

## Pros and cons of VCG mechanism

- ① DSIC - hence very low cognitive load on the bidders
- ② No deficit (and subsidy) if items are goods
- ③ Never charges a losing agent
- ④ Individually rational to participate - nobody loses money.

## Criticisms of VCG:

### ① Privacy and transparency:

- (a) it reveals true valuations/types. Two competing companies would not like to make the private information public.
- (b) a malicious auctioneer may introduce fake bidders to extract more payment from the bidders.

### ② Susceptibility to collusion:

Players	A	B
1	200	0
2	100	0
3	0	250

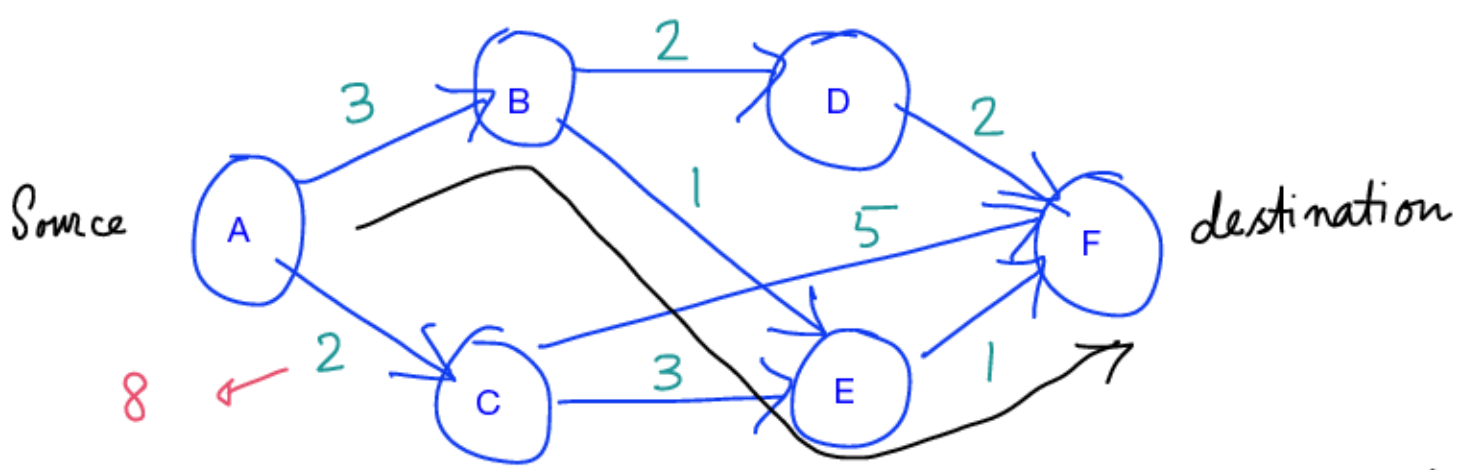
payment
150
50
0

example: public goods

If 1 and 2 collude and bid higher, both of them reduces their payments  $\Rightarrow$  utility increases.

### ③ Not fungal: payment could be very large

VCG is guaranteed to be no deficit, but can charge payment much larger than the cost.



Example: item delivery network (e.g., Amazon)  
 This is a cost setup, hence the values can be considered to be negative. Each edge is a player.

Efficient allocation:  $A \rightarrow B \rightarrow E \rightarrow F$

$$P_{AB} = (-2 - 3 - 1) - (-1 - 1) = -4$$

$$P_{AB} = (-8 - 3 - 1) - (-1 - 1) = -10$$

effect of the other players' costs.

#### ④ Revenue monotonicity violated

revenue monotonicity: revenue weakly increases with number of players.

	F	M	payment
1	0	90	0 → 0
2	100	0	90 → 0
3	100	0	→ 0

nobody's pivotal

## ⑤ Not budget balanced

This is a no deficit mechanism, but it almost always keeps surplus - which can be large.

Problem: this money cannot be redistributed among the same players, since that will change their payoffs and the resulting mechanism can be not DSIC.

If the players are partitioned into two groups and the surplus of one group is redistributed over the other group - then it is budget balanced, but the overall efficiency is compromised.

This surplus has to be taken away or destroyed -  
money burning

To understand this trade off better, see

Nath and Sandholm (2019): Efficiency and budget balance in general quasi-linear domains, Games and Econ Behavior.

Remark: these are certain limitations, VCG still is quite elegant and widely used in various settings. Good to know the limitations for effective use.