

Gas Models and three difficult objectives

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Object of the presentation

- There are models of the European gas market
- There are also three objectives
 - Competitiveness
 - Security of supply
 - Sustainability
- Can the models help the objectives?

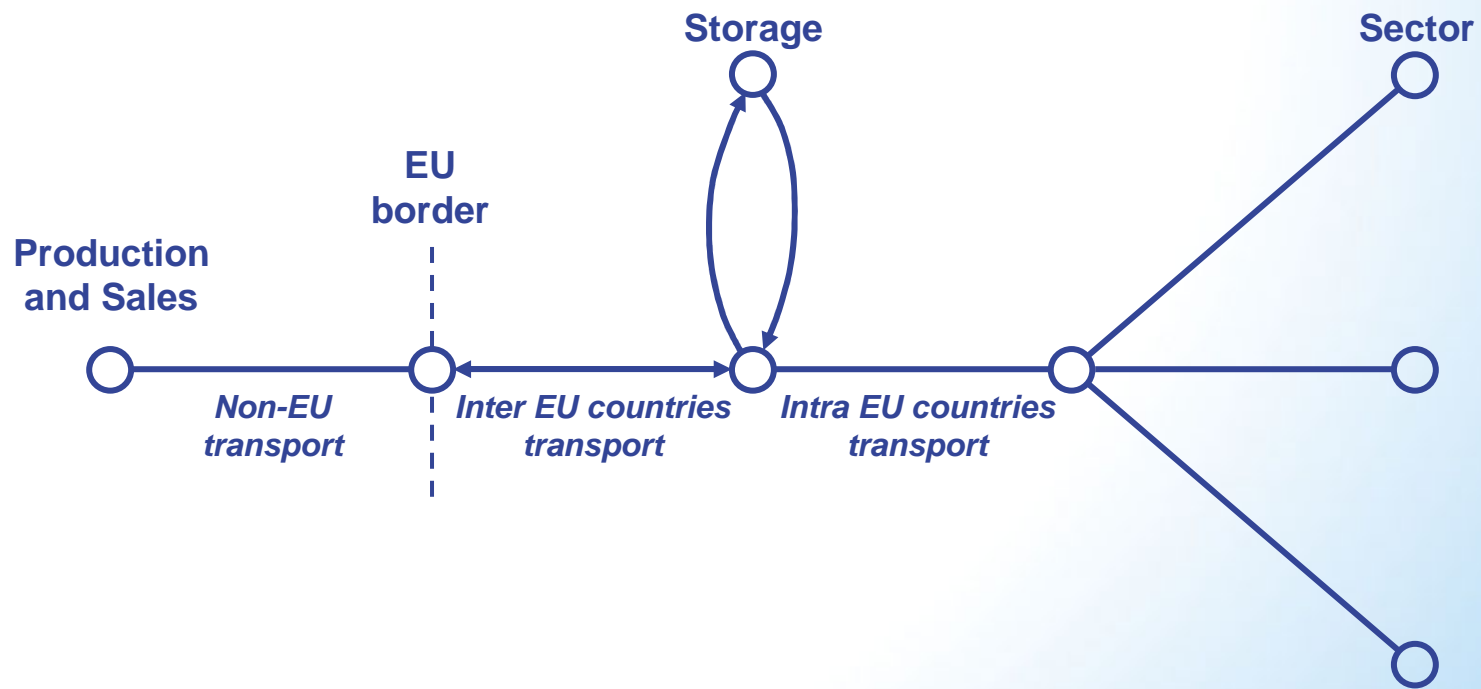
The models

- Four models of the European market
- Related but certainly not identical
 - GASNAT: CPB
 - GASMOT: DIW
 - GASTALE: ECN, different versions, among them
 - Egging/Gabriel

The basics of competition

- DG COMP has a view of the product and geographic markets
 - Production and sales (including LNG)
 - Transmission not larger than national)
 - Storage (not larger than national)
 - Supply
 - To wholesale (not larger than national)
 - Retail (not larger than national)
- And two other markets that we neglect here
 - Exploration and network operations

A Pictorial Description



Gas production and sales

- Producers are countries/companies
 - companies appear in GASTALE
- Producer represented by full cost or full cost functions
 - Variable capacities in GASNAT
 - Fixed capacities otherwise
 - Data coming from different sources and difficult to compare
- Sell
 - to countries (GASNAT, GASTALE, GASMODO)
 - to sector in country (Egging/Gabriel)

Transport is EU wide

- In all models
- This is different from DG COMP view
- No detailed description of the grid
 - A point to point representation between countries
 - From countries to countries (GASNAT, GASMODO, Egging/Gabriel)
 - Along corridors from producers to countries (GASTALE, GASMODO)
- Note: Before restructuring
 - gas transport was not cross border driven
 - Today: cross border capacities!!!

Transport capacities

- Variable in GASNAT and last version of GASTALE
 - Investment and operations cost for expanding capacity
- Full cost and exogenous capacities otherwise.
 - With pricing of congestion on capacities

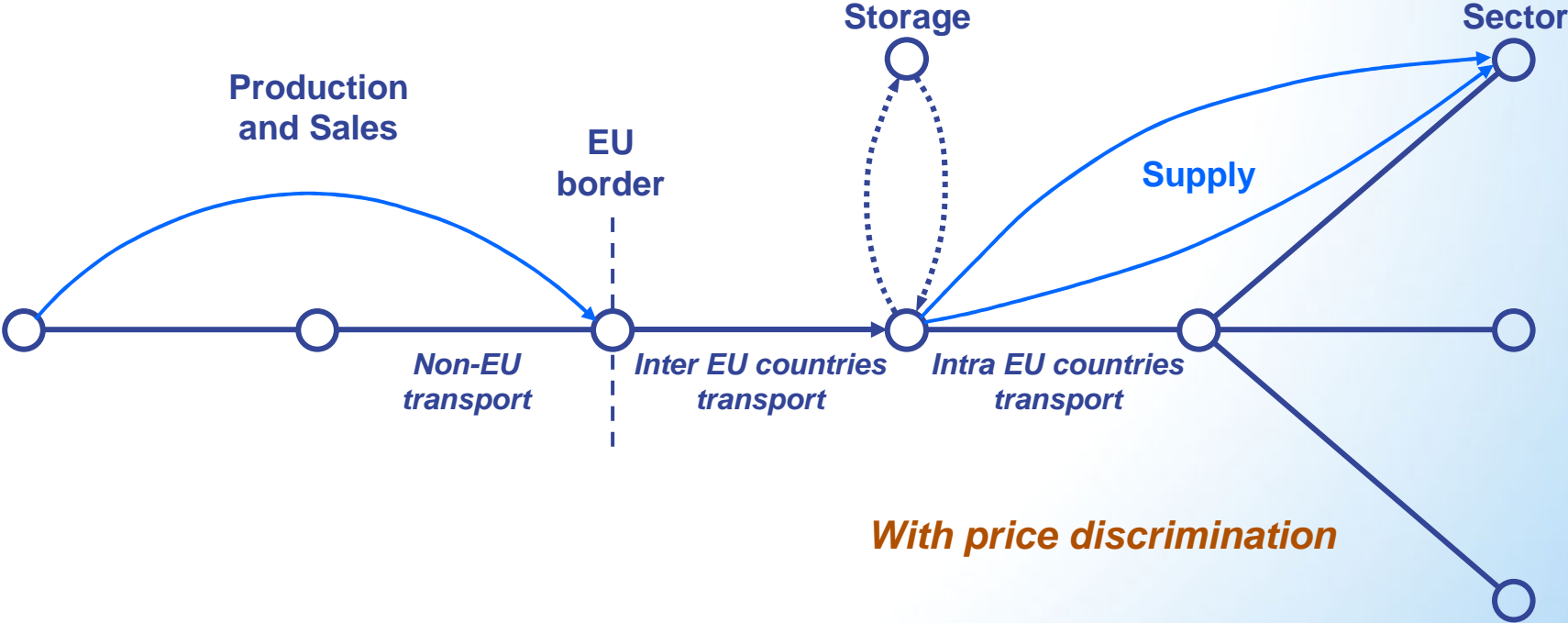
Storage

- No storage in GASMOD and GASTALE
- Storage is national in GASNAT and Egging/Gabriel
 - Exogenous capacities in Egging/Gabriel
 - Variable capacities in GASNAT

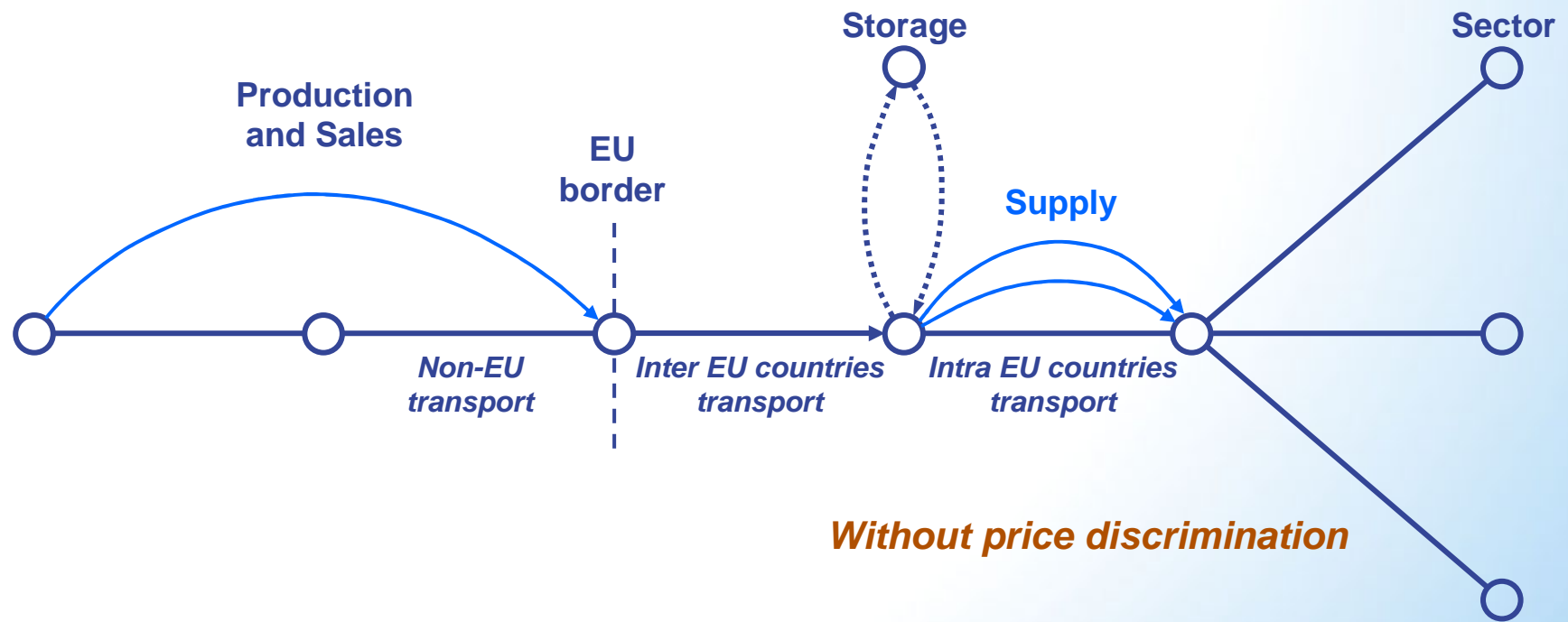
Various assumptions on Transport Supply

- Transport is EU wide in all models
- But supply differs from model to model
 - And supply is at the core of DG COMP concerns

Supply: GASTALE (1)

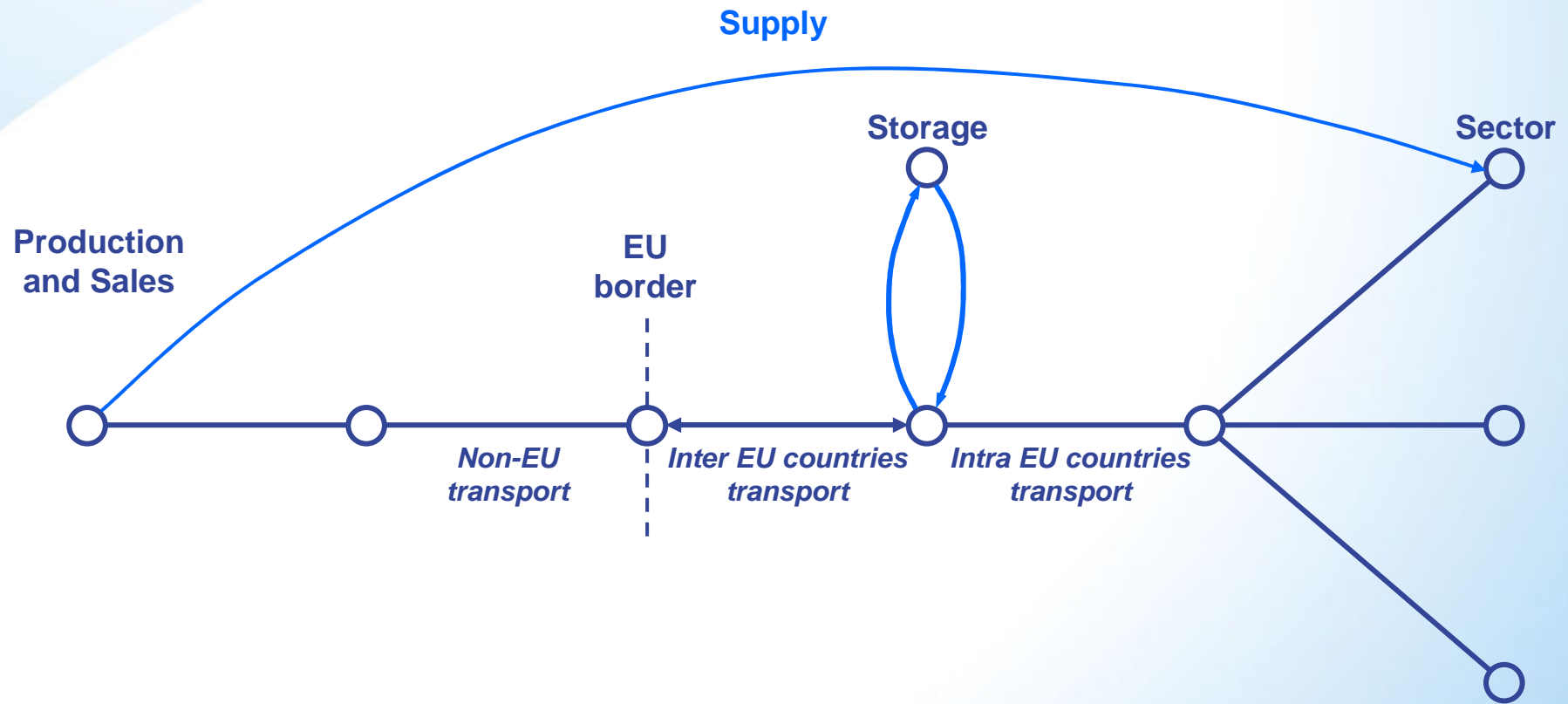


Supply: GASTALE (2)



Interpretation: Supply is no larger than national with or without destination clause.

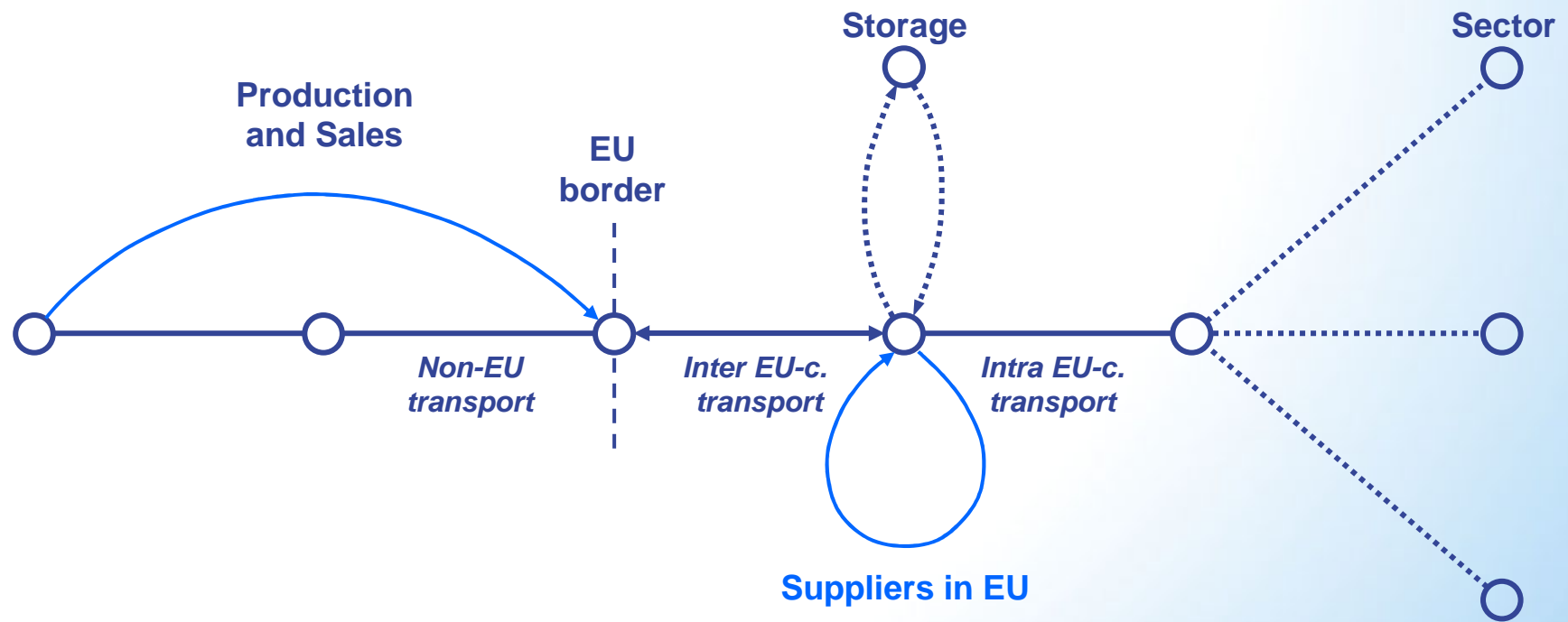
Supply: Egging / Gabriel



Producers directly sell to sectors, buy transport and storage services

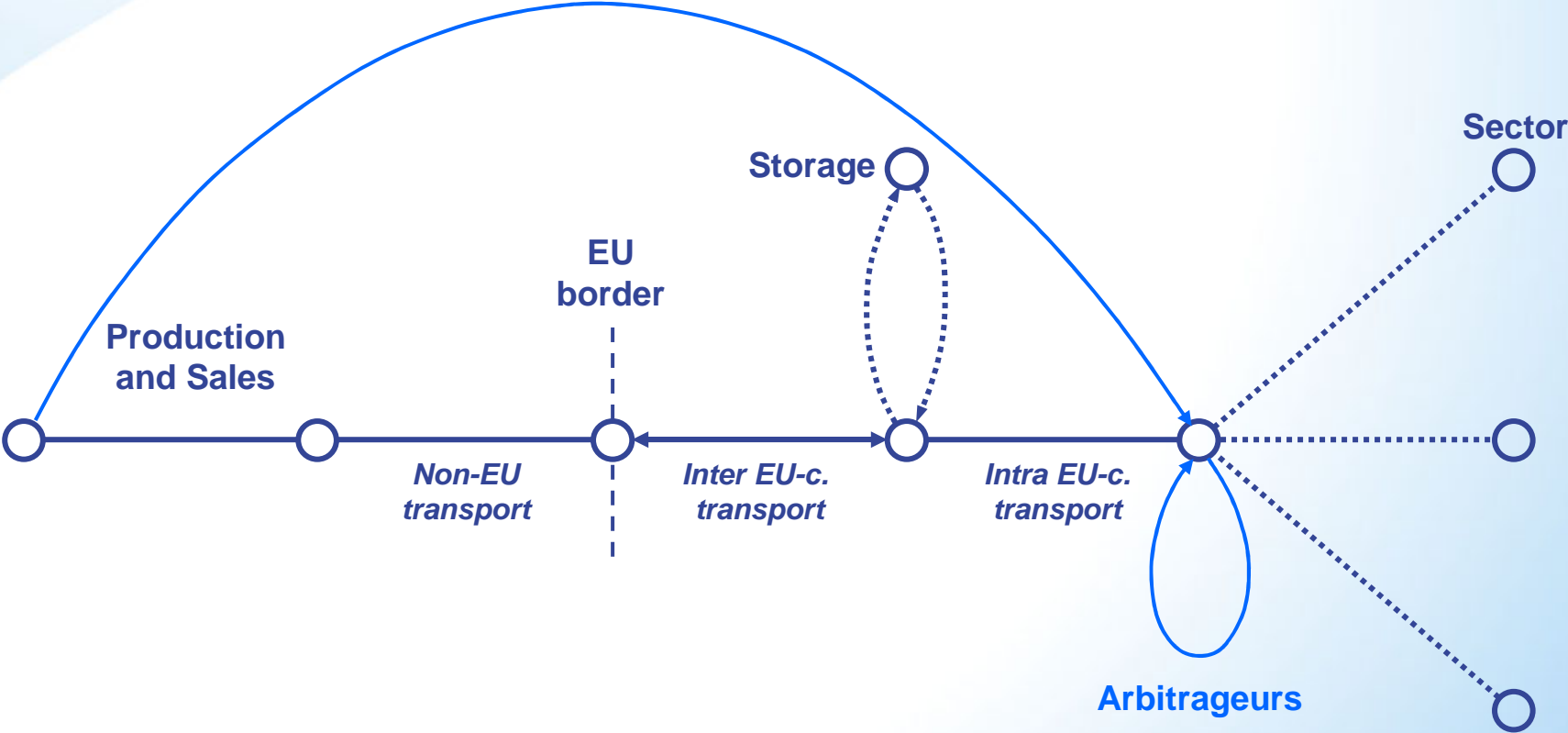
Interpretation: destination clause still applies.

Supply: GASMOD



Interpretation: Supply is EU-wide (eliminates destination clause)

Supply: GASNAT



Interpretation: Arbitrageurs eliminate destination clause.

The technicalities of supply

- Wholesale and retail
 - GASNAT: a single linear demand function
 - GASMODO: a single constant elasticity demand function
 - GASTALE: three demand sectors (household industry and power) linear demand functions
 - With possibilities of discrimination between sectors
 - Egging/Gabriel: linear demand functions for three demand sectors (household industry and power)

The usual weakness of supply

- The critical problem of the demand side
 - GASNAT:
 - wide range of demand elasticities (from 0.18 to 0.65 with base 0.25)
 - GASMODO:
 - a “rather low” elasticity (0.6, 0.7)
 - GASTALE:
 - Pindyck 1979) with elasticities ranging from 1.5 to 2.2
 - Egging/Gabriel:
 - “low elasticities”
- The same shortcoming as in electricity: lack of a good demand model

Conclusion on the product and geographic markets

- Product markets in line with DG COMP
 - Gas production and sales, transport, storage, supply
- Divergences on the geographic markets
 - Supply
 - From sector/country supply (GASTALE) to EU wide supply (GASMOD)
 - Transport: EU wide
 - Storage: national
- The geographic markets are in flux

The assessment of competitiveness

- Models for assessing losses due to market power
 - And hence the gains of competitiveness
- Two standard competition paradigms
 - Perfect competition
 - Cournot competition
 - Applied to gas production and sales
 - Applied to gas supply
 - Never to transport or storage
 - » Recall: EU-transport is regulated but
 - » Non EU-Transport is not regulated (Russia did not ratify ECT)
 - » Storage is not regulated

Oligopolies in production and sales

- GASNAT and Egging/Gabriel
 - Straight Cournot application on gas production and sales
 - E.g. Egging/Gabriel
 - Price increase by 86% in Cournot
 - Producer surplus drop by 28%
 - The changes differ by country
 - Transport and storage makes profits because of arbitrage possibilities (transport and storage arbitrageurs make profits)
 - But this is due to “low elasticity demand”
 - » And possibly to existing capacities that also restrict substitution possibilities

Is this type of analysis useful?

■ Yes

- The Commission has little legal power (if any) on resources owned by States; it can apply competition law to firms
- But Egging/Gabriel show that investments in transport and storage can decrease market power of the producers
 - Therefore modelling market power on the producer side only is useful
- The model also shows who gains from investments
 - This helps but does not completely solve the problem of finding who will finance this infrastructure (computing a cash flow based on a decrease of price is not standard business practice)
- More on that later

A standard debate on Cournot

- GASNAT and Egging/Gabriel resort to conjectural supply functions
 - This generalizes Cournot but also makes the model clumsy
 - The approach has no foundation in economics (it is somewhat equivalent to conjectural variation)
 - It is a nice computational trick; it cannot be validated in practice and will just make all results (e.g. of how gains from a pipeline reinforcement) contestable
- In all cases Cournot results significantly depend on the price elasticities
 - And also possibly here on capacity constraints
 - We should know more about demand but
 - “it is not a good subject for a PhD thesis”

A more sophisticated debate on Cournot

- GASTALE and GASMOD go much beyond the sole market power in production and sales
- Recall: the Commission finds that the supply market is national and concentrated. It wants to act.
- Recall also: Double marginalisation
 - What is worse than a monopoly? a chain of monopolies
 - What is worse than an oligopoly? a chain of oligopolies
- This is what GASTALE implements
 - Subject to drastic assumptions on the supply market
- And what GASMOD does not really implement
 - By relaxing these assumptions

Introduce competition in supply

- The double marginalisation argument « finds » (in principle) that there is a lot to gain by making the supply market competitive.
- This is a recurrent argument of the Commission
- GASMOD and GASTALE (1) confirm
 - But with different assumptions on the market
 - And different modelling approaches
- What do they do?

Three market scenarios

- Recall Egging/Gabriel
 - Cournot vs. Competition in production/sales
- GASTALE and GASMODO
 - Competition in both production/sales
 - Cournot in both production/sales
 - Cournot in production/sales competition in supply (“EU liberalisation” in GASMODO)
- GASTALE
 - GASTALE and price discrimination between demand sectors

GASMOD says that the Commission is right

■ GASMOD

- “in the EU liberalization scenario we find a welfare close to the case of overall perfect competition”
- Two underlying effects
 - Competition in supply increases welfare (almost by construction)
 - The representation of supply in GASMOD eliminate spatial discrimination
 - » hence increases welfare (already observed by Golombek et al (1995))

And GASTALE confirms

- GASTALE

- *“total surplus falls as the market moves from the competitive benchmark to oligopolistic producers/competitive traders and then to oligopolistic producers and traders...;the figures also show that if border price discrimination occurs, the producers profit increases at the expense of both trader profits and consumer surplus. However this effect is not large...”*

Is this really true?

- Both models give similar results
 - Even though they are not the same
 - In terms of data and market structure
- This may suggest that the finding is firm
 - “this contradicts the widespread thesis that an oligopolistic downstream market is the best response to an oligopolistic upstream market”
- But this is not the case: the debate is on the comparison between: double marginalisation vs. supply with bargaining power
 - But we did not model the latter

Back into some theory

- A technical issue
 - Modelling double marginalisation is more difficult than what appears in GASTALE and GASMODO
 - GASNAT discusses the difference between open and closed loop models of Cournot competition and the difficulty of closed loop models
 - That both GASTALE and GASMODO assume away by convenient assumptions.
- The area is murky (check Karp and Newbery 1993)
 - Open loop, dynamic consistency, Closed loop, Markov perfect equilibrium..
 - » we know little as to what is more realistic?
 - » And little about the numerical impact of the assumptions

The last version of GASTALE

- Introduces long term contract to mitigate the unrealistic Cournot behaviour
- This brings us back to the old dilemma
 - Long term contracts are good because they mitigate market power
 - Long term contracts are bad because they foreclose entry
- There is a paper (Neuhoff and von Hirschhausen)
 - With two demands for gas: long term and short term
 - And no relations between both?
 - Long term should be more elastic and hence decrease market power
 - But there should be a no arbitrage relation between both
 - » Now that it is possible to resell the gas
 - And hence less market power in the long run may decrease market power in the short run
- This suggests that
 - Supply can be made more competitive by allowing long term contracts
 - Which is not the position of DG COMP

On gas models and competitiveness

- The treatment of oligopolies and “anti competitive effects” is far from clear cut
 - And even the definition of the product and geographic markets are far from univoque
- We can make quite a lot of assumptions on the representation of market power
 - And should check the variability of the outcome
- But the main issue is that the difference becomes crucial and largely unexplored in static and dynamic models, that is when investments are stake

Moving to investments

- Discussed in GASNAT
 - an investment model in production and transmission
 - That accounts for the character of non renewable resource of gas
 - And contains some interesting notions of option value of the flexibility of Groningen field
- The last version of GASTALE also models investments (in transmission and storage)

Investments are important for Security of supply

- Studies of security draw the attention to
 - The increased dependence on gas
 - And the increased dependence on Russian gas
 - » In a climate that some claim is more driven by politics than business
- One then asks to consider measures to decrease this dependence
 - But little is proposed except (e.g. Keppler 2007)
 - Diversification of sources through investments
 - More liquidity in the market (among others through LNG)

Competitiveness and security of supply

- Welfare is increased if we consume more gas: recall
 - GASMOD and GASTALE: a dramatic welfare increase accompanied by an increase of gas consumption (in a reference year) of 65% (GASMOD), 50% (GASTALE)
- they could still be more gas: common wisdom is that power will play a significant role in the increased gas consumption

Sustainability and gas consumption

- Nuclear is uncertain in many countries
- Coal might be out if there is a floor on carbon
 - After the revision of the ETS (and there are good lobbyists pushing for it)
- Renewable and conservation? costing and pricing information remains scarce
- There could thus be more demand for gas
- Except if people feel that gas is insecure

What do the models tell?

- Recall Egging/Gabriel study of strategic investments
- The more recent version of GASTALE looks at investments to get the gas.
 - They are significant,
 - with a large part in countries that some think insecure.
 - And hence also subject to exercise of market power (market power on non EU transport is never represented so far in our models)
- But even this does not involve any representation of security of supply: it just assumes that the infrastructure will come and that there will be no disruption.
- Are we sure the investments will come?
 - A producer state is not a producer company: investment criterion might be different
 - And uncertainties may deter investments.

Can we go beyond our current investment models

- Could models tell us more? Yes
- Introduce scenarios of disruptions (the old IEA approach)
 - They can be economic (market power margins) or political (physical) disruptions
 - This can be interpreted as “N-1” as in electricity
- Change the models into investment models (this goes beyond the old IEA approach)
 - The European gas market must have the infrastructure to meet the “N-1” disruptions
- Can we model that?
- If we can, do models tell us who will finance the infrastructure?

We might have a financing problem

- GASNAT and the new version of GASTALE can in principle accommodate the N-1 criterion
- But there is a critical incentive question
 - How does one get the payment for the infrastructure in the N-1 states
 - Without a single grid investor?
 - In other words, we need to find a market mechanism for pricing security of supply (in this case the capability to meet the N-1 criteria).
 - All models assume a single perfect TSO in gas transport.
 - But this is quite different from the current geographic market of transportation.
 - That DG COMP sees as national

Models tell us again and again about the same difficulty

- Can we manage without a single grid operator?
 - The reason: the grid and more specifically a grid with redundancies for security of supply is a complex public good
 - The question goes much beyond reduction of trade because of national TSO operating within sufficient capacities
 - It is about disruptions because national TSO may not have the incentive to jointly finance N-1 secure grids.

This raises important questions

- An N-1 secure grid implies
 - An overhaul of the product definition
 - Storage, transmission, supply (interruptible contracts)... are (imperfect) substitutes for security of supply
 - » This is the underlying modelling assumption of the last version of GASTALE
 - This should come under the single TSO
 - And an implied change of the geographic market of transmission
 - A search for forms of legally acceptable agreements between operators (suppliers and producers) to (maybe) help set up this single operator
 - That current models do not mention
 - And that should be inserted in the models

The other proposal for security of supply

- A more liquid market
- How do we measure liquidity?
 - Suppose a transaction (in this case a disruption): will the price on the market change?
 - In practice: a market would be liquid if the “N-1” disruptions do not imply more than a 5% price increase.
 - This look like the S(S)NIP criterion in competition law
 - In GASTALE “a system (is) secure if the analyzed disruption scenarios result in temporary wholesale gas price increases of no more than 20%...”
- Develop our perfect competition models in that direction
 - With a better representation of the grid and storage.

Conclusion: models can be used and abused

- The same is true for gas models
 - Competitiveness in supply: results on the sole double marginalization do not tell anything on the comparison of double marginalisation and bargaining power
- Technical ambiguities remain
 - the various possible Cournot assumptions should
 - not prevent us from using the models but
 - should also not be ignored
 - and their impact assessed.

Gas models reveal our ignorance about gas

- We do not know enough about demand
- We do not know what the true geographic market is (think of using a grid model to conduct a SSNIP test)
- We do not know how to invest in a redundant grid without a single operator somewhere
- We do not know what type of agreements between undertakings would lead to the emergence of that investor in the supranational grid.