



MS-E2177 - Seminar on Case Studies
in Operations Research

Effects of Import Tariffs to International Plywood Trade

Project Plan

Aukusti Kiuru

Elias Koivulehto (Project Lead)

Janne Lahti

Tuukka Stewen

March 4, 2020

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1 Background

The export of wood products is very important to Finland, as it constitutes for 20% of the total export of goods [1]. Our client for this project is Metsä Wood, one of the main Finnish wood product companies and a part of the forest industry group Metsä Group. The main products of Metsä Wood include laminated veneer lumber, birch and spruce plywood, and other construction and timber products [2]. In our project we will focus on the two variants of plywood they produce.

Plywood is a material made of multiple thin sheets of wood that are glued together, and it is used in various applications in construction and manufacturing. The different varieties of plywood include hardwood plywood (birch plywood is of this variant), softwood plywood (spruce plywood is of this variant), and other types such as tropical plywood. This differentiation is important, as the applications are different for each type of plywood, and different trade agreements, such as tariffs, are put in place for the different varieties [3].

Import tariffs are a form of tax associated with the import of goods from a foreign country. For example, the EU has import tariffs for the import of both hardwood and softwood plywood to certain countries [4]. Countries (or a coalitions of countries, such as EU) can also differentiate between different partner countries, by giving some countries reductions on tariffs based on the agreements between said countries. For certain products, the tariff mechanism also includes a quota that is shared with all imports: before the quota is fulfilled, the import is tariff-free, and the tariff is added after the quota is fulfilled. [5]

Import tariffs are important as an instrument of political and economic power, as they can be used to balance the import and domestic production of a good. A quite recent example of this is the tariff introduced by the United States to the import of hardwood plywood from China. In 2017, the US International Trade Commission reported that China was importing hardwood plywood to the US at lower than fair price, made possible by subsidies by the Chinese government. It was speculated that this would intentionally hinder the domestic production in the US, and to counteract this, the US International Trade Commission introduced a tariff to the import of hardwood plywood from China. [6]

The goal of this project is to explore the impacts of import tariffs on plywood trade. Interesting topics and ideas already discussed with the client include: Visualising and analysing EU import data to examine the trade volumes before and after the quota for tariff-free import is fulfilled, forecasting trade behaviour in future seasons, and utilising network or elasticity models to better understand the flow of goods when tariffs are introduced or tariff quotas are fulfilled.

2 Objectives

During the initial talks within our team and with the representatives of Metsä group, several possible objectives were formed. Based on these discussions the project was scoped, such that the objective of the project can be divided to two parts. Firstly, our goal is to find out how import tariffs and quotas have affected the import of plywood to the EU and consequently how it might have affected the trade inside EU. Secondly, it would be interesting to build a model that could be used to further analyse the plywood trade, such as the effect of possible changes in tariffs or quotas.

In order to fulfill our first objective, we start by defining and later by fulfilling some alternative goals. First we need to gather information on both how the international trade works but also by more focusing on the plywood markets. For this purpose we both search information from online but also discuss the matter with our client. For instance, it is crucial for us to understand the current state of market, such as which countries are the main players in the plywood markets and which countries contribute the most to the import to EU.

After getting a better understanding on the whole concept, we continue to form a better understanding on the possible effects of tariffs and quotas. In order to find out if some relation can be seen between the changes in import tariffs and the plywood trade, we need to find out appropriate data for both the trade and the tariffs. Then, by studying the data we should be able to draw some preliminary conclusions on the effect of tariffs, based on which further analysis can be made.

With these preliminary results, we can then broaden our view. For instance at this stage we can include the effect the plywood tariffs might have to the trade of substitutes or we can include the effect of exchange rates in the analysis. After that, our objective is to start building an appropriate model to analyse and possibly forecast the effect of tariffs have in plywood trade in EU. Possible approaches we might think of are gravity models, an approach that builds on a network, or some time-series approaches, such as using ARIMA-models. Especially gravity models have been used to study the effects of tariffs in trading before [7].

All in all, the main objective is to both study the effect of tariffs in the international plywood trade and also be able to build a tool to analyse the future trade. This would generate valuable information for our client in order to make different kind of strategic decisions in the future. First we focus on the effects of trade in EU, since this is the most important for our client, but we might broaden our approach to also consider the trade effects in the whole world. However, this might be rather difficult due to the challenges of obtaining sufficient data for the purposes.

3 Tasks

The project can be divided on a general level into 4 tasks presented below. Each of the tasks consist of several subtasks, and the tasks are not necessarily presented in a chronological order. Interaction with the client is heavily present in all the four tasks. As the client is located close to the university, the interaction is mostly carried out by having regular meetings with the project group and the representatives of the client.

3.1 Planning and initial research

Planning the project includes discussions with client about the objectives and the scope of the project, as well as defining the initial schedule for completing the project and recognising and evaluating the risks of the project. Furthermore, since all the relevant fields and contexts of the project, including wood industry, international trade, and customs and tariff policies, are not familiar to the members of the project group, extensive exploring of background materials as well as scientific literature review is needed to get acquainted with the aforementioned topics. Additionally, mathematical models presented in academic literature regarding similar fields and problems are studied.

3.2 Data

Relevant data for the topic and the project is searched from various sources where import and export data of plywood using the HS tariff classification system is provided. Furthermore, data containing the applied tariffs between traders is searched. The most suitable data is then collected from various sources and preprocessed to an utilizable form. The data is evaluated and visualized in order to get early insights of the phenomena in the data, but also to validate its quality.

3.3 Modelling and implementation

Based on the data and the literature review, different mathematical approaches, methods and tools are considered and investigated to be utilized for the problem and the data of the project. The most suitable methods are then employed to create mathematical model(s) to be applied for the problem. The model(s) are implemented using R and/or Python. The implemented model(s) are experimented and compared using the collected data, and results are evaluated and validated to be reasonable. The most suitable model(s) are chosen with the client for further analysis, and modifications to the models are made if needed during the process.

3.4 Analysis and reporting

The results and findings acquired using the implemented models and tools are analyzed in cooperation with the client in order to validate that the results are valuable and provide relevant insights to the defined problem. The progress and results of the project are also reported and presented three times during the course for the other project groups and course staff. This project plan is written to outline the planned progress of the project, and the actual progression is reported in an interim report. Key results and findings, as well as the implemented models and tools are presented in the final report.

4 Schedule

The project was started as soon as the subject was given. Also, regular meetings were agreed to be held with the client and the first meeting took place almost instantly in the beginning. This proved to be a very good start for the project. Figure 1 shows the timeline of the project and its different tasks and activities.

Tasks	Activities	Week Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
Client interaction	Meeting at Metsä wood office				■	■	■	■	■			■	■	■	■	■	■	■	■	■	■	■	■	
Reporting	Project plan delivery											■												
	Interim report delivery																	■						
	Final report delivery																						■	
Data	Collection				■	■	■	■	■	■														
	Pre-processing						■	■	■	■	■	■												
Modelling	Various methods												■	■	■	■	■	■	■					
Analysis	Various methods																	■	■	■	■	■	■	

Figure 1: The schedule of the project. The weeks correspond to official week numbers of the year 2020.

From the Figure 1 it can be seen how already some data collection and preprocessing of the data has been made. However, we might still have to get back to these steps when we start the actual model building and analysis in order to get more comprehensive results. All in all, the project plan, the interim report and the final report guide our work throughout the whole process.

5 Resources

Our project team consists of four students, Aukusti Kiuru, Elias Koivulehto, Janne Lahti and Tuukka Stewen, of which Elias Koivulehto has been assigned the role of the project manager. The students have varying backgrounds, since three of the them major in Operations Research and one from Sustainable Energy Systems and Markets. In addition, the students have other studies from different fields, such as machine learning, industrial engineering or financial en-

gineering. This allows our team to look at the problem from multiple different perspectives. Because of the different backgrounds we try to distribute the work evenly among the project members, such that we take into consideration that each person has strengths in certain part in the project.

The contact person inside Metsä group is Joonas Tuovinen and in our meetings also Tuukka Karvinen has been present. With them we first briefed the assignment and after that we have further discussed the subject quite often. For instance in our meetings we have already discussed what is the main question we want to focus on and also possible approaches that could be used in the modelling of the effect of tariffs. In addition, the course staff, including Professor Ahti Salo and assistant Roni Sihvonen, give us feedback and support if needed.

Our most critical resource is the data, since the type of data we have access to defines mostly what kind of approaches we are able to start to develop. The data, we need to find by ourselves, but Joonas provided us some good resources where sufficient data could be found. Especially the databases of Eurostat [8] and WITS (World Integrated Trade Solutions) [9] are something we focus in the beginning, since they seem to hold information that should be very valuable for us.

Technical resources include different computing software which we use to build our implementation. Additionally, we have academic access to scientific literature from online and also through the university's library. Also Joonas and Tuukka K. have also sent us few articles on the subject and given us valuable insights on the plywood markets. On a more technical side, we have a possibility to use the university's servers Brute and Force to run R or Python scripts if necessary.

6 Risks

The risks of the project were defined by expecting the most obvious obstacles that the project would face. The risks were evaluated as low, medium or high. Also the effects of the risks were estimated qualitatively. It was also surveyed how to avoid these possible risks. Table 1 shows the risks and their likelihood, impact and effect and how to avoid them.

Table 1: Estimated risks of the project work.

Risk	Likelihood	Impact	Effect	How to avoid
Analysis fails / no useful results	Medium	High	No use for the model	Proper planning
Data quality or compatibility issues	Medium	Medium / High	Misleading or inadequate results	Limiting the amount of different data sources
Scope of the project is too broad	Medium	Medium	Low quality results and possible delays	Clear vision of the project at an early state
Team member absence	Low	High	Too much work for others	Clear roles for all members of the group
Issues in communication with the client	Low	Medium	Results do not align with expectations	Regular meetings and email communication

From Table 1 it can be seen that the likelihood of most of the risk we expect to face is either low or medium. This is especially good, since when we analyse the possible impact of these risks, it can be seen how the realization of these risks would either have a high or a medium impact to the whole project. Therefore, in order to avoid these risks we already surveyed ways to avoid these risks as shown in the table. All in all the future of the project looks promising.

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