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The History of Sinks – An Analysis of Negotiating Positions in the Climate Regime

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ABSTRACT

The issue of terrestrial carbon sinks, officially labelled as Land use, Land-use change and Forestry (LULUCF) has been one of the most contentious and difficult issues in the international climate change negotiations. This study analyses the negotiation process on sinks from the third Conference of the Parties (COP 3) to COP 7 by using a multinomial logit model to identify factors influencing the negotiating positions on LULUCF of 166 Parties to the United Nations Framework Convention on Climate Change (UNFCCC). The results show that the importance of the forestry sector of a country does not seem to have affected the negotiation positions on LULUCF. However, the results suggest that the LULUCF issue was used by those Parties with a rather negative attitude towards international climate policy to reduce their Kyoto commitments. Pro-sinks Annex I Parties seem to have been motivated by the amount they were able to reduce their reduction target due to sinks, but not necessarily by the stringency of their target.
By applying a zero-inflated count model, the study examines which factors influenced the participation in the submission process on LULUCF. Those Parties having taken a pro-sink position on Article 3.4 have been participating most in the submission process. The exact opposite is the case for the CDM, where the opponents of forestry projects have been the most active Parties in providing submissions. Delegation size has some, but rather modest influence on the participation in the submission process.

Keywords:
Kyoto Protocol, sinks, LULUCF, negotiating positions, multinomial logit model, zero-inflated count model

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1. Introduction

The United Nations Framework Convention on Climate Change (UNFCCC), a legal framework under which Parties to the Convention commit themselves to stabilizing the greenhouse gas (GHG) concentration of the atmosphere, entered into force in 1994. Parties to the UNFCCC have been meeting every year since to develop and further define this framework. At the third conference of the Parties, COP 3, the Kyoto Protocol was adopted. It sets legally binding emission reduction targets for the so called Annex I[1] countries (industrialized countries and a number of countries with economies in transition) which have to reduce their overall greenhouse gas emissions by at least 5% below 1990 levels in the first commitment period (2008-2012). Thus, in Kyoto, the basic structure of the climate regime was decided. However, international regimes are under constant development. Many times certain aspects which are left open to be resolved at later stages of negotiations, and which are considered to be of rather technical nature, later turn out to be major issues with great impact on the overall effectiveness of the regime (Depledge 2001). The introduction of sinks in the climate change regime – officially labeled as Land use, Land-use change and Forestry (LULUCF) – is such an issue.[2] In using the example of the negotiations on LULUCF in the Kyoto Protocol, I combine qualitative background information with a quantitative approach of to explain negotiating positions and behavior of Parties to the UNFCCC. As most of the studies on negotiating positions in international climate policy are of rather qualitative nature, the use of statistical analysis is rather new and can provide additional insights into the negotiation process. The results obtained from this study can contribute to a better understanding of the negotiation process in general, as well as the role of sequestration in the negotiation of emission reduction targets. The latter might be especially relevant because negotiations on emission reduction targets for a second commitment period are envisaged to start in 2005.

The first part of the paper sketches the negotiation process related to the introduction of LULUCF in the climate regime. In the second part, I examine possible factors influencing negotiating positions and the participation of Parties in the negotiation process by using regression analysis.

2. The history of sinks in the climate negotiations

2.1. LULUCF rules for Annex I Parties

For analyzing the negotiation process, it is necessary to look at the roots of the sinks discussion in the climate regime. The first call for a global effort on sinks creation by afforestation took place at the 1989 Nordwijk conference, one of the first global policy meetings on climate change (Nordwijk Conference 1989). At the United Nations Conference on Environment and Development in 1992, the goal to negotiate a forest convention failed. Although, terrestrial carbon sinks play a considerable role as an obligatory element of national emission inventories, the (non-binding) targets of the UN Framework Convention on Climate

[1] The Parties with their respective reduction commitment are listed in Annex B of the Kyoto Protocol includes almost the same Parties as the Annex I of the UNFCCC. Both terms are often used interchangeably. In the following, I refer to Annex I Parties as those with reduction commitments.

[2] The term `sink´ is defined by the UNFCCC as „any process, activity or mechanism which removes a greenhouse gas, an aerosol or a precursor of a greenhouse gas from the atmosphere“ (Article 1.8). In the following, sinks and LULUCF are used interchangeably, although in the strict sense LULUCF activities can encompass sinks as well as sources of emissions from the land use sector.

Change (UNFCCC) only refer to emissions. The Convention defines the term sink, but does not give any details on how sinks should be accounted for.
The Berlin Mandate which was adopted in 1995 in order to strengthen the commitments of Annex I Parties under the Convention by the adoption of another protocol or legal instrument, explicitly refers to "emissions by sources and removals by sinks", thus taking on the language used in the UNFCCC.[3] The Ad Hoc Group (AGBM) installed under the Berlin Mandate met eight times before the third Conference of the Parties (COP 3) to work towards the development of targets and rules for what then was going to turn into the Kyoto Protocol. Many of the country proposals on quantitative reduction targets – by then labeled QUELROs[4] - brought up in the AGBM process included sources as well as removals by sinks. Referring to the submissions by Parties on reduction commitments, the report of the AGBM at its sixth meeting states that "the alternatives also reflect a range of views on the inclusion of removals by sinks. Some Parties prefer that sinks and sources be treated equally, while other Parties have proposed alternative approaches for taking sinks into account."[5] Since most submissions of countries on QUELROs included sinks, the need for clarification on how to account for these lead to the establishment of an informal sinks consultation group. A questionnaire was introduced to clarify the main issues relating to sinks in establishing reduction commitments.[6]
It was only few months before COP 3 (December 1997) that negotiators became aware of how important the sinks issue was for the negotiation of the quantitative reduction targets. A compilation of the country submissions on the questionnaire was available at the second part of ABGM 8 held in Kyoto days prior to COP 3. Most of the Parties of the Umbrella Group[7] were the most active supporters of an introduction of sinks in the calculation of targets, while the EU and the Alliance of Small Island States (AOSIS) belonged to the most prominent opponents since Kyoto. [8]
The chairman of the informal sinks consultation group reported to AGBM 8 a few day before the start of the negotiations of COP 3 that all Parties present had agreed that sinks were "important and should be included in commitments, subject to concerns about definitions, timing and scope."[9] However, the informal consultations did not lead to an agreement on the sink categories to be included. Since at COP 3, the numbers on QUELROs could not be fixed until this decision was taken, time pressured to finalize the negotiations as soon as possible. In the round-the-clock sinks consultations in Kyoto, Parties could agree to include afforestation, reforestation and deforestation (ARD), leading to the wording in Article 3.3.[10] But due to the

[3] See decision 1/CP.1 FCCC/CP/1995/7/Add.1, I. (f) Coverage of all greenhouse gases, their emissions by sources and removals by sinks and all relevant sectors", II. 2. The process will, inter alia: (a) Aim, as the priority in the process of strengthening the commitments in Article 4.2(a) and (b) of the Convention, for developed country/other Parties included in Annex I, both - to elaborate policies and measures, as well as - to set quantified limitation and reduction objectives within specified time-frames, such as 2005, 2010 and 2020, for their anthropogenic emissions by sources and removals by sinks of greenhouse gases not controlled by the Montreal Protocol.
[4] Abbreviation for quantified emission limitation and reduction obligations
[5] FCCC/AGBM/1997/3/Add.1
[6] See FCCC/AGBM/1997/8
[7] This group consists of the US, Canada, Japan, New Zealand and Australia, Iceland, Russia, Ukraine and Norway.
[8] For the submitted proposals of the pre-Kyoto process, see FCCC/AGBM/1997/MISC.4 and Add.1-2, as well as the compilation FCCC/AGBM/1997/INF.2. Submissions in favour of sinks included those of Australia, Canada, Denmark, Iceland, New Zealand and the European Union, while Japan, Kenya, Marshall Islands and Nauru wanted to see sinks to be excluded in the first commitment period. Interestingly, the position in favour of sinks expressed by the European Union and the rather sceptical position of Japan were the exact opposite of what both are pushing for since Kyoto.
[9] See FCCC/AGBM/1997/8/Add.1, see also tape of report of La Vina to the CoW of COP 3 on 6 December 1997.
[10] Article 3.3: "The net changes in greenhouse gas emissions by sources and removals by sinks resulting from direct human-induced land-use change and forestry activities, limited to afforestation, reforestation and

lack of scientific knowledge and data on further activities, it was laid down in Article 3.4 that these should be decided by COP/MOP 1 and apply only in the second and subsequent commitment periods. During the final negotiations taking place in the night session of 11 December 1997, Japan managed to add to Article 3.4 a sentence allowing additional human-induced activities already in the first commitment period if a Party decided so (Fry, 2002). This sentence should have significant consequences for the further negotiation process by leaving great uncertainties on the magnitude of the already fixed targets and opening a loophole which could be used by Parties in the following to renegotiate their targets. Since Article 3.7 stipulates that sinks will not be included in the base year emissions (gross-net approach), every ton of CO2 accounted for by additional sinks activities under Article 3.4 would be a factual decrease of the reduction target for those countries having a net sink in the commitment period.[11] Australia, however, managed to insert an exception into Article 3.7 which allows Annex I Parties with net emissions in 1990 from land-use change and forestry to use a net-net approach, by adding land use emissions to their base year emissions. The latter is a special gift to Australia which had considerable net emissions in the LULUCF sector in 1990. The EU which came to Kyoto to avoid the inclusion of LULUCF, slowly moved towards accepting certain sinks activities, partly for tactical reasons and partly due to internal opposition from France, Finland, Sweden and Italy (Oberthür and Ott 1999; Fry 2002).

Therefore, the text on sinks (Article 3) coming out of Kyoto, taken under the severe time pressure and lack of data, left many issues unclear and open to different interpretations. The following negotiations – especially the ones on Article 3.4 - were then used by some countries to reopen the negotiation on the targets decided at COP 3 by reinterpreting the LULUCF decision. Recognizing the lack of scientific knowledge, the session of the Subsidiary Bodies in June 1998 asked the Intergovernmental Panel on Climate Change (IPCC) to produce a Special Report on LULUCF. The negotiation on LULUCF came to a hold until the report was published in May 2000 (IPCC 2000) because it was expected to deliver the scientific background on LULUCF carbon sequestration relevant for the further decision-making under the Kyoto Protocol. The report was perceived as quite supportive of sinks. Seemingly technical issues, as for example how to define a forest, and how to differentiate between deforestation and harvest, were as much a source of disagreement as the decisions on which additional LULUCF activities to include under Article 3.4. At the SBSTA meeting in Lyon, in September 2000, it became clear that uncertainties regarding Article 3.4 were still significant. Australia and Japan pushed for narrow definitions of additional activities (e.g. fire control, pest control) fearing that broad definitions (forest management, cropland management etc.) as favored by the US and Canada would lead to a disproportionately large flow of sinks credits into the two latter countries. The EU which had initially opposed any inclusion of additional activities was a weak opponent due to internal differences. Finally, broad definitions were adopted (Fry 2002). The developing countries had hardly been heard regarding this issue. However, at SBSTA 13, Brazil, speaking on behalf of G77 and China introduced a set of principles addressing developing country concerns regarding LULUCF in the Kyoto framework. The additional activities under Article 3.4 became the crunch issues, leading to the collapse of the negotiations in November 2000 in The Hague. A compromise paper elaborated by the President of COP 6, Jan Pronk, could not break the deadlock in the negotiations. (Ott 2001; Grubb and Yamin 2001) The resumed session in July 2001, took place under politically different circumstances since President Bush had announced the withdrawal of the US from the Kyoto Protocol, thus giving further power to the rest of the Umbrella group whose ratification was now needed to let the Kyoto Protocol enter into force.

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deforestation since 1990, measured as verifiable changes in carbon stocks in each commitment period, shall be used to meet the commitments under this Article of each Party included in Annex I…."

[11] However, as described below, not all of the additional activities under Article 3.4 have been included based on a gross-net approach.

At the resumed COP 6bis (July 2001) in Bonn, countries tried to find a rule for how to account for additional activities. Parties were allowed to propose their own forest management cap which then entered into what became known as 'Appendix Z'. The latter includes the maximum allowable amount of forest management that can be accounted for by each Party. As these caps represent a proportion of the forest management activities undertaken anyway, and are accounted for on a gross-net basis, they lower the factual reduction targets of Parties. Russia, not being able to propose a figure, introduced a paragraph allowing to revise the figure on the forest management cap at a later stage. The final decisions on the negotiating text was therefore postponed until COP 7 where Russia managed to double the provisional figure given at COP 6bis.[12] The LULUCF text was finally adopted at COP 7 in Marrakech. Eligible activities as stipulated by the Marrakech Accords are afforestation, reforestation and deforestation (Article 3.3), as well as forest management, revegetation, cropland management and grazing land management (Article 3.4). While all forest activities are accounted for on a gross-net basis and are limited by a country specific cap, cropland and grazing land management as well as revegetation are included without any limits, but are based on a net-net approach. Parallel to the discussion on additional activities under Article 3.4, it was decided at COP 7 to include LULUCF into the CDM. The following paragraph will shortly summarize the process leading to this decision.

2.2. LULUCF in the Clean Development Mechanism

The draft text on Clean Development Mechanism (CDM, Article 12) contained a note that sinks might be included in the CDM depending on the resolution of the issue under Article 3 (Fry 2002; Depledge 2001). However, in the final version coming out of Kyoto, this footnote had been erased. Thus, the text on Article 12 only refers to emission reductions. It remained unclear if this wording meant that sinks were to be excluded from the CDM or not. (Depledge 2001).

A number of countries have kept this debate alive since Kyoto and have demanded that sinks should be eligible.[13] The main supporters of LULUCF in the CDM were the US, Canada, Japan, and the coalition of Latin-American countries GRILA.[14] The European Union, Brazil, China and India, AOSIS and Russia belong to the countries having opposed the inclusion of LULUCF in the CDM. The decision on the issue was passed between the CDM and the LULUCF contact group until COP 6bis, with no group wanting to take the responsibility for the subject.

It was not only contentious whether to include LULUCF at all, but also which activities would be eligible in the case of such an inclusion. Some countries were aiming at an even wider inclusion of LULUCF than stipulated under Article 3. Opinions differed especially concerning the viability of avoided deforestation – emission avoidance through forest protection projects – in the CDM. The potential scale, leakage problems, socio-economic as well as sovereignty concerns have been brought up as arguments against its inclusion.

The final decision at COP 7, only includes afforestation and reforestation, while avoided deforestation is eligible under the Adaptation Fund of the Kyoto Protocol. The use of LULUCF credits for complying with the reduction targets was limited to 1% of base year emissions of each Annex I Parties per year. Nevertheless, concerns regarding non-permanence of carbon sequestration as well as social and environmental effects were still prevailing. At

[12] See also Fry (2002) as well as Jung et al. (2004)

[13] See also FCCC/CP/1998/MISC.7

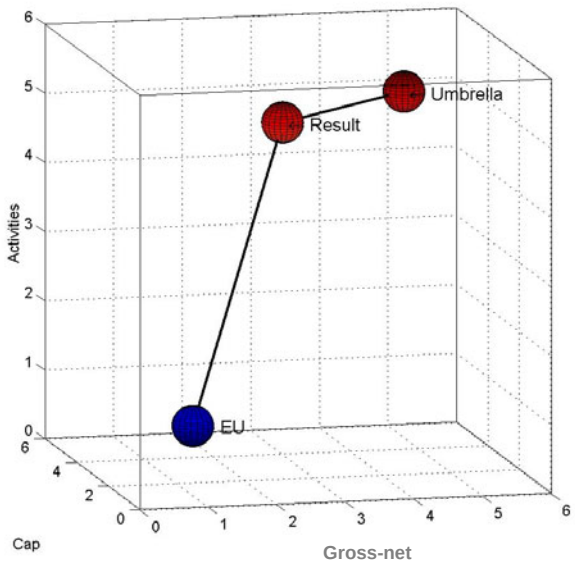
[14] The Latin American group GRULAC has split up over the issue of sinks in the CDM. While Brazil and Peru wanted to see any sinks projects excluded, most of the resting Latin-American Parties formed the GRILA group which was actively pushing for sinks in the CDM.

COP 9, expiring credits which are supposed to address the concerns regarding the reversibility of carbon sequestration in afforestation and reforestation projects were adopted.

3. Country negotiating positions

In the following, I analyze the distribution of positions of countries in the negotiation process on LULUCF. We focus on the three most important negotiation issues regarding LULUCF: the inclusion of mandatory LULUCF activities in Article 3.3 as negotiated mainly at COP 3, the inclusion of additional LULUCF activities in Annex I under Article 3.4 as well as the inclusion of LULUCF in the CDM – both under negotiation until COP 7. The negotiating positions described here represent the position Parties have voiced during the greatest part of negotiation on the respective issue.[15]

Figure 1: Country negotiating positions versus negotiation result



The position taken by a Party during the negotiations, however, does not necessarily reflect what it agreed to in the final decision. Since decisions in the international climate regime have to be taken by consensus, the text over which Parties are negotiating has to be adapted in such a way that all Parties will be able to consent to it.[16]

For understanding better how decisions are taken in the framework of the international climate regime, it has to be emphasized that decisions are not simple yes-versus-no options. Negotiations are the development of a legal text in which Parties and negotiating coalitions try to introduce as much of their own position as possible. The search for compromise

[15] Voicing a position does not necessarily mean that a Party expressed this position in an official document, since informal meetings and conversation in the door halls are an important element of international climate change negotiations as well. Since we conduct a cross-sectional analysis, we cannot consider changes in country positions over time. This approach is justified, when assuming that the respective position is the one expressed during the biggest part of the negotiation process.

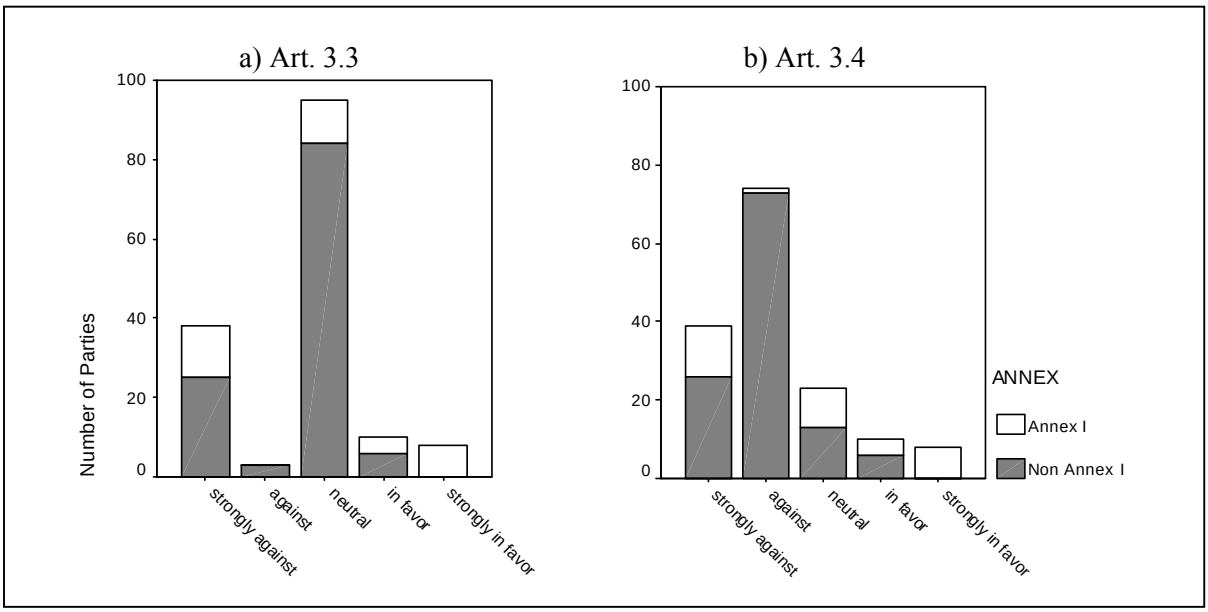
[16] However, no clear definition of consensus exists. The latter is necessary due to the lack of an agreement on a voting rule. Often it is defined negatively to mean that there are no stated or formal objections to a decision. A Party can reluctantly consent to a decision, but then ask for its concerns to be noted in the report after adoption. There is a great level of discretion of the presiding officer to decide whether the objection of a Party has to be formally considered or only represents some lesser level of discontent that will allow a decision to go forward after the adoption (Depledge 2001).

consists of the change in parameters of the decision along different dimensions, trying to find the point that will make consensus possible. Graphically, this can be represented by a three-dimensional diagram as the one represented in Figure 1, which plots in a very simplified manner the positions of the Umbrella group and the EU versus the final outcome. In reality, even more dimensions and areas outside of the LULUCF negotiations will have to be considered elucidating the complexity delegates are facing at international climate change negotiations.[17] The country positions this paper is referring to are the ones that a Party was pursuing in the negotiations (in our graph represented by the bowls "EU" and "Umbrella"), independently of what was the final outcome of the negotiations (bowl "Result" in Figure 1). The following paragraphs describe the negotiating positions of 166 Parties[18], measured on a scale from "strongly against", "against", "neutral", "in favor", and "strongly in favor".

3.1. LULUCF in Annex I countries

Figure 2 a) illustrates the distribution of negotiating positions of Parties regarding the debate held at COP 3 in Kyoto on whether to include LULUCF in the calculation of reduction commitments at all.

Figure 2: Distribution of Parties´ negotiating positions on Article 3



The relatively big proportion of Parties taking a neutral stance in Kyoto can be explained be the above mentioned lack of knowledge on the subject. Only a small proportion of mainly Annex I countries has been pushing for the inclusion of LULUCF, while a significant coalition of Annex I and Non-Annex I sinks opponents has voiced strong concerns. The group of strong opponents consisted mainly of AOSIS, India, Brazil, and the EU with the exception of Finland, France, Italy and Sweden, while the Umbrella group was actively pushing for the inclusion of sinks at Kyoto.

[17] The most important parameters along which negotiators moved in the negotiations on LULUCF are the number and type of eligible LULUCF activities, the degree to which the use of these different activities was limited by a cap, the definition of forest, the discounts applied to LULUCF activities for example in the case of forest management, the reporting and verification procedures as well as the inclusion of LULUCF activities in the base year of the emission inventory (gross-net versus net-net calculation).

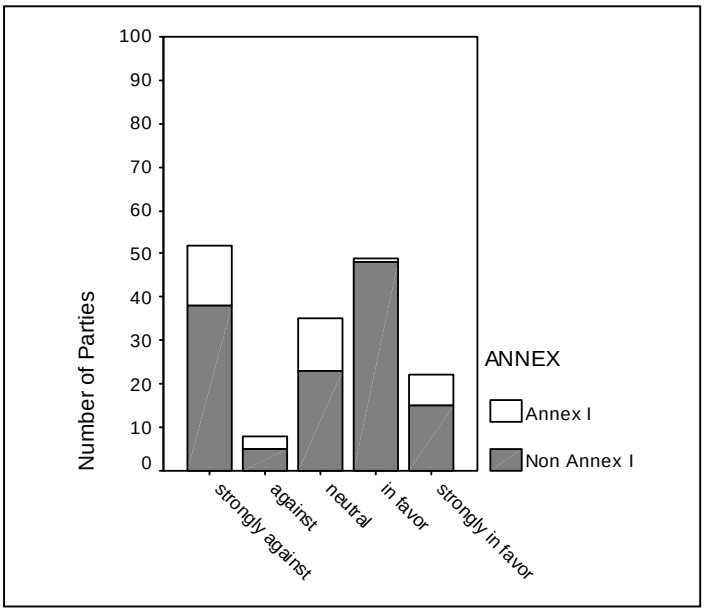
[18] The 166 countries encompass most of the Parties to the UNFCCC at COP 3. Literature review, interviews of (former) delegates and UNFCCC recordings were used for collecting this information.

There was considerably more time for Parties to develop a position towards the inclusion of additional LULUCF activities under Article 3.4 after Kyoto. Figure 2.b) illustrates the changes in the distribution of positions in the post-Kyoto phase (Article 3.4) as compared to the ones on Article 3.3 at COP 3. Most of the neutral Non- Annex I Parties on Article 3.3 had shifted to the group of opponents of the inclusion of additional activities, while the coalitions representing the supporters and strong opponents had remained unchanged. It can be seen that the division on LULUCF was not between Annex I and Non-Annex I Parties, but caused by different criteria.

3.2. LULUCF in the CDM

The negotiating positions on the issues of whether to include LULUCF in the CDM, as shown in Figure 3, follow a different pattern than on Article 3.

Figure 3: Distribution of Parties´ negotiating positions on LULUCF projects in the CDM



The coalitions of Annex I Parties taking a strong position in favor and against sinks under Article 3 did so as well for sinks in the CDM. However, a relatively big proportion of Parties remained undecided on the issue, while the Annex I supporters have been joined by a significant coalition of Non-Annex I Parties in favor of including sinks in the CDM. While Parties belonging to the African group, OPEC as well as the Environmental Integrity Group voiced some support for the issue, the Latin-American CDM sinks supporters (GRILA) strongly fought for the inclusion of forestry projects in the CDM.
The inclusion of LULUCF in the CDM is often mentioned as the issue over which there has been a significant split of G77 and China. This is due to the fact that Non-Annex I Parties can be found in both extreme positions, strongly pushing for as well as strongly being against the sinks inclusion. This split is mainly represented by the coalition of most Latin-American countries strongly interested in sinks in the CDM facing the rather skeptical coalition of China, Brazil, AOSIS and many Asian countries.

3.3. Number of Parties versus power

The above description of the distribution of negotiating positions, however, does not tell much about why certain decisions were taken the way they were. The sheer number of Parties taking each position does not equal the negotiating power represented by the respective coalition. In reality, only a few number of Parties is actually influencing the outcome of the negotiations, while especially most Non-Annex I Parties remain sidelined.
The main goal of this paper is, however, to find factors explaining Parties´ negotiating positions by conducting a statistical analysis, and not explaining the outcome of the negotiations.

4. Statistical analysis of country positions and participation in the negotiations

After having identified the negotiating positions of countries, I use two different regression models for categorical independent variables to analyze issue related to the negotiating positions. First, a multinomial logit model is applied to identify factors affecting the respective positions taken in the negotiations. Second, I examine factors influencing the participation of Parties in the submission process in the international climate negotiations by using a zero-inflated count model.

4.1. A multinomial logit model of negotiating positions

When using the negotiating position as the dependent variable, the outcome categories of "strongly against" to "strongly in favor" represent a Likert scale which is frequently interpreted as a continuous scale in order to be able to conduct a standard linear regression analysis. Long (1997), however, remarks that such an assumption often leads to distorted results, and that an ordered logit/probit or a multinomial logit model are more appropriate for dependent variables with categorical outcomes. I use the multinomial logit model to avoid the parallel regression assumption of the ordered logit model.[19]
The multinomial logit model is used for estimating a regression model with nominal dependent variables. In the following, each of our country positions represents a nominal outcome.[20] However, the dependent variable is recoded to only three outcome categories by

[19] The outcomes of negotiating positions can be seen as an ordered scale, which makes the ordered logit model the first choice. For using the latter, parallel regression assumption has to be fulfilled, though, which is not the case in this analysis. For details on the parallel regression assumption in ordered logit models see Long (1997), page 140-145.

[20] The model can be derived as a probability model as specified by the following equation:

$$\Pr(y_i = m|x_i) = \frac{\exp(x_i ß_m)}{1 + \sum_{j=2}^{J} \exp(x_i ß_j)}$$, for m>1

Let y be the dependent variable with J nominal outcome categories. Then $\Pr(y_i = m|x_i)$ is the probability of observing outcome m given the ith observation of the independent variable x. The ß´s represent the coefficients which are obtained by maximum likelihood estimation. The maximum likelihood estimator used for the estimation of the results is based on the probability equation is:

$$L(\beta_2;.....,\beta_J|y;X) = \prod_{m=1}^{J} \prod_{y_i=m} \frac{\exp(x_i\beta_m)}{\sum_{j=1}^{J} \exp(x_i\beta_j)}$$

joining the two categories "against" and "strongly against" as well as "in favor" and "strongly in favor". Consequently, the resulting scale used in the multinomial logit analysis consists of "against", "neutral" and "in favor".[21]

The research questions guiding this analysis are based on different hypothesis which are supposed to be tested by the model. The *first hypothesis* assumes that there are certain domestic interests from a forestry lobby influencing the negotiating position towards LULUCF. Should this hypothesis hold, Parties with a bigger forestry lobby should have a higher probability to be in favor of including LULUCF in the climate regime. The size of the forestry lobby is captured by the variable export of forest products as % of GDP.

The *second hypothesis* stipulates that the LULUCF issue was used by those Parties with a rather negative attitude towards international climate policy to reduce their Kyoto reduction targets or compliance costs through the backdoor. The part regarding the general attitude towards climate policy is operationalized by the independent variable "number of the Fossil-of-the-Day Awards" representing the degree of destructive participation of a Party in the climate negotiations. The "Fossil of the Day Award" is granted at a daily basis at the international climate change negotiations to those countries which are considered to have made the worst input to or to have blocked the progress of the negotiations. The problem that a certain number of awards has been granted for the support of LULUCF, which would make our model tautological, has been accounted for by not considering those awards granted for issues related to LULUCF.[22]

Table 1: Independent variables of the multinomial logit model (explaining negotiating positions)

Hypo-theses	**Independent variables**	**Concept**	**abbreviation**	**Source**
1	Export of forest products (% of GDP)	Importance of forest industry	export_gdp	Calculated based on data from FAO (2003)
2	Distance to target with sinks (in % of AAUs)	Stringency of Kyoto reduction target with LULUCF in Article 3	gap_sinks	Own calculations based on UNFCCC data reported in IEA (2003), page15 (business as usual emissions are obtained by linear extrapolation of the change in emissions 1990-2001 to the year 2012)
	Distance to target without sinks (in % of AAUs)	Stringency of Kyoto reduction target without LULUCF	gap_nosink	
	Reduction in distance to target due to Article 3 sinks (in % of AAUs)	Gain due to introduction of sinks in Article 3	gain_sinks	
	Number of Fossil of the Day Awards (COP 5-COP 9)	Destructive participation in the climate negotiations	Fossil	www.fossil-of-the-day.org
	Membership in G77+China	Developing country	g77	

The independent variables representing the stringency of the respective Kyoto reduction target (distance to target) and the gain due to the introduction of sinks under Article 3 (reduction in distance to target) are used to analyze the second part of the hypothesis referring to the motivation to renegotiate the target. Should this hypothesis hold, Parties with a high number

Taking the logs of L, we obtain the log likelihood equation which can be maximised by applying iterative numerical methods. For further details on the MNLM see Long (1997), Long and Freese (2003), Powers and Xi (2000), Menard (2001) and Agresti (2002).

[21] This is done to guarantee that each category at least comprises a minimum amount of observations. The other reason is to avoid any doubt about the independence of outcome categories.

[22] The award is an initiative of the Climate Action Network (CAN). A list of the number of awards per Party including the reasons for the respective awards can be found at www.fossil-of-the-day.org.

of awards, a relatively stringent target and/or a relatively high decrease in the target due to the inclusion of sinks should be the ones favoring sinks and vice versa.
Furthermore, the membership of G77 and China is used as a dummy variable to examine if the negotiating position is influenced by the membership in the negotiation group of the developing countries. The independent variables included in the analysis are summarized in Table 1.

4.2. A count model of participation in the submission process

A second part of my analysis intents to examine a *third hypothesis* relating to factors influencing the participation of Parties in the negotiations on LULUCF. The hypothesis states that those Parties in favor of the inclusion of LULUCF in the climate regime have been participating more actively in the negotiations on the issue than the other Parties. Although, the number of submissions is only one of many possible indicators of active participation in the climate negotiations, it is the only one which can be measured quantitatively, thus giving some impression of the behavior of countries in the negotiations on sinks.

Table 2: Independent variables of zero-inflated count model (explaining number of submissions)

Hypothesis	Independent variables	concept	abbreviation	source
3	Outcome categories of country positions "against", "in favor" and "neutral"	Position taken on LULUCF	art4_a (Art.3.4 against) art4_n (Art.3.4 neutral) artcdm_a (CDM against) artcdm_n (CDM neutral)	See above
4	Average number of delegates (COP 3 to COP 7)	Active participation in the negotiation process	delegates	Michaelowa and Lehmkuhl (2004)

A *fourth hypothesis* stipulates that the delegation size influences the number of submissions a country contributed in the process. Since LULUCF is a highly technical issue, it can be expected that for participating in the submission process a country needs to possess the human resources and the technical know how on the issue. With smaller delegations, it is increasingly hard for delegates to follow and participate in the discussions on all the issues under negotiation.
The dependent variable is the number of submissions on LULUCF until COP 7. The independent variables included in the model (Table 2) are the average delegation size as well the dummy variables on the positions "against" and "neutral" on additional sinks in Article 3.4 and the CDM, with the category "in favor" serving as the reference category. [23] The positions on Article 3.3 were not considered here, as we have learned from the analysis above that only after COP 3 Parties had a well founded position on the sinks issue. Since the number of submissions is a count variable, a model for count outcomes has to be applied. Models for count outcomes are the Poisson regression model, the negative binomial regression model and the zero-inflated count models.[24] The best fitting model to the distribution of the observed

[23] The categorical variables representing the country positions with the outcome categories standing for each position taken on sinks is included here as a set of dummies. For a variable with J categories, only J-1 dummy variables have to be included to prevent perfect collinearity. The excluded category is the reference category.
[24] Count models are specifically designed for outcome variables indicating how many times something happened. They are based on the Poisson distribution ($\Pr(y|\mu) = \frac{e^{-\mu}\mu^{y}}{y!}$, for y= 0, 1, 2,…)

number of submissions is the zero-inflated Poisson model, which will be applied in the following. For details on the model selection, see Appendix B. In the following, the results of the two models are presented.

5. Results

5.1. Factors influencing negotiating positions

5.1.1. LULUCF in Article 3

After running the multinomial logit model for negotiating positions on Article 3.3 and Article 3.4, a set of variables can be identified as having a significant relation to the respective negotiating positions at the 5% level.[25] Tables 3 and 4 show the Likelihood-ratio tests (LR test) for the positions on Article 3.3 and 3.4.[26] In both cases, a significant influence can be identified for the number of "Fossil-of-the-Day Awards", the reduction in distance to target due to the introduction of sinks in Article 3 (gain_sinks) as well as the stringency of the Kyoto target (gap_nosink). For Article 3.4, additionally, being a member of G77 has a significant effect.

Table 3: Likelihood-ratio test for independent variables explaining positions on sinks in Art. 3.3 and 3.4

Ho: All coefficients associated with given variable(s) are 0.

a) Art.3.3	chi2	df	P>chi2
fossil	44.353	2	0.000
gap_nosink	14.670	2	0.001
gain_sinks	9.333	2	0.009

b) Art.3.4	chi2	df	P>chi2
fossil	43.102	2	0.000
gap_nosink	10.731	2	0.005
gain_sinks	7.633	2	0.022
g77	41.423	2	0.000

---

putting into relation the expected number of times an event occurred (μ) with the number of times an event did occur (y) given a certain value of the independent variable x.

$$\mu_i = E(y_i | x_i) = \exp(x_i ß)$$

While the negative binomial improves accounts for the failure of the Poisson model to deal with over dispersion (greater variance than mean), the zero-inflated (zero-inflated Poisson, ZIP and zero-inflated negative binomial, ZINB) count models change the mean structure to allow zeros to be generated by two separate processes, thus increasing the probabilities of a zero-count. They exclude those zeros from the calculation which are considered not to be able to get a non-zero outcome due to structural reasons, e.g. in this case, those who will not participate in the submission process at all, independent of delegation size and negotiating positions. The ZIP model used in the following, calculates the probability for each count among those not always zero as:

$$\Pr(y_i \Big| x_{i,} A_i = 0) = \frac{e^{-\mu_i} \mu_i^{y_i}}{y_i!}$$

For further details on count models see e.g. Long (1997) as well as Long and Freese (2001).

[25] For the output of the regression analysis on Article 3, see part a) and b) of Appendix A.

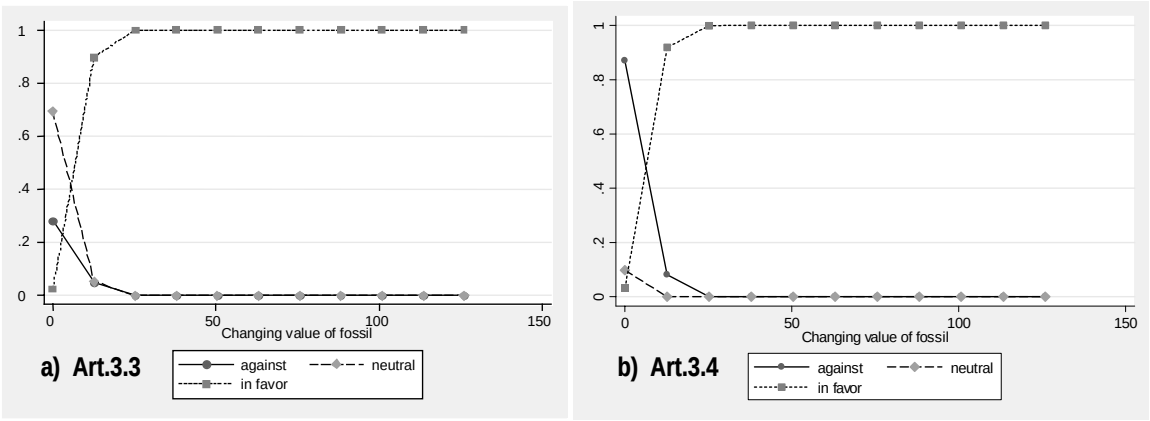
[26] The likelihood-ratio test which compares the likelihood-ratio statistics of the restricted model with the one of the full model [G^2=-2 ($L^2_r - L^2_f$)] is used for obtaining significance levels of individual variables. In the following, we are referring to significant variables as those significant at the 5% level.

Regarding our first hypothesis, no significant relation between the variables representing the importance of the forest sector and the negotiating position can be identified. This suggests that the negotiating positions of Parties on Article 3 have not been influenced by a forest lobby, which does not mean that there might be other domestic influences belonging to other sectors of the economy.

The significant variables are all relating to the second hypothesis. Graphical summaries provide the best tool for identifying basic patterns of (nonlinear) influence of these variables on the negotiating positions. The following graphs represent the effect of a change in the independent variables on the predicted probabilities of belonging to each group – measured on a scale from 0 to 1.

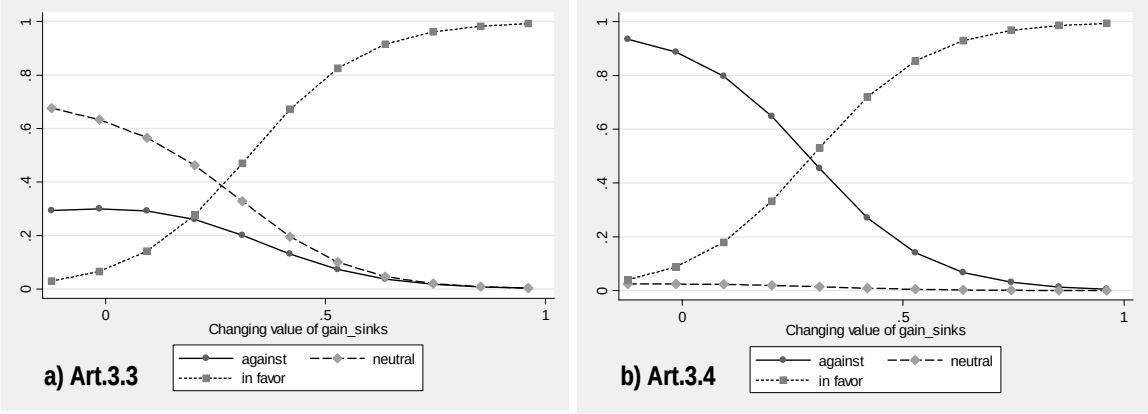
The results illustrated in Figure 4, support our hypothesis that both for Article 3.3 and Article 3.4 countries holding a higher number of "Fossil-of-the-Day Awards" tend to belong to those countries being in favor of including sinks in Article 3. The countries which have never been granted any award are most probable of either having stayed neutral (Article 3.3 at COP3) or having fought against the inclusion of LULUCF (Article 3.4 in the post-Kyoto phase). Therefore, the countries pushing for the inclusion of sinks in the calculation of reduction targets seem to have been especially those countries usually inhibiting progress in the climate change negotiations and vice versa.

Figure 4: Predicted probability of negotiating positions on Art. 3 with varying „Fossil of the Day Awards"



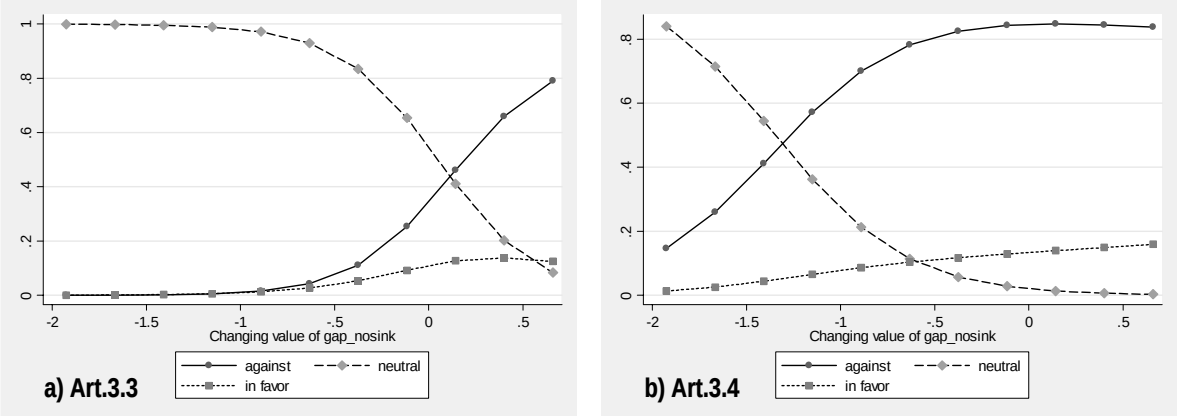
Further support for our second hypothesis is provided by the results represented in Figure 5. These indicate that Parties tended to have a supportive position towards LULUCF under Article 3, the more they could decrease their distance to target due to the inclusion of sinks.

Figure 5: Predicted probability of negotiating positions on Art. 3 with varying gain due to introduction of sinks in Article 3



This hardens the often heard suspicion that sinks – disguised as a technical issue - were used by certain Annex I Parties as a tool to loophole the commitments made under the Kyoto Protocol. Furthermore, Figure 5 provides some interesting insights regarding the influence of information available on the respective negotiation issue. As described above, there was hardly any information on how certain sinks options would change the reduction target of different countries at COP 3. Graph 5 a) suggests that it were mainly the sinks supporters who were aware of their possible benefits due to the introduction of sinks in Article 3, while the probability of the sink opponents is affected less strongly by the gains. On Article 3.4, though, Parties had more time to gather information on the effects of each option on their own target, and therefore their benefits and losses. Figure 5 b) therefore, shows that, in choosing their negotiating positions, Parties based their decision on the degree by which sinks would reduce their Kyoto target, with those countries turning into sinks supporters which became aware that they would benefit from it and vice versa. The neutral positions on additional sink activities seem unaffected by their gains in the reduction target.
But were those Parties speculating to reduce their target by including LULUCF also those Parties with the most stringent reduction targets? Reducing a target which implies almost no real reduction above the business as usual case or even a target granting hot air is different to trying to reduce a target which seems is very strict. Figure 6 plots the probabilities of belonging to each group with varying stringency of target. It is surprising that it seem to be especially those Parties with a relatively strict target (greater than zero) which were opposing sinks, while the probability of belonging to the sink supporters is only increasing slightly with the stringency of the target. The Parties with the greatest amounts of hot air, are most likely to be in the neutral group, while the ones with the most stringent targets have the highest probability of opposing sinks.

Figure 6: Predicted probability of negotiating positions on Art. 3 with varying stringency of target



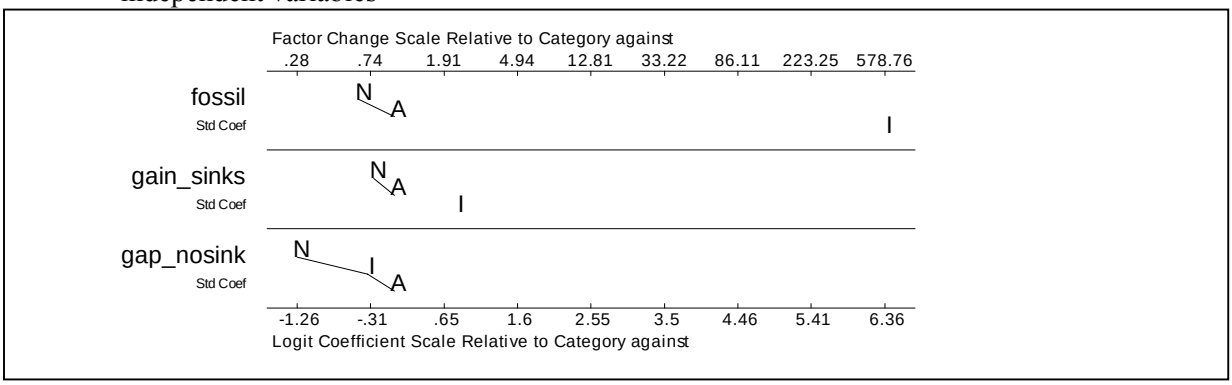
This pattern does not suggest that the main driving force of Parties to include sinks was lying in the fear not to be able to comply with their reduction target.
In order to show the dynamics among negotiating positions, odds ratios can be calculated to illustrate, for example, how a change in expected reduction of distance to target affects the odds of a Party in choosing a pro-sinks relative to a neutral position.[27] To analyze such

[27] An odds ratio is the ratio of the probabilities of outcome m versus outcome n as x_k increases by δ. The odds ratio is defined by:
$\frac{\Omega_{m|n}(X, x_k + \delta)}{\Omega_{m|n}(X, x_k)} = \exp(\beta_{k,m|n}\delta)$, with $\beta_{k,m|n}$ being the the coefficient representing the effect of x_k on the negotiating position m versus n. . For further details, see Long (1997).

questions, I use odds ratio plots as the one represented in Figure 7.[28] The positive sign of, for example, the coefficient $\beta_{I|N}$ is expressed by a letter "I" standing to the right of the letter "A" representing the negotiating positions "In favor" and "Neutral". The magnitude of the effects is expressed by the distance between the letters, with the scales representing the value of $\beta_{k,m|n}s$ at bottom and the $\exp(\beta_{k,m|n})$s at the top.[29] Lines between the letters show insignificant coefficients. With this information, we are now able to identify patterns regarding negotiating positions on sinks in Article 3, starting with the factor changes in the odds of negotiating positions on Article 3.3 shown in Figure 7.

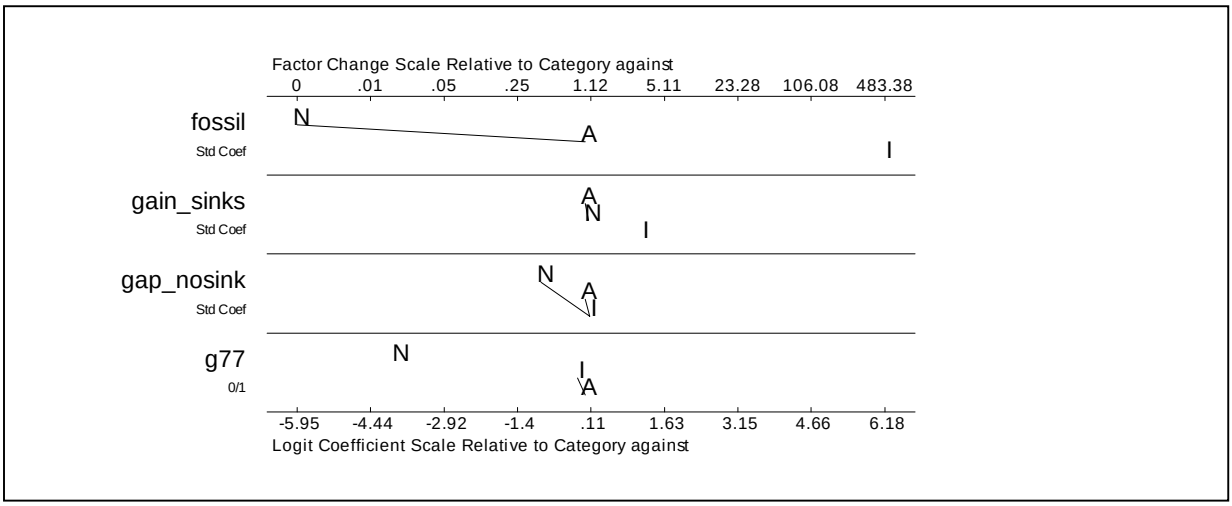
With a standard deviation increase in the number of "Fossil-of-the-Day Awards", the odds of taking a supportive position on sinks in Article 3.3 versus being against (or versus being neutral) increase significantly. The effect of a standard deviation increase in the reduction of the target (gain_sinks) on the odds of being in favor versus being against follow the same pattern as the one just mentioned, but the magnitude of the effect is only about one tenth of it. The effects of both variables on the odds of being neutral versus against are not significant.

Figure 7: Factor changes in the odds of negotiating position on Article 3.3 due to change in independent variables



For positions on Article 3.4, shown in Figure 8, the pattern changes to some extent. With increasing awards, the odds of being against versus taking a neutral positions towards additional sinks activities increases considerably.

Figure 8: Factor changes in the odds of negotiating positions on Article 3.4 due to change in independent variables



[28] These can be generated by STATA and provide a relatively easy way to identify patterns which would otherwise be complicated to extract from a big number of coefficients.

[29] With s being the standard deviation. "Against" is used as base category.

The effect of an increasing stringency of target, decreases the odds of staying neutral relative to taking a position on the issue, but only to a small extent. The same can be said for membership of G77 and China. The most interesting conclusion from the odds ratio plots is that the effect of the number of "Fossil-of-the-Day Award" on the odds of being in favor versus being neutral or against, are dominating in terms of its magnitude, thus suggesting that the main driving force of Parties to push for the inclusion of sinks in the calculation of reduction targets has been a rather negative attitude towards international climate policy. The motivation to reduce the reduction target has also been relevant for the choice in negotiating position, but to a smaller extent. The stringency of the target does not deliver an explanation for why Parties supported sinks, since it seem to have been especially those Parties with a relatively strict target taking an opposing position on sinks in Article 3.
For Article 3.4, being a member of G77 and China increases the odds of taking a position versus staying neutral highly. Thus, regarding additional LULUCF activities G77 and China countries were either belonging to the supporters or the opponents, but showing a greater tendency to belong to the latter. Since the introduction of sinks under Article 3 affects only Annex I Parties directly, the sinks opposing developing nations reminded Annex I Parties of their commitments made at Kyoto, pointing out not to undermine the environmental integrity of the Kyoto Protocol. In the following, we examine the results of the multinomial logit model for the negotiating positions regarding LULUCF in the CDM.

5.1.2. Forestry in the Clean Development Mechanism

While Annex I Parties were the ones most directly affected by the decisions on LULUCF under Article 3, the consequences of a decision on whether to include sinks in the CDM were especially relevant for developing countries. Rather than directly reducing the emission targets of Annex I Parties, sinks in the CDM were to influence the supply of emission certificates on the international market, thus influencing the price of emission reductions. [30] The incentives for Annex I Parties to include sinks are, therefore, linked to the possible reduction in compliance costs due to cheaper prices on the international market. On the other hand, developing countries had to consider their benefits from a CDM including forestry projects as compared to a purely energy based CDM.[31] The variable "reduction in distance to target due to Article 3" does only make sense for LULUCF regarding Article 3, and was therefore not included in the model analyzing positions on LULUCF in the CDM.

Table 4: Likelihood-ratio test for independent variables explaining positions on sinks in the CDM

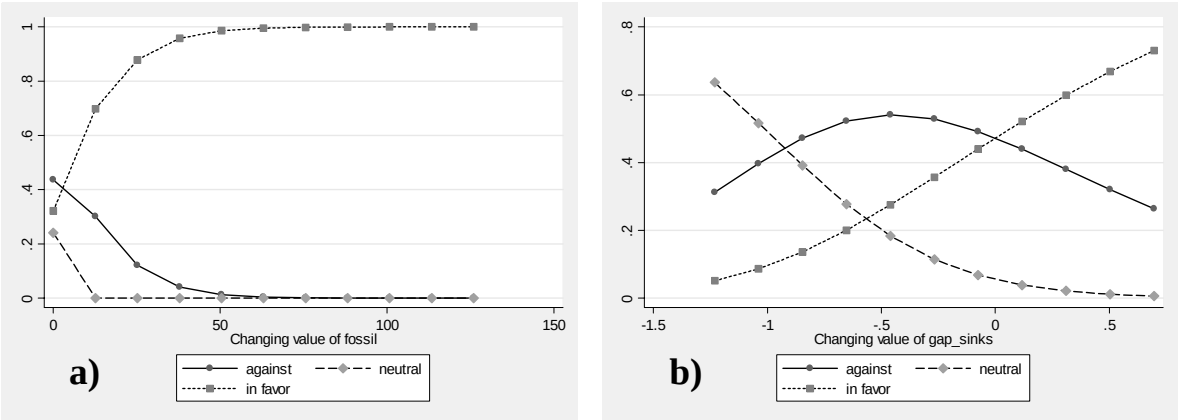
```
 Ho: All coefficients associated with given variable(s) are 0.

     pos3cdm |       chi2   df   P>chi2
-------------+------------------------
      fossil |     23.692    2    0.000
   gap_sinks |     13.064    2    0.003
         g77 |     29.912    2    0.000
--------------------------------------
```

[30] It is, however, rather unlikely that the introduction of forestry projects in the CDM will have a significant effect on the international market price. For an analysis of the effects of COP 9 policy decisions on LULUCF in the CDM on the carbon market, see Jung (2003).
[31] Therefore, it would be promising to include the variable forestry CDM potential at this point. Unfortunately, there is no reliable data available for the all the developing countries included in our analysis. Therefore, we focus only on the interest of Annex I Parties. A comparison of negotiating positions on sinks in the CDM with the benefits and losses encountered by Annex I and Non-Annex I Parties can be found in Jung (2003).

Since during the negotiations on sinks in the CDM, it was clear that sinks under Article 3 would be included, and some rough picture existed on what this would mean for the respective reduction targets, the variable distance to target (gap_sinks) used here accounts for this knowledge by representing the distance to target including the sinks options under Article 3.3 and 3.4. Table 4, summarizing the results of the LR tests, shows the significant variables which will be examined closer below.[32] Regarding the first hypothesis, no influence of the importance of the forest industry, measured as export of forest products in percent of GDP can be found, thus repeating the result obtained for Article 3.

In the following, the results regarding the second hypothesis are described by first looking at the variation of predicted probabilities of belonging to each group with increasing number of "Fossil-of-the- Day Awards". Figure 9 a) shows that – as the results for Article 3 - mostly the countries which have a tendency to inhibit progress in the climate change negotiations, have the highest probability of belonging to the supporters of sinks in the CDM. The only difference to Article 3 is that now even countries without any awards have some probability of supporting sinks. Figure 9 b), representing the effects of the stringency of the reduction target, shows a less clear picture than the one on Article 3. While Parties with a lot of hot air are most probable neutral regarding LULUCF in the CDM, the ones with a relatively stringent target are most likely to be in favor of sinks. The ones with some amount of hot air (up to 1 % of AAU´s) are most likely to be against sinks in the CDM. When neglecting the part of the curve representing Parties with amounts of hot air greater than 0.5% of AAU´s, one can summarize that Parties with a more stringent target have an increasing probability of belonging to the group of the supporters and a decreasing probability of belonging to the opponents of sinks in the CDM. The pattern shown for Parties with hot air greater than 0.5 % of AAU´s cannot be easily explained, and is probably caused by the fact that most of the countries in transition with high amounts of hot air (in percentage of AAU´s) are rather small Parties not taking a position on the issue.

Figure 9: Predicted Probabilities of negotiating positions with varying "Fossil-of-the-Day Awards" and varying stringency of the reduction target

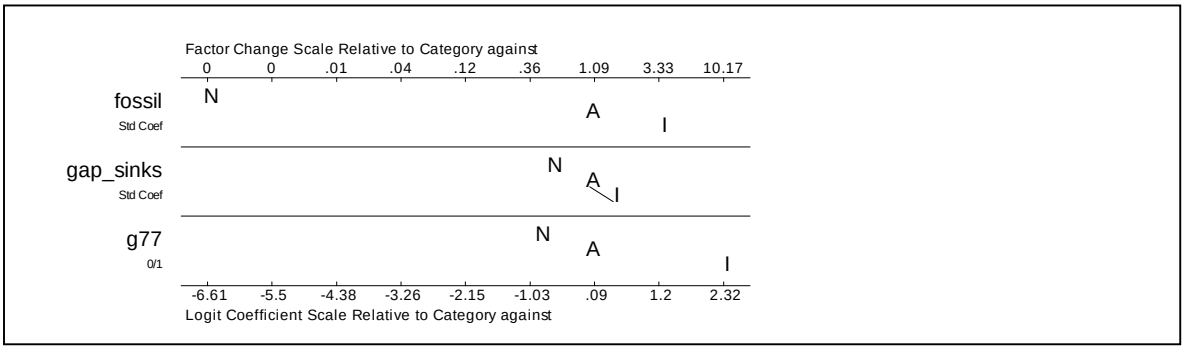


The odds-ratio plots can contribute some additional information regarding the effect of the independent variables. Figure 10 illustrates, that a standard deviation increase in the number of "Fossil-of-the-Day Awards", still increases the odds of being in favor versus being against (or neutral). However, the increase in the odds of being in favor relative to being against is only a fraction of the effects measured for Article 3. Now, the increase in the odds of being against versus being neutral increases significantly with a higher number of awards a country is holding, thus, illustrating that positions on forestry in the CDM are less clearly attributable

[32] For the output of the regression analysis for sinks in the CDM see part c) of Appendix A.

to those Parties normally blocking progress in the negotiations as it is for Article 3.With an increasing stringency of target, the probability of taking a position (no matter of against or in favor) increase slightly compared to the one of staying neutral, with the magnitude of the effect being minor, though.

Figure 10: Factor changes in the odds of each position on sinks in the CDM due to change in the independent variables



The increased support of CDM forestry projects by certain developing nations is illustrated by the relatively strong increase of the odds of being in favor versus staying neutral (or against) caused by the membership in G77/China.
The following paragraph examines our third and fourth hypothesis, thus analyzing participation of Parties in the submission process on LULUCF.

5.2. Participation in the submission process

As mentioned above, a zero-inflated count model will be used to examine which factors influenced the number of submissions on LULUCF a Party provided in the negotiation process. Before interpreting the results of the model, I will shortly explain the two different groups of results which are created by the zero-inflated models. Zero-inflated models assume that there are two latent groups, the "Not Always Zero" and the "Always-Zero" group. A country belonging to the first group has a positive probability of a nonzero count, while the ones of the latter group will always have zero counts due to structural reasons. A country in the "Always Zero group" for submissions in the climate negotiations can be thought of as a country which generally do not participate in the submission process, independently of their position and delegation size. The "Non Always Zero" group comprises those Parties which did not provide a submission to the LULUCF process, but generally belong to the Parties willing to provide submissions. With this idea in mind, it is now possible to come to the interpretation of the results of the regression analysis, represented in Table 5.
For those Parties being able or willing to participate in the submission process at all, taking an opposing and neutral position (relative to a supporting position) on additional sink activities under Article 3.4 (art4_a, art4_n) as well as being against forestry projects in the CDM (artcdm_a) relative to supporting them, has a significant influence on the number of submission on LULUCF a Party provided in the negotiation process until COP 7. Furthermore, the delegation size affects how active a country participated in the submission process. Being against additional sinks activities decreases the number of submissions by 35% as compared to those being in favor. For the Parties having stayed neutral, this decrease even amounts to 86%. Consequently, the Parties favoring the inclusion of additional sink activities have also been the most active ones in the submission process, a result supporting the third hypothesis. For the positions on forestry in the CDM, the opposite seemed to have been the case. Having taken a position against sinks in the CDM increases the number of submissions

by 45% as compared to the sink supporters. The latter might be due to the sink opponents trying to inhibit a broad introduction of forestry in the CDM on a technical level.

Table 5: Results of the ZIP model: factor changes in the expected counts

```
Count Equation: Percentage Change in Expected Count for Those Not Always 0
------------------------------------------------------------------------
  submission |      b         z     P>|z|      %      %StdX      SDofX
-------------+----------------------------------------------------------
      art4_a |  -0.43103   -2.705   0.007    -35.0    -17.4     0.4427
      art4_n |  -1.97339   -4.600   0.000    -86.1    -51.3     0.3645
    artcdm_a |   0.36930    2.955   0.003     44.7     19.5     0.4819
    artcdm_n |  -0.92443   -0.672   0.502    -60.3    -31.5     0.4091
   delegates |   0.01690    4.323   0.000      1.7     19.2    10.3794
------------------------------------------------------------------------
Binary Equation: Factor Change in Odds of Always 0
------------------------------------------------------------------------
     Always0 |      b         z     P>|z|      %      %StdX      SDofX
-------------+----------------------------------------------------------
      art4_a |  -0.40951   -0.395   0.693    -33.6    -16.6     0.4427
      art4_n | -16.37148   -0.019   0.985   -100.0    -99.7     0.3645
    artcdm_a |  -4.13318   -3.036   0.002    -98.4    -86.4     0.4819
    artcdm_n |  14.45751    0.017   0.986  1.9e+08  36961.7     0.4091
   delegates |  -0.14649   -1.474   0.140    -13.6    -78.1    10.3794
------------------------------------------------------------------------
  Vuong Test =  5.44 (p=0.000) favoring ZIP over PRM.
------------------------------------------------------------------------
    b = raw coefficient
    z = z-score for test of b=0
    P>|z| = p-value for z-test
    % = percent change in odds for unit increase in X
    %StdX = percent change in odds for SD increase in X
    SDofX = standard deviation of x
```

Among the Parties generally being able to participate in the submission process, for every additional delegates, the number of submissions of a Party increases by 1.7 %. Therefore, the hypothesis relating to the influence of delegation size on the number of submissions is supported. However, the delegation size seems to play a rather small role for the participation of Parties in the submission process on LULUCF. The latter finding, which is rather surprising, shows that if a Party feels that an issue is important, it is able to contribute to the negotiations, even if its delegation size is relatively small.[33]

Among those generally not submitting text proposals to the UNFCCC process (Always Zero group), the only significant influence is exerted by the variable being "against" (as compared to being "in favor") of sinks in the CDM. Consequently, opposing sinks in the CDM decreases the odds of belonging to the group normally not participating in the submission process by 98% relative to the sink supporters.

6. Summary and conclusion

The negotiation on sinks in the Kyoto Protocol has been one of the most complicated and contentious issues in the history of climate change negotiations. Since most Parties were lacking knowledge on the issue when coming to COP 3 in Kyoto, a basis on which to take decisions regarding LULUCF were missing. Most of the Parties which had taken a strong position at Kyoto in 1997 remained with it in the negotiation on additional sinks activities

[33] Small countries join to negotiation coalitions like the one of AOSIS to take advantage of economies of scale. Some submissions in our data set are not individual submissions by one country, but proposals elaborated by a whole negotiation group.

afterwards, while the majority of developing countries, mostly unaware about the issue when coming to Kyoto, had moved to the group opposing additional sink activities afterwards. Regarding sinks in the CDM, however, the Annex I sink supporters were joined by a relatively big coalition of developing countries interested in attracting CDM forestry projects.
A multinomial logit regression is conducted to test two hypothesis regarding factors influencing Parties´ negotiation position on LULUCF. The results do not support that the importance of the forestry sector of a country has a significant influence on the countries´ negotiating position on LULUCF. They, however, suggest that the LULUCF issue was used by those Parties with a rather negative attitude towards international climate policy to reduce their Kyoto reduction targets. The countries holding a higher number of "Fossil-of-the-Day Awards", which is supposed to represent the general attitude towards international climate policy, have a strongly increasing probability to have supported the inclusion of sinks in the climate regime. In choosing their negotiating position regarding sinks in Article 3, Annex I Parties seem to have been motivated by the amount they were able to reduce their reduction target due to sinks. Interestingly, though, it have been rather those countries with stricter targets which have the highest probability of opposing sinks in Article 3, while the probability of belonging to the sinks supporters is only slightly increasing with the stringency of the target. The general attitude towards climate policy seems to have been a major driving force for the Parties pushing for sinks, while the rationale to reduce the reduction target played an important, but smaller role in determining the pro-sink positions. Regarding the inclusion of forestry projects in the CDM, Parties were increasingly "in favor" and decreasingly "against" with a growing distance to target. However, for the issue of forestry in the CDM, the influence of the general attitude towards international climate policy is unclear, since an increase in this variable leads to an increase in the odds of supporting as well as opposing sinks. An important variable able to contribute more to the explanation of the main reasons for positions on sinks in the CDM might be the benefits or losses encountered by Parties due to the introduction of forestry in the CDM. Since no data on CDM potentials is available for all the Parties included in our analysis, this paper is not able to answer how much this factor contributed to the choice of negotiating position on the issue.
A second part of the paper, analyzes two hypothesis relating to the participation of Parties in the submission process by applying a zero-inflated Poisson model. For those Parties having taken a pro-sink position on Article 3.4, results suggest that sinks supporters have been more actively participating in the submission process, while the exact opposite seems to be the case for the Parties being "in favor" of forestry projects in the CDM. The countries opposing sinks in the CDM obviously tried to inhibit a broad inclusion of sinks by influencing the negotiation outcome on a technical level.
The last hypothesis stipulating that Parties with bigger delegations tend to provide a higher number of submissions is supported by the results of the zero-inflated Poisson model, although the influence of the delegation size on the number of submissions is found to be rather modest. Thus, active participation seems to be less a question of negotiation resources but rather of how much a Party is interested in an issue.
Although, all the Parties have one vote in the climate change negotiations, in reality negotiation power is distributed quite unequally. Since the LULUCF issue touches the basic structure of the climate change regime, namely the size of reduction commitments (Article 3) and the compliance costs (CDM), our analysis of LULUCF positions can be seen as a representative picture of the constellation of countries in the regime. It raises the question of how far climate policy at the international level will be able to go ahead if this constellation of interest remains.
Regarding the future development of the regime, it can be suspected that a coalition of Parties similar to the ones supporting LULUCF will try to introduce further sequestration options, including ocean and geological sequestration. If the negotiations on targets for a second

commitment period will start in 2005 as foreseen, then Parties should have learned their lessons from the negotiation on LULUCF. These lessons include the knowledge that agreeing on targets before the detailed rules are fixed will lead to a renegotiation of targets on the basis of bending the rules at later stages. Furthermore, all Parties should be well prepared on important issues to avoid having to take decisions without sufficient information, as happened at COP 3 in Kyoto, so that they will be able to negotiate on more equal grounds. If some Parties are given a first mover advantage, the others will not be able to react until they can gather some knowledge on the issue by themselves. While LULUCF has been said to have functioned as the "valve" of the system which kept certain countries on board, future constructions of the climate regime – whatever it may look like – should build the valve in such a way that the amount of air able to escape will be limited enough to guarantee the environmental integrity of the regime.

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Appendix A: Outputs of the multinomial logistic regression

a) LULUCF in Article 3.3.

```
mlogit pos3_3 fossil gain_sinks gap_nosink, nolog

Multinomial logistic regression                 Number of obs   =        166
                                                LR chi2(6)      =      76.15
                                                Prob > chi2     =     0.0000
Log likelihood = -113.56242                     Pseudo R2       =     0.2511

------------------------------------------------------------------------------
      pos3_3 |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
against      |
      fossil |   .0329181    .128491     0.26   0.798    -.2189196    .2847557
  gain_sinks |   1.731744   2.955764     0.59   0.558    -4.061447    7.524935
  gap_nosink |   3.908627   1.548864     2.52   0.012     .8729092    6.944346
       _cons |  -.6868255   .1931756    -3.56   0.000    -1.065443   -.3082083
-------------+----------------------------------------------------------------
infavor      |
      fossil |   .5004913   .1383879     3.62   0.000      .229256    .7717266
  gain_sinks |   7.017412   2.485572     2.82   0.005     2.145781    11.88904
  gap_nosink |   2.845325   1.950547     1.46   0.145    -.9776761    6.668327
       _cons |  -3.396361   .5679294    -5.98   0.000    -4.509483    -2.28324
------------------------------------------------------------------------------
(Outcome pos3_3==neutral is the comparison group)
```

b) LULUCF in Article 3.4

```
. mlogit pos4_3 fossil gain_sinks gap_nosink g77, nolog

Multinomial logistic regression                 Number of obs   =        166
                                                LR chi2(8)      =     134.46
                                                Prob > chi2     =     0.0000
Log likelihood = -58.530728                     Pseudo R2       =     0.5346

------------------------------------------------------------------------------
      pos4_3 |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
neutral      |
      fossil |  -.4375222   .3678655    -1.19   0.234    -1.158525    .2834809
  gain_sinks |   .4527596   3.307597     0.14   0.891     -6.03001     6.93553
  gap_nosink |  -2.844789   1.136494    -2.50   0.012    -5.072277   -.6173012
         g77 |  -3.899084   .7304488    -5.34   0.000    -5.330737    -2.46743
       _cons |   .3349913   .4212885     0.80   0.427    -.4907189    1.160702
-------------+----------------------------------------------------------------
infavor      |
      fossil |    .454336   .1337445     3.40   0.001     .1922017    .7164703
  gain_sinks |   7.590269   4.010061     1.89   0.058    -.2693056    15.44984
  gap_nosink |   .2779969   2.116523     0.13   0.896    -3.870312    4.426306
         g77 |  -.1593247   1.155538    -0.14   0.890    -2.424137    2.105488
       _cons |  -3.514556   1.167763    -3.01   0.003     -5.80333   -1.225782
------------------------------------------------------------------------------
(Outcome pos4_3==against is the comparison group)
```

c) LULUCF in the CDM

```
mlogit pos3cdm fossil gap_sink g77, nolog

Multinomial logistic regression                 Number of obs   =        166
                                                LR chi2(6)      =      58.79
                                                Prob > chi2     =     0.0000
Log likelihood = -146.44479                     Pseudo R2       =     0.1672

------------------------------------------------------------------------------
     pos3cdm |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
against      |
      fossil |  -.0919479   .0427586    -2.15   0.032    -.1757532   -.0081426
   gap_sinks |  -1.562626   1.410285    -1.11   0.268    -4.326734    1.201483
         g77 |  -2.354354   .6800833    -3.46   0.001    -3.687293   -1.021415
       _cons |   1.946727    .658705     2.96   0.003     .6556894    3.237765
-------------+----------------------------------------------------------------
neutral      |
      fossil |  -.5451994   .2799611    -1.95   0.051    -1.093913    .0035143
   gap_sinks |  -3.778272   1.563696    -2.42   0.016     -6.84306   -.7134837
         g77 |  -3.175203   .7417021    -4.28   0.000    -4.628912   -1.721493
       _cons |   1.968392   .6899926     2.85   0.004     .6160314    3.320753
------------------------------------------------------------------------------
(Outcome pos3cdm==infavor is the comparison group)
```

Appendix B: Selection of count model

In searching for the model best fitting the observed distribution of counts of the dependent variable (number of submissions on LULUCF), following results were obtained:

1. The negative binomial (NBRM) is improving the fit as compared to the Poisson regression (PRM):

a) due to significant likelihood ratio test of alpha

```
Negative binomial regression                      Number of obs   =        166
                                                  LR chi2(5)      =     124.24
                                                  Prob > chi2     =     0.0000
Log likelihood = -268.14357                       Pseudo R2       =     0.1881

------------------------------------------------------------------------------
  submission |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      art4_a |   -.619316   .2665798    -2.32   0.020    -1.141803   -.0968292
      art4_n |  -1.329155   .4806714    -2.77   0.006    -2.271254   -.3870569
    artcdm_a |   1.331145   .1732532     7.68   0.000     .9915746    1.670715
    artcdm_n |  -2.089603   .6238856    -3.35   0.001    -3.312396   -.8668094
   delegates |   .0329865   .0074908     4.40   0.000     .0183048    .0476683
       _cons |    .465179   .2763312     1.68   0.092    -.0764202    1.006778
-------------+----------------------------------------------------------------
    /lnalpha |  -1.012437     .34038                     -1.679569   -.3453042
-------------+----------------------------------------------------------------
       alpha |   .3633326   .1236711                      .1864543    .7080049
------------------------------------------------------------------------------
Likelihood-ratio test of alpha=0:  chibar2(01) =   27.56 Prob>=chibar2 = 0.000
```

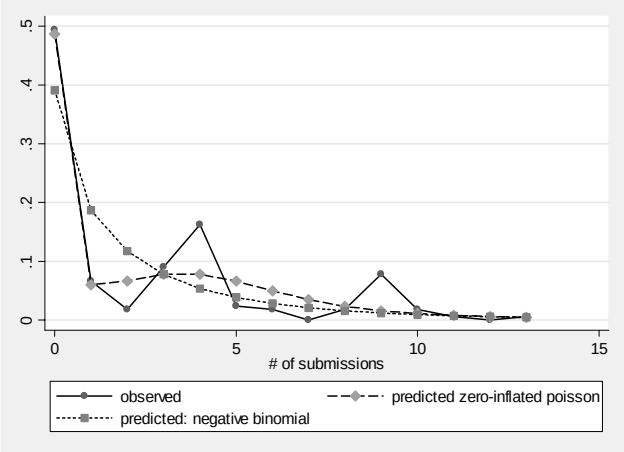
2. The zero-inflated Poisson (ZIP) model is improving the fit over the PRM and the NBRM (improves prediction of zeros and values below 3)

a) Vuong test of non-nested models tests if ZIP model reduced to the PRM (H0 = $\psi_i = 0$), with ψ_i = Probability of being in the Always-zero group

```
Zero-inflated poisson regression                  Number of obs   =        166
                                                  Nonzero obs     =         84
                                                  Zero obs        =         82
Inflation model = logit                           LR chi2(5)      =      86.84
Log likelihood  = -227.3408                       Prob > chi2     =     0.0000
------------------------------------------------------------------------------
  submission |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
submission   |
      art4_a |  -.4310257   .1593487    -2.70   0.007    -.7433435   -.1187079
      art4_n |  -1.973386   .4290423    -4.60   0.000    -2.814294   -1.132479
    artcdm_a |   .3693047   .1249779     2.95   0.003     .1243526    .6142569
    artcdm_n |  -.9244265   1.375518    -0.67   0.502    -3.620392    1.771539
   delegates |   .0169008   .0039091     4.32   0.000     .0092391    .0245624
       _cons |   1.458952   .1826816     7.99   0.000     1.100903    1.817002
-------------+----------------------------------------------------------------
inflate      |
      art4_a |  -.4095072   1.036309    -0.40   0.693    -2.440636    1.621622
      art4_n |  -16.37148   847.3344    -0.02   0.985    -1677.116    1644.373
    artcdm_a |  -4.133179   1.361336    -3.04   0.002    -6.801349    -1.46501
    artcdm_n |   14.45751   847.3263     0.02   0.986    -1646.272    1675.187
   delegates |  -.1464866   .0993528    -1.47   0.140    -.3412144    .0482413
       _cons |   1.850835    1.34625     1.37   0.169    -.7877661    4.489436
------------------------------------------------------------------------------
Vuong test of zip vs. standard Poisson:           z =     5.44  Pr>z = 0.0000
```

b) The improved fit can be easily shown by plotting the predicted versus the observed counts of the respective models

Figure 11: Fit of predicted counts of NBRM and ZIP to observed data



3. The zero-inflated negative binomial (ZINB) is not improving the fit as compared to the ZIP model.
(The likelihood ratio test of α tests whether ZINB reduces to the nested ZIP (or NBRM reduces to the nested PRM) by testing the H_0: α = 0 (no over dispersion), with α = parameter reflecting unobserved heterogeneity among observations.

Likelihood-ratio test comparing ZIP to ZINB: 0.000Prob>=0.449

Consequently, the ZIP model is the best model, and is thus, used for our analysis regarding participation of Parties in the submission process on LULUCF