# Revisiting conservation farming : substantial gains and little downside from farming of *Totoaba Macdonaldi*

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# Meet *Totoaba Macdonaldi*

(a) Totoaba and Vaquita

(b) Totoaba swim bladder

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- Fished with gillnets, destroying vaquita population as bycatch ($\approx$ 10 individuals remaining)

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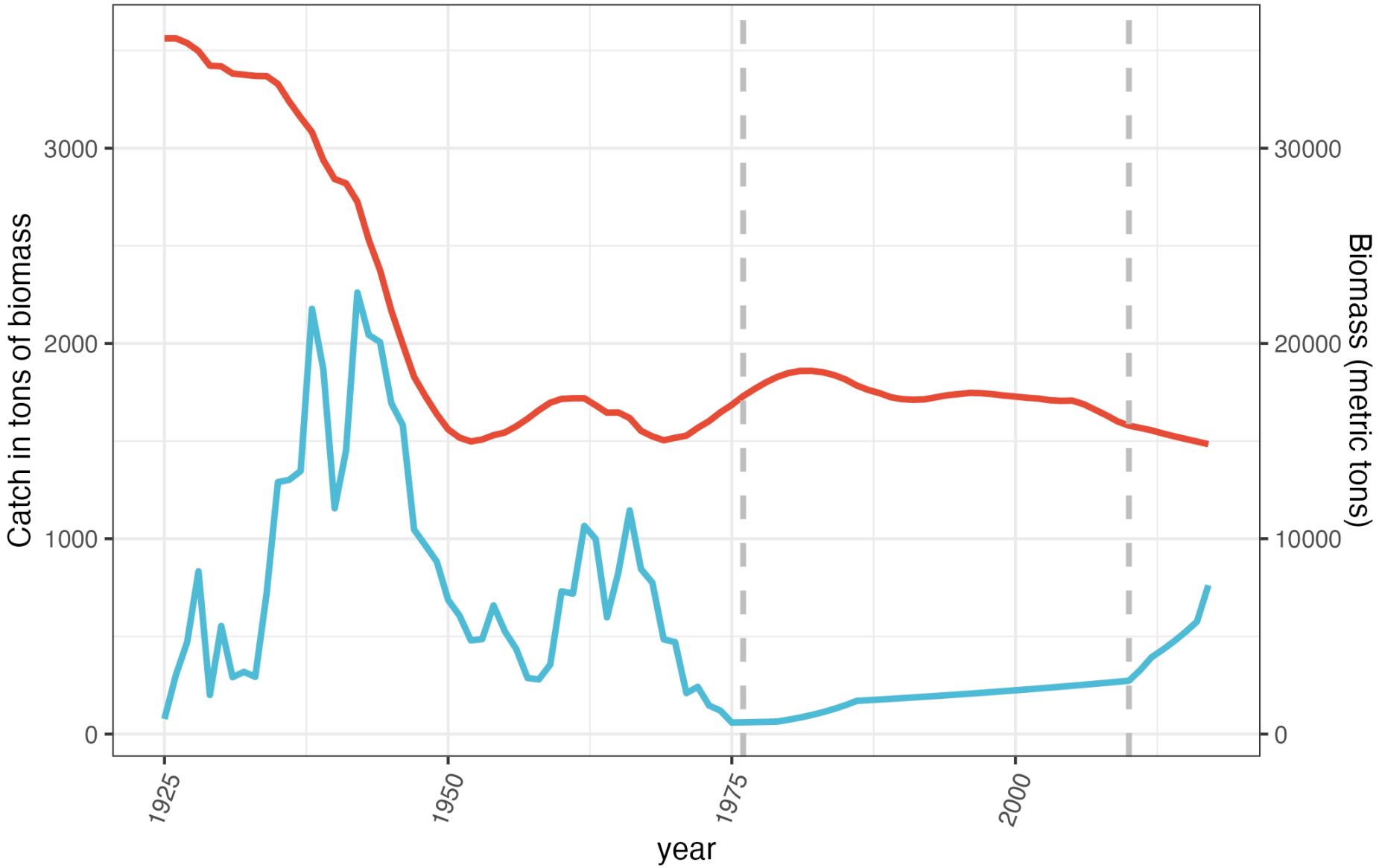
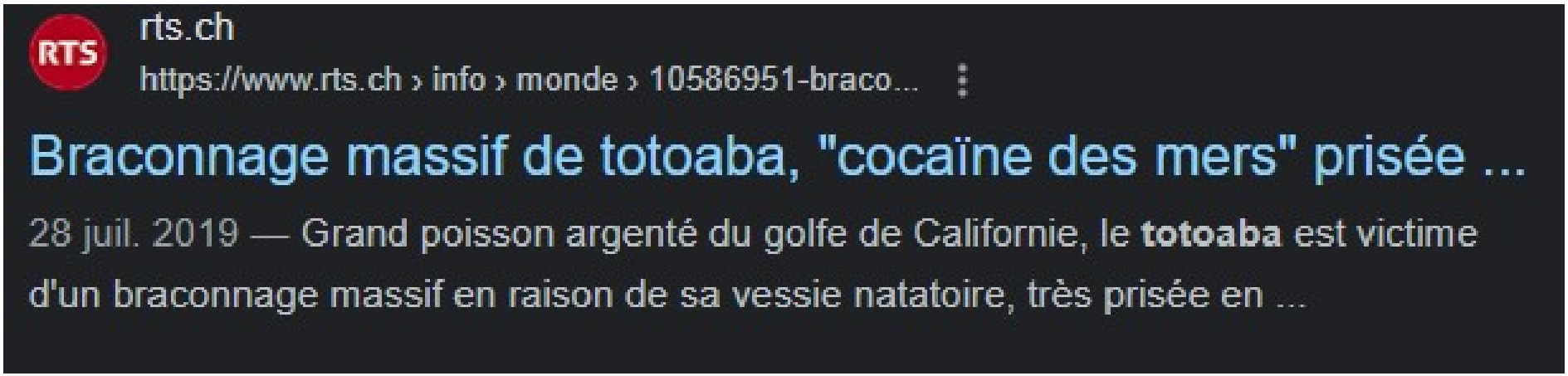
- Need a specific export permit

# Evolution of stock



# Cocaine of the sea



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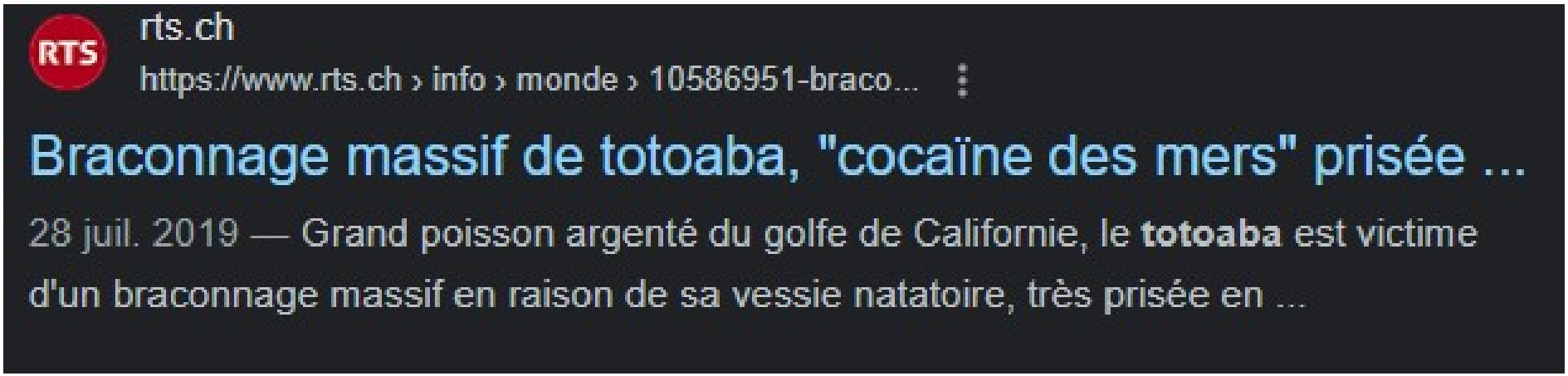


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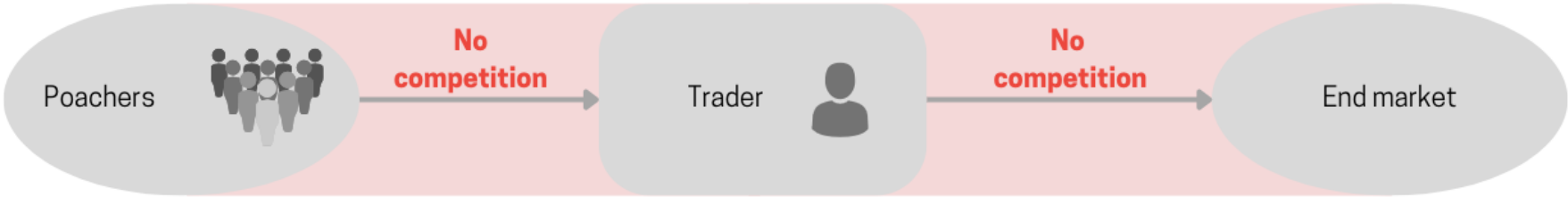


Figure: Supply chain

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- Curb poaching and increase population size
- Decrease illegal profits

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- Farmed specimens may not form substitutes - 71% of tiger derivative consumers prefer wild tigers (Gratwicke et al., 2008)
- Legal trade may make laundering easier, lowering illegal transaction costs- for reptile trade in Asia, many species sold as captive-bred could not be found in breeding facilities during inspections (Nijman and Shepherd, 2009)

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What we do :

- Revive an industrial organization, bioeconomic model (Damania and Bulte, 2007) and prove different result
- Apply them in the case of Totoaba to gauge the opportunity - **not going over new and rich data, but happy to discuss it!**

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3. We assume a linear demand function, and account for imperfect competition later on

$$P(q) = \alpha - \beta q \tag{3}$$

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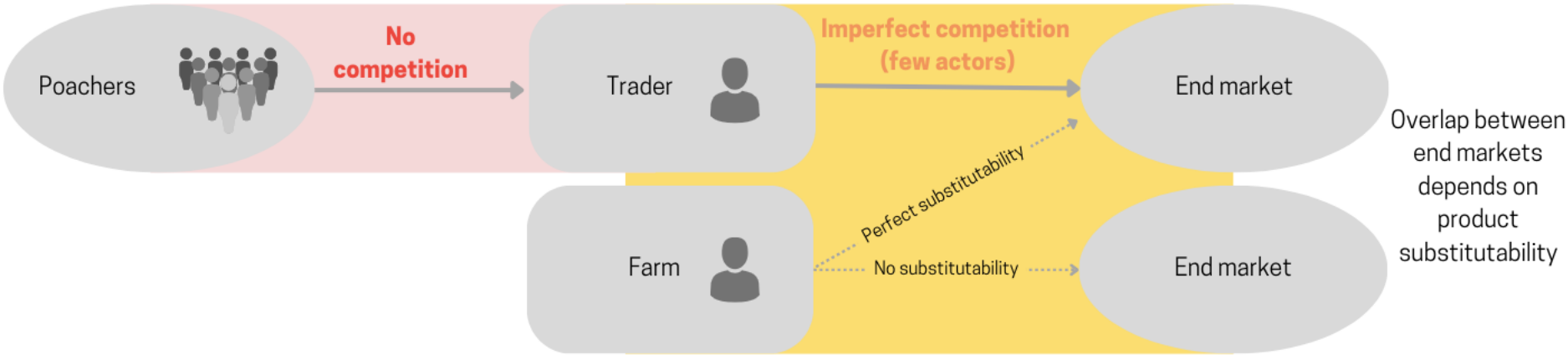
3. $s(x)$ clears the market and the steady state catch is:

$$q_M^W = \frac{\sigma^2 x^2 (\alpha_m - c) - W_1 \sigma x}{2(\sigma^2 x^2 \beta^m + W_2)} \tag{6}$$

# Aquaculture

We include aquaculture and evaluate the following policy scenario :



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$$\Pi^F = (P^F - v)q^F \tag{8}$$

With $v$ the unit cost corresponding to the capitalized sum of annual costs

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$\Rightarrow$ Depending on model parameters, poaching can increase or decrease in steady state.

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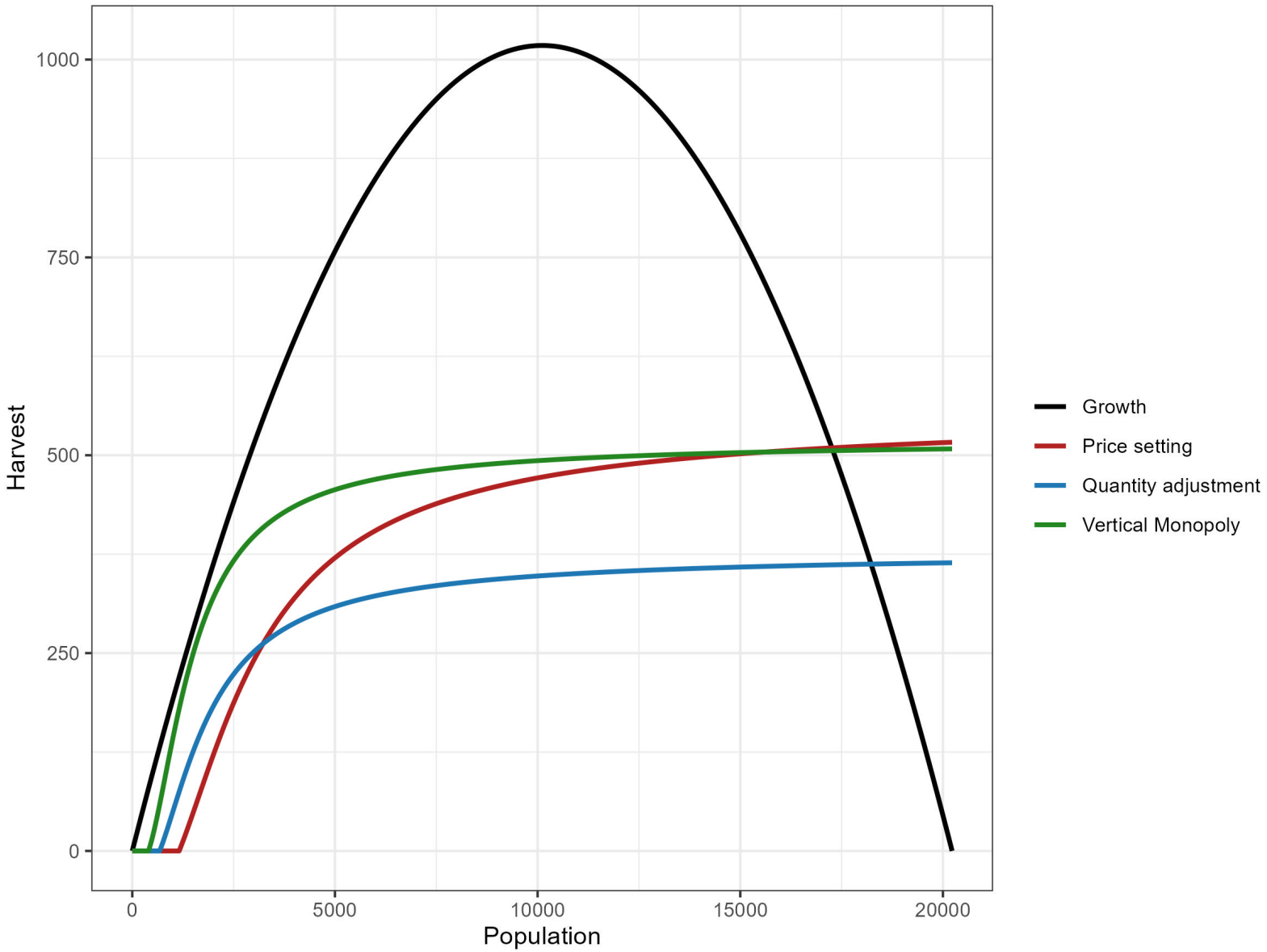
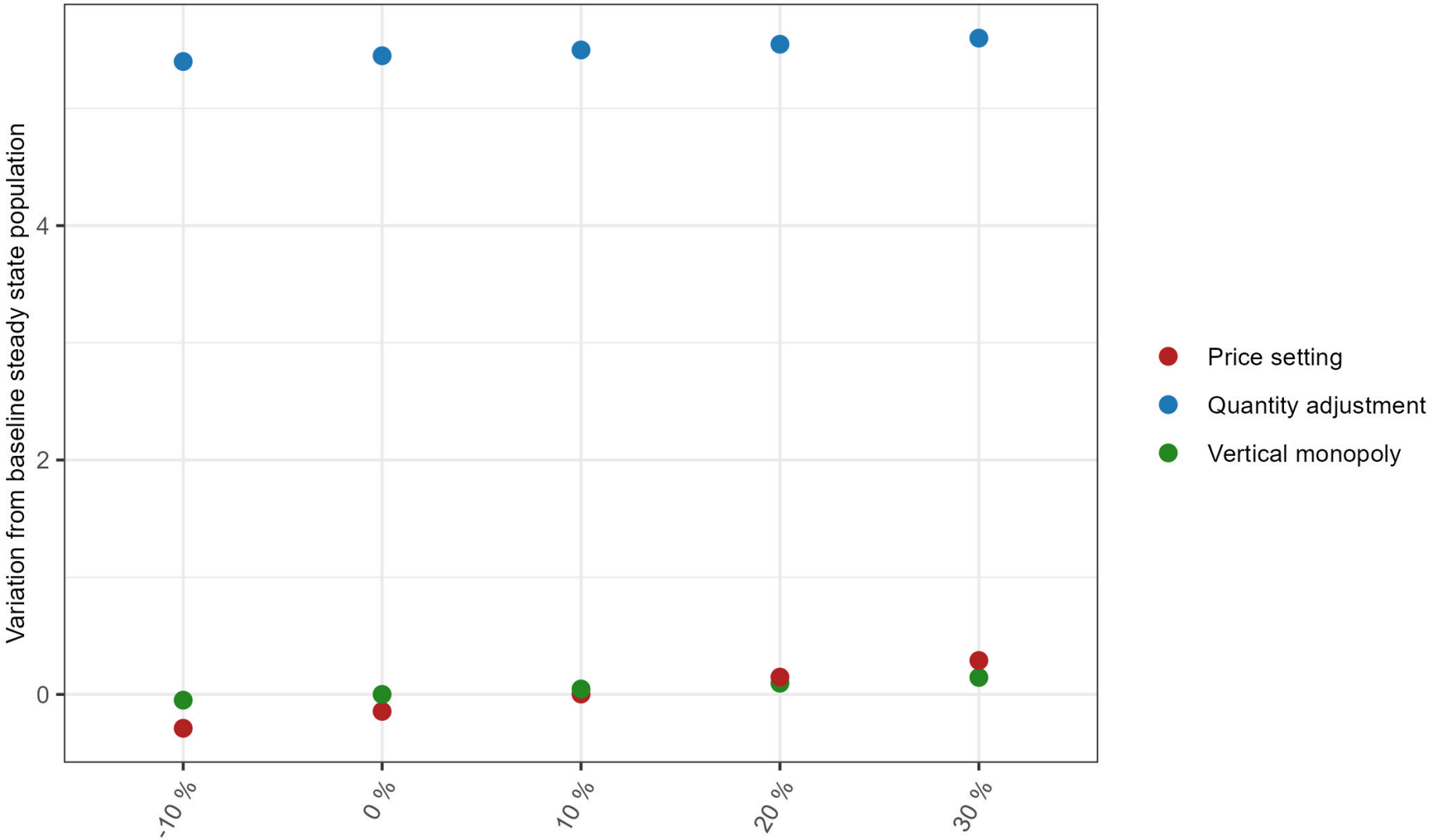

1000
750
500
250
0
Harvest
0
5000
10000
15000
20000
Population
Growth
Price setting
Quantity adjustment
Vertical Monopoly

# Results

| Scenario | Poached harvest (in mt) | Farmed harvest (in mt) | Steady state population (in mt) | Illegal profit (in million USD) | Farming profit (in million USD) | Fishing profit (in million USD) | Aggregate profit (in million USD) | Illegal profit change (in million USD) | Variation in ss. pop. | Poaching change (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| Vertical Monopoly | 505.81 | 0.00 | 17286.0 | 400.08 | 0.00 | 1.60 | 401.68 | 0.00 | 0% | 0% |
| Quantity adjustment | 362.46 | 334.15 | 18228.0 | 205.44 | 174.60 | 0.74 | 380.78 | -194.63 | 5.45% | -28.34% |
| Price setting | 536.94 | 432.53 | 17257.5 | 84.27 | 57.26 | 4.41 | 145.94 | -315.81 | -0.16% | 6.15% |

Bioeconomic performance

# Is a vertical monopoly really a 'conservationist's best friend'?



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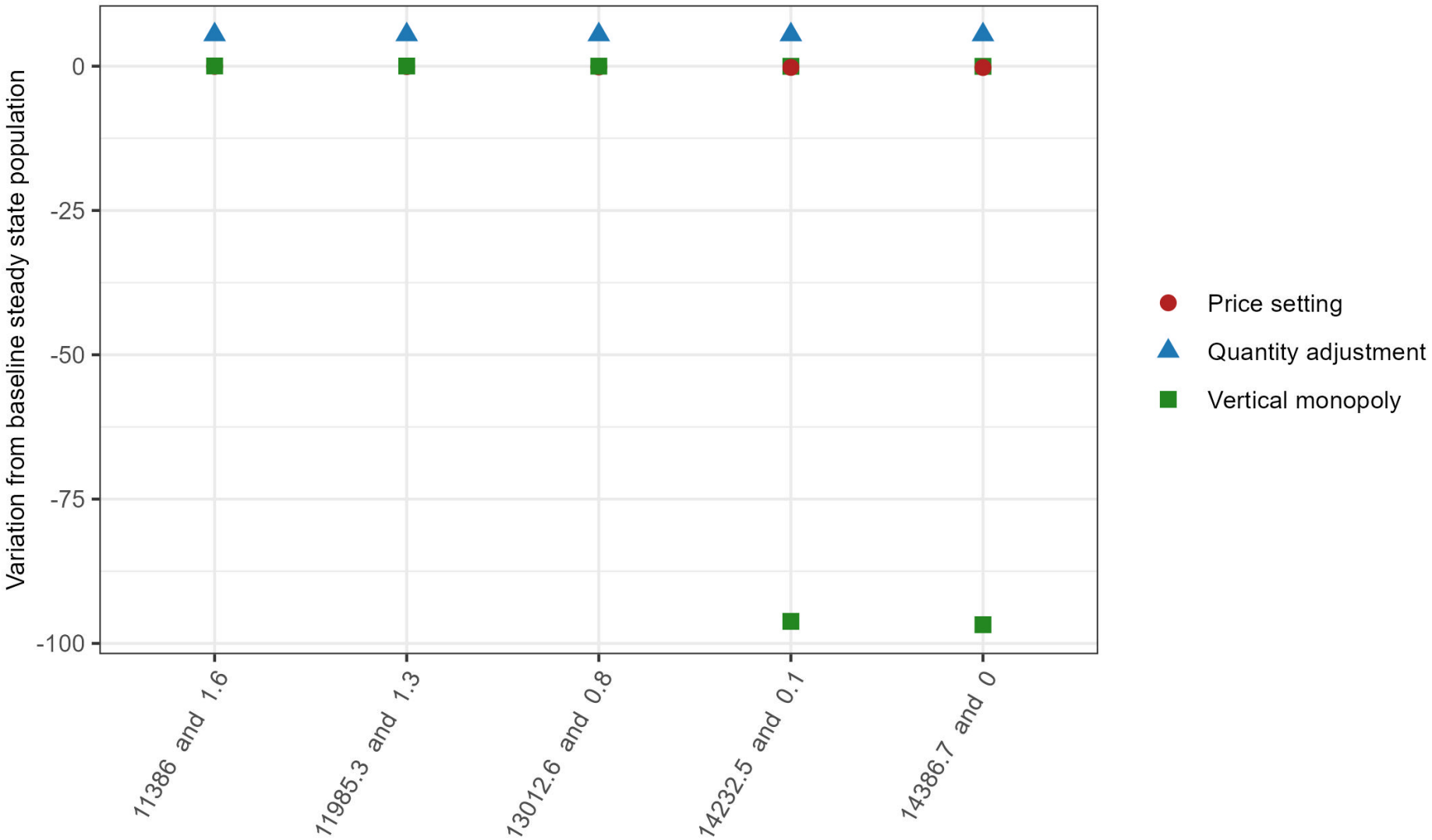
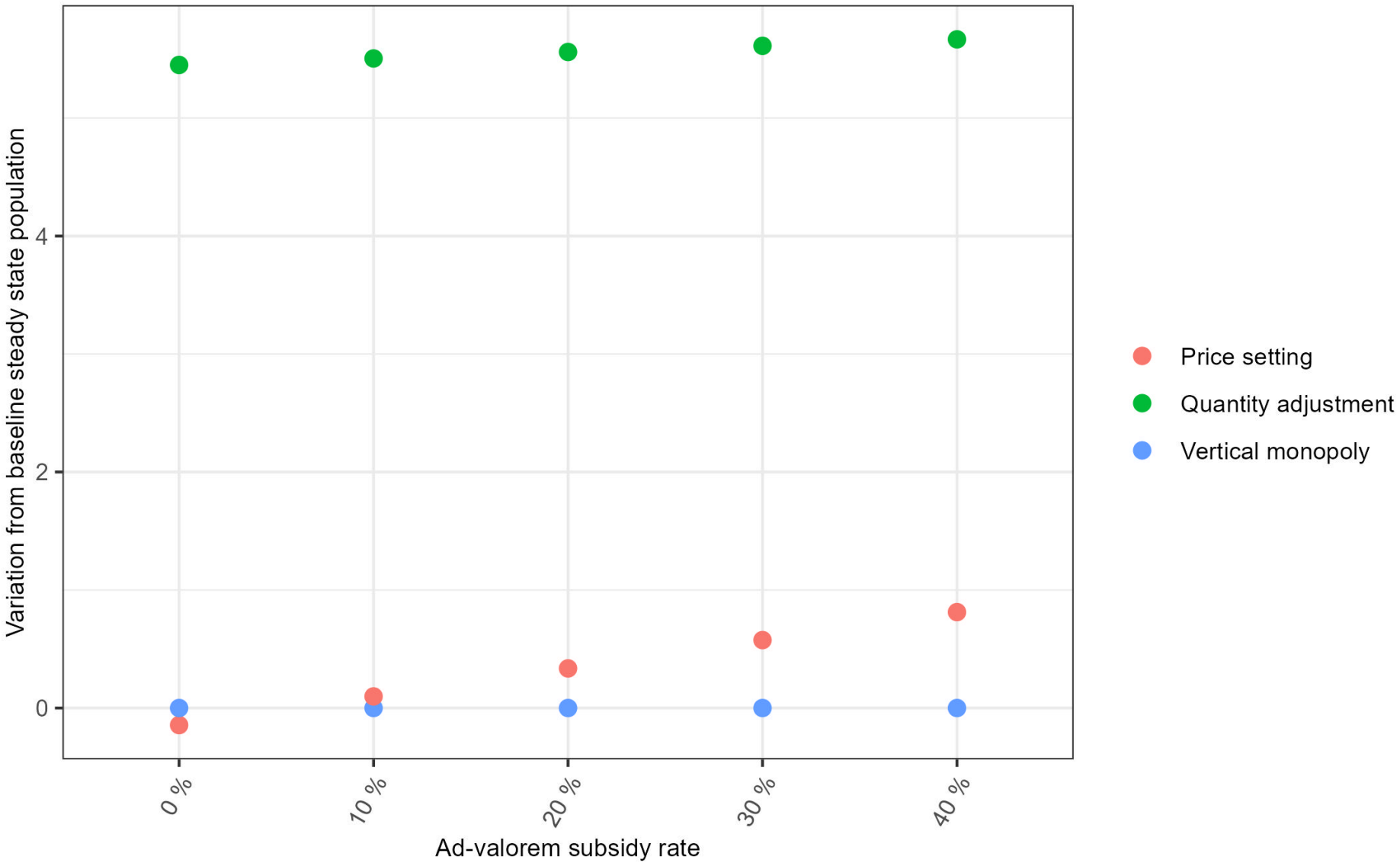
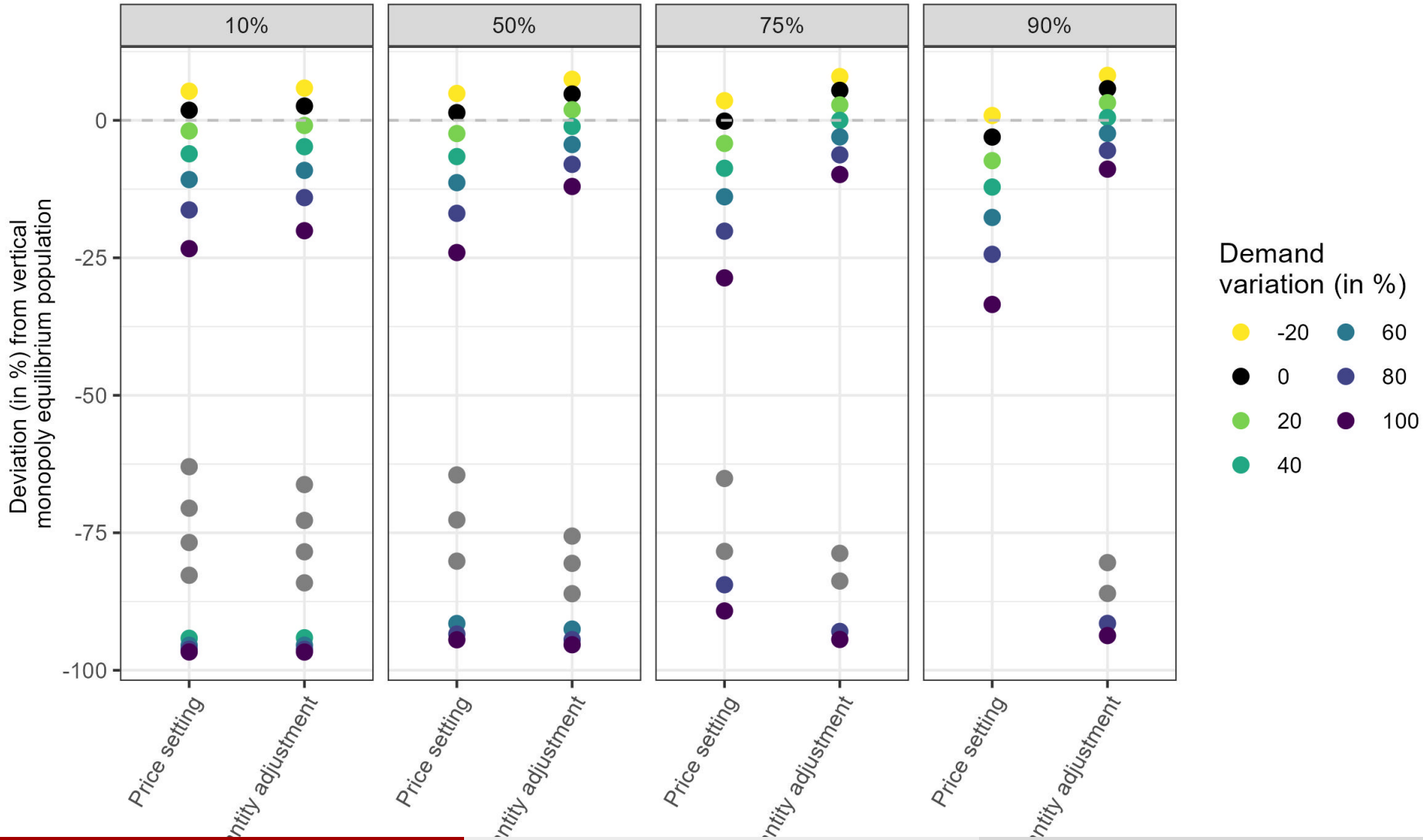


# Would subsidies work?



# Demand : evolution and substitutability



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$\Rightarrow$ Next paper on consumer preferences in Asian markets

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  $\Rightarrow$ Smart tracking necessary

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# Main takeaways

- Success of conservation farming depends on market and species specific contexts
- Need to carefully consider market dynamics and constraints : intricate nature of supply chain limits Bertrand scenario
  Even if Bertrand competition : may not harm the stock!
- Trade liberalization with demand reduction policies can be welfare improving and yield conservation benefits
- Need of smart design to leverage asymetric information for policy success

# Questions to you

- Are there more recent articles on the effect of lifting such a trade restriction? (Hsiang and Sekar, 2016)

# Questions to you

- Are there more recent articles on the effect of lifting such a trade restriction? (Hsiang and Sekar, 2016)
- Any literature on legalizing illegal international trade?

# Thank you, happy to answer to any question!

# Oligopoly

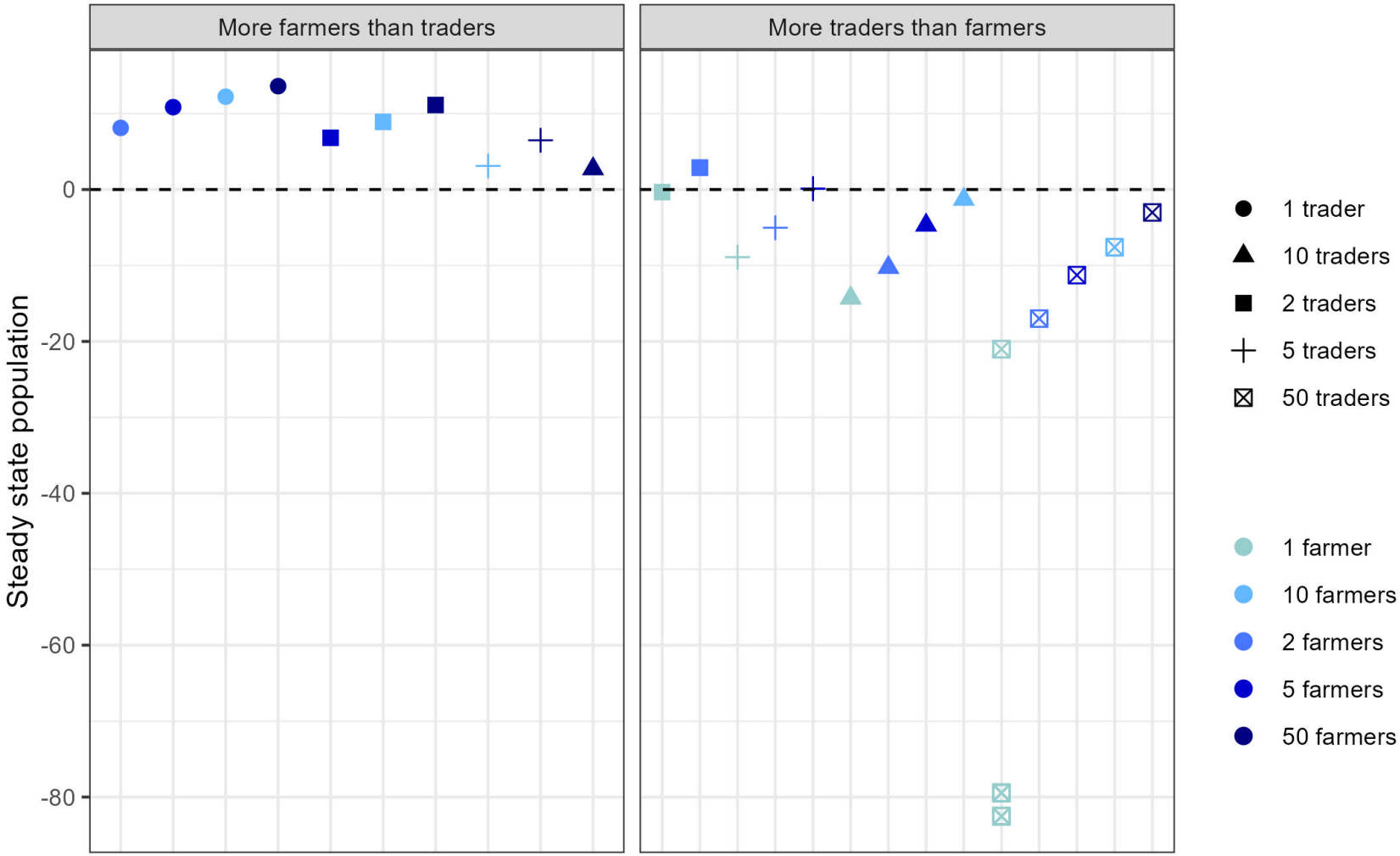


Figure: Steady state population in Cournot oligopoly

# Oligopoly

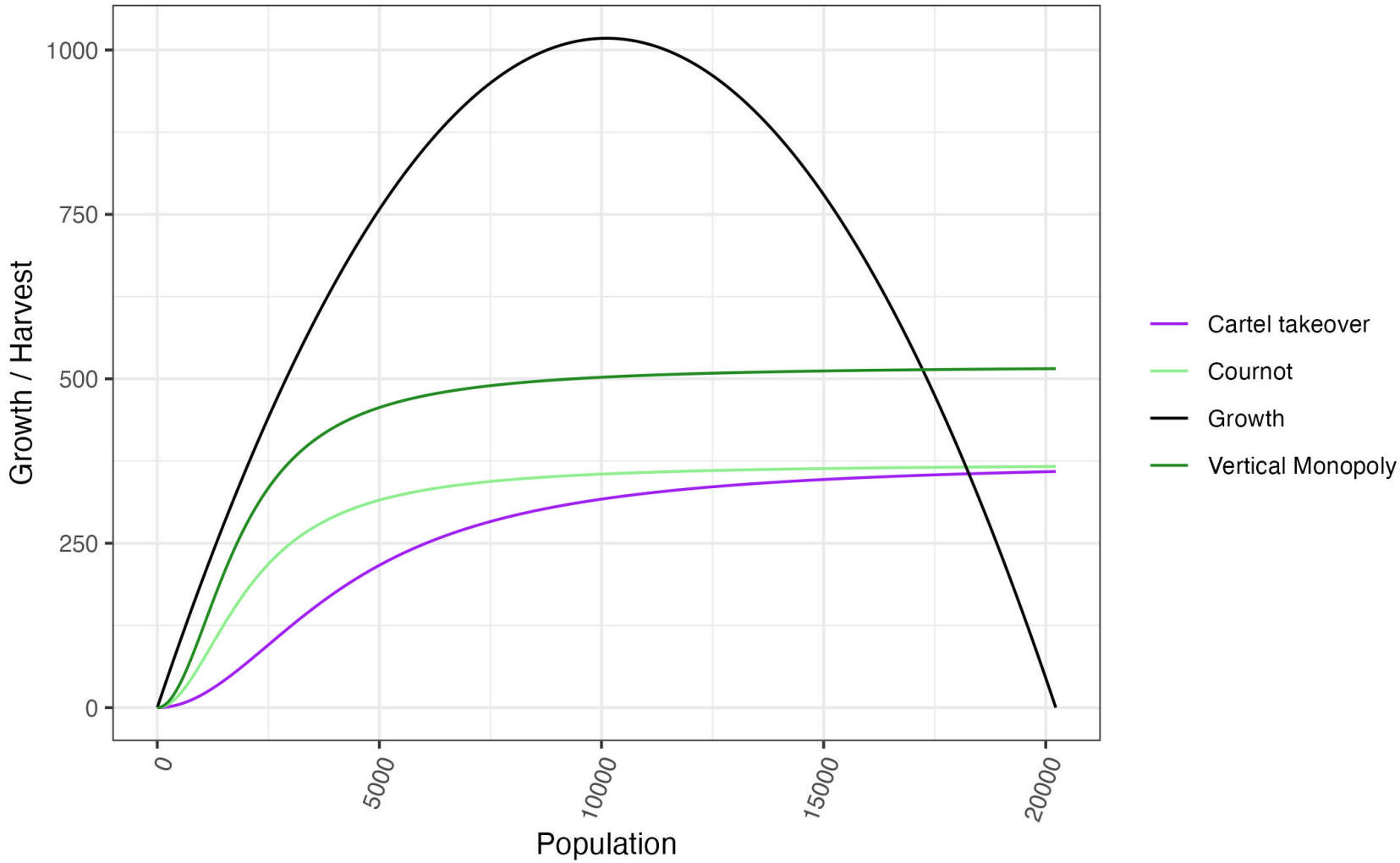


Figure: Equilibrium with cartel takeover

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