How not to Design Renewable Energy Auctions

Endogenous Rationing

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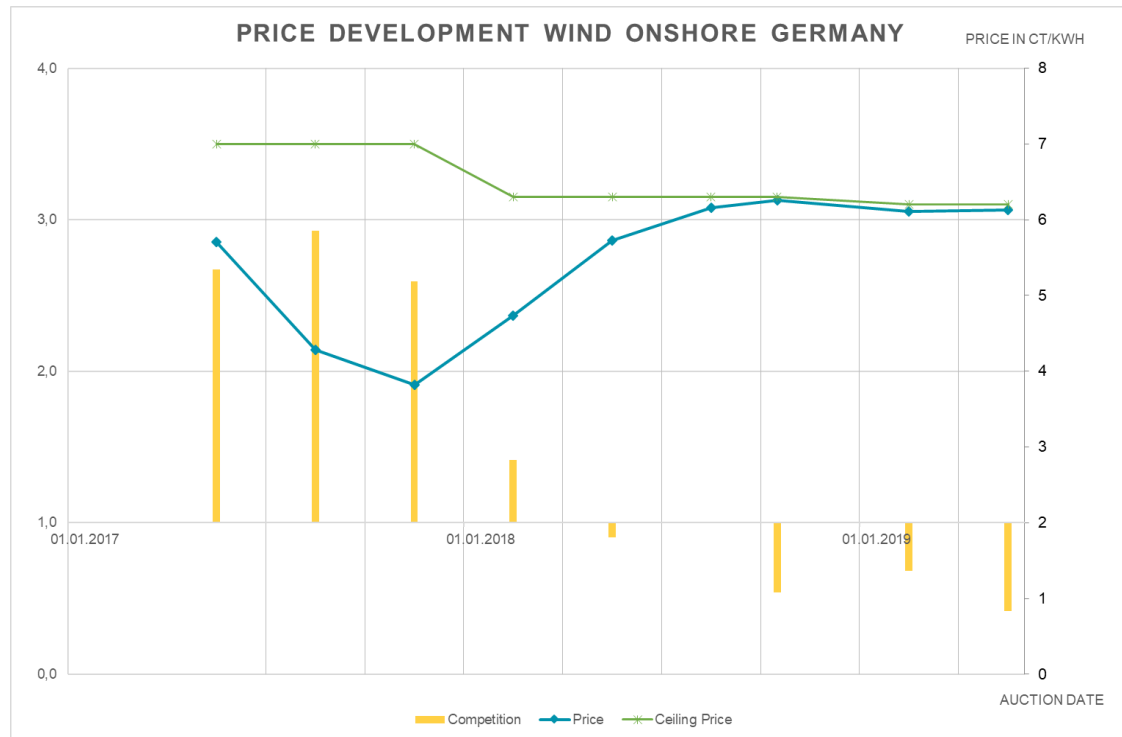
Institute of Economics (ECON)
Research Group Strategic Decisions

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Low participation in auctions leads to high prices

- ➢ Higher tender volumes for wind onshore necessary to achieve expansion targets.

- ➢ Lack of supply leads to undersubscription in wind onshore auctions.

- ➢ Coordination of bidders on the ceiling price.

- ➢ Examples: Germany, France

PRICE DEVELOPMENT WIND ONSHORE GERMANY PRICE IN CT/KWH

Competition   Price   Ceiling Price

AUCTION DATE

Data from bundesnetzagentur.de

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Endogenous rationing as a solution proposal

Endogenous Rationing:
supply-dependent reduction

Endogenous Reduction of Awarded Volume	Endogenous Determination of Ceiling Price
In case of undersubscription only a certain percentage (e.g. 80%) of the offered volume is awarded.	Ceiling price is determined by bids in previous or current tender round.

General idea: Guaranteed competition in tender rounds.

Auction-theoretic model

➢ Procurement auction

➢ Demand: k units of a good (projects)

➢ Value auctioneer v

➢ Ceiling price r for each unit

➢ Supply: n potential participants with single-unit supply (single-project bidders)

➢ Project costs of bidders

   – Prequalification costs q (sunk costs)

   – Realisation costs x (independently and identically distributed)

> Not all project developers participate in the auction.

> How many projects are awarded if $n < k$?

Endogenous reduction of awarded volume

➢ Let m be number of actual bidders participating in the auction.

➢ Rationing rule:

> If $m \leq k$, only $m - 1$ units of the good are awarded.

➢ Idea:

„Due to the rationing there are always more bidders in the auction than auctioned goods. Thus, there is always enough competition."

Critical assessment of endogenous volume reduction

➢ The choice to participate is i.a. dependent on the number of potential competitors $n-1$ and the number of auctioned goods k.

➢ In an auction without rationing and k goods, the last bidder (i.e., the bidder with the highest costs and thus the highest bid) will only win, if at most k bidders participate. He will only participate if this event has a positive probability.

k goods

Maximal $k-1$ other bidders?

Low realisation costs

Bidder with relatively high costs

High realisation costs
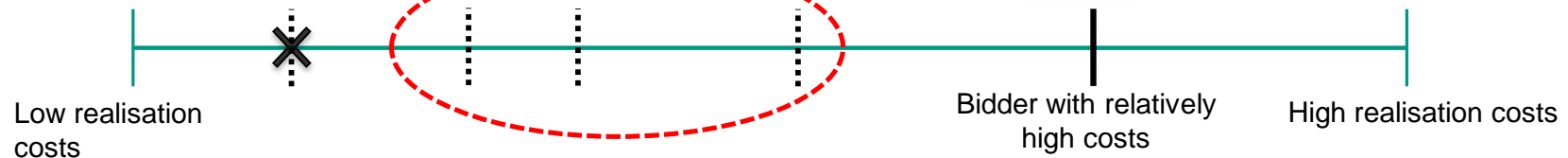
Endogenous volume reduction further reduces supply

➢ In the case of endogenous rationing, when only m bidders participate, this „last" bidder will not be awarded, since only $m-1$ goods are auctioned. His probability of winning is thus 0. If he participates he will in all cases face a loss of q, so he will not participate.

➢ The second-to-last bidder becomes the last bidder and the same argumentation holds for him.

➢ This results in a downwards spiral of supply.

➢ In the equilibrium, no bidder will participate.

Note that for this argumentation it is not important whether the number of potential bidders n is greater than, equal to or smaller than the number of goods k.

Endogenous determination of ceiling price leads to even higher prices

➢ Analysis of sequence of T auctions

➢ Ceiling price r^{t+1} in auction $t+1$ is dependent on the bids of the active bidders in auction t.

➢ Example: $r^{t+1} = \min\{r^t, a \cdot p^t\}$ with $a \geq 1$ and reference price p^t in t

– Uniform-pricing: p^t is lowest rejected bid in t.

– Pay-as-bid: p^t is average of all awarded bids in t.

➢ Results (in the equilibrium):

Participants will submit higher bids in the first $T-1$ auctions than in auctions without adjustment of the ceiling price.

Optimal ceiling price is dependent on aims

Possible Aims

➢ Maximisation of auctioneer's rent (consumer's rent) ➡ $0 < r < v$

$$Max\{\ Awarded\ volume\ *\ (Value\ auctioneer - Award\ price)\}$$

➢ Maximisation of welfare (minimisation of social costs) ➡ $r = v$

$$Max\{\ Awarded\ volume\ *\ (Value\ auctioneer - Costs\ of\ awarded\ projects)\}$$

➢ Maximisation of awarded volume ➡ $r = \infty$

$$Max\{\ Awarded\ volume\ \}$$

➢ Minimisation of payments per good ➡ $r = 0$

$$Min\{Award\ price\}\ \text{or}\ Min\ \{Awarded\ volume\ *\ Award\ price\}$$

> It is not possible to achieve everything at once!

Endogenous Rationing worsens the situation

Awarded Volume
➢ Downwards spiral   ➢ Additional shortage of supply

Ceiling Price
➢ Higher bids of participants   ➢ Not more competition but higher prices

Comparing to auctions without endogenous rationing we find:

➢ Number of awarded goods decreases further.

➢ Prices for goods increase (or are constant at level of the ceiling price).

➢ Consumer's rent decreases.

➢ Social costs increase.

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Conclusion

➢ Summary

– An auction is not a mechanism to create competition, but to allocate the entities.

– Endogenous rationing cannot secure competition.

– Additional insecurities in the market prevent incentives for market entry.

– It is important to know one's aims when designing an auction.

➢ (Optional) proposals:

– Creation of additional supply rather through political measures.

– One-time reduction of tender volume in combination with higher volumes in later rounds.

– Transparency is vital to signal reliability and create a sense of trustworthiness.

– Rely on market mechanisms, as high prices with low level of competition generate incentives for market investments.

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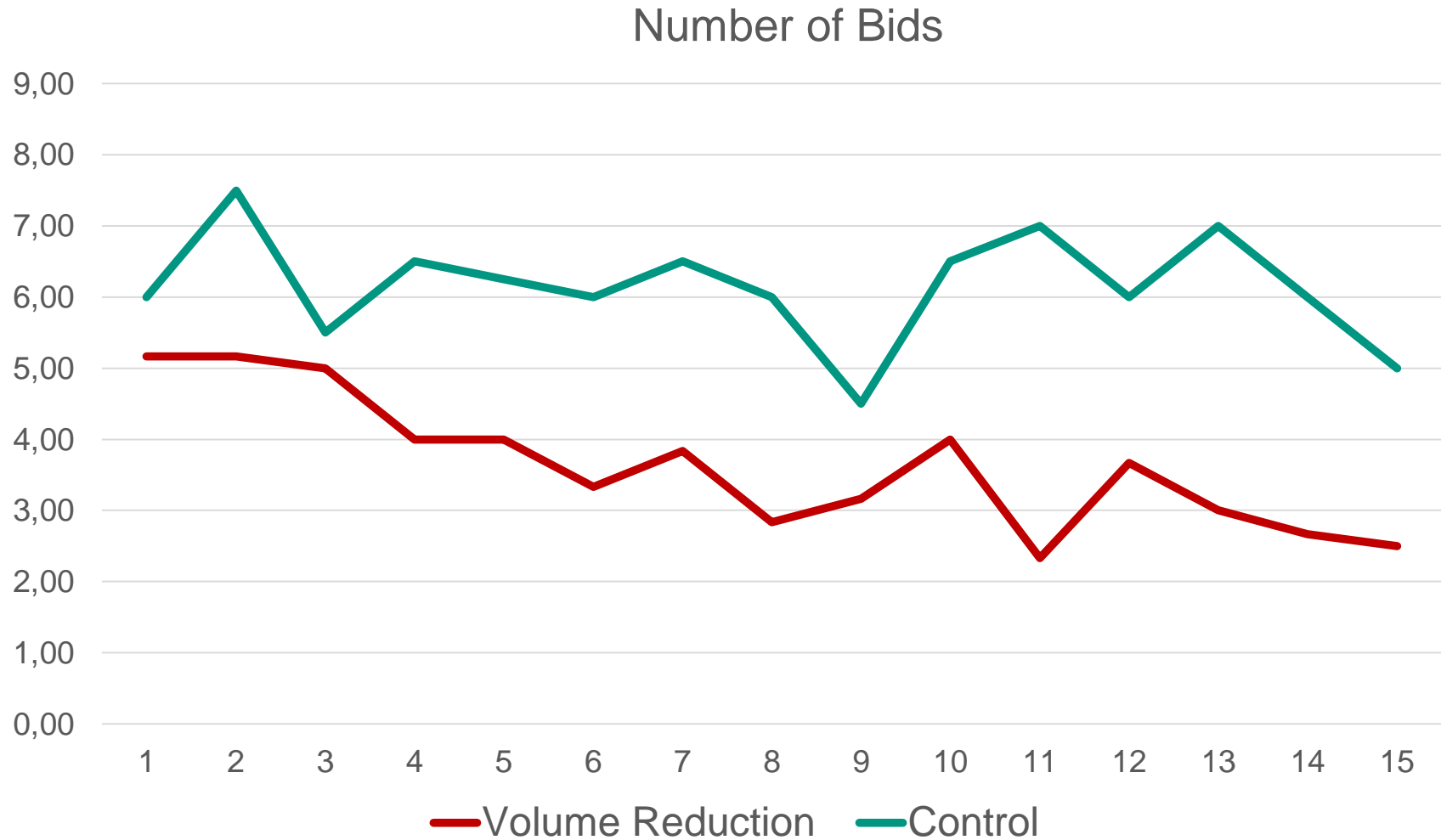
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Backup: Experiment Results

Number of Bids
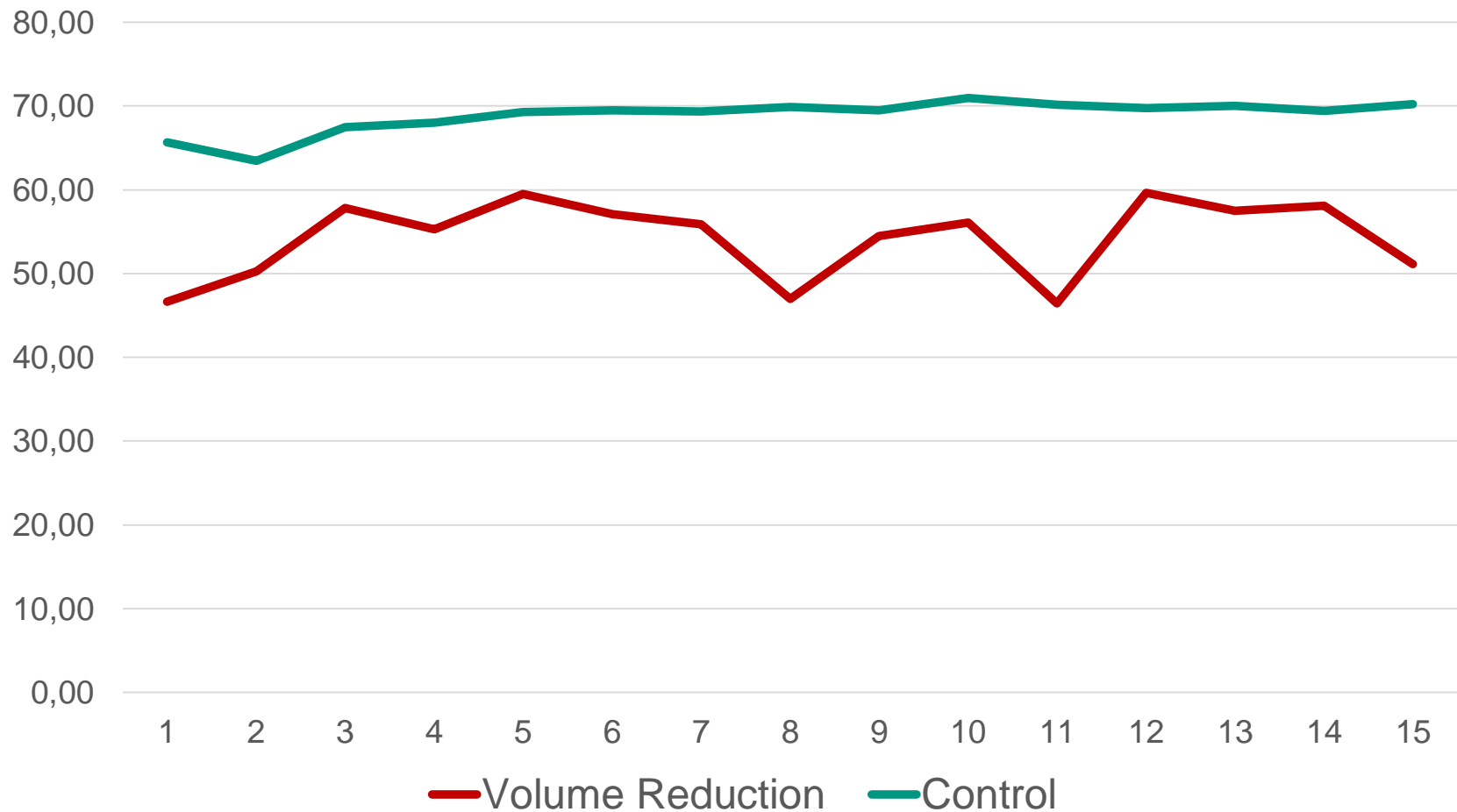
Backup: Experiment Results

Number of Awarded Bids

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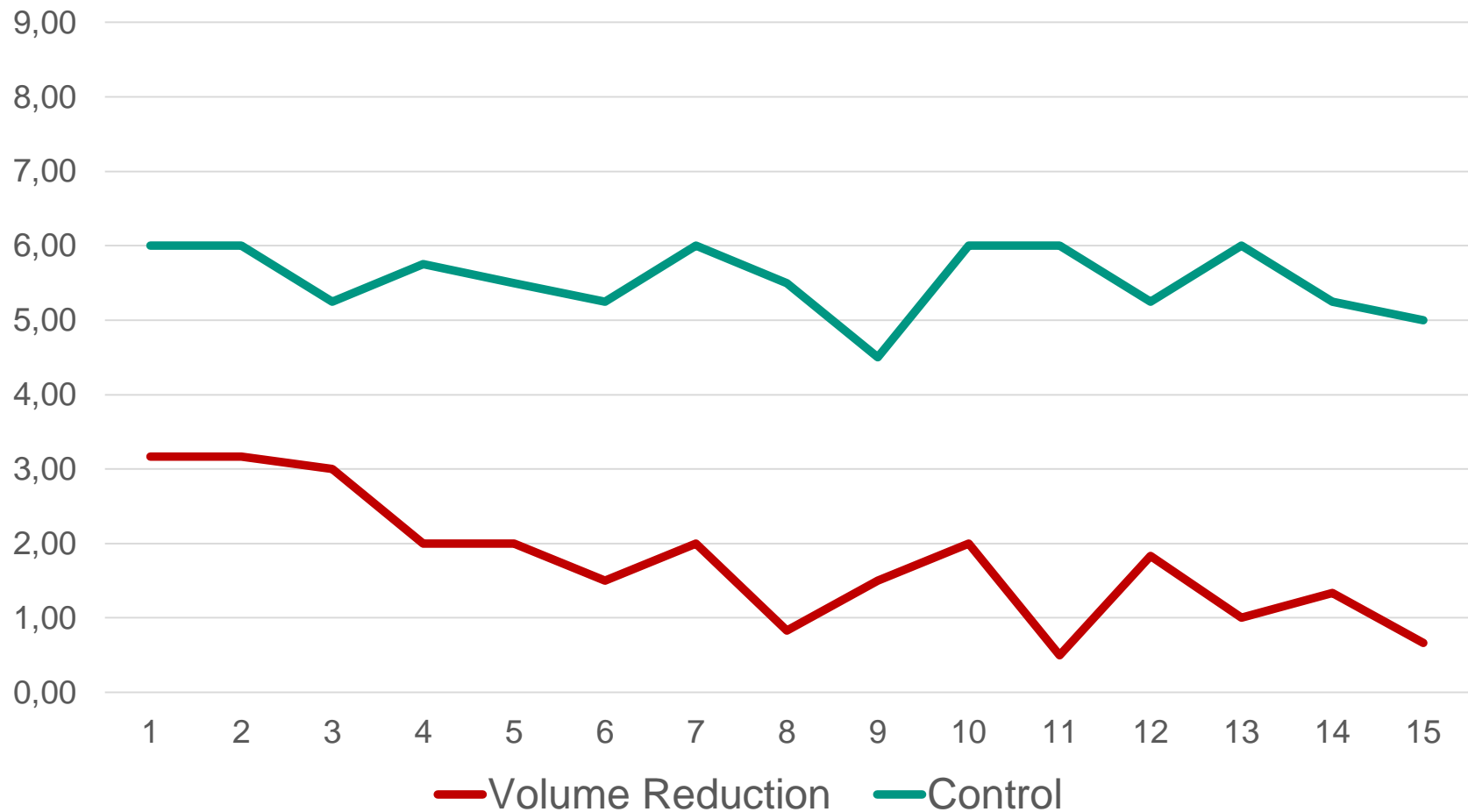
Backup: Experiment Results

Average Awarded Bids

Legend: Volume Reduction, Control

Backup: Experiment Results

Auctioneer's Rent

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Social Welfare

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