Two-Sided versus Complement Products: Pricing and Welfare

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November 28, 2014
Pros & Cons seminar, Stockholm

Motivation and Research Question-I

- Two-sided markets have become famous because standard results regarding competition among firms do not apply to firms active in two-sided markets

- It has been argued, among other things, that:
  - a monopolist may give away a product for free
  - a merger may lead to lower prices
  - collusion may be beneficial to consumers
  - and so on...

- When one hears people talk about two-sided markets, one often hears that
  - "two-sided markets are like markets for complement products"
- Is this true?
- To what extent?
- Which are the differences and which are the similarities?
- Do they matter?

- Pros & Cons conference:
- if two-sided markets were simply markets for complement products, then the theory of two-sided markets would add little to existing IO knowldge and competition policy
- except possibly that there are more markets for complement products than we thought

My answers today

- Two-sided markets are different from markets for complement products
- But
  - under some conditions, firms in two-sided markets may behave (e.g. price) as firms in one-sided markets that sell complement products
- Even when this happens
  - welfare consequences may be very different

Background

- Presentation is based on work done for the following papers
  - Price Competition in Two-Sided Markets with Heterogeneous Consumers and Network Effects (with Tobias Klein), Net Institute Working Paper No. 2013-13; *under revision*
  - Optimal Cartel prices in Two-Sided Markets (with Federico Boffa), NET Institute Working Paper No. 2014-19, *under revision*
  - Network Effects and the Efficiency Defence in Mergers Among Two-Sided Platforms (with Damien Geradin and Konstantina Bania), *work in progress*

Outline of the talk

- The two definitions
- Pricing and welfare results in one-sided markets
- A simple model:
  - pricing
  - welfare
- Some extensions
- Lessons from these simple models
- More complex models
- Conclusions

Two-sided markets

- Two-sided market: A firm sells two different products or services to two different groups of customers and demands are interrelated through indirect network effects.
  (note: the groups of customers are not different in the sense of price discrimination)
- When choosing, *customers* do not take these network effects into account (*do not internalize*, hence often called "externalities").
- When setting prices or quantities, *firms* take network effects into account (*do internalize*), as they own both products.

Markets for complement products

- Markets with complement products: Demand of one product declines with a increase in the price of the other (or price of one declines with a decline in the quantity of the other).
- When choosing, (non-naive) *customers do internalize.*
- *Firms internalize only the effects among products they own* (e.g. monopoly versus duopoly).

Well-known results from one-sided markets

- With substitute products, prices are strategic complements and quantities are strategic substitutes.
- Hence, monopoly (or collusion or a merger in the absence of efficiency gains) will raise prices and lower quantities.
- This is becase the monopolist will internalize the *positive effect* raising the price of one product has on profits from the other product.
- As a result, moving from competition to monopoly, consumers will be worst off and total welfare will decline.
- Thus, *competition policy has been concerned with* markets for *substitute products*.

Often forgotten results from one-sided markets

- With complement products, prices are strategic substitutes and quantities are strategic complements.

- Hence, monopoly (or collusion or a merger) will lower prices and raise quantities.

- This is becase the monopolist will internalize the *negative effect* raising the price of one product has on profits from the other product.

- As a result, moving from competition to monopoly, consumers will be better off and total welfare will increase.

- Thus, *competition policy has been little concerned with* markets for *complement products*.

A simple monopoly model

- There are two market sides, advertising ("a") and viewership ("v"). There is a monopolist pay-TV.
- Demand on one market side depends on price on that market side and quantity on the other market side.
- The broadcaster sets either quantity or price on each market side
- Both demands will react to changes in quantity or price on one side only

Lessons from the simple monopoly model

- Across sides product may be
  - complements (both sides care positively about the other side)
  - one a complement to the other and the other a substitute to the first
    - i.e. if advertisers like viewers but viewers do not like advertising, then viewers are a complement to advertisers but advertisers are a substitute for viewers..

- In both cases a monopolist may sell a product at a very low price (or even at zero) to increase sales of the other product
- Just as in a one-sided market a monopolist selling complement products.

A Simple Duopoly Model

- Free-to-air television
- Exogenously free (for expositional reasons, but see Calvano and Polo (2014))
- Two horizontally (and vertically) differentiated channels, one per broadcaster
- Broadcasters choose advertising quantity (i.e. time) on their channel
- Viewers single-home, while advertisers may multi-home

Advertisers demand

- Same assumptions as in Peitz and Valletti (2008, IJIO)
- These imply that:
  - Advertising demand for one channel depends *only on the price* that it charges *per viewer*.

- Viwers like to watch TV content
- Viewers have preferences on the type of content (e.g. poltical preferences) distributed between extreme left and extreme right
- Channel 1 and 2 are horizontally differentiated (e.g. politically differentiated: one is left-wing, one is right-wing)
- Viewers bear a cost when watching a TV channel which does not match their (e.g. political) preferences
- Viewers dislike advertising, but they cannot avoid it, because content is sold togetehr with advertising.

Viewers demand - II

- Viewers watch one (or no) channel
- Viewers choose the channel that yields them the highest utility
- Hence,
  - the allocation of viewers across the two channels is determined by (the difference in) the amount of advertising (as with prices in normal markets)
  - channels are not only horizontally differentiated but also vertically differentiated, in the eyes of viewers, since they broadcast different levels of advertising.
  - whereas horizontal differentiation is exogenous, vertical differentiation is endogenous, as the quantity of advertising is determined by the broadcasters.

Competition in Advertising Quantities

- Broadcasters have only one instrument to compete: advertising quantity.
- It turns out that:
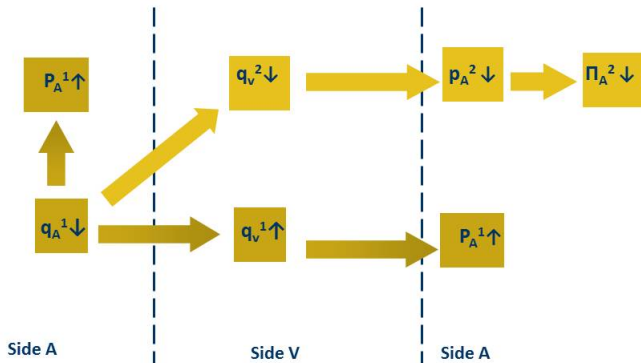 - Advertising quantities are strategic complements

  implying that:
  - i.e. the more channel 1 advertises, the more also channel 2 advertises

Advertising financed TVs setting ad quantities

Keeping fixed q^2_A, p^1_V and p^2_V

$P_A^1 \uparrow$	$q_V^2 \downarrow$ → $p_A^2 \downarrow$ → $\Pi_A^2 \downarrow$	
$q_A^1 \downarrow$ → $q_V^1 \uparrow$ → $P_A^1 \uparrow$		
Side A	Side V	Side A

Some intuition

- Products on the advertisers' side of the market are substitutes to each other but will become complements once network effects have been taken into account.
- As the price to the viewers is exogenously set to zero, profits are gained on the advertisers side of the market only.
- Firms will thus be competing in advertising quantities with complement products as in a one-sided market.
- As in a one-sided market with complement products, quantities will be strategic complements.
- Monopoly, by incentivizing the internalization of these strategic effects, will lead to higher ad quantities, and lower ad prices, than competition.

Consumer welfare: the intuition

- Moving from (imperfect) competition (i.e. oligopoly) to monopoly, advertising quantities increase.
- Viewers are worse off because they view more ads.
- The number of viewers declines (if agregate demand is elastic)
- Advertisers benefit from higher advertising quantities but lose from reaching fewer viewers.
- Overall consumer welfare (viewers+advertisers) may rise or decline

Welfare: the standard

- Since there are two sides of the market and two groups of customers, there are two consumers' welfares (viewers and advertisers).
- If the merger leads to a higher consumer welfare from one group and a lower one for the other group:
  - do we look at the sum of the two?
  - do we look at each one separately?
- Economics: if you have a consumer welfare standard, you sum up individual consumers gains; then you might as well sum up the two consumers welfares
- Argument even stronger if you have a total welfare standard; since you sum up consumers welfare and producers welfare, you might as well sum up the two consumers welfares
- However, in Mastercards (2007), GC and ECJ said "separately"
- AG: You can sum up welfare of the same category of consumers across different markets, but not sum up welfares of consumers of different categories
- " Competition law ... is not intended to favour one category of

Some further intuition

- Suppose viewers' prices were positive but exogenously fixed.
- The main consequence would be that broacasters profits would depend not only on advertising revenues but also on viewers revenues.
- By setting advertising quantity broacasters would affect not only advertising prices but also viewers quantity and thus viewers revenues.
- Advertising quantities will play a similar role to viewers prices on the viewers' side of the market.
- Hence, there will be an additional strategic complementarity of setting ad quantities on the viewers side of the market.
- Monopoly will lead to higher advertising quantities, and lower advertising prices, than competition.

Advertising financed TVs setting ad quantities
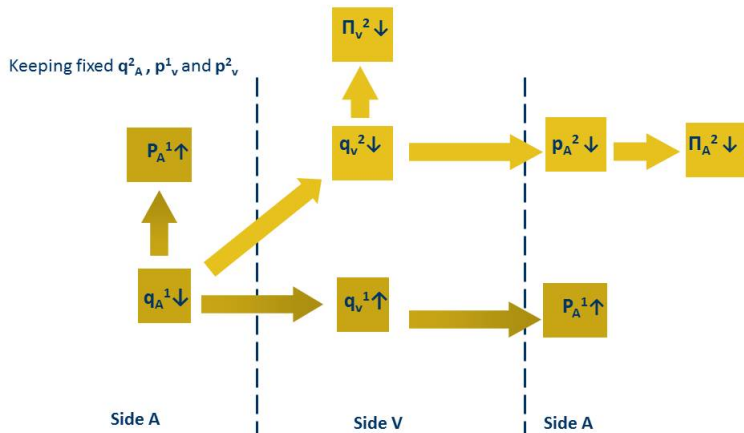
Some even further intuition

- Suppose broadcasters also set viewers prices (Pay-TV or Pay-per-View)
- The main consequence would be that broacasters profits would depend not only on advertising quantities but also on viewers prices
- By setting viewer prices, broadcasters will affect the number of viewers as they would in a one-sided market.
- But they will also affect the amount of advertising and the revenues from advertising.
- Viewers prices will play the opposite
- Hence, there will be an additional strategic complementarity when setting prices on the readers side of the market,
- All in all, a monopolist will tend to increase prices on the viewers side and increase quantities (or reduce prices) on the advertisers side.

Pay-TVs setting also viewer prices

Keeping fixed q^1_A, q^2_A and p^2_v
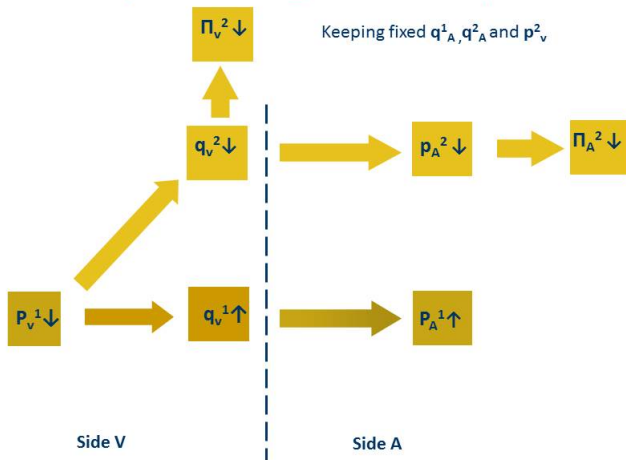
Lessons from the simple duopoly model(s)

- In two-sided markets, as in one-sided markets with complement products, once network effects are taken into account, quantities may be strategic complements while prices may be strategic substitutes (see also Reisinger, Ressner and Schmidtke, 2009, JIE)
- Hence, monopoly (or collusion or a merger) may raise quantities (or lower prices) of competing products
- Such an increase in quantities (or decline in prices) may still damage consumers
- In particular, while consumers on one side may suffer (e.g. viewers), consumers on the other side may benefit (e.g. advertisers)
- Overall consumers may benefit or may lose.
- Total welfare may decline or increase.
- When competition policy has a consumer welfare standard, it may be crucial to identify consumers (e.g. viewers and/or advertisers?)

Complements or substitutes?

- In the simple model above, ad quantities were the only instrument. Hence, when moving from competition to monopoly, firms change those.

- Given strategic complementarity, ad quantities increase.

- In more complex models, firms have two instruments: ad quantities/prices and viewers quantities/prices.

- There are in general four effects a firm has on its rival:
  - 1) within side effects of viewers quantities/prices
  - 2) within side effects of advertising quantities/prices
  - 3) across sides effects of viewers quantities/prices
  - 4) across sides effects of ad quantities/prices

- For complementarity to play a role (e.g. in a merger) one needs complementarity in at least one of these effects to be strong enough.

Conclusions-I

- Two-sided markets are different from markets for complement products
- Under some conditions, firms in two-sided markets set prices (or quantitites) as in markets for complement products.
- These conditions relate to the prevalence of some form of complementarity in demand
- They relate to size and sign of the indirect network effects, i.e. to the importance of (endogenous) vertical product differentiation due to the network effect.
- More precisely, they relate to the importance of this (endogenous) vertical product differentiation versus the (often exogenous) horizontal product differentiation.
- However, the welfare consequences are instead very different.
- This is due to the fact that in a two-sided market there are two distinct group of customers

Conclusions-II

- Competition policy has been little concerned about markets for complement products (e.g.Motta(2004))
- This is mainly because a lack of competition in markets for complement products does not damage consumers
- The theory of two-sided markets has showns that complementarity in demand is much more widespread than it appears at first sight.
- Markets where such (hidden) complementarity in demand is present are widespread and growing (e.g. digital markets)
- But in two-sided markets a lack of competition may still damage consumers.
- Hence the theory of two-sided markets is useful for competition policy.

Thanks

- Thanks for the attention
- Comments are welcome