Auctioning Airport Slots

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Terms of reference

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- Study commissioned jointly by DETR and HM Treasury
- Reviews the options for using market mechanisms such as auctions for slot allocation at congested airports
- Develops an outline for how a slot auction might work in practice
- Considers the possible benefits of such arrangements relative to the existing regime

Key findings

- Despite the complexity of slot allocation, it is feasible to use an auction mechanism
- A modified simultaneous multiple round auction is our preferred auction design
- A formal secondary market is desirable, either on its own or as an adjunct to an auction
- The benefits of market mechanisms are greatest if usage rights are time-limited, but there are still benefits even with current grandfathering arrangements
- Market mechanisms should not be introduced without measures to prevent excessive concentration of slot holdings

Why allocation methods matter

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- There is significant excess demand at present
  - Heathrow and Gatwick have excess demand for slots for large parts of the day;
  - Other airports have excess demand at peak times
  - There may be considerable 'repressed' excess demand
- Demand for air travel continues to grow
- Increasing the supply of slots is slow and uncertain
- New capacity does not remove the need to allocate slots
  - New slots need to be given out for the first time
  - Competing demands for peak slots must be resolved

Why use market mechanisms?

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Market mechanisms

(Auctions and/or well-established secondary trading)

Price signals

Slots go to those carriers who value them most

Incentive to switch between peak/off-peak or airports for those carriers who can do so most easily

Cost of capacity shortage becomes obvious, facilitating assessment of where and by how much to extend capacity

What are the problems with market mechanisms?

- Those with the greatest willingness to pay for slots may not necessarily generate the greatest social value from them
- Without adequate safeguards, market power may persist or be built up
- Regional routes with a public service function may need to be protected

The slot allocation problem

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- The allocation of slots affects the services offered by airlines and competition in air travel
- Allocating slots is a very complex problem
  - Potentially large number of slots to allocate at once
  - Runway, stand and terminal constraints
  - How slots are used affects utilisation of airport capacity
  - Synergies between slots for carriers
  - Matching slots may be required at both ends of a route

Capacity constraints at airports

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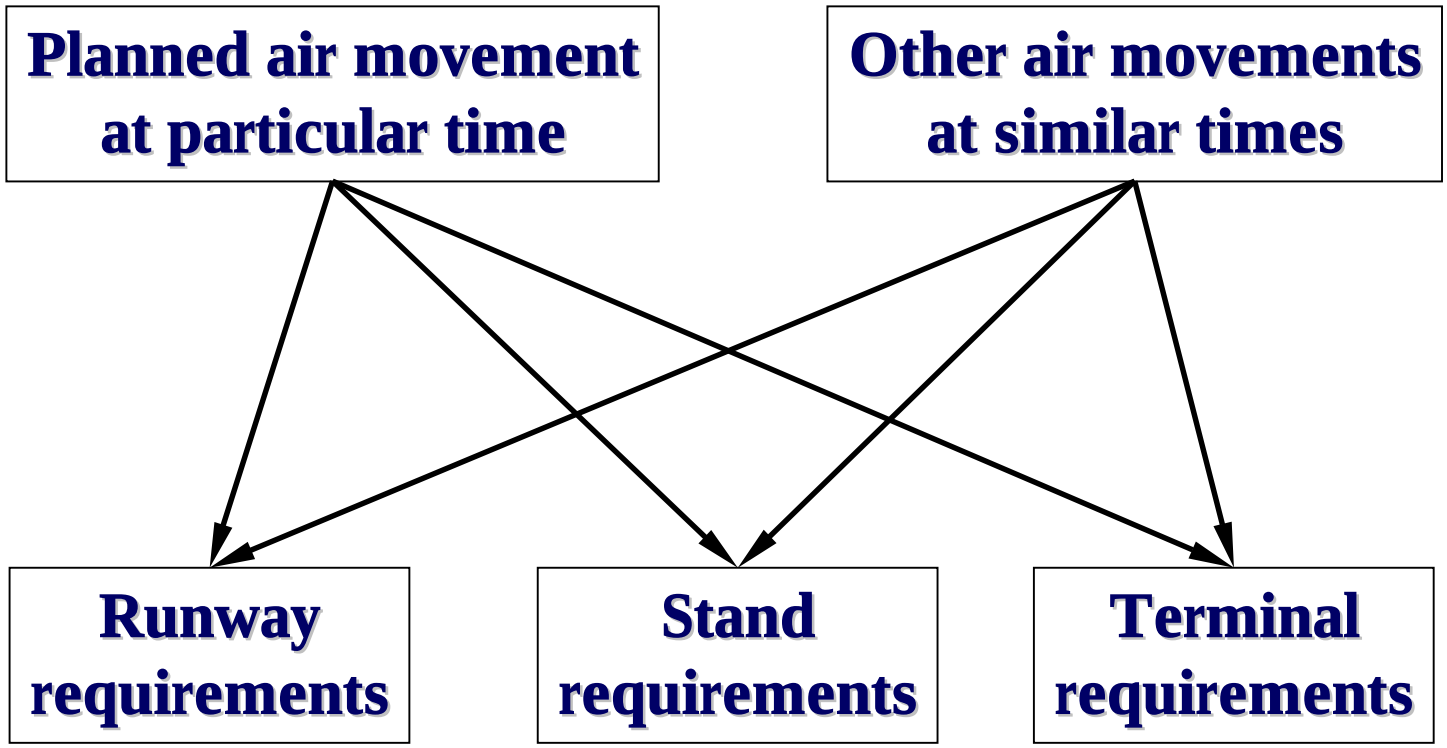

Aircraft size
Take-off/landing
Routing direction

Aircraft size

Aircraft size
Load factor
Terminal preference

Objectives for auction design

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- Efficient, pro-competitive outcomes
- No more complex for bidders than necessary
- Allow bidders to build up attractive combinations of slots and to substitute between slots depending on price
- Fit into international scheduling timetable
- Limit any possible build-up of market power

Auction structure – key points

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- Combine terminal, stand and runway into *flexible bundles* to reduce risk and complexity and increase efficiency
- Allow carriers to express preferences for slots within particular *time windows*
- Within these time windows, use scheduling algorithms to determine who is scheduled to fly when
- Use an *open auction format* to allow bidders to combine and substitute slots at different times
- Use flexible rules similar to merger control regulations to constrain market power

Lots and bids

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- Lots defined as **time windows for landing / take-off** on a particular **day of the week** for an **entire season**
- Bids for a particular time window consist of a **bid amount** and a nomination of **usage factors**:
  - Use of slot for take-off or landing
  - For take-off slots, the routing direction
  - Size and category of aircraft
  - Preference for terminal, where applicable
  - Maximum passenger load factor
- There would be **multiple winners** for a particular time window with the exact number being determined during the auction
- Bid determines how a particular slot can be used
- Any later misuse of a lot would need to be penalised

An example – slots in Heathrow

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Time window length	Windows per day	Windows per week (# of lots)	Slots daily	Average slots per window	Maximum slots per window	Minimum slots per window
1 hour	17	119	1,334	78.5	85	48
30 mins	34	238	1,334	39.3	43	24
20 mins	51	357	1,334	26.2	28	16
15 mins	68	476	1,334	19.7	22	12

- Bids made for time windows
- Within time windows, actual ticket time determined by scheduling algorithms
- Exact number of winners depends on nominated traffic patterns

Evaluating bids

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- Faced with a number of bids, the auctioneer determines the combination of bids that are ***feasible*** and have ***maximal total value***
- In practice, this would often mean taking highest bids, but not always
- Example
  - Feasible combinations of bids are A (total 200) and B&C (total 250)
  - 'Highest bids' are B and C, even though A has a higher bid amount

		Runway	***Terminal***
	Availability	2 units	4 units
	Bid amount	***Capacity required***	***Capacity required***
Bid A	200	1 unit	3 units
Bid B	150	1 unit	2 units
Bid C	100	1 unit	2 units

Possible auction formats

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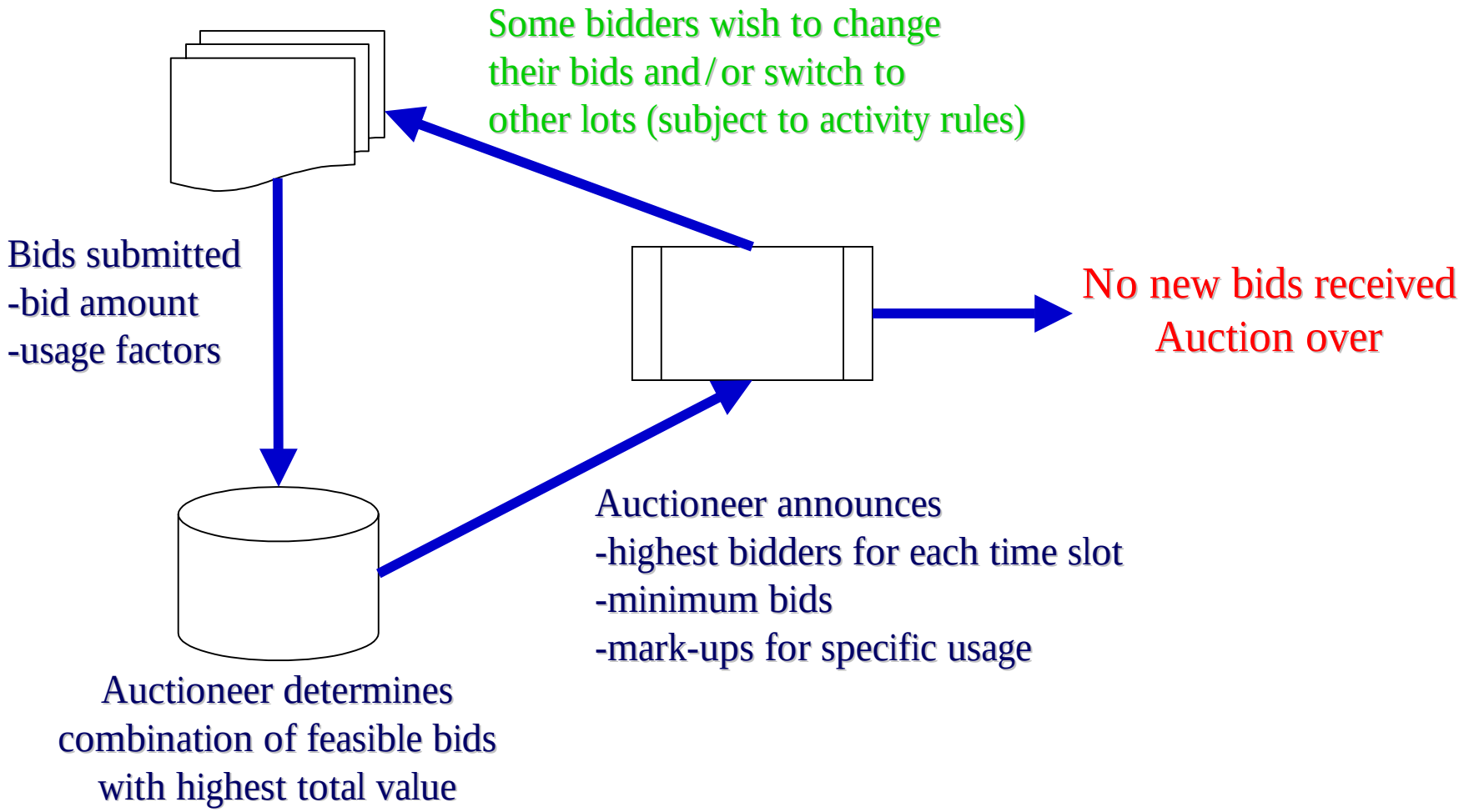
- Simultaneous multiple round auction (SMRA)
  - All lots auctioned in parallel
  - Auction closes simultaneously on all lots when bid activity stops (no new bids, no raised bids)
  - Bidders can move between lots and increase their bids from round to round (subject to activity rules)
- One-shot sealed bid, two variants:
  - Pay what you bid
  - Pay the amount of the highest losing bid
- Combinatorial bidding (i.e. bids made on combinations of lots and accepted or rejected in their entirety) possible in both formats
- SMRA may be combined with a 'last round' provision to guarantee completion by a certain date

How an SMRA would work



SMRA: pros and cons

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+ Open format – bidders can observe each other's behaviour and cross-check their own valuations, reducing uncertainty
+ Flexibility – bidders can switch between lots and take account of synergies
+ Likely to generate efficient outcomes

– May facilitate collusion
– May advantage strong bidders
– Is not guaranteed to finish within a given period of time without provision for a final round

One-shot sealed bids: pros and cons

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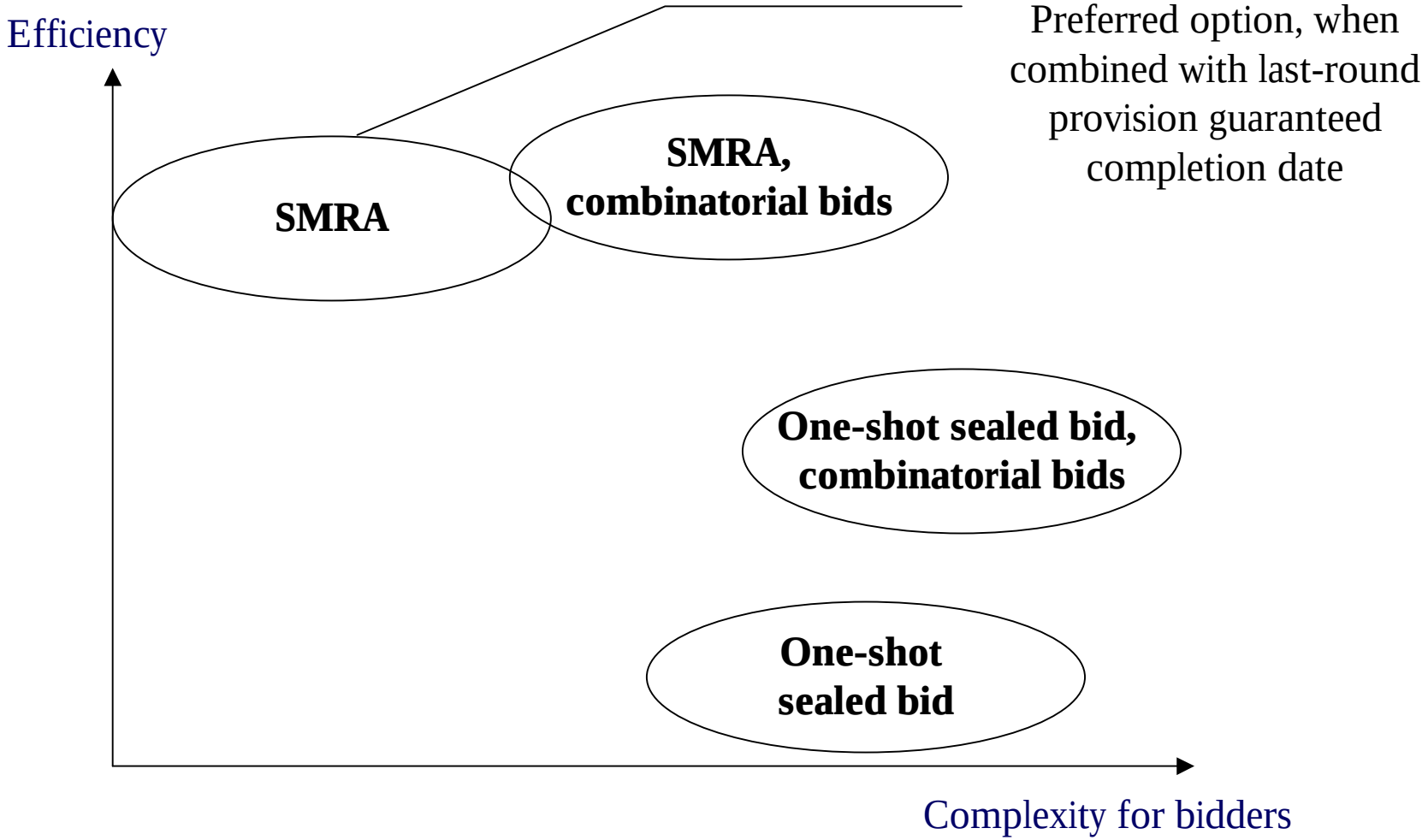
+ Is guaranteed to finish within a given timeframe
+ Strong bidders are not systematically advantaged

– Strategically complex – bidders may need to second-guess other bidders
– Probably requires combinatorial bidding to deal with synergies effectively
– Cannot guarantee efficient outcomes to the same degree as an open auction

A comparison of auction formats



Role of a secondary market

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- Current grey market trading arrangements are opaque and illiquid
- A formalised secondary market provides for efficiency gains regardless of the method of primary allocation
- Alongside an auction it would:
  - Reduce residual inefficiencies
  - Permit some simplification of the auction
  - Provide a forum for part-season trading
  - Provide flexibility mid-season over the duration of the usage rights
- A secondary market alone does not provide a mechanism for allocating new capacity

Organising secondary trading

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- All secondary trading should occur through a single formal market to maximise liquidity
- Trading could occur through buy/sell/swap orders
- Transactions could be conducted quickly and efficiently over a bespoke electronic system
- Sellers should **not** be able to discriminate between buyers
- Pre-negotiated transactions would still be possible, but would have to be transparent with other parties allowed to better the terms offered

Controlling market power

- Both primary auction and secondary market need measures to protect competition
- US experience suggests that introducing market mechanisms without appropriate safeguards can lead to concentration
- Hard quantitative limits on number of slots that can be held/acquired would be too blunt an instrument
  - Competition varies route by route
  - Undertakings on slot use may be sufficient to address competition concerns
- Concentration of slot holdings beyond a certain level should create a rebuttable presumption of market power
  - Case-by-case analysis to clear further slot acquisitions
  - Triggers application of 'use-it-or-lose-it' rule

Safeguarding regional routes

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- At present, carriers may re-deploy slots within their portfolio from regional routes in order to:
  - Serve more profitable routes
  - Increase frequencies
- Auction does not necessarily jeopardise regional routes:
  - Small carriers serving only regional routes may come under pressure; but
  - Other carriers may find it easier to expand their portfolio and thus continue serving regional routes
- Subsidising regional routes or allowing non-airline bids can address any problem more directly

How does this compare with the current framework?

- European regulation provides for:
  - Grandfathering
  - A slot pool
  - Preferential treatment of ‘new entrants’ in relation to pool slots
  - Slot transfers (but not sales)
  - Protection of regional services
  - Airport co-ordination
- Actual slot allocation managed by ACL for 12 UK airports
- Continuous allocation process throughout the year, but with two intensive periods shortly before the IATA scheduling conferences (November and June)

The slot allocation process

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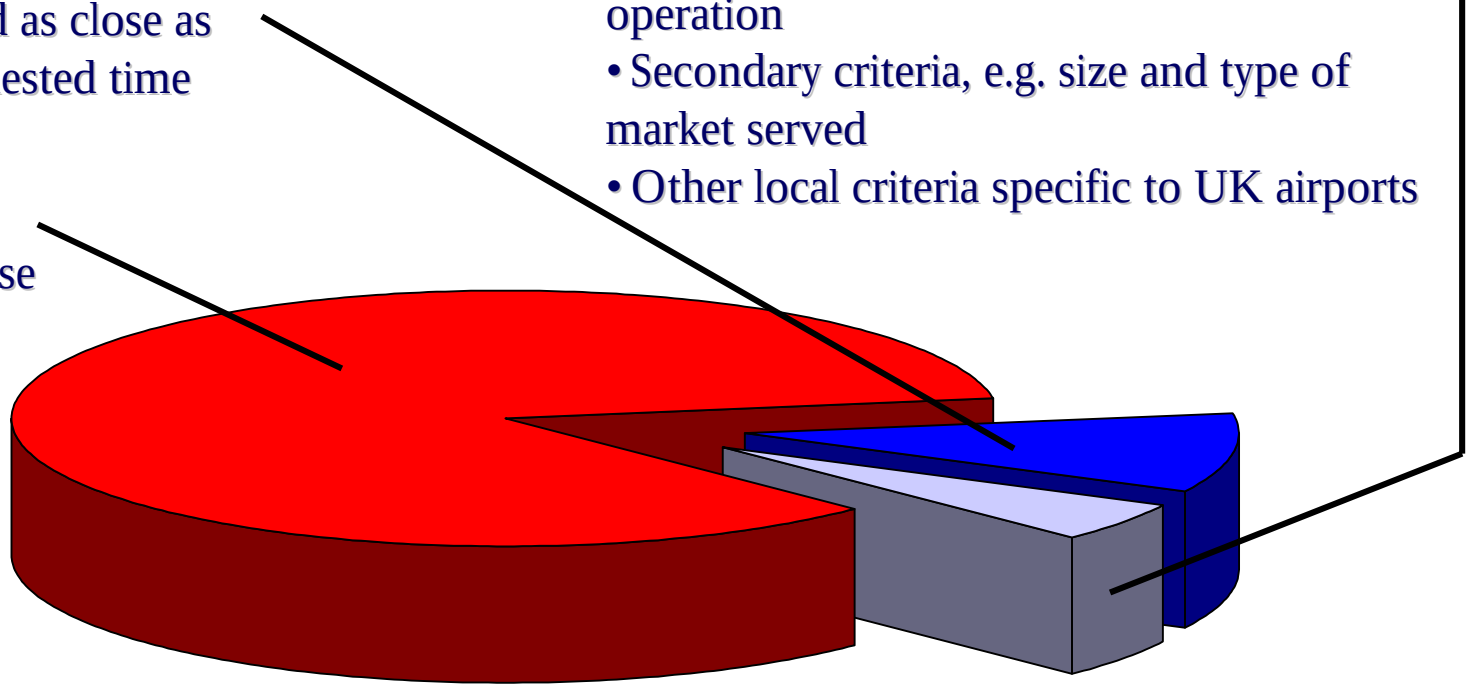
(3) Remaining slots allocated to new requests:

- 50% to 'new entrants'
- Primary criteria e.g. historical precedence, year-round services, effective period of operation
- Secondary criteria, e.g. size and type of market served
- Other local criteria specific to UK airports

(2) Changed historics put into database – if they breach scheduling rules, they are re-scheduled as close as possible to requested time

(1) Historics put into ACL database



(4) Subsequent confirmation/renegotiation of allocation at the IATA scheduling conferences

Problems with the current regime

- Inertia in distribution of slots leads to inefficient use
  - Small proportion of total slots available for allocation
  - Administrative procedures do not guarantee highest value use
  - Restrictions on secondary trading lead to lack of liquidity and inefficiency
- Perverse incentives
  - Grandfathering and lack of trading opportunities form a vicious circle
  - Strong incentives not to return slots (babysitting)
- Competitive restrictions due to barriers to expansion
  - Current system reserves slots for small scale entrants, but creates considerable barriers to expansion for mid-sized carriers
  - Effective competition may depend more on the ability of mid-sized carriers to expand routes/frequencies than on very small scale entry
  - International agreements such as Bermuda II mean that expansion by existing operators is essential for competition
- Magnitude of welfare losses may be considerable but hidden

Impact of various reforms

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	Existing administrative arrangements	***Market-based allocation***
Pool size limited by grandfathering	■ Inefficient allocation ■ Barriers to expansion and distortions of competition ■ Perverse incentives	■ Increased efficiency ■ Reduced incentives to hoard slots ■ Competitive restrictions remain ■ Lack of liquidity
Curtail grandfathering and increase pool size	■ Number of slots to be allocated likely to be a problem for existing procedures ■ Scope for increased inefficiency	■ Greatest potential for increased efficiency ■ Competition enhanced … ■ …but only if measures are in place to prevent creation or abuse of strong market position

Duration of usage rights

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- Curtailing grandfathering would:
  - remove expansion barriers
  - increase liquidity
- Shorter duration rights would:
  - provide for more slots to be auctioned each season
  - reduce prices and funding requirements for entrants
  - possibly increase uncertainty and hamper investment in new routes
- More work required, but duration of 3 – 6 years may be appropriate

Conclusions

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