Overview
The aim of the paper is to review and assess the current state of knowledge relating to the competitive situation in forest sector markets, and how the notion of competition has been implemented in forest sector models. The importance of competitive markets to obtain an efficient market outcome cannot be underestimated, as it is one of the main requirements for a well-functioning economy. However, if forest sector markets are characterized as imperfect, policy intervention might be warranted and special care need to be taken when outlining forest sector models.

The forest sector in many industrialized countries can be characterized by a large amount of individual forest owners supplying the market with different types of feed-stocks (henceforth referred to as producers of wood materials), while the demand side is usually highly concentrated (hereafter referred to as consumers of wood materials). Due to the bulkiness of the feedstock and high transportation costs, there are limited possibilities for producers of wood materials (one of many) to access markets that are far away from their felling area, and thus to affect prices. As a consequence, wood material consumers (one of few) may obtain a better negotiating position, and can take advantage of the market situation. This asymmetry in bargaining power can potentially cause quantities and prices to be set away from the long-run equilibrium levels.

With increasing interest for biomass and the transition towards a bioeconomy, the importance of well-functioning forest sector markets is of great social importance. Contingent on the description of the forest sector it should be evident that forest sector models should take the specific market characteristics in regard when constructing the models. However, this may not always be the case, as is noted in e.g. Hautamäki et al. (2012); Kallio (2001); Ronnila (1995). A problem with assuming perfect competition when noncompetitive elements are influencing the market is that models may provide misleading forecasts regarding the sustainability of a bioeconomy. Based on this description of the forest sector, together with an expected greater dependency on forest materials in the future, a comprehensive review and assessment regarding the competitive situation of the forest sector markets are needed. The specific research questions the paper will answer is:

- Is the forest sector operating under perfect or imperfect wood material markets?
- How do forest sector models handle the notion that wood material markets may not be competitive?

Methods
The paper will entail a literary review performed in two stages. The first stage will be to perform a narrative literary review to examine the competitive situation on the forest sector markets and to analyse and assess the obtained results. The article search was conducted mainly using Scopus and Web of Science. Keywords used were: market power forest, market structure forest, oligopsony forest, forest competition, cointegration forest, to name a few. The second part of the paper will be to explore how the notion on competition and competitive markets has been implemented in forest sector models. This was done by collecting forest sector model studies using the same databases. Only articles written in English have been included and no exclusions due to geographical scope has been done. However, a majority of the articles included are focusing on the forest sector in the Nordic countries, North America and/or Europe.

Results
There are many different approaches to evaluate the competitive situation on the forest sector market. Unfortunately, there is no definitive answer regarding the competitive situation on the forest sector in general as some studies have found imperfect markets outcomes (e.g. Bergman and Brännlund (1995); Braier et al. (1997); Brännlund (1988); Murray (1995)), while others have argued that wood material markets are competitive (e.g. Bergman (1993); Bergman and Nilsson (1999); Bernstein(1992)).

It appears to be the case that wood material markets are too complex to be adequately described by traditional economic theory. That is, even though the characteristics and the theoretical description of the market suggests possibilities of imperfect outcomes, the simultaneous and continuous decisions made by the market actors may reduce the effects for noncompetitive behavior. However, this finding also highlights the need for detailed analysis of the spatial issues, rather than examining aggregated market sectors. Forest sector models, on the other hand, are for the most part assuming integrated markets and perfect competition rather than exploring the
question in detail. A possible explanation for this approach is to avoid adding levels of complexity to models and there construction.

Conclusions
Traditionally, it has been argued that pulpwood markets are operating under monopsony/oligopsony, while sawtimber markets are operating close to perfect competition. However, an alternative explanation is that aggregated (i.e. national/continental/international) wood material markets are operating closer to perfect competition than pure monopsony/oligopsony, while disaggregated (i.e. regional/local) markets are subject to noncompetitive behavior as consumers can exert market power and influence local prices. This explanation is more suitable than the traditional assumption as it allows for greater flexibility in modeling and fits empirical evidence. It also highlights the need for detail and sector specific studies examining the competitive situation from a spatial perspective, as the competitive situation may differ between regions rather than between industry sectors.

As the notion of competitive markets has such a pivotal role in economics, and as greater dependency on the forest is expected in the future, the question of whether forest sector markets are competitive should not be left down to model assumptions made by convenience. Rather, the question should be taken into consideration when constructing economic models.

References