The impact of risk, time, and social preferences on individual investment decisions in a fishery

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Overview of Norwegian fisheries management

Capacity remains high

Progress in Norwegian fisheries management since the 1970s (Gullestad, 2014)

- Closing the commons
- Removing subsidies
- Allocating fishing rights
- Regulating capacity
Number of fishing vessels and engine power in Norway (1990–2015)

Source: Norwegian Directorate of Fisheries
Management effectiveness of the world’s marine fisheries

Figure 3, Reprinted
Overcapacity raises challenges
to Norwegian and global fisheries

- Causes economic inefficiency
- Incentivizes illegal fishing
- Put fisheries sustainability at risk
- Increases regulating cost

Catch-share managed fisheries perform better (e.g., Costello, 2008), but may not be economically efficient.
Understanding investment drivers

Research question
Examine beyond the traditional investment drivers

• Need to understand what drives investments
• Nøstbakken (2012): economic factors at firm level
• This paper: also examines behavioral and socioeconomic factors at owner level
Experiments and survey

Unique dataset

- 164 vessel owners participated
- Economic experiments with real payoffs to elicit:
  - risk preferences
  - time preferences
  - competition preferences
- Survey
  - investments in quotas and vessels (2008-2013)
  - socioeconomic backgrounds
  - perceptions of future profitability, environment, policy
  - attitudes towards work
  - attitudes towards regulation compliance
  - Attitudes towards competition, income distribution
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Summary statistics
Number of investments made (2008–2013), by individuals

<table>
<thead>
<tr>
<th>N of inv.</th>
<th>Quota</th>
<th>Vessel</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>111</td>
<td>71</td>
</tr>
<tr>
<td>1</td>
<td>33</td>
<td>71</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>164</td>
<td>164</td>
</tr>
</tbody>
</table>

Mean:
- Quota: 0.55
- Vessel: 0.78

Variance:
- Quota: 1.05
- Vessel: 0.87
Results

Quota investments

Estimate Poisson model: factors that drive quota investments

- More likely to increase quota if
  - plan to work longer
  - more intrinsically motivated to work
  - Attitude on competition (incentivize people)
  - Attitude on income distribution (effort needs to be rewarded)

- Less likely to increase quota if
  - concerned about future profit
  - concerned about nature issues (stock, climate)
  - read only Fiskeribiladet (a conservative newspaper pre-2008)
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Vessel investments

Estimate Poisson model: factors that drive vessel investments

- More likely to invest in vessel if
  - plan to work longer
  - care more about own payoffs (individualistic)
  - went to college

- Less likely to increase quota if
  - more risk averse

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Conclusion

Quota and vessel investments are driven by non-traditional investment drivers.

- **Quota**
  - Social preferences
  - Political views (on income distribution, competition, compliance)
  - Motivations to work
  - Perceptions of future (profitability, nature)
  - Media influence

- **Vessel**
  - Risk attitude
  - Individualism

- **(Non-efficiency) Factors that we considered explain more variations in quota investments than in vessel investments**
Future work

Next step

Try estimate zero-inflated poisson model on quota investments
– need to convince Stata
Thank you!
Appendix
## Eliciting risk preferences

<table>
<thead>
<tr>
<th>Row</th>
<th>Lottery A</th>
<th>EV</th>
<th>Lottery B</th>
<th>EV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P(High)=30%</td>
<td></td>
<td>P(High)=10%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>P(Low)=70%</td>
<td></td>
<td>P(Low)=90%</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>High = 83kr</td>
<td>39.6kr</td>
<td>High = 141kr</td>
<td>23.1kr</td>
</tr>
<tr>
<td></td>
<td>Low = 21kr</td>
<td></td>
<td>Low = 10kr</td>
<td></td>
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<td>39.6kr</td>
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<tr>
<td></td>
<td>Low = 21kr</td>
<td></td>
<td>Low = 10kr</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>High = 83kr</td>
<td>39.6kr</td>
<td>High = 172kr</td>
<td>26.2kr</td>
</tr>
<tr>
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<td>7</td>
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<td>39.6kr</td>
<td>High = 311kr</td>
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<td>Low = 21kr</td>
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<tr>
<td>14</td>
<td>High = 83kr</td>
<td>39.6kr</td>
<td>High = 3521</td>
<td>361.1kr</td>
</tr>
<tr>
<td></td>
<td>Low = 21kr</td>
<td></td>
<td>Low = 10kr</td>
<td></td>
</tr>
</tbody>
</table>
### Eliciting time preferences

<table>
<thead>
<tr>
<th></th>
<th><strong>Choice A</strong>  (Today)</th>
<th><strong>Choice B</strong> (8 months later)</th>
<th><strong>Implied r</strong> (annualized)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>700kr</td>
<td>700kr</td>
<td>2.58%</td>
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<td>2</td>
<td>700kr</td>
<td>712kr</td>
<td>5.40%</td>
</tr>
<tr>
<td>3</td>
<td>700kr</td>
<td>725kr</td>
<td>8.00%</td>
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<tr>
<td>4</td>
<td>700kr</td>
<td>737kr</td>
<td>10.68%</td>
</tr>
<tr>
<td>5</td>
<td>700kr</td>
<td>749kr</td>
<td>13.35%</td>
</tr>
<tr>
<td>6</td>
<td>700kr</td>
<td>761kr</td>
<td>16.27%</td>
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<tr>
<td>7</td>
<td>700kr</td>
<td>774kr</td>
<td>18.98%</td>
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<tr>
<td>8</td>
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<td>9</td>
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<td>798kr</td>
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<td>10</td>
<td>700kr</td>
<td>810kr</td>
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</tr>
<tr>
<td>11</td>
<td>700kr</td>
<td>823kr</td>
<td>30.28%</td>
</tr>
<tr>
<td>12</td>
<td>700kr</td>
<td>835kr</td>
<td>35.00%</td>
</tr>
</tbody>
</table>
### Eliciting competition preferences

<table>
<thead>
<tr>
<th>Situations</th>
<th><strong>Choice A</strong></th>
<th><strong>Choice B</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>You</td>
<td>Other</td>
</tr>
<tr>
<td>1</td>
<td>+230</td>
<td>-100</td>
</tr>
<tr>
<td>2</td>
<td>+100</td>
<td>+230</td>
</tr>
<tr>
<td>3</td>
<td>+250</td>
<td>+0</td>
</tr>
<tr>
<td>4</td>
<td>-180</td>
<td>+180</td>
</tr>
<tr>
<td>5</td>
<td>+180</td>
<td>+180</td>
</tr>
<tr>
<td>6</td>
<td>-250</td>
<td>+0</td>
</tr>
<tr>
<td>7</td>
<td>-100</td>
<td>-230</td>
</tr>
<tr>
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<td>+0</td>
<td>+250</td>
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<td>-180</td>
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<tr>
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<td>13</td>
<td>+180</td>
<td>-180</td>
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<td>14</td>
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<td>+100</td>
</tr>
<tr>
<td>15</td>
<td>-100</td>
<td>+230</td>
</tr>
<tr>
<td>16</td>
<td>+0</td>
<td>-250</td>
</tr>
</tbody>
</table>
Views on controversial issues

- Responsibility
  1. People should take more responsibility to fend for themselves
  10. The public should take greater responsibility to ensure everyone has what they need

- Competition
  1. Competition is healthy. It stimulates people to work hard and develop new ideas
  10. Competition is bad

- Income
  1. There should be greater equality between people’s incomes
  10. Personal effort should be awarded higher
Perceptions of future profitability, environment, policy

**Profit**  Crew situation (finding qualified workers)
**Profit**  Costs (salaries of crew, fuel, maintenance, etc.).
**Profit**  Price and market situation of fish
**Nature**  Fish population development
**Nature**  Natural disasters, climate change, etc.
**Policy**  Political uncertainty in relation to fishing licenses
**Policy**  Regulation complexity
**Policy**  Quota policy
**Other**  Generational
What do you think are important about jobs

Rate from 1 (least important) to 5 (most important)

- Good salary
- Good colleagues
- Not much stress
- Safe work place
- Good working hours
- Community
- Long vacation
- Responsibility
- Meeting people
- Being treated equally
- Family friendly
- Opportunity to be initiative
- Feeling of accomplishment
- Interesting
- Meet my own abilities
- Learn new skills
- Being heard in making decisions
Motivations of obeying laws

The following behavior can:

- discard
- under-report
- sell to outside organizations
- illegal gears
- undersized catches
- hire illegal labor
- withhold info
- spread wrong info

never be justified
sometimes be justified
usually be justified
Number of investments by year

![Graph showing the number of investments by year, with two lines: one for the number of vessel investments and another for the number of quota investments. The graph shows a decrease from 2008 to 2009, followed by an increase through 2013.](image-url)
## Regression results on number of investments

<table>
<thead>
<tr>
<th></th>
<th>Total number of inv in quota</th>
<th>Total number of inv in vessel</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Years to retire</strong></td>
<td>0.035***</td>
<td>0.025***</td>
</tr>
<tr>
<td></td>
<td>(0.009)</td>
<td>(0.007)</td>
</tr>
<tr>
<td><strong>Discount rate</strong></td>
<td>-0.760</td>
<td>-0.587</td>
</tr>
<tr>
<td></td>
<td>(1.423)</td>
<td>(0.971)</td>
</tr>
<tr>
<td><strong>Risk aversion</strong></td>
<td>0.127</td>
<td>-0.550**</td>
</tr>
<tr>
<td></td>
<td>(0.370)</td>
<td>(0.279)</td>
</tr>
<tr>
<td><strong>Social type: individualistic</strong></td>
<td>0.212</td>
<td>0.339**</td>
</tr>
<tr>
<td></td>
<td>(0.240)</td>
<td>(0.160)</td>
</tr>
<tr>
<td><strong>Intrinsic motive to work</strong></td>
<td>0.306***</td>
<td>0.045</td>
</tr>
<tr>
<td></td>
<td>(0.091)</td>
<td>(0.047)</td>
</tr>
<tr>
<td><strong>Attitude on competition</strong></td>
<td>0.172**</td>
<td>-0.014</td>
</tr>
<tr>
<td></td>
<td>(0.086)</td>
<td>(0.045)</td>
</tr>
<tr>
<td><strong>Attitude on income</strong></td>
<td>0.101**</td>
<td>0.023</td>
</tr>
<tr>
<td></td>
<td>(0.041)</td>
<td>(0.029)</td>
</tr>
<tr>
<td><strong>Attitude on compliance</strong></td>
<td>-0.291</td>
<td>-0.766</td>
</tr>
<tr>
<td></td>
<td>(0.604)</td>
<td>(0.491)</td>
</tr>
<tr>
<td><strong>Only read Fiskeribladet</strong></td>
<td>-0.561*</td>
<td>-0.146</td>
</tr>
<tr>
<td></td>
<td>(0.311)</td>
<td>(0.196)</td>
</tr>
<tr>
<td><strong>Profit Concern</strong></td>
<td>-1.601**</td>
<td>-0.544</td>
</tr>
<tr>
<td></td>
<td>(0.660)</td>
<td>(0.360)</td>
</tr>
<tr>
<td><strong>Nature Concern</strong></td>
<td>-1.924***</td>
<td>-0.138</td>
</tr>
<tr>
<td></td>
<td>(0.687)</td>
<td>(0.385)</td>
</tr>
<tr>
<td><strong>College</strong></td>
<td>-0.108</td>
<td>0.401***</td>
</tr>
<tr>
<td></td>
<td>(0.246)</td>
<td>(0.151)</td>
</tr>
<tr>
<td><strong>Constant</strong></td>
<td>-4.524***</td>
<td>-0.738</td>
</tr>
<tr>
<td></td>
<td>(1.085)</td>
<td>(0.548)</td>
</tr>
<tr>
<td><strong>Observations</strong></td>
<td>164</td>
<td>164</td>
</tr>
<tr>
<td><strong>Pseudo $R^2$</strong></td>
<td>0.238</td>
<td>0.096</td>
</tr>
</tbody>
</table>