



ICT-onderzoek Platform Nederland

# Catholijn Jonker

(TUD)

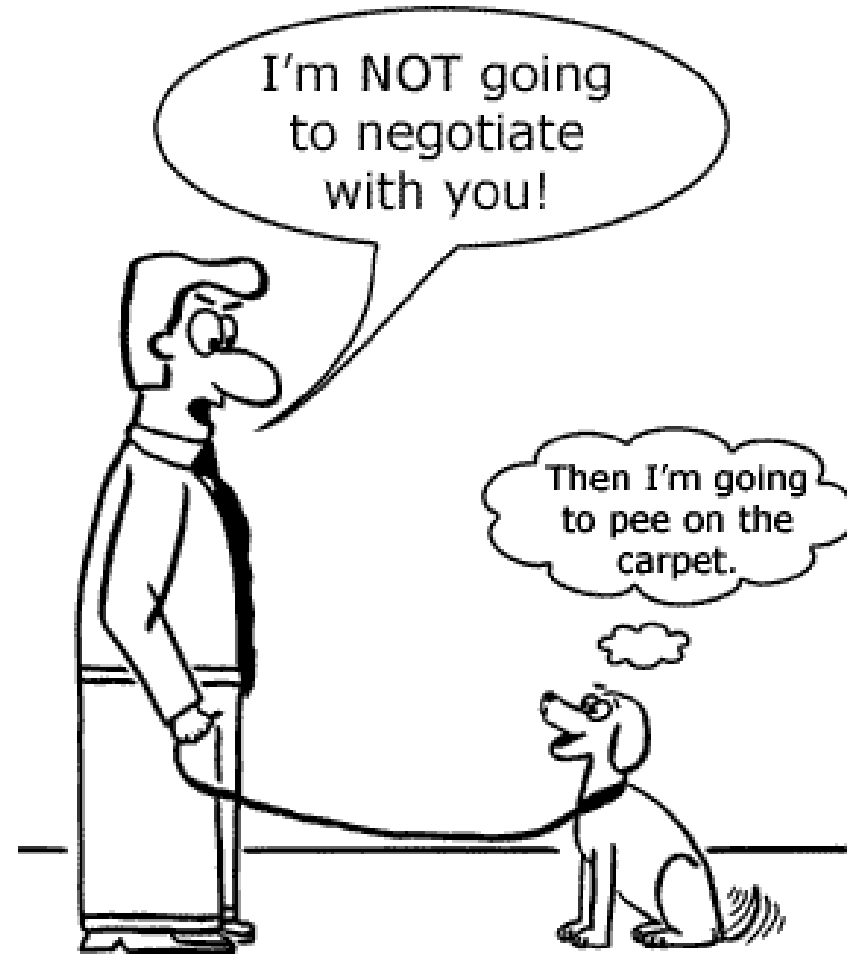
*Negotiation Dynamics*



# Negotiation Dynamics

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Man-machine interaction group

Joint work with:  
Tibor Bosse  
Koen Hindriks  
Dmytro Tykhonov



# Negotiation

Trade: exchange of goods and services

Negotiation: reaching a trade agreement



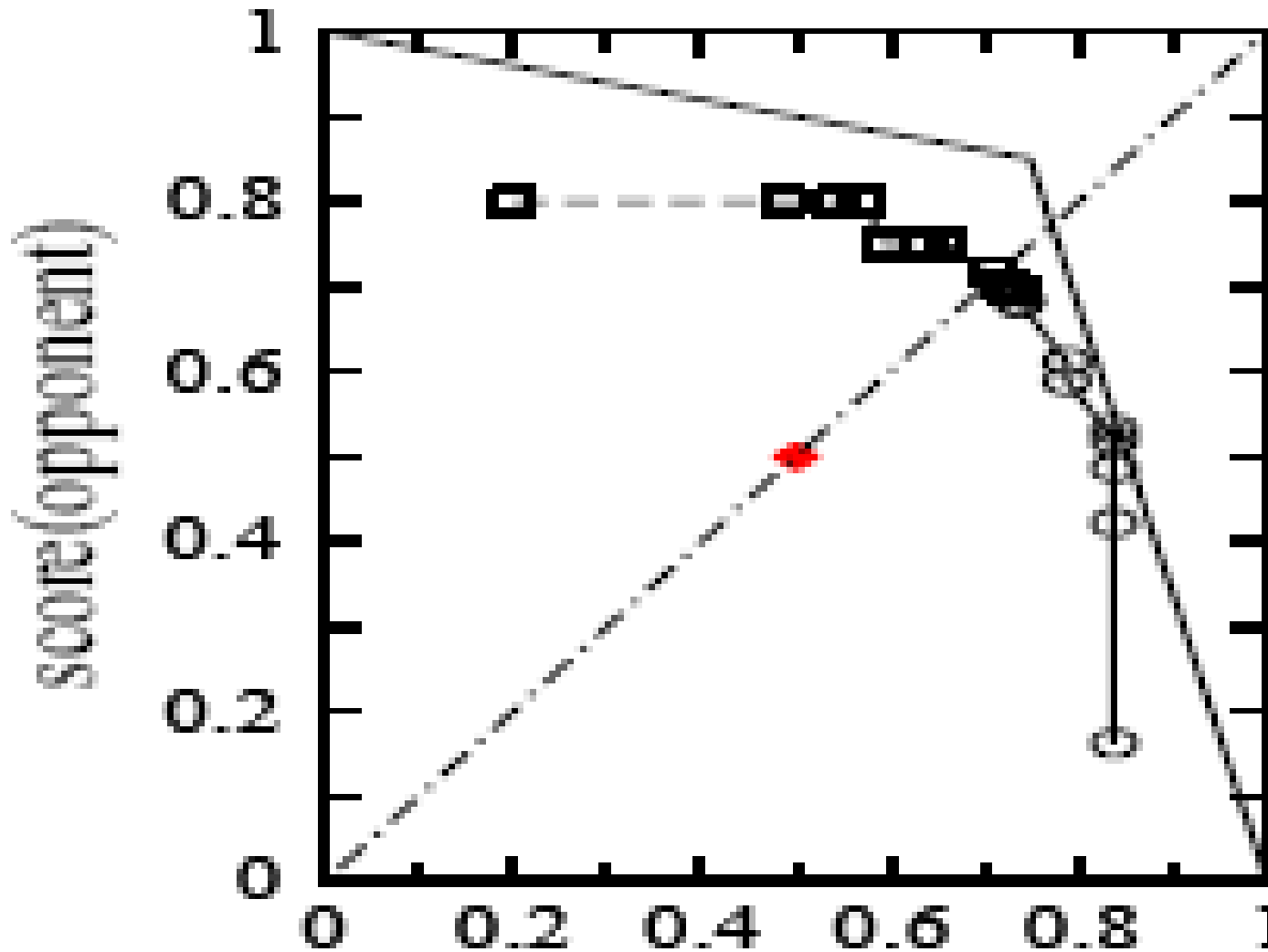
# The process matters



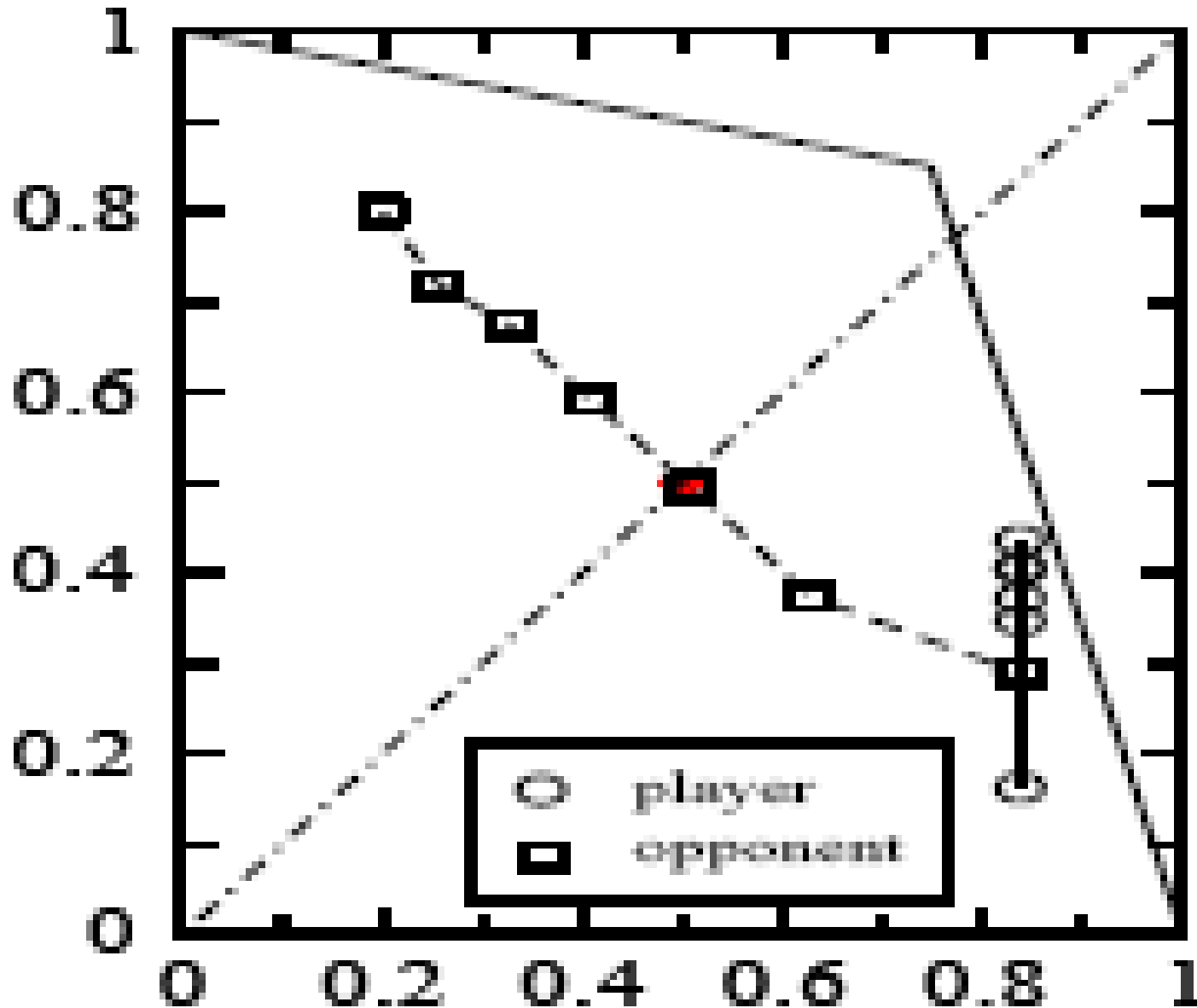
Even for negotiating software agents!



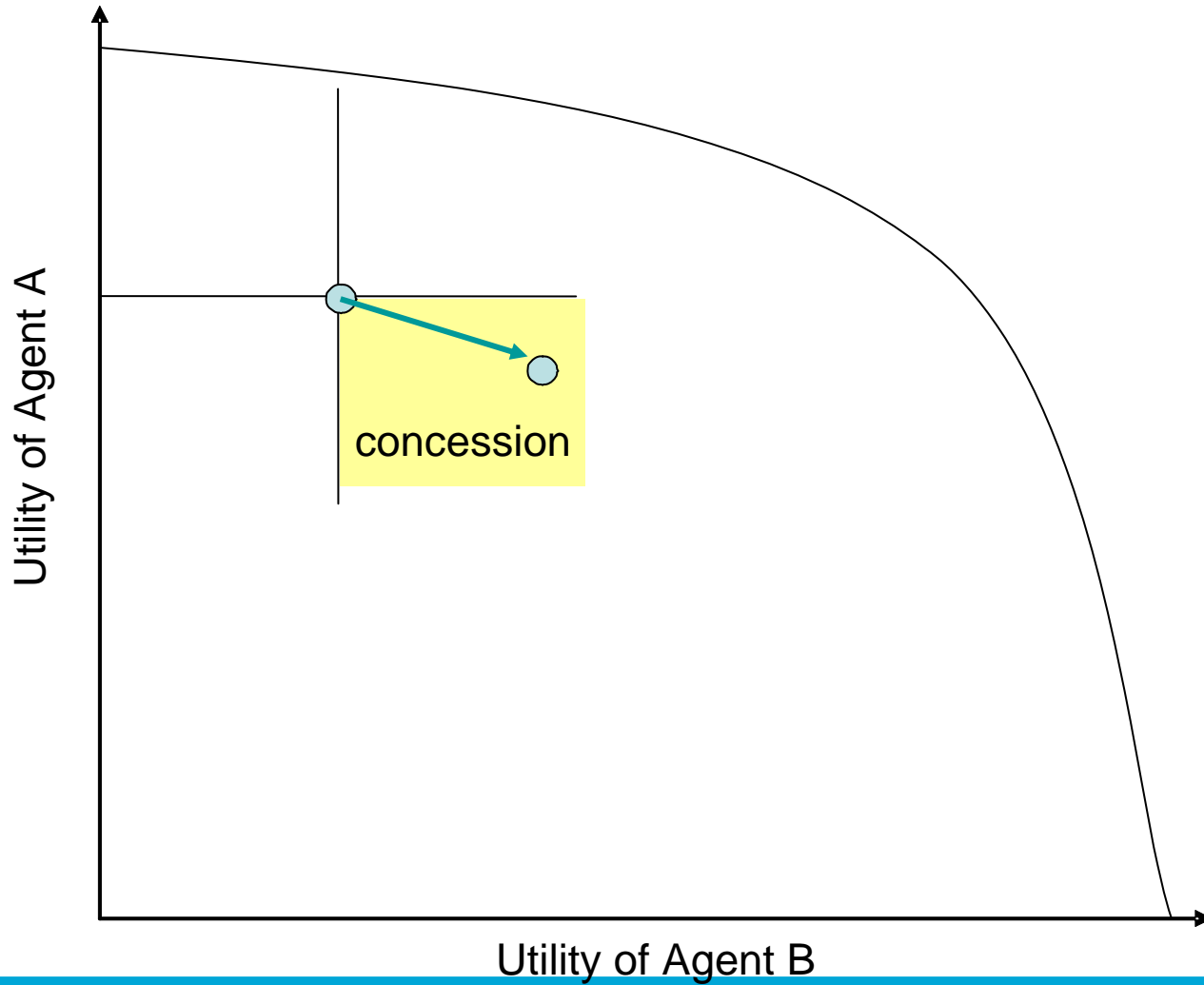
# Trade-off vs Trade-off strategy



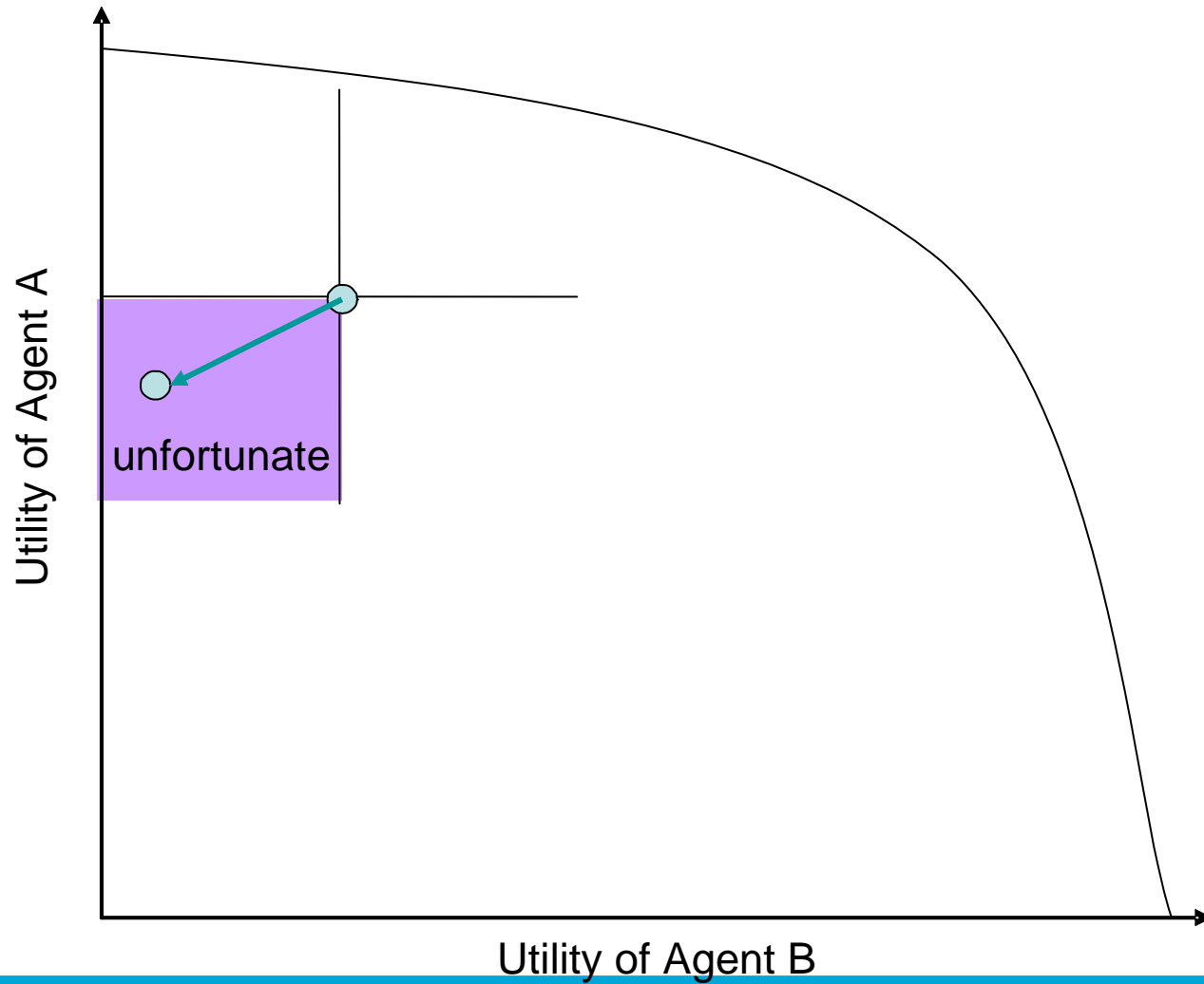
# Trade-off vs Responsive strategy



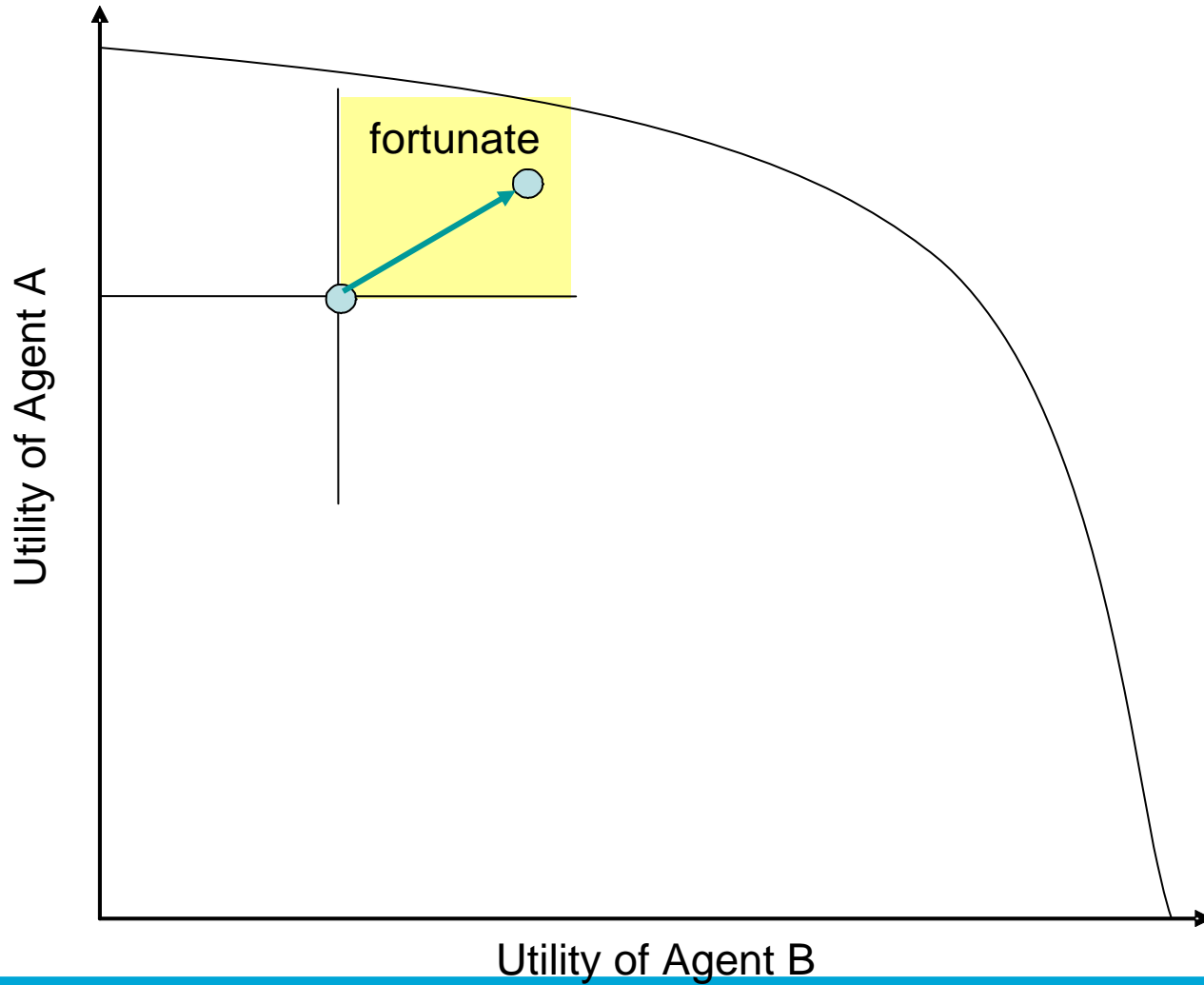
# Concession step



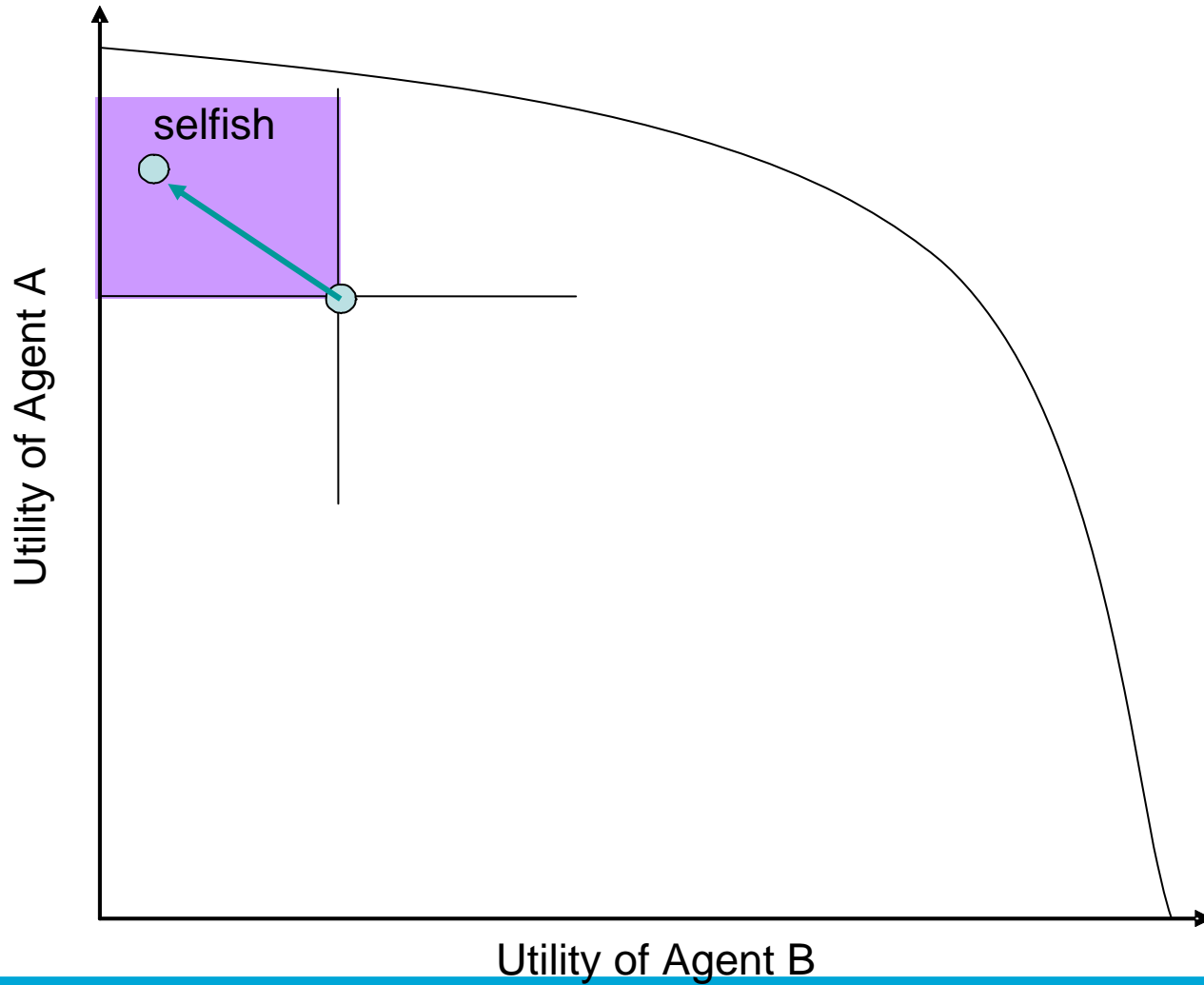
# Unfortunate step



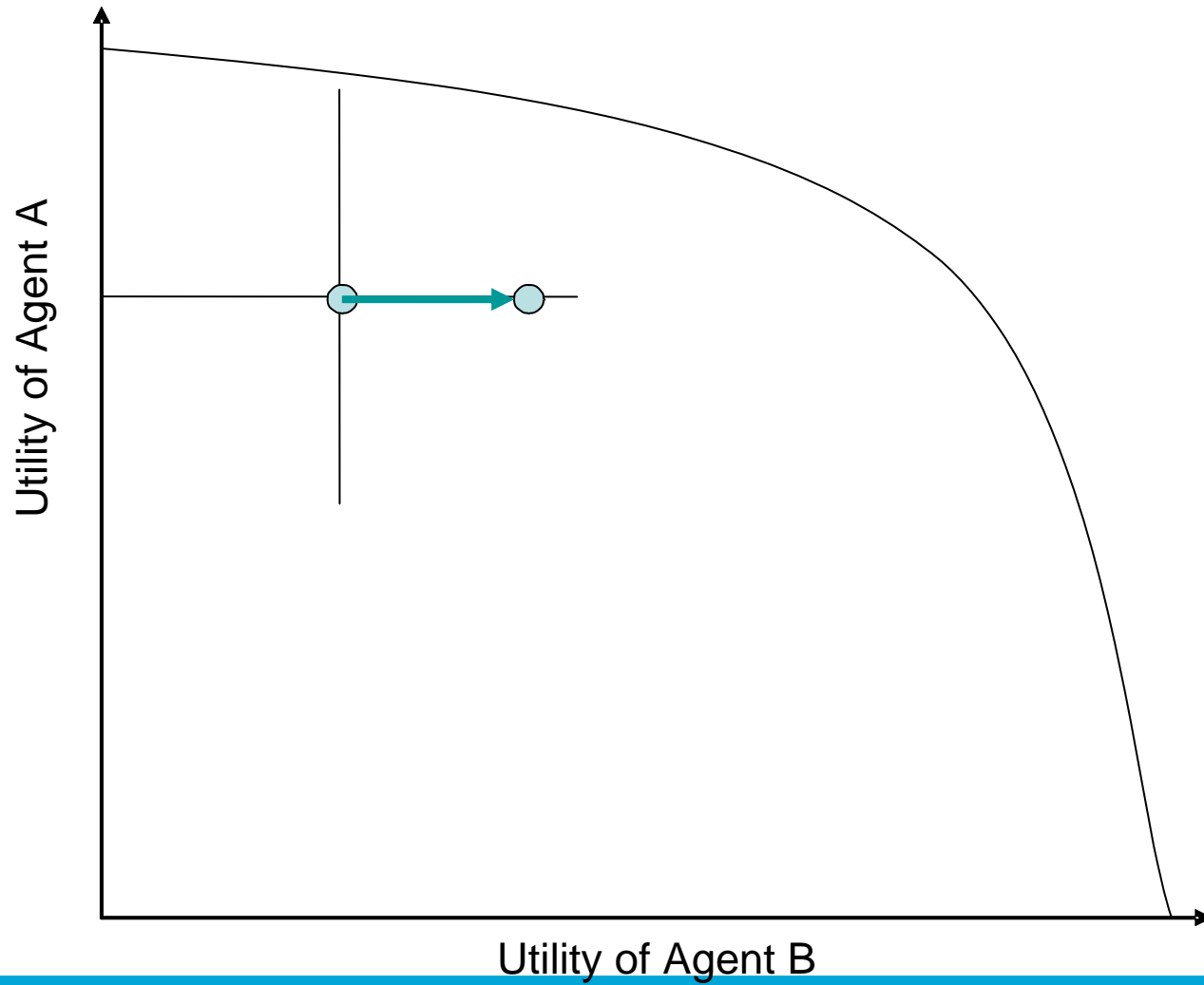
# Fortunate step



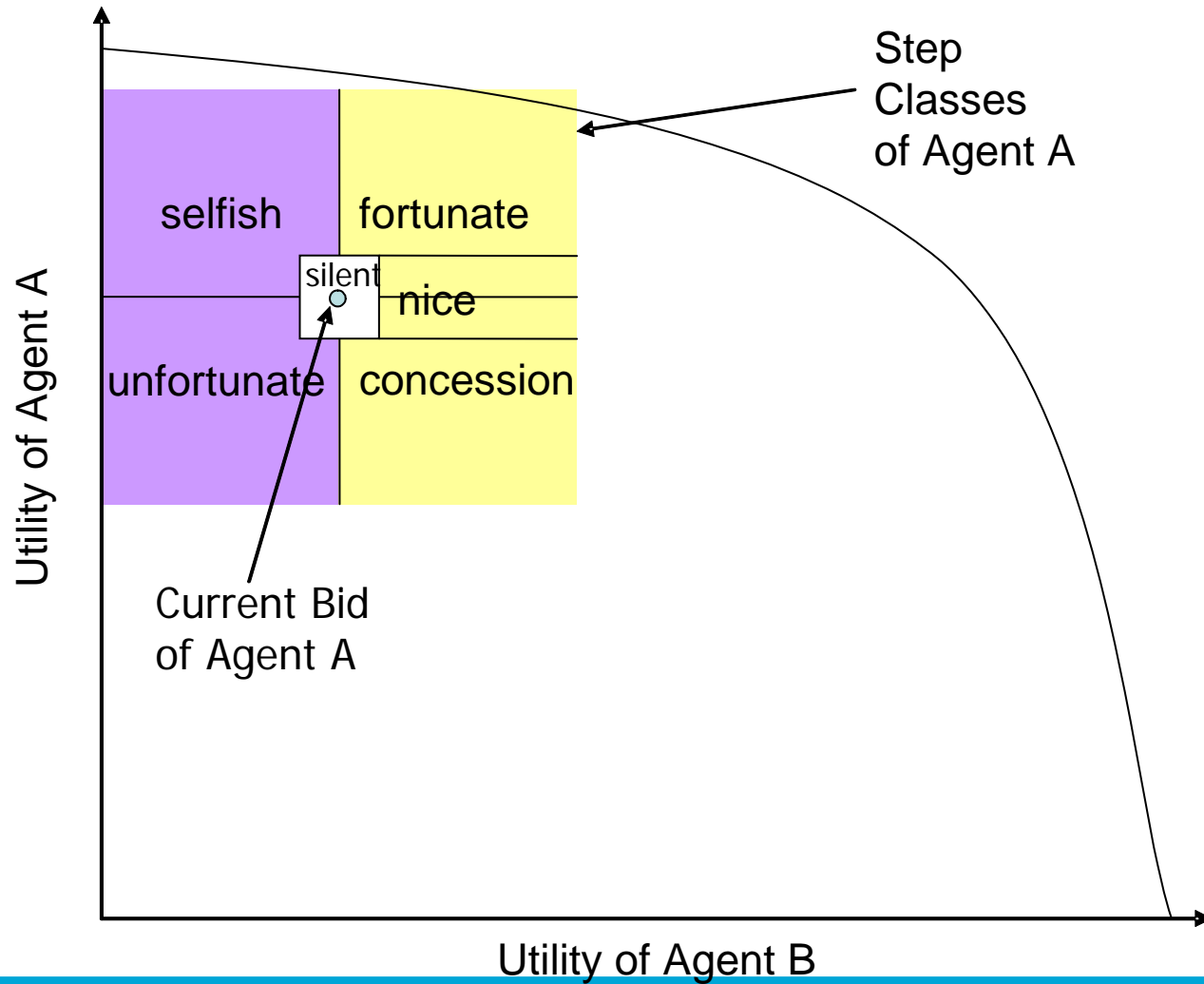
# Selfish step



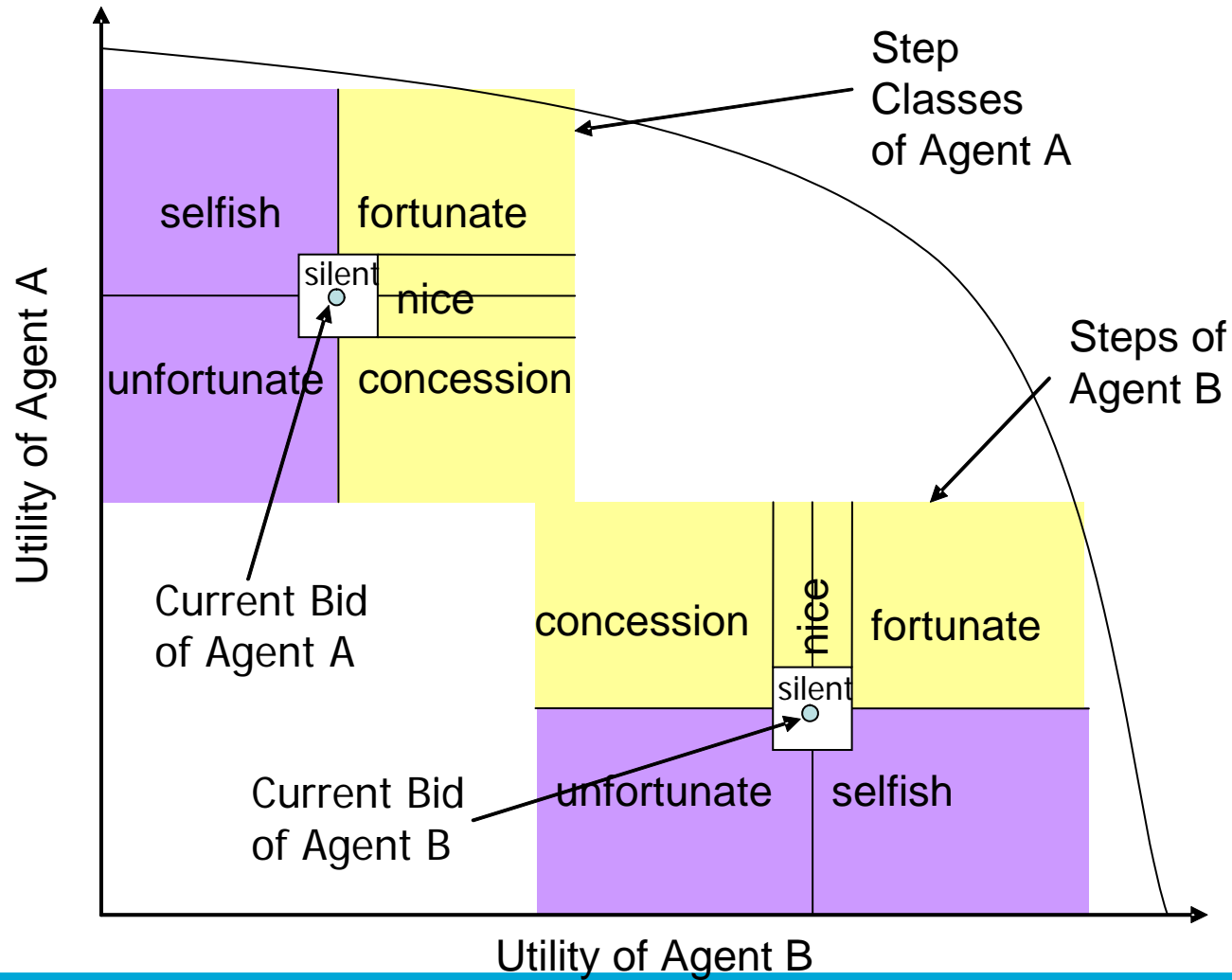
# Nice step



# Classification of negotiation steps



# Classification of negotiation steps



# Experimental Setup - Tournament

- Three strategies:
  - ABMP<sup>\*</sup>
  - Trade-Off<sup>\*\*</sup>
  - Random-Walker
- Three domains:
  - Second hand car selling<sup>\*</sup>
  - Service-oriented negotiation<sup>\*\*</sup>
  - AMPO vs City<sup>\*\*\*</sup>

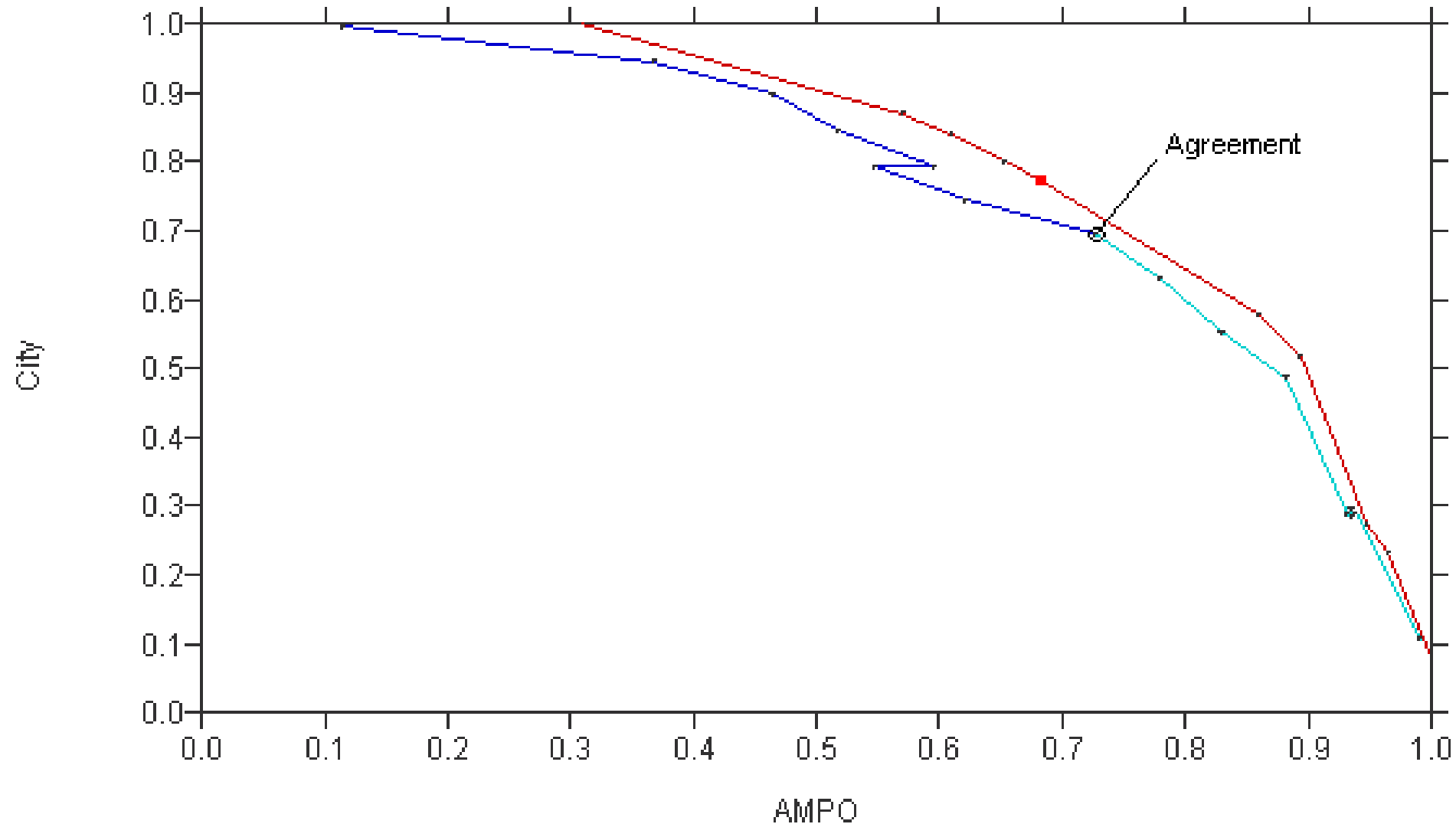


<sup>(\*)</sup> [Jonker and Treur, 2001];

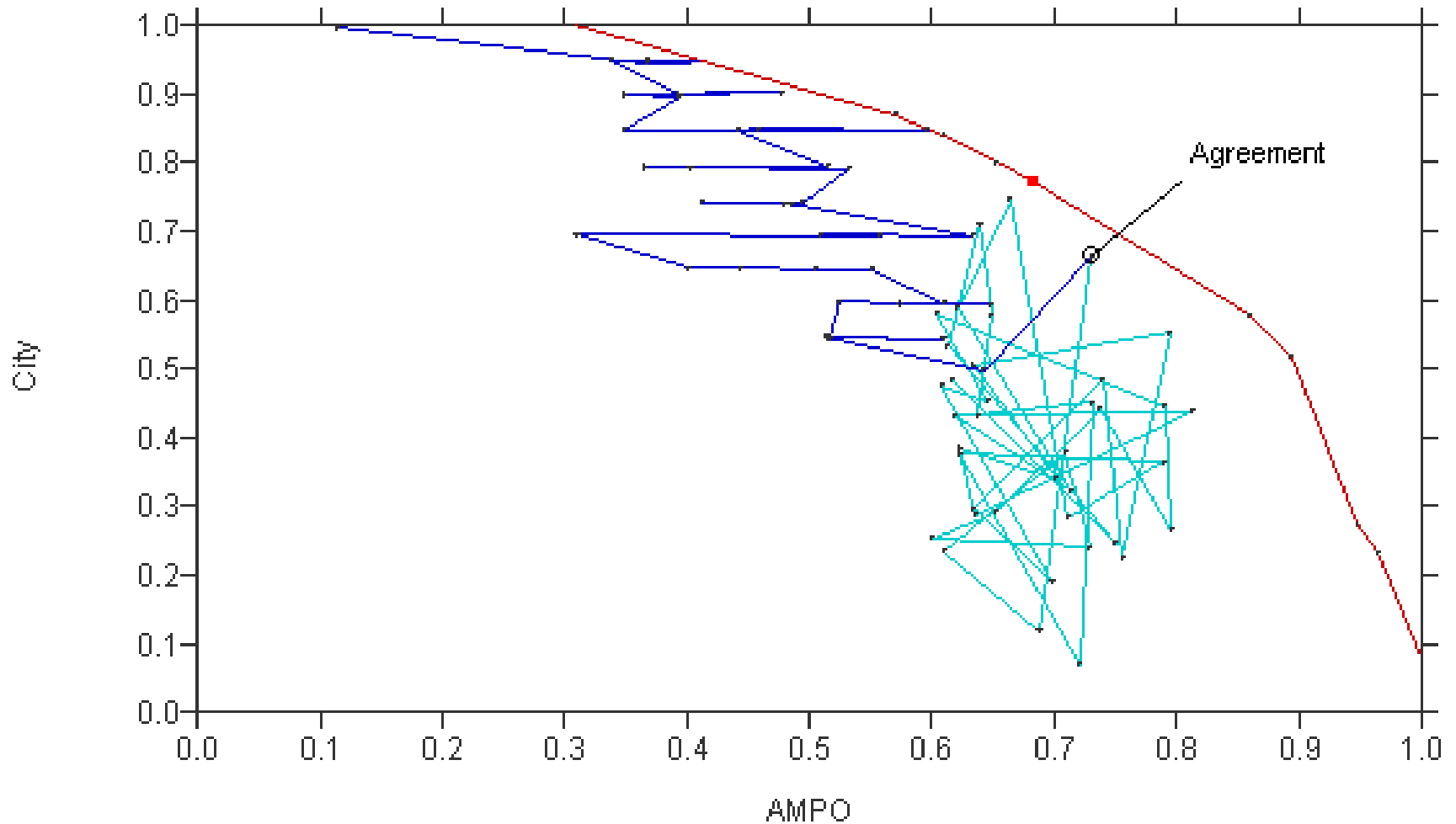
<sup>(\*\*)</sup> [Raiffa, 2002];

<sup>(\*\*)</sup> [Faratin *et al.*, 2003];

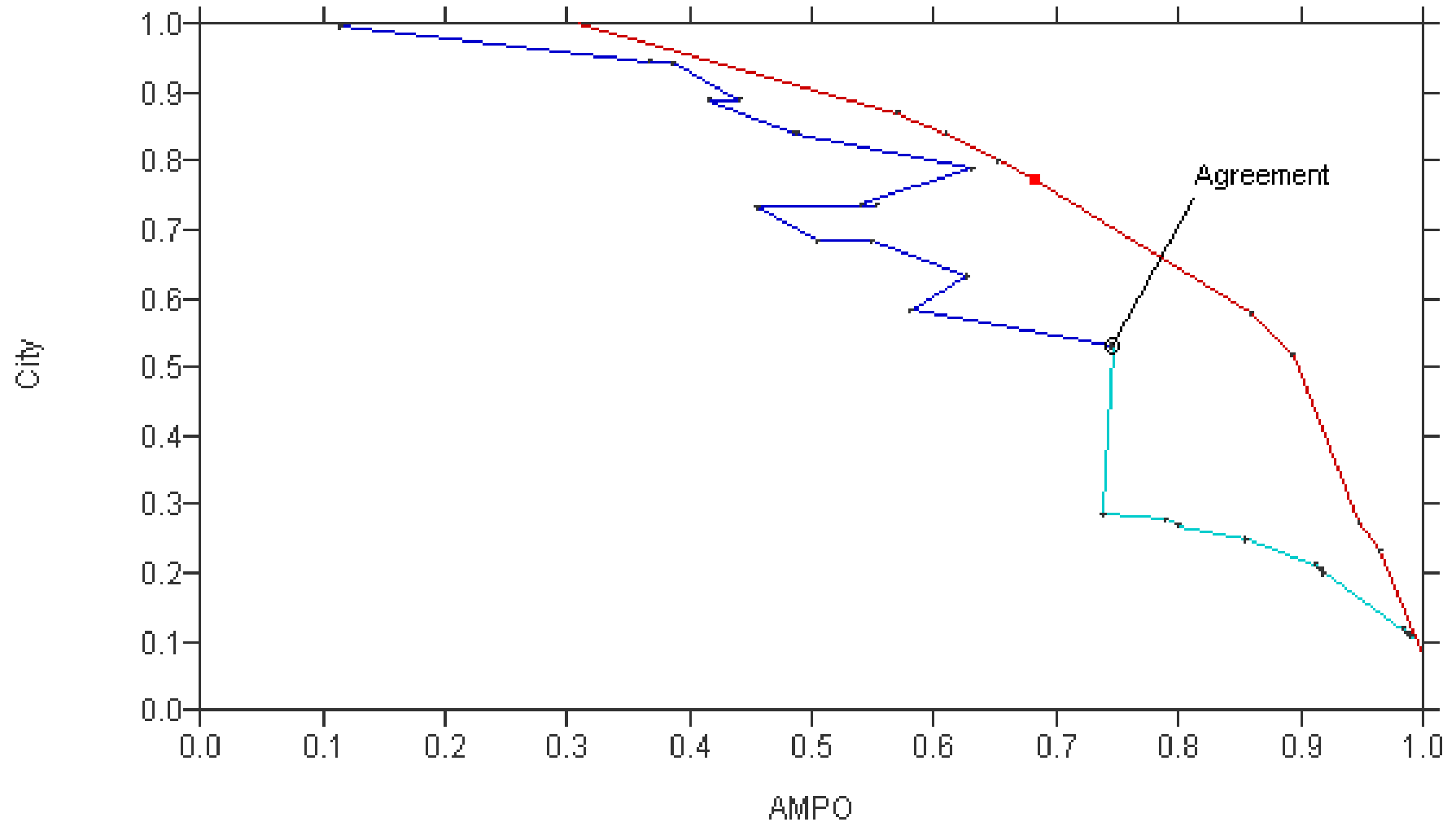
# Trade-Off (City) vs Trade-Off strategy (AMPO)



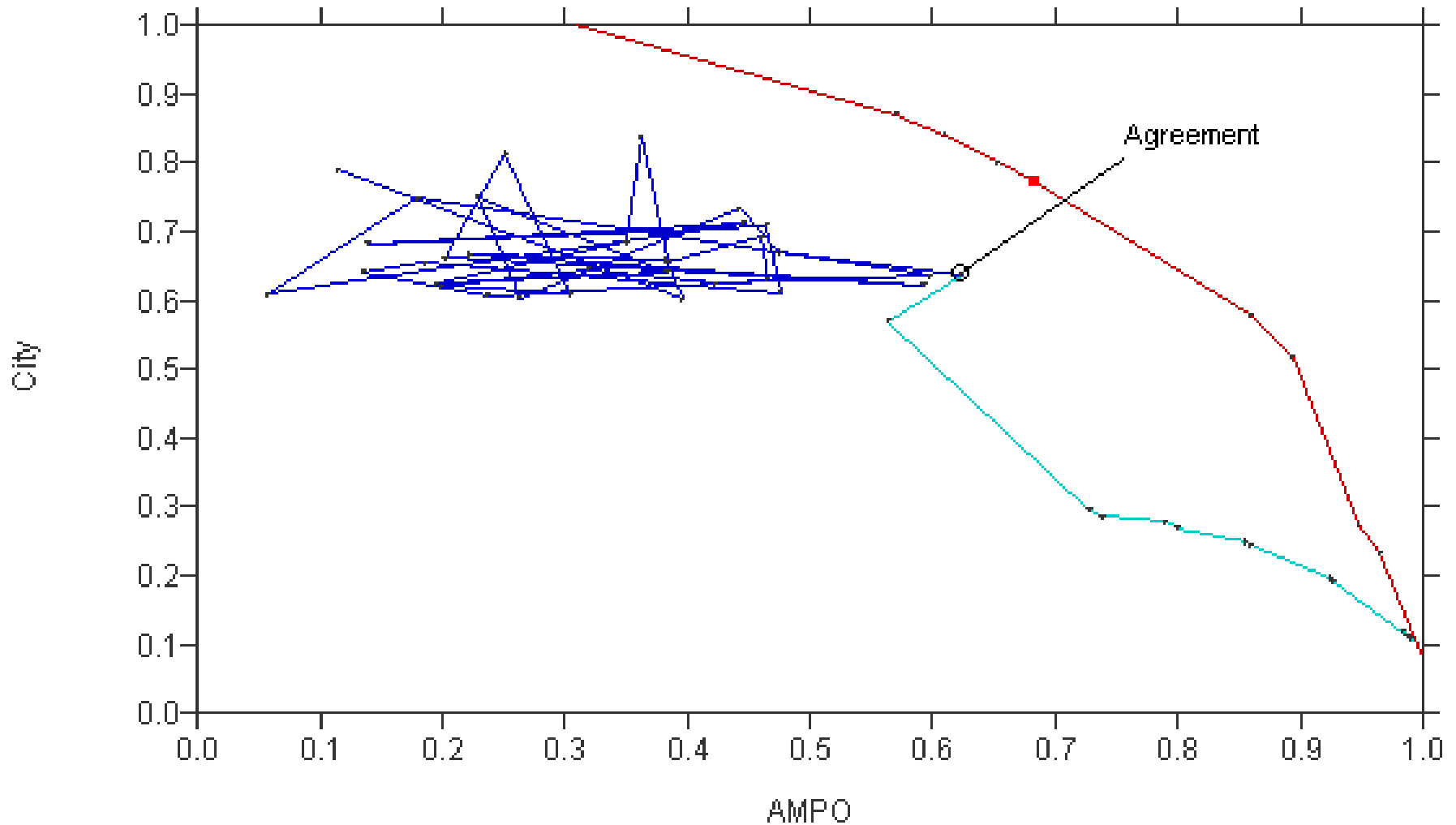
# Trade-Off (City) vs Random Walker (AMPO)



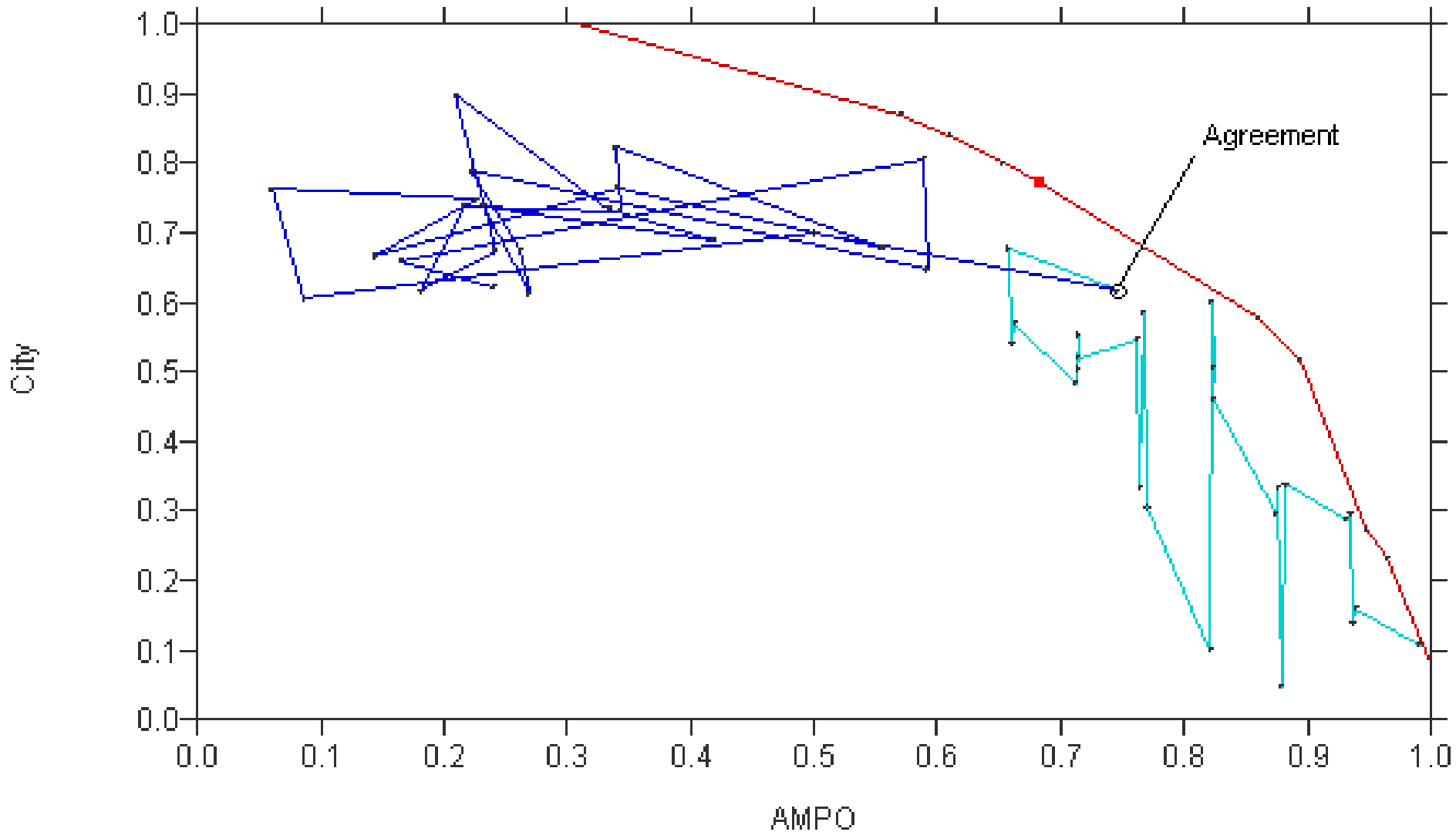
# Trade-Off (City) vs ABMP (AMPO)



# Random Walker (City) vs ABMP (AMPO)



# Random Walker (City) vs Trade-Off strategy (AMPO)



# Outcome Utility

- Overall utility:
  - ABMP 0.72,
  - Trade-Off 0.74, and
  - Random Walker 0.69.
- **Trade-Off** better than ABMP on:
  - SON domain
  - AMPOvsCity domain;
- **ABMP** better than Trade-Off on:
  - Second hand car domain;
- ABMP weak on the SON domain

*The domain matters!*



# The Three Domains

- Second hand car selling domain:
  - 5 issues (4 discrete issues and price issue),
  - only the buyer's preferences and the price issue are **predictable**
- Service-oriented negotiation (SON):
  - 4 continuous issues;
  - all issues are **predictable**;
- AMPO vs City
  - 10 issues;
  - only 8 issues are **predictable**;



# Dynamics Analysis

	ABMP	Random	Trade-Off	Human
Selfish	0%	25%	0%	7%
Fortunate	0%	25%	0%	8%
Unfortunate	15%	25%	5% - 30%	10%
Concession	85%	25%	45%	75%
Nice	0%	0%	5% - 50%	0%

*The opponent matters!*



# Understanding the opponent

- Trade-Off:
  - **Fantastic** for predictable domains (SON domain);
  - In AMPOvsCity domain: **wrong weights**;
  - Second hand car domain: **wrong weights, wrong evaluations**;
- ABMP:
  - **Ok** on competitive domains (SON domain);
  - **Very stable**;



# Conclusions

- The bidding process matters, even for software agents.
- Want to negotiate efficiently? Know your partner!
- Insufficient domain knowledge implies unfortunate steps.
- Insufficient opponent knowledge implies unfortunate steps.
- Develop a strategy in the context varying domains!
- The insights gained helped us to define a better strategy, and the work continues.

