NOT FOR CITATION

Paper presented in the BIOECON seminar in Cambridge 29.-30. August 2006

Eero Vatanen & Paula Horne
Finnish Forest Research Institute

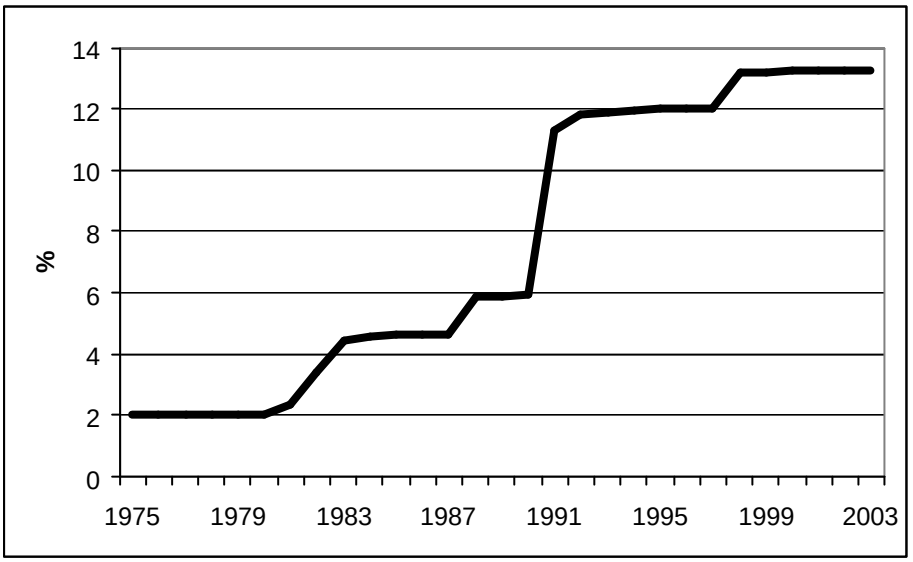
District level analysis of the intensity of forest protection and the impacts of forestry on the value added and unemployment

Abstract
Biodiversity conservation in forests has been claimed to have had an negative impact on the regional development as it decreases logging opportunities, and thereby forestry revenue and employment. Conservation in Finland is geographically very unevenly distributed so that over three quarters of protected forest land is situated in Northern Finland. The purpose of this study is to analyse whether the districts with larger percentage of nature conservation areas have performed worse than others in terms of the development of forestry value added and employment over the study period 1975 - 2003. We used the shift and share analysis to differentiate the special features at district level from the national or structural trends of the economy. We clustered districts in quartiles according to their conservation percentage. The results show that even though forestry employment has decreased nationally due to mechanisation, the decrease has been largest in districts with highest conservation percentage. However, due to the bleak economic development of those districts the relative importance of forestry has increased since the mid 1970's.

1 Introduction

In Finland, about 3,5 million hectares of forests (13 % of total forestry area) is under nature protection or in restricted use. Forests have been protected with different policy instruments since the early 1900. Nature protection started in a larger scale in the 1960's. In this study we examine forest conservation over the time span between 1975 and 2003. In 1975 about 2 percent of forestry land had been protected while now over 13 percent is under conservation (figure 1).

Figure 1 Percentage of forest conservation in Finland between 1975 - 2003



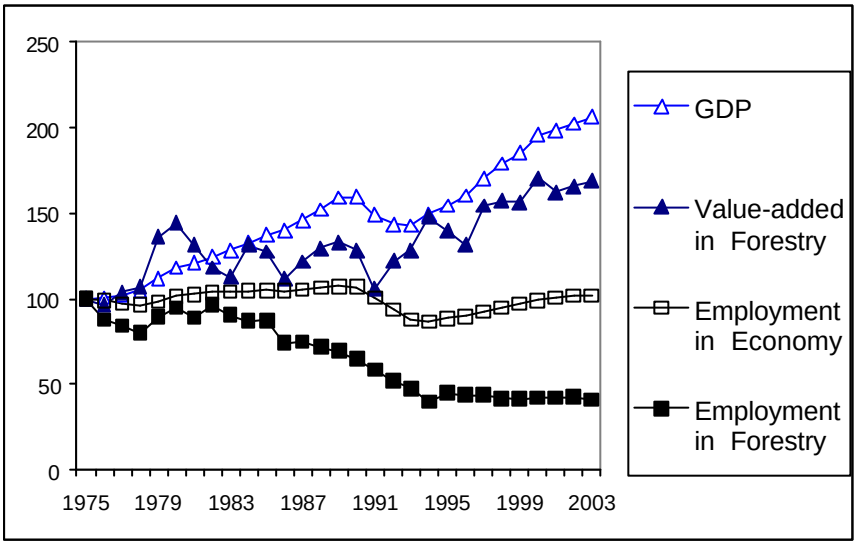
Nature conservation is now one of the major land uses and the increasing land area under conservation has risen political and economical conflicts in national and in regional scale. It has been claimed that nature conservation has an negative impact on the regional development as it decreases logging opportunities, and thereby forestry revenue and employment. Also the decreased logging opportunities have been assumed to diminish timber supply to forest industry at least in a regional scale. However, with the Rio Convention and the EU claim to halt decrease of biodiversity by 2010, there is a growing need to increase forest conservation areas, as forest is the primary habitat for 37.5% of threatened species and for 46% one of the habitats they inhabit. In Finland herb-rich forests are uncommon and most of them (93%) are situated in the southern part of the country. They are important habitats for many of the endangered species: herb-rich forests are primary habitat for over 50% of endangered forest species in Finland (Rassi ym. 2000).

Conservation in Finland is geographically very unevenly distributed so that over three quarters of protected forest land is situated in Northern Finland. In the North 17 percent of the forests are protected whereas in southern Finland the percentage is only 1.8 (Metsien suojelun tarve … 2000). The biggest needs for improvement of the conservation network are in Southern and Central Finland, and in the hemi- and

southboreal as well as the western parts of the midboreal regions the proportion of protected forests is especially low (Virkkala et al. 2000).

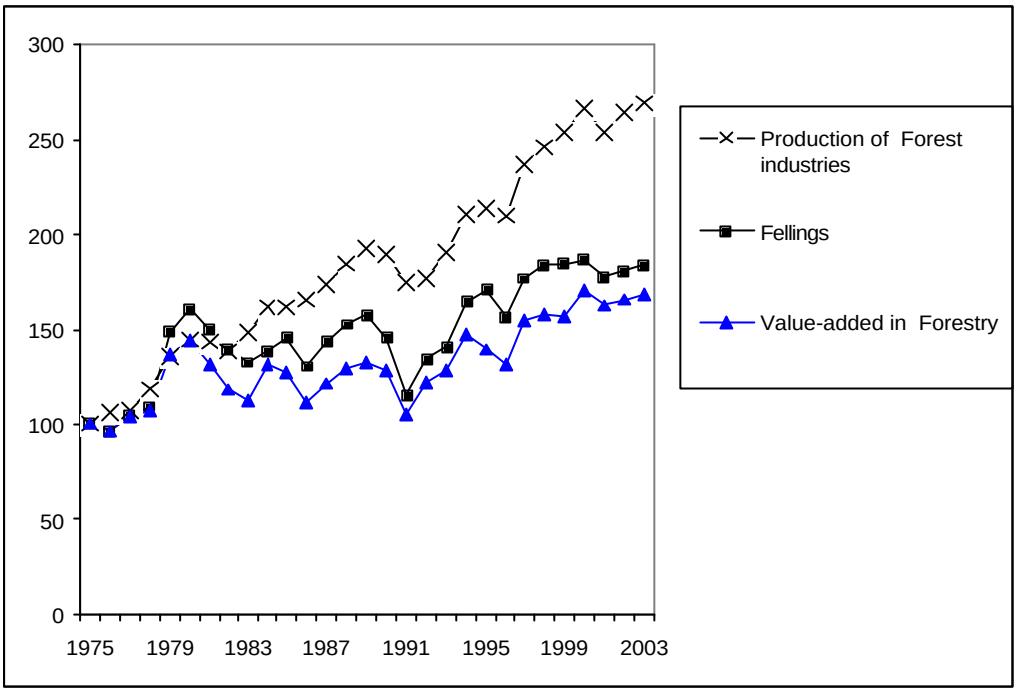
The relative economic importance of forestry to Finland's national economy has declined during the past few decades. The real value added of forestry nationwide has increased by 69 % and employment in forestry has decreased by 59 % over the period of 1975-2003. However, the real GDP nationwide has increased by 106 % and overall employment has increased by 1,5 % over the same period. The annual development of indexed value added and employment are presented in figure 2.

Figure 2 Change of value added and of employment in forestry and in the national economy over 1975-2003.



The development trend of value added in forestry follows those of marketed cuttings and the development of forest industry (figure 3).

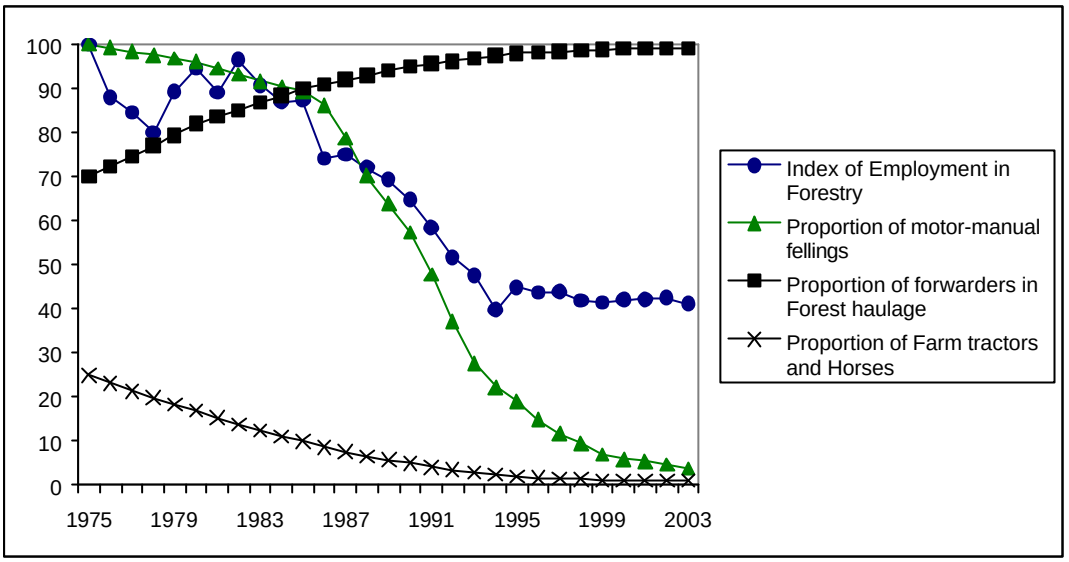
Figure 3 Real indexed development of production in forest industry, of value added in forestry and of the volume of fellings.



The dependence of the development of forestry value added and cuttings is self evident as the value added consists of the revenue from forestry income. The slight difference in the development of cuttings and forestry value added since the early 1980's is due to the decreased income from forestry employment. The gap between the development trend of forestry industry and cuttings is due to the increased timber imports and a higher production level of coated papers.

The main reason for decreased employment in forestry in nationwide over our study period is the mechanisation of harvesting process. By 1975 the short distance hauling was already nearly totally mechanised (Metsäteho 2006). A foresters with chain saws were replaced by harvesters in 1980's and 1990's (Figure 4).

Figure 4 Time series of the development of employment in forestry.



The impact of forest conservation is part of the development in forestry value added and employment. In national scale the negative impact has been partly overcome by imported timber. Also the amount of national market cuttings has increased even though the percentage of protected areas has nearly seven-folded. The impact of conservation on forest employment is probably small in the national scale. Also in the regional scale its relative impacts as compared to that of mechanisation of harvesting is small.

The purpose of this study is to analyse whether the districts with larger percentage of nature conservation areas have performed worse than others in terms of the development of forestry value added and employment over the study period 1975 - 2003.

2 Data and method

2.1 Data

The data on nature conservation areas by districts over the years from 1975 to 2003 were collected for this study. The data includes nearly all areas of different conservation status. The valued added and employment by districts and over the years was collected from the Finnish National Statistics time series data where the smallest unit is a district.

2.2 Method

Our purpose was to analyse whether nature conservation has had an impact on regional forestry value added and employment apart from the other factors in play. We tackled the task by first differentiating the local development of value added and employment from the structural and national trends. This method of decomponation is known as the shift and share analysis. The analysis was developed first by Dunn (1960)

and further developed by Fuchs (1962) and Ashby (1964). The analysis has been used since the 1960's in studies of regional differences, especially in changes in employment. The method is used to examine why the trend of a certain variable in the region differs from the national trend as explained by the structures in economies and specific regional characteristics. Differences in regional development can be analysed both in absolute and in relative terms. We used trends relative development to analyse:

- the impact of forestry on the development of local economy
- how the local impact has differed from that of the impact of forestry in the national scale
- if the difference in impacts is due to the structural elements of forestry in local and national scale

We can assume that the development of a local economy R and the impact of certain economic sector i on the that development C_{iR} is due to the national trends in that secor C_{iN}, differences in the sectoral structure of local and national economies S_{ic}, and regional impacts due to differences in the local and national sector R_{ic}.

Thus the impact of forestry on a local economy R can be written as:

$$C_{iR} \ ? \ C_{iN} \ ? \ S_{ic} \ ? \ R_{ic}$$

where C_{iN} is the impact of forestry i on the change in the national economy X^0_n over a certain time period. This can be written as:

$$C_{iN} \ ? \ \frac{x^1_{in} \ ? \ x^0_{in}}{X^0_n}$$

S_{ic} is the impact of the structural component that is written as the difference between forestry's impact on the change in local economy and in national economy.

R_{ic} is the impact of the local component. The local component of forestry is positive if the change in forestry is bigger in the local economy than in the national economy. Thus we can write the relative impact as:

$$C \ ? \ \frac{C_{ir}}{C_{in}}$$

If C ?1, the change in forestry is larger in local economy than in the national economy.

3 Results

We grouped the district in quartiles according to their percentage of forest conservation. Two large cities were excluded from the analysis.

I : districts with more than 4,1 % of forest protected (exc. Helsinki and Oulu)
II : districts with 1,96 - 4,1 % of forest protected
III : districts with 1,09 - 1,96 % of forest protected
IV : districts with less than 1,09 % of forest protected

Districts in group I are located in Northern and Eastern Finland and some to the coastal areas. Group I with largest percentage of forest conservation (about 20 percent of forest area) still covers more than 90 % of all forest conservation area in Finland. Districts with smallest conservation percentage (group IV) are located in the middle part of the country.

Value added and employment has decreased in relative terms in the group I as compared to the other groups. The largest increases their shares have been in the group III (table 1).

Table 1. Share of value added, employment and forest conservation by groups in years 1975 and 2003

	Local economy				Forestry				Share of conservation by groups	
Group	Share of value added %		Share of employment %		Share of value added %		Share of employment %			
Year	**1975**	**2003**	**1975**	**2003**	**1975**	**2003**	**1975**	**2003**	**1975**	**2003**
I	11,1	8,6	12,4	9,9	33,2	27,9	32,7	26,1	97,8	93,5
II	21,7	17,9	23,5	20,3	23,9	25,1	23,7	25,0	2,1	3,5
III	17,3	16,0	19,4	16,8	21,9	24,1	21,3	24,2	0,1	1,6
IV	19,6	19,6	21,0	20,0	19,0	20,1	19,5	21,0	0,0	0,7
Helsinki, Oulu	30,3	37,9	23,7	32,9	2,0	2,8	1,9	2,6	0,0	0,7
Whole country	100	100	100	100	100	100	100	100	100,0	100,0

The relative economic importance of forestry has increased the most in the group I (table 2, C_{iR} %). However, the regional component (R_{ic} 5) is negative for the group which means that in group I the value added of forestry has increased less than in the national economy in general. This indicates that the large increase in the conservation area has had a negative impact on the local development in the districts belonging to the group I.

Table 2. Impact of changes in forestry value added on the change of value added by groups

Shift and Share				Impact of forest conservation on the forest land area in commercial use
	? C_{iR} %[2]	C_{iR} %[3]	R_{ic} %[4]	
I	60,1	3,3	-2,1	-19,2
II	69,6	2,2	0,2	-2,8
III	90,9	2,9	0,6	-1,5
IV	107,3	2,0	0,2	-0,7
Helsinki, Oulu	158,2	0,2	0,1	-5,2
Whole country	106,5	1,8	0,0	-11,5

The overall employment has increased only in Helsinki and Oulu districts. Group IV with least conservation areas has had a smaller decrease in employment than the other groups. The impact of forestry on the development of employment has been negative in all groups with the largest impact in the group I. The regional component for employment is negative only for group I.

Table 3. Impact of changes in forestry employment on the change of employment by groups

Shift and Share			
	? C_{iR} %	C_{iR} %	R_{ic} %
I	-19,2	-3,7	-0,5
II	-12,1	-1,2	0,0
III	-12,0	-1,2	0,1
IV	-3,0	-1,1	0,1
Helsinki, Oulu	40,9	-0,1	0,0
Whole country	1,5	-1,2	----

5 Discussion

The results of the shift and share analysis indicate that the districts with largest proportion of forest conservation have had the most dire development of regional economy and employment in forestry. However, more analysis is needed to examine the role of forest conservation in the development of value added and employment in economic sectors that benefit from forest conservation, for example accommodation and tourism.