (2013), On the Synchronous Approvals of GM Crops: Potential Market Impacts of a Trade Disruption of EU Soy Imports, Food Policy 41, p. 166-176.

Hertel, T. W. (1997), Global Trade Analysis: Modelling and Applications, Cambridge University Press, Cambridge.

Hufbauer, G. C. and Oegg, B. (2003), The Impact of Economic Sanctions on US Trade: Andrew Rose's Gravity Model, International Economics Policy briefs, PB03-4, Institute for International Economics.



Hufbauer, G. C., Elliott, K. A., Cyrus, T. and Winston, E. (1997), US Economic Sanctions: their impact on Trade, Jobs and Wages, Peterson Institute of International Economics.

Hufbauer, G. C., Schott, J. J., Elliott, K. A. and Oegg, B. (2007), Economic Sanctions Reconsidered, Third Edition, Peterson Institute of International Economics.

Kaempfer, W. H. and Lowenberg, A.D. (1988), The Theory of International Economic Sanctions: A Public Choice Approach, *The American Economic Review* 78, p. 786-793.

Kaempfer, W. H. and Lowenberg, A.D. (1999), Unilateral Versus Multilateral International Sanctions: A Public Choice Perspective, *International Studies Quarterly* 43, p. 37-58.

Kaempfer, W.H. and Lowenberg, A.D. (2007), The Political Economy of Economic Sanctions, in *Handbook of Defence Economics*, Volume 2, p. 867-911.

Kirshner, J. (1997), The microfoundations of economic sanctions, *Security Studies* 6, p. 32-64.

Kitous, A., Saveyn, B., Gervais, B., Wiesenthal, T. and Soria, A. (2013), Analysis of the Iran Oil Embargo, JRC scientific and policy reports.

Mack, A. and Khan, A. (2000), The efficacy of UN sanctions, *Security Dialogue* 31, p. 279-292.

Mitra, S. and Josling, T. (2009), Agricultural Export Restrictions: Welfare Implications and Trade Disciplines, International Food & Agricultural Trade Policy Council, IPC Position Paper.

Narayanan, G. B., Aguiar, A. and McDougall R. (2015), Global Trade, Assistance, and Production: The GTAP 9 Data Base, Center for Global Trade Analysis, Purdue University.

Oprunenco, A. (2012), The Impact of the Russian Wine Embargo: Estimation of the Economic Impact.

Panagiotou, D. (2008), Trade Bans, Imperfect Competition, and Welfare: BSE and the US Beef Industry, PhD thesis, University of Nebraska.

Pape, R. A. (1997), Why economic sanctions do not work, *International Security* 22, p. 90-136.

Philippidis, G. (2010), EU Import Restrictions on Genetically Modified Feeds: Impacts on Spanish, EU and Global Livestock Sectors, *Spanish Journal of Agricultural Research* 8, p. 3-17.



Pierre, B. and Philippidis, G. (2014), Modelling the Common Agricultural Policy, General equilibrium effects of the 2014-2020 budget agreement.

Rodriguez, U., Garcia, Y., Garcia, A., and Tan, R. (2007), Can Trade Policies Soften the Economic Impacts of an Avian Influenza Outbreak? *Asian Journal of Agriculture and Development* 4, p. 41-50.

Russian government (2014), Постановление Правительства Российской Федерации от 20 августа 2014 г., № 830.

WTO (1994), General Agreement on Tariffs and Trade, Article XI, https://www.wto.org/english/res_e/booksp_e/analytic_index_e/gatt1994_05_e.htm.

WTO (2014), Russian Federation – Measures on the importation of live pigs, pork and other pig products from the European Union, WT/DS475/1, 14 April 2014, [https://docs.wto.org/dol2fe/Pages/FE_Search/FE_S_S006.aspx?Query=\(@Symbol=%20wt/ds475/*\)&Language=ENGLISH&Context=FomerScriptedSearch&languageUIChange d=true#](https://docs.wto.org/dol2fe/Pages/FE_Search/FE_S_S006.aspx?Query=(@Symbol=%20wt/ds475/*)&Language=ENGLISH&Context=FomerScriptedSearch&languageUIChange d=true#).

WTO (2015), Russian Federation – Measures on the importation of live pigs, pork and other pig products from the European Union, WT/DS475/6, 23 April 2015, [https://docs.wto.org/dol2fe/Pages/FE_Search/FE_S_S006.aspx?Query=\(@Symbol=%20wt/ds475/*\)&Language=ENGLISH&Context=FomerScriptedSearch&languageUIChange d=true#](https://docs.wto.org/dol2fe/Pages/FE_Search/FE_S_S006.aspx?Query=(@Symbol=%20wt/ds475/*)&Language=ENGLISH&Context=FomerScriptedSearch&languageUIChange d=true#).