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Announcement Effects from Voluntary Partnership Agreements

A Gravity Model Approach

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Abstract

The effects on trade from negotiating and entering voluntary partnership agreement is estimated using forest product trade data from 2000 to 2014 on countries in the Forest Law Enforcement, Governance and Trade (FLEGT) licensing process. Gravity model framework is used and the result shows that beginning negotiations lead to an export drop by approximately 0.6 percent and is relatively stable the following years. Entering a voluntary partnership agreement (VPA) shows signs of a similar initial export drop but with increasing magnitude over time. When EU timber regulation is introduced, countries currently involved in the process of becoming licensed by FLEGT experience on average an additional export drop of 0.26 percent. The most plausible reason for the export drop is due to expected increased production costs and small price premium for licensed forest products.

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1. Introduction

Battling illegal logging and preventing the environmental, economic and social problem that follows have been on the debate for a long time. Several international initiatives have been introduced to solve this issue, and two recent ones are EU timber regulation and Forest Law Enforcement, Governance and Trade (FLEGT). These action plans are still in its earlier stages and evaluation of the actual effects of these are still few, until now. A country willing to adjust its forest governance with the aim to become licensed within the FLEGT program goes through several stages to finally enter a Voluntary Partnership Agreement (VPA). The program is implemented to ban illegally harvested timber from entering the European Union. This research aims to estimate the initial effects on forest product trade flows following the year an announcement is made regarding FLEGT licensing in the coming future.

The first official stage in the VPA process is *negotiation*, and the aim of this research is to examine is if there are announcement effects on trade flows from the negotiating country to the EU. The second stage in the process is the VPA *entry*, and what the direction and magnitude of the announcement effect from this is also investigated in this study. The final research aim is how these announcements interact with the implementation of EU timber regulation. The theory takes departure in the widely used gravity model of trade along with the popular concept of announcement effects, the latter being predominantly used in macro- and financial economics. The method of estimation used to answer this study's goals are to include the stages of the VPA as proxies for trade costs in the gravity model, using Ordinary Least Square (OLS) and Pseudo-Poisson Maximum Likelihood (PPML) with fixed effects. There are previous research on forest product trade flows using gravity model (e.g. Buongiorno, 2015 & 2016) and announcement effects on financial markets (e.g. Andersen, Bollerslev, Diebold, & Vega, 2003) but research with the combination of these are to the authors knowledge not existing.

The result of this research is useful as an early stage evaluation in the performance of FLEGT together with EU timber regulation. It can be used to forecast primarily European importer's reactions to defined policy measures, and additionally, a more general context of other regions with similar regulations. Finally, the effectiveness of this governance system can be evaluated within the fields of forest and environmental policy as well as developing economics.

The outline of this paper is as follows: first a presentation of the overview of international trade with tropical timber and issues of forest certification, a presentation of FLEGT and a literature review on timber trade using gravity model and announcements effects. Next, the theoretical foundation of the gravity model is presented followed by the model used, method of estimation and a data overview. Then the results and its interpretation followed by a discussion of the findings. The paper ends with conclusions from the work and suggestions for further research.

2. Tropical timber trade and forest certification

The following chapter gives an overview of the production of and trade in tropical timber, discusses certification and gives a brief description of FLEGT. A literature review on previous research of the topic gravity model with timber trade and additionally announcement effects is also presented.

2.1 Tropical timber and the role of certification

Production of tropical roundwood have been increasing in recent decades but at the same time, consumption in tropical countries has experienced an even greater growth rate leading to many tropical timber-producing countries undergo a shift from net exporters to net importers. The dominating export product has been low value-added products such as roundwood but towards the 90s, especially in Asia, exports have increased in processed goods with higher value-added products such as wood-based panels. The large trade flows in forest products have been highly concentrated within three regions, Pacific Rim, North America and Europe's developed countries. This has however also changed with increased demand in places such as Asia. The Uruguay Round led to eases in both tariff and non-tariff measures targeting tropical timber products but some barriers remained while others emerged. Examples of barriers that emerged are export restrictions on roundwood in developing countries to support value-added timber products, environmental and trade restrictions in developed countries, quotas on imports of unsustainable produced timber products and import barriers in form of certifications. All these measures may affect timber trade flows significantly. Regarding how woods from temperate and tropical regions compete on the world market, evidence suggest (as cited in Barbier, 1998) that substitution between temperate and tropical wood is low and may therefore be viewed as

different commodities, however export restriction on roundwood as the one mentioned afore, have led to some producers diversifying source of input. (Barbier, 1998)

Forest certification (FC) serves agents on the timber market in different ways. The industry uses it as a marketing tool and to increase access similarly to the forest owners and managers, but also to gain market advantage (Rametsteiner & Simula, 2003). Certified forests have increased rapidly in the beginning of this century however they still only account for 3,2 % of world forest and in developing countries; the fraction is even smaller at only 10 % of the certified forests being located in these parts of the world (GFA, 2018). Rametsteiner & Simula (2003) emphasize that little or no data is available for supply and demand of certified timber but most of it is produced in boreal zones and only 10 % of the world's harvested roundwood enters international trade and 10 % of this comes from tropical regions. The authors also argue that the demand for certified forest products is concentrated to environmentally aware markets in developed countries. They conclude that certification may be yet another requirement imposed by importers with low price premium, difficulties for developing countries to achieve and it could therefore act as a trade barrier instead of increasing market access. The low price premium is confirmed by Paletto & Notaro (2018) who conclude by a willingness-to-pay study that secondary wood manufacturers in Italy are prepared to pay more for local materials than certified materials. Varangis, Crossley, & Primo Braga (1995) do not expect significant commercial benefits in developing countries while certain firms on niche markets could acquire significant rents. Barbier (1998) argues that there is also concern that forest and timber certification leads to increased production costs, reducing competiveness on the market. Furthermore, Barbier argues that even though if costs are increased from the implementation of certification schemes, changed production procedures and substitution effects may be relatively low, it is still likely to lead to trade losses and diversions on importing markets. However, the cost share of raw material is small in higher processed wood products hence the impact on final consumer prices of sustainable forest management may therefore be modest, Barbier concludes.

2.2 Forest Law Enforcement, Governance and Trade

European Union's action plan for FLEGT was established in 2003 and aims "to reduce illegal logging by strengthening sustainable and legal forest management, improving governance and promoting trade in legally produced timber" (FLEGT, 2018a). FLEGT defines illegal logging as

"… the harvesting, processing, transporting, buying or selling of timber in contravention of national and international laws" (FLEGT, 2018b). The impact of illegal logging can have a negative effect in different areas. The environmental impacts may be for example, deforestation and loss of biodiversity while the societal impacts may be government revenue losses and corruption (Tacconi, 2007). The global annual market value loss is estimated to be at over ten billion USD (Kishor & Oksanen, 2006).

FLEGT action plan lists seven measures that together should prevent imports of illegal timber into EU and at the same time improve supply of legal timber. The second measure is the one focusing on promoting trade in legal timber. This includes the involvement of major consumer countries working to together for a multilateral framework restricting illegal timber entering their markets. As a part of this, voluntary partnership agreements (VPAs) have been introduced between EU and timber-producing countries. The purpose is to guarantee that the timber and timber products exported to EU are legal according to the forestry legislations of the exporting country. VPAs consists of establishing a strict control program that award timber products that meet the standards with a FLEGT license and are therefore free to enter the EU market. (FLEGT, 2007)

Entering a VPA is voluntary but legally binding on both sides once an agreement is made. The role of the exporting country is to implement systems to verify that the timber exports are legal, while the importing EU country agrees to only import licensed timber products from that country. The control system implemented by the exporting country is called legality assurance system (LAS) and "is designed to identify, monitor and license legally produced timber, to ensure that only legal timber is exported". Each exporting country develops its own LAS in accordance with its current legislation and control system and hence the final agreed VPA may differ between countries. (Ibid.)

VPAs are negotiated in four phases, where the first phase is an informative stage were the exporting country gathers the information needed to make a decision whether to start a formal negotiation for a future VPA. In the next phase the formal negotiations begin and the announcement effect from these negations is one of those focused on in this research. In this stage the content of the VPA is to be agreed upon, such as the details of LAS. Once the content is agreed upon, the exporting country becomes a "partner country" and the VPA is initiated. The

third phase is ratification and implementation, where the VPA is signed by the partner country, EU Council and the European Commission all of which is then approved by the European Parliament. Once the LAS is in place in the partner country, it is controlled by an independent auditor. The final phase is the licensing, where each shipment to the EU must be accompanied by a FLEGT License while shipments without this will be denied entrance into the EU. (Ibid.)

A question that arises when discussing FLEGT and VPAs are what options importers have if licensed forest products are not in their main interest. This is where the mandatory EU timber regulation introduced in 2013, comes in. The requirements put on the importer are in many ways similar to those put on FLEGT licensed products. While the license guarantees that the requirements are met, operators importing non-licensed products must instead themselves exercise due diligence on for example, traceability when placing timber products on the European market. Importers are subject to checks from authorities and penalties, such as fines are imposed. (European Parliment, 2010)

2.3 Gravity model and timber trade

Some but fairly limited amount of research has been conducted on trade flows of forest products using the gravity model. Buongiorno (2016) applies the model with success in the context of forecasting and policy analysis. The author uses panel data ranging from 2005 to 2014 on different wood commodity groups with the estimation methods ordinary least square (OLS), fixed effects and random effects. The results from this were used together with GDP projections to forecast changes in trade flows for the following years up to 2020. As for policy application, the Trans-Pacific Partnership (TPP) expected effect on GDP growth was used as an example to show the impact on forest product trade. The result from the estimations showed as expected, a positive elasticity for GDP on imports and exports and the performance of OLS with random effects were similar with high significance while fixed country effects performed less well. The forecasted growth rates were highest for China and its trading partners due to China's expected GDP growth rate while the growth rate overall was the lowest in trade with paper and paperboards. The effect of TPP showed that Vietnam would see the highest increase in trade due to the country being expected to have favorable position in the policy while again, the trade in paper and paper products are expected to experience the lowest growth.

Buongiorno (2015) studies forest product trade within EU and shows a positive and significant effect of introducing the euro. The time period used is 1988 to 2013 and as in Buongiorno (2016), different forest commodities are used but also the sum of these while only OLS and fixed effects are applied. The author includes a dummy for introducing the euro in the model to single out the impact of a currency union on forest product trade. In addition, an interaction variable was added to see how the effect of the euro varied across exporting countries. The impact of the euro exhibited a growth rate in trade of the summed forest products by 6.8 ± 1.3 %. For the two subgroups, wood and articles of wood and pulp and fibrous cellulosic material, the effect of the euro was higher and similar between the groups while it proved to be insignificant for the subgroup paper and paperboard. The highest significant effect of the euro for the exporting countries (using summed forest products) was observed for Italy and lowest for Finland, 35 ± 12 % and 2.8 ± 1.3 % respectively.

Akyüz, Korkut, & Yildirim (2010) examine trade currents between Turkey and the EU regarding forest products. The gravity model was applied to panel data ranging from 2000 to 2006 using least square method. Instead of fixed effects, variables such as population, distance and borders were included along with export value of forest products and GDP. The result shows an adjusted R^2 of 0.63 and coefficients for GDP close to 1. Their EU dummy, expressing membership before 2004, was highly significant with negative coefficient as the authors expected.

Houghton & Naughton (2017) found that international tropical timber agreements lead to a decrease in timber log exports although the effect was offset by an increased export in other forest products. They perform a separate analysis for tropical and non-tropical countries using a random growth model between the years 1970-2011. Country and time fixed effects were implemented and exports of the country is used as the dependent variable. As dummy variables, they add membership in the 1983 and 1994 International Tropical Timber Agreements (ITTA) which varies in treatment between tropical and non-tropical countries. Further covariates included in the model are market potential, population, GDP per capita and GDP. Results show that the overall log exports fell for both tropical and non-tropical ITTA members. However, examining the export effects for different log types shows signs of substitution. As for sawn wood the coefficient for 1983 ITTA show an increase in exports for non-tropical member countries and again signs of substitution can be found for more processed products. For total

exports the 1983 ITTA exhibited an increase in exports for tropical member countries using fixed effects while insignificant for non-tropical member countries.

2.4 Announcement effects

Andersen et al. (2003) showed that macroeconomic announcements lead to conditional mean jumps in the U.S dollar exchange rate. The authors used a data set consisting of exchange rates, macroeconomic expectations and macroeconomic realizations to show that announcement surprises, defined as the difference between expectations and realizations, leads to conditional mean adjustments and that these occur quickly. Specifically, a "jump" occurs immediately after an announcement and is followed by little movement thereafter. With a two-step least square applied on high frequency data, Andersen, Bollerslev, Diebold, & Vega (2007) draw similar conclusions as Andersen et al. (2003), finding instantaneous announcement effects but also that these effects vary with business cycles.

Clarida & Waldman (2008) examines the effect of inflation surprises on nominal exchange rate where inflation surprise, similar to Andersen et al. (2003), is the difference between expected and announced inflation. By using OLS on panel data and regressing inflation surprises on exchange rates, they find that higher than expected inflation leads immediately to an appreciated currency and vice versa. Faust, Rogers, Wang & Wright (2007) base their work on a model similar to Clarida & Waldman (2007) but uses high frequency data during a longer time span. They too conclude that macro announcements consisting of higher than expected releases, appreciates the dollar directly and from this they draw conclusions on risk premiums for holding currency and the long run effects on the dollar.

Work on announcement effects discussed previously explains the movements on financial markets with regards to macroeconomic announcements, while research on the effect of international policy releases is scarcer. However, Bevan & Estrin (2004) examine foreign direct investment (FDI) in European transition economies and include an announcement dummy for admission to the EU with significant results. Their model includes many similarities to the gravity model of trade controlling for costs, openness and institutional development. The authors also expect that changes in these variables affect FDI with time lag. Opposing commonly used specification when applying gravity model in international trade, Bevan & Estrin (2004) imposes random effects in their regression. Their result show that FDI indeed is determined by gravity

factors and the announcement dummy is significant, current and lagged, leading to the conclusion that potential membership in the EU increases FDI. A small sign of the initial effect being greater than the lagged is also present.

3. Gravity and Trade Costs

The development of the traditional gravity model of trade is presented in this chapter and how VPA together with announcments effects is implemented in the model.

3.1 The Gravity model of trade

Tinbergen (1962) introduced the popular gravity model of trade for predicting bilateral trade flows which mimics the law of gravity in physics, shown in equation (1).

$$m^{ij} = A\frac{y^j y^i}{(d^{ij})^\rho} \qquad (1)$$

(1) implies that trade flows m between country i and j can be explained by the economic mass y of the countries and the distance d between them. The Gravity Model has in the past been criticized due to the lack of theoretical foundation. However, Anderson (1979) showed that it could be derived from the properties of expenditure systems, Bergstrand (1989) introduces a generalized gravity model and Deardorff (1998) used two extreme cases (firstly frictionless trade and secondly differentiated goods) of the Heckscher-Ohlin model to show that the Gravity Model holds.

McCallum (1995) introduced a border dummy to measure the effect on trade flows between provinces if goods have to cross a border. Anderson & Van Wincoop (2003) developed the model further addressing problems with previous model with omitted variable bias and not being able to conduct comparative statics exercises. They introduced on the consumer side, a constant elasticity of substitution utility function and on the producer side, monopolistic competition to arrive at the today widely used gravity model shown in equation (2).

$$X^{ij} = \frac{y^i y^j}{y^w}\left(\frac{t^{ij}}{P^i P^j}\right)^{1-\sigma} \qquad (2)$$

X is the value of trade between country *i* and *j*, y is the GDP in country *i*, *j* and *w* (world) which are proxies for economic mass. Bilateral trade resistance between *i* and *j* is represented by t (eq. 3) while p is the multilateral resistance (price indices) in *i* and *j* respectively. This model can be transformed to a log-linear form arriving at the theoretical model, shown in (4) where bilateral trade costs, such as borders, are represented by δ.

$$t^{ij} = e^{\delta^{ij}}(d^{ij})^{\rho} \qquad (3)$$

$$lnX^{ij} = \alpha + \ln\left(y^i y^j\right) + (1-\sigma)\delta^{ij} + \rho(1-\sigma)lnd^{ij} + (\sigma-1)\ln\left(P^i P^j\right) + \varepsilon_{ij} \quad (4)$$

When applying the logic of the gravity model to sectoral trade flows like timber products it is not as straight forward as looking at aggregated trade flows between two countries as a whole. Theory says that when economies have monopolistic competition, larger countries produce a greater variety and thus explains the larger trade volumes (WTO, 2012). Hence, higher GDP may not lead to greater exports in a specific sector. However, Hummels & Klenow (2005) argues that larger economies actually do export both a greater variety of goods and greater volumes of each good. Gravity model may therefore be used to estimate sectoral trade flows but GDP may not be significant in this setup.

3.2 Trade costs; Non-tariff Barriers and Announcement effects

The outcome of a VPA is a license system for forest products, which can be seen as so called non-tariff barrier (NTB). NTBs are all trade barriers that are not tariffs. As tariffs have been reduced in major industrialized countries as a result of multilateral trade agreements there has been an increase in NTBs that may distort trade (Deardorff & Stern, 2001). Several effects can be derived from NTBs, such as reducing the quantity of imports while increasing its price therefore leading to welfare costs, the authors argue. Deardorff & Stern (2001) argues that there are three drawbacks of using formal models such as the gravity model for estimating the extent of NTB: firstly it requires a well specified model to not overestimate the effect, second, unrealistic assumptions in the model makes it hard to estimate effects in specific industries and third, they cannot tell how far trading patterns depart from free trade, however estimates can still be useful for identifying relative levels of protection.

FLEGT and the VPAs are still in an early stage, which means that the actual impact on trade of these agreements cannot be estimated. Instead the announcement effects of being involved in future VPA is seen as an indication of a future NTB. The concept of announcement effects implies that in forward-looking economies, markets will react to new information that might have an impact on participants in the future (Whitta-Jacobsen & Sørensen, 2005). Announcement or signals might therefore affect the course of the economy already before the anticipated event has actually happened. The concept is often used in financial economics where participants pay close attention to central bank statements. The usage in the context of this paper is that market reactions to an announcement of negotiating a VPA can tell presently what the stakeholders' action plans to the trade agreement are. The idea of implementing this in the gravity model trade cost variable is then as follows; EU importers might expect that a future VPA will: *(i)* increase trade costs, hence importers will by the announcement start to withdraw investments/trade routes, gradually decrease imports and look for substitutes and alternative trading partners, *(ii)* decrease trade costs, increasing its investment and supply chain leading to a gradually increased import, or *(iii)* leave trade costs unaffected, leading to an unchanged decision plan.

3.3 The Model

The general model used for estimations is constructed based on the gravity model framework and represented by equation (5).

$$Export_{it} = \beta_0 + \beta_1\gamma_i + \beta_2\delta_t + \beta_3 \ln(X) + \beta_4 N_{it} + \beta_5 E_{it} + \beta_6 I * N_{it} + \varepsilon_{it} \qquad (5)$$

$$\beta_4 N_{it} + \beta_5 E_{it} = \sum_{j=0}^{J} \theta_j N_{t-j} + \sum_{k=0}^{K} \rho_k E_{t-k} \qquad (6)$$

All models use $Export_{it}$ as the dependent variable which is the export value of forest products from country i to the EU at time t. Further the variables γ_i and δ_t are the country and time fixed effects respectively, and ε_{it} the error term.

X consists of the variables used to serve as proxies for supply; $GDP_{it}, Forest\ area_{it}, Forest\ rent_{it}$. GDP_{it} is the gross domestic product of country i at time t. The corresponding coefficient is expected to be positive and close to one, hence unit elastic. $Forest\ area_{it}$ is the amount of forest in country i at time t, also with an expected positive coefficient. $Forest\ rent_{it}$ is the so called forest rent in i at time t, which is the presented as

percentage of GDP. It indicates the harvest cost of roundwood in the country and the importance of the forest industry for the economy.

The variables of interest, N_{it} and E_{it} are NTB and therefore trade costs. N_{it} is the dummy variable for VPA negotiation. Beginning negotiations signals to exporters that in some years, only forest products with FLEGT license will be allowed in to the EU from the country i. In equation (5) N_{it} take the value of one if country i is currently at the negotiation stage of a VPA at time t, and the value of zero otherwise. E_{it} is the dummy variable for entering a VPA. This signals that the FLEGT licensing system will be in place in only a couple of years. E_{it} take the value of one if country i has entered a VPA at time t, and the value of zero otherwise. In equation (6) these are specified as their lagged versions, N_{t-j} and E_{t-k} respectively.

The purpose of $I * N_{it}$ is to capture strengthening or weakening effects of the VPA in relation to country characteristics and EU timber regulation. I is a integration dummy variable taking the value of one if country i has a supply proxy of interest above the sample mean or being under influence of EU timber regulation at time t, and zero otherwise. Note that however, EU timber regulation is not country specific.

4. Method and Data

This chapter explains the procedures of estimating the model presented in section 3.3 and how and where the data for this research was obtained.

4.1 Method of Estimation

The two methods of estimations used are PPML and OLS, both using fixed effects and robust standard errors. PPML solves the problem of heteroscedasticity in a nonlinear gravity model, is consistent with fixed effects, zero trade values are dropped in OLS while naturally included in PPML and the interpretation of coefficients follows the same pattern as in OLS (note that in PPML, the dependent variable is in import values while OLS uses logged values), while it is not necessary for the data to follow a Poisson distribution (Shepard, 2016). An argument supporting this method is Santos Silva & Tenreyro (2006), who shows that the PPML estimator can indeed provide consistent estimates of the traditional non-linear gravity model.

Fixed country effects are used to control for all time invariant effects at country level such as distance, common language and colonial heritage. Fixed time effects are used to control for time variant effects that are assumed to affect all observed countries in the same way for example, business cycles and oil price fluctuations. Countries enter VPAs at different points in time and should therefore not be omitted when using time fixed effects. Additionally, robust standard errors are used to handle heteroscedasticity.

The model shown in equation (5) is estimated in several ways with PPML and OLS, both with logged values of GDP, forest area and forest rent, while only the OLS has logged export value. Two estimations uses the model as specified in (5), one with interaction and one without, and one estimation use the specification as in (6) but without interaction. In addition a robustness check is performed excluding non-tropical countries. STATA program was used for all estimations, where "xtpoisson" and "xtreg" commands were used for the PPML and OLS estimations respectively.

4.2 Data

Panel data during the time period 2000-2014 was collected on all twelve countries which were involved in any stage of a VPA process in that period. As controls in a difference in difference approach, data on the same number of countries was collected. The control countries were chosen on the basis of being net exporters of forest products and located in the tropics (except South

Africa, Papua New Guinea and Uruguay). All tropical countries in the world were controlled for being net exporters during the selected time period using data from FAO database, and those that were found to be net exporters are included as controls. The final dataset contains 390 observations; the VPA and control countries are shown in Table 1.

Table 1: All countries in the data set are located in the tropics except South Africa, Papua New Guinea and Uruguay.

VPA Country:	**Control Country:**
Africa:	
Cameroon	Benin
Central African Republic	Cote d Ivorie
Democratic Republic of Congo	Equatorial Guinea
Gabon	Guinea
Ghana	Mozambique
Liberia	South Africa
Republic of the Congo	
Asia:	
Indonesia	Cambodia
Laos	Myanmar
Malaysia	
Thailand	
Vietnam	
South America:	
Guyana	Brazil
Honduras	Suriname
	Uruguay
Oceania:	
	Papua New Guinea

The following annual data have been collected; total aggregated export value of forest products to the EU (current value 1000 USD), GDP (current value USD), forest cover (percentage and area) and forest rents. Export values were collected from the forestry section in the FAO database using the items aggregated option, summing all subcategories. Data on GDP, forest cover and rents were collected from World Bank database. Dummies for VPA stages were added manually for each country whereas late negotiations and entries in one year was added to the next year instead to be more representative for a dataset only containing annual observations.

5. Results

This chapter presents the estimation results from the methods discussed in previous chapter. Table 2 shows the estimates without interaction variables. In column (1), the PPML without lags is presented. In this estimation, all variables are significant except VPA Entry and log(Forest Area) is only significant at five percent level. Speaking for this model is the highly significant log(GDP) and its coefficient being very close to one, hence unit elasticity meaning one percent increase in GDP leads to one percent increase in exports. Forest rent and Forest area are also proxies for supply and as expected, these variables also have positive coefficients, but the magnitude of Forest area being almost five times larger. VPA Negotiation is highly significant with a negative coefficient, indicating that being currently involved in the negotiation process reduce exports on average by approximately 0.6 percent. Column (2) presents the same specification but using OLS. The only significant variable is Forest area, now with an increased magnitude, while neither VPA negotiation nor entry is significant. However, Negotiation has changed sign to being positive while entry remains negative.

Column (5) shows the results of PPML using lagged values of negotiation and entry. Compared to (1), the in common variables have similar magnitude and forest area is now significant at one percent level. All negotiation lags are significant at one percent level while only the time periods one, three and four are significant for entry. The coefficients are plotted in Figure 1, showing that the first effect of starting negotiations is an export drop of 0.5 percent on average with small signs of increasing in magnitude with time while entering the VPA leads to decreased exports with distinct increasing magnitude over time. OLS with lags is displayed in column (6), with forest area still being the only significant supply proxy. None of the negotiation lags are significant and the sign of the coefficients are positive. However, the same entry lags are significant as in (5), with the same sign and a slight increase in magnitude.

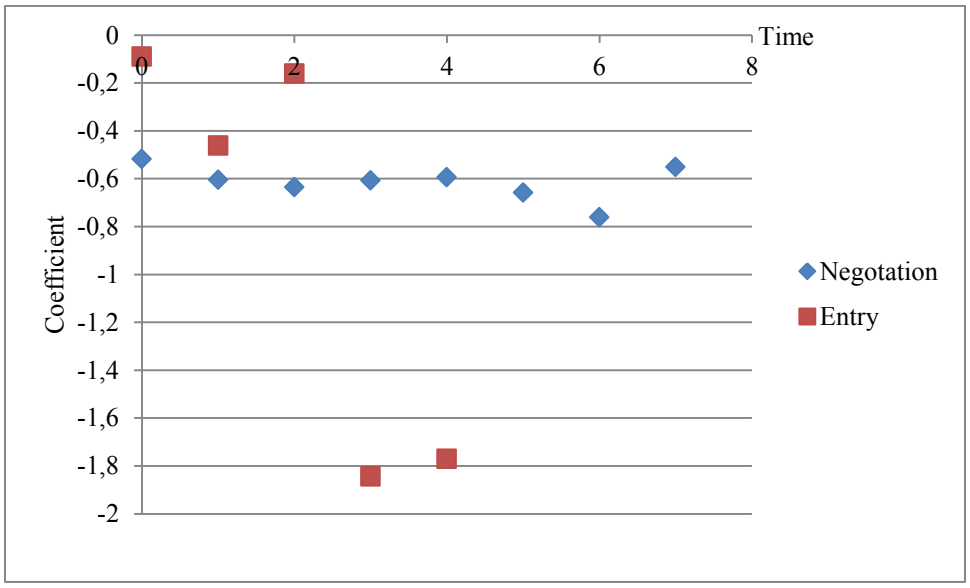

Figure 1: The immediate export drop when beginning a VPA negotiation is stable over time, while the effect after entering a VPA is increasing with time.

For robustness check, the pairs (1) & (3), (2) & (4), (5) & (7) and (6) & (8) have the same setup respectively but with non-tropical countries excluded from the dataset. Beginning with comparing (1) & (3), there are a few changes to note. GDP is no longer unit elastic and the significance has dropped to the five percent level. Forest rent and VPA negotiation experience a slight decrease in magnitude while forest area is no longer significant. VPA entry however, is now significant at the ten percent level with an increase in magnitude. Next examining (2) & (4), the main difference is that forest area is no longer significant and hence no variables in (4) are. (5) & (7) differ in the same way as their non-lagged counterparts and the same lagged VPA stages are still significant with some small, mostly decreasing changes in magnitude. Finally the pair (6) & (8) is examined, and again forest area is no longer significant while VPA entry lags go through small changes in magnitude. Some furthers tests, not shown in Table 2, were conducted. In the PPML models, forest area was replaced with forest coverage (percentage), returning the same results and forest rent and forest area was added and removed respectively yielding less significant variables and without GDP being unit elastic. These tests are available by the author upon request.

Table 2: Estimated coefficients with PPML and OLS using fixed country and time effects.

VARIABLES	(1) PPML	(2) OLS	(3) PPML	(4) OLS	(5) PPML	(6) OLS	(7) PPML	(8) OLS
log(GDP)	1.002***	0.645	0.895**	0.514	1.024***	0.723	0.928**	0.625
	(0.305)	(0.867)	(0.390)	(1.031)	(0.291)	(0.878)	(0.379)	(1.058)
log(Forest Rent)	0.633***	0.468	0.572***	0.352	0.614***	0.524	0.565***	0.452
	(0.103)	(0.399)	(0.187)	(0.532)	(0.105)	(0.409)	(0.179)	(0.557)
log(Forest Area)	2.972**	6.187**	0.704	4.803	3.305***	6.230**	1.284	4.914
	(1.371)	(2.907)	(2.626)	(4.072)	(1.234)	(3.007)	(2.479)	(4.270)
VPA Negotiation	-0.596***	0.159	-0.572***	0.265				
	(0.118)	(0.311)	(0.157)	(0.339)				
VPA Entry	-0.316	-0.391	-0.389*	-0.376				
	(0.258)	(0.344)	(0.233)	(0.329)				
VPA Negotiation Lag								
Time 0					-0.517***	0.161	-0.488***	0.239
					(0.092)	(0.299)	(0.103)	(0.303)
Time 1					-0.604***	-0.117	-0.587**	-0.035
					(0.224)	(0.302)	(0.238)	(0.323)
Time 2					-0.635***	0.334	-0.606***	0.472
					(0.159)	(0.421)	(0.189)	(0.452)
Time 3					-0.607***	0.279	-0.573***	0.402
					(0.116)	(0.344)	(0.155)	(0.418)
Time 4					-0.594***	0.386	-0.582***	0.555
					(0.131)	(0.568)	(0.172)	(0.611)
Time 5					-0.657***	0.633	-0.620***	0.813
					(0.142)	(0.541)	(0.189)	(0.596)
Time 6					-0.760***	0.337	-0.781***	0.477
					(0.116)	(0.506)	(0.181)	(0.598)
Time 7					-0.551***	0.615	-0.531***	0.668
					(0.210)	(0.635)	(0.176)	(0.675)
VPA Entry Lag								
Time 0					-0.090	-0.376	-0.167	-0.399
					(0.229)	(0.309)	(0.217)	(0.276)
Time 1					-0.461***	-0.604**	-0.501***	-0.634**
					(0.114)	(0.263)	(0.089)	(0.236)
Time 2					-0.160	-0.783	-0.264	-0.827
					(0.450)	(0.586)	(0.403)	(0.515)
Time 3					-1.844***	-1.920***	-1.740***	-1.808***
					(0.084)	(0.439)	(0.172)	(0.548)
Time 4					-1.770***	-2.202***	-1.712***	-2.126***
					(0.242)	(0.595)	(0.145)	(0.616)
Fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
With lags	no	no	no	no	yes	yes	yes	yes
Only tropical	no	no	yes	yes	no	no	yes	yes
Observations	390	383	345	340	390	383	345	340
Robust standard errors in parentheses				*** p<0.01, ** p<0.05, * p<0.1				

In Table 3, the result including the interaction variable is shown. All variables are significant at the one percent level and the unit elasticity of GDP is still present. Forest rent and area have positive coefficient while VPA negotiation itself and its integration with EU timber regulation is negative. The estimated value of the coefficient for the interaction variable means that being exposed to EU timber regulation while at the same time negotiating a VPA, leads to on average to a 0.26 percentage drop in exports in addition to the average export drop of 0.57 from only negotiating. Not shown in the table, interactions between negotiation and forest area and negotiation and forest rent were tested, resulting in omitted variables.

Table 3: Estimated coefficients using PPML with integration variable.

VARIABLES	PPML
log(GDP)	0.985***
	(0.312)
log(Forest Rent)	0.584***
	(0.096)
log(Forest Area)	3.344***
	(1.235)
VPA Negotiation	-0.571***
	(0.146)
(VPA Negotiation) x (EU Timber Regulation)	-0.258***
	(0.098)
Fixed effects	yes
Only tropical	no
Observations	390
Robust standard errors in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	

6. Discussion

With the results from the estimations at hand, it is clear that the PPML model performs better in this setup than the OLS. The bad performance in the OLS is mainly reflected in GDP not being significant and the coefficient deviating from one. The problems discussed when using aggregate trade flows in a gravity model by WTO (2012) may be one reason for this; however Akyüz et al (2010), Buongiorno (2015 & 2016) and Houghton & Naughton (2017) showed it indeed can be done. Another reason could be missing values but due to export being summed over the whole EU, the data is in large extent complete. PPML on the other hand returned mostly high significant estimations with coefficients of the expected sign and therefore these models will be used for further analysis.

Export drops caused by VPA negotiation is an intriguing result from the PPML model. When time is not taken into consideration in examining the entry of a VPA, the findings are not as definitive. If instead time after announcement is included in the model, some further deductions can be made. The year a negotiation commences, exports drop and this effect is more or less persistent in the following years. When entering a VPA later, exports drop further but increases the time after. This contradicts with the announcement effects discussed in financial literature, Andersen et al. (2003), Clarida & Waldman (2007) and Faust et al. (2007) whom all find the announcements lead to jumps with diminishing effects afterwards. There are likely several reasons for this difference. The mentioned studies have higher frequency in their data and the financial asset markets might not be comparable with the international forest product trade. The study by Bevan & Estrin (2004) might instead share more characteristics and the movements found in the period after an announcement are more in line with the effects of VPA negotiation. The increasing magnitude with time after entry may be explained by importers trying to extract as much resources as possible up until just before the licensing system is in place.

So what are the driving forces behind making announcements of a future VPA leading to an export drop? One cause could be the low price premium of certification discussed by Paletto & Notaro (2018) and the market advantage discussed by Rametsteiner & Simula (2003) might not be present. The potential benefits on niche markets, in line with the argument by Varangis et al. (1995) is most likely not large enough to have an impact on the global trade flows. The increased

production costs due to increased standards (Barbier, 1998) are probably the main reason for the drops in exports even though the impact should be small for the end consumer.

The result from the estimation using the integration between VPA negotiation and EU timber trade regulation is highly interesting. Even though the timber regulation imply similar standards on non-FLEGT countries, and therefore the increase in production costs is likely of the same magnitude, countries in a VPA process are affected more by the regulation. This could indicate some kind of loop holes in the legislation. European importers not willing to comply with the new standards may find new trade routes and avoid auditing in various ways. The sought after environmental benefits and the abolishment of illegal logging from EU timber regulation and FLEGT program might therefore be absent.

Even though the estimation with integration variable could be seen as provoking, an apparent issue with the methods used overall is that it is hard to single out the effect from only the EU timber regulation. Due to its implementation happening within the same time span as the FLEGT action plan, the effects from the VPA and the regulation could interfere with each other. It could be the case that the announcement of the regulation does explain some of the variation in exports from countries that have problems which are targeted (environmental issues, illegal logging etc.), therefore entering FLEGT is not random and thus correlated with being extra "vulnerable" by EU timber regulation. The robustness check using only tropical countries reveal that there is generally an overestimation of the effect when using the whole dataset. This indicates that non tropical countries are affected to a greater extent; however it is hard to draw further conclusions since all FLEGT countries are in the tropics.

7. Conclusions

FLEGT tries to reduce illegal logging and support imports of legal timber to the EU and one of its measures is to license forest products that meet the FLEGT standards. For a country to start issuing FLEGT licenses, it has to go through the stages of VPA. This research aimed to examine how announcement of negotiating and entering VPA effects trade flows to the EU and how these interact with EU timber regulation. The result shows that beginning negotiations lead to an export drop to approximately 0.6 percent on average and is relatively stable the coming years. Entering a VPA shows signs of a similar initial export drop but with increasing magnitude over time. When EU timber regulation is introduced, countries currently involved in the process of becoming licensed by FLEGT experience on average an additional export drop of 0.26 percent. Reasons discussed concerning the obtained results are higher production costs, low price premiums and possible loop holes to avoid regulations.

There are several interesting topics for further research on this subject. An ex-post policy evaluation of the FLEGT licensing system similar to this research would certainly generate added knowledge on the trade impacts. The possible loop holes discussed should definitely be further looked into to maintain the quality of EUs common trade policy. The local effects on environment and livelihoods following FLEGT is a final research suggestion.

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