New near-urban forests
The rich are getting richer – but what’s in it for me?

Signe Anthon
Bo Jellesmark Thorsen

Introduction

In the following we will go through

- Basic idea
- The hedonic pricing study
- The Danish tax system
- Financing of new forest projects
Introduction

- Basic idea:
  - To use a hedonic pricing study of a public afforestation project to analyse the distributional effects and financing possibilities caused by the taxation of properties and income

- Case study: Two public afforestation projects
  - True Forest
  - Bakkely Forest

The hedonic pricing study

- Data
  - Houses sales 1987-2001
  - House and neighbourhood characteristics
  - Distance to the new forest

- Analysis
  - Fitting
  - Chow tests for stability
  - Logarithmic transformation of some variables
  - Test for correlation and multicollinearity
  - Outlier tests
The hedonic pricing study - results

Figure 2. The estimated increase in house prices close by the two afforestation projects as a function of distance to the area

A windfall gain to house owners:

- Establishing the forest cause an increase in the market value of nearby houses

- All of the houseowners benefit from this, even if they do not themselves consider the forest a benefit

<table>
<thead>
<tr>
<th></th>
<th>True Forest</th>
<th>Bakkely Forest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of houses</td>
<td>977</td>
<td>500</td>
</tr>
<tr>
<td>Average house price</td>
<td>157,000 €</td>
<td>129,000 €</td>
</tr>
<tr>
<td>Aggregated price increase (pot.)</td>
<td>4.4 mio. €</td>
<td>1.2 mio €</td>
</tr>
</tbody>
</table>
The Danish tax system

- Annual property tax
  - Tax revenues go to the municipality and the county
  - A known percentage of the public valuation of the house, which must track the market price
  - The percentage varies locally

- Income tax
  - Paid to state, county and municipality
  - In our study, however, only municipal tax revenue is expected to increase as richer people buy up the house near the forest
  - Local data obtained from Danish Statistics

---

Property taxes

- PV of Property Tax Revenue:

\[
R_p = \frac{p \cdot \Delta h}{r \cdot (1+r)^j}
\]

- Assumptions
  - There is a five year, \(j=5\), delay for public valuations to catch up the induced increase \(\Delta h\)
  - Discount rate is \(r=0.03\) and tax rate is \(p\), which depends on the location
Property tax - results

Income taxes

- PV of Income Tax Revenue:

\[ R_t = \gamma \cdot s \cdot Y \cdot \Delta h/h \sum_{t=0}^{\infty} \frac{\min\{1,mt\}}{(1+r)^t} \]

- Assumptions
  - A proportion, \( \gamma \), of the new comers’ moving in at rate \( m \) each period, are from other municipalities
  - A fixed proportion of the income is used for housing expenditure
  - The new house owners use the same proportion of income on housing expenditure and pay the income tax rate
Income tax - results

We find that given the local moving patterns, with varying $\gamma$ and $m$, the NPV of future increased tax revenue for the local municipality is quite substantial.

<table>
<thead>
<tr>
<th></th>
<th>Newcomers</th>
<th>House sales per year</th>
<th>NPV 3% (1000 euro)</th>
</tr>
</thead>
<tbody>
<tr>
<td>True Forest</td>
<td>22 %</td>
<td>3 %</td>
<td>1744</td>
</tr>
<tr>
<td>Bakkely Forest</td>
<td>28 %</td>
<td>4 %</td>
<td>750</td>
</tr>
</tbody>
</table>

Distributional effects

- Who gains and who pays?
  - EU
  - The state and the general public
  - Counties
  - Municipalities
  - Local population
  - Land owners
Financing afforestation

<table>
<thead>
<tr>
<th></th>
<th>True Forest</th>
<th>Bakkely Forest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural land</td>
<td>-1,344</td>
<td>-806</td>
</tr>
<tr>
<td>Establishment</td>
<td>-887</td>
<td>-565</td>
</tr>
<tr>
<td>Forest management</td>
<td>0</td>
<td>27</td>
</tr>
<tr>
<td><strong>Total costs</strong></td>
<td><strong>-2,231</strong></td>
<td><strong>-1,344</strong></td>
</tr>
<tr>
<td>Property tax revenue</td>
<td>2,123</td>
<td>562</td>
</tr>
<tr>
<td>Income tax revenue</td>
<td>1,672</td>
<td>718</td>
</tr>
<tr>
<td><strong>Total tax revenue</strong></td>
<td><strong>3,795</strong></td>
<td><strong>1,280</strong></td>
</tr>
<tr>
<td><strong>Balance</strong></td>
<td><strong>1,564</strong></td>
<td><strong>-64</strong></td>
</tr>
</tbody>
</table>

Conclusion

- In Denmark, with a forest cover of only 10%, city-near afforestation is a benefit for nearby dwellings
- Nearby house-owners obtain a windfall gain from the afforestation
- … but not only they benefit. Through taxation, the local community also benefits substantially.