Liquidity: What you see is what you get?

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Discussion Outline

1. Paper Summary
2. Comments on the Paper
3. Related Questions

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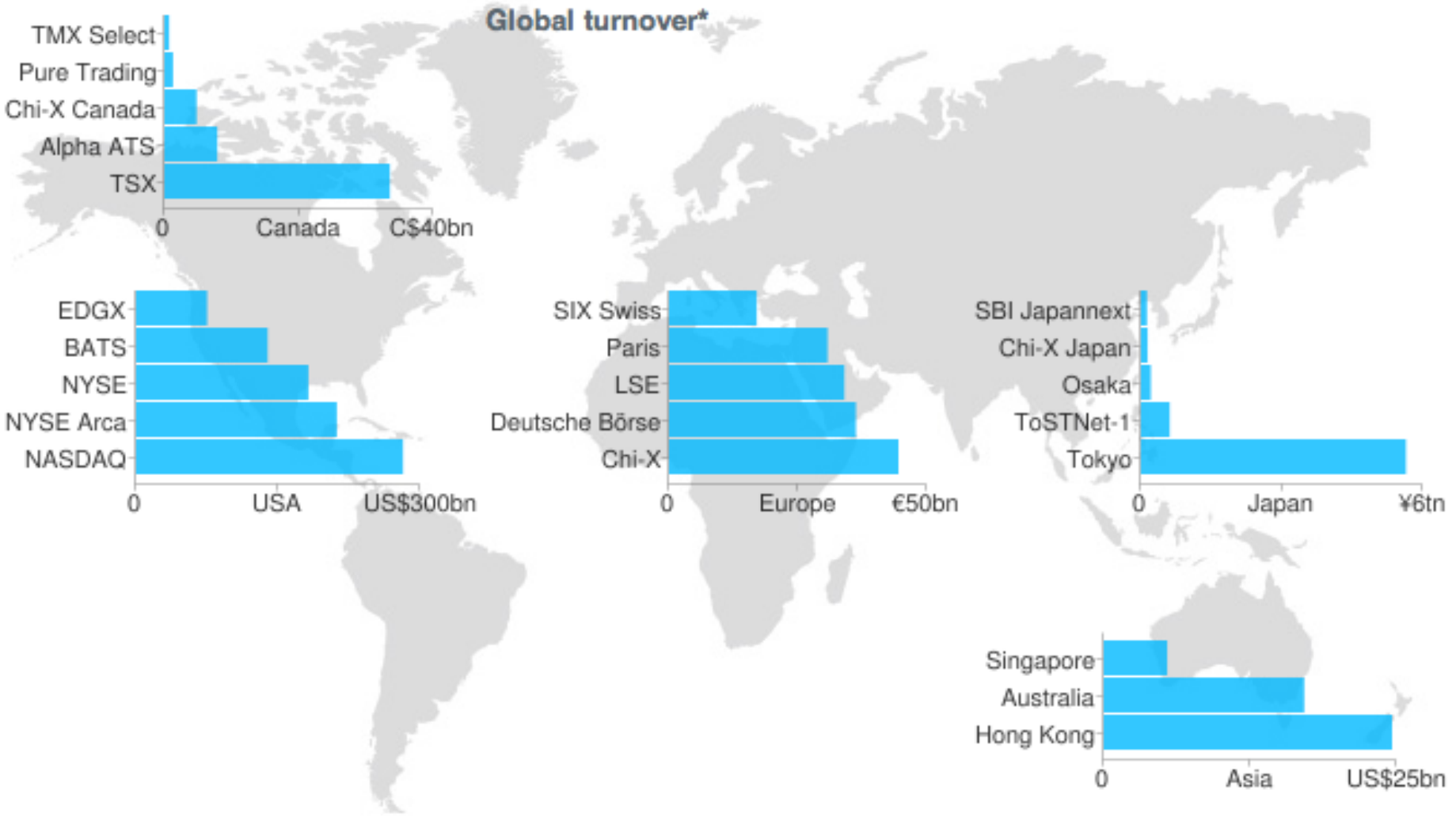
4. 

We live in a Fragmented World



*Securities volume on electronic venues for week ending 16th Sep 2011

Paper Summary

- **Question**: Is the consolidation of depth across trading venues a good statistic of market liquidity?
- **Answer**: No, it overestimates available liquidity
  - Trading in one venue induces cancellations in other venues
- **The Paper**
  - 1. Theoretical Model
  - 2. Documents empirically this fact
- **Policy implication**: all investors should have access to all markets simultaneously

Model

- Sandas' reduced formed Glosten (1994)
  - Static setting where (uninformed) market makers (MM) build a LOB
  - Investors then submit orders of random size $x \sim \exp(1/\phi)$
  - Linear price impact λx
- Additional assumptions
  - Two venues (A and B)
  - Proportion α, β of traders only send orders to one venue
  - Proportion γ use SORT, send to both in a "sequential" fashion
- Break-even condition yields 2x2 non-linear system for ask depth

$$Q_{A1} = \underbrace{\frac{p_1 - c - X - \phi\lambda}{\lambda}}_{\text{One-venue Depth } Q_{cons,1}} \underbrace{- \frac{\gamma(1-\pi) Q_{B1}}{\gamma(1-\pi) + (\alpha + \gamma\pi)\exp\left(\frac{Q_{B1}}{\phi}\right)}}_{\text{Adjustment extra Adv. Sel.}}$$

Main Results

Taking partial derivatives one gets

Proposition 1: "Static"

$$\frac{\partial \left(Q_{A1} + Q_{B1} \right)}{\partial \gamma} < 0$$

$$Q_{Frag,1} \equiv \left(Q_{A1} + Q_{B1} \right) > Q_{Cons,1}$$

Proposition 2: "Dynamic"

Consider a one unit trade in venue i

- $\Delta Q_{Frag,1} = -1$ when $\gamma = 1$, and $\Delta Q_{Frag,1} < -1$ when $\gamma < 1$.
- $\Delta Q_{j \neq i,1} < 0$

Model: General Comments

- **Appealing Features**:
  - Nests Sandas (2001)
  - Easy to compute numerically (no closed-form)
  - Straightforward structural estimation (GMM, see Sandas 2001)

Model: General Comments

Less Appealing Features

- MM: Ad-hoc $h(x)$ linear specification
  - Ok if MM only concerned with information (Huberman Stanzl 2004)
  - But recent studies show HF MM are highly concerned with inventory management
  - Spillovers are different if total impact is non-linear $\Longrightarrow$ Pricing formulas do not hold

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  - What are informed traders solving? No sense of price informativeness
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  - What are informed traders solving? No sense of price informativeness
  - What are liquidity traders solving? No sense of welfare
  - Difficult to interpret outcomes...

Model Specifics: Routing

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- **Key driving assumption**: SORT traders increases adverse selection costs in venue i
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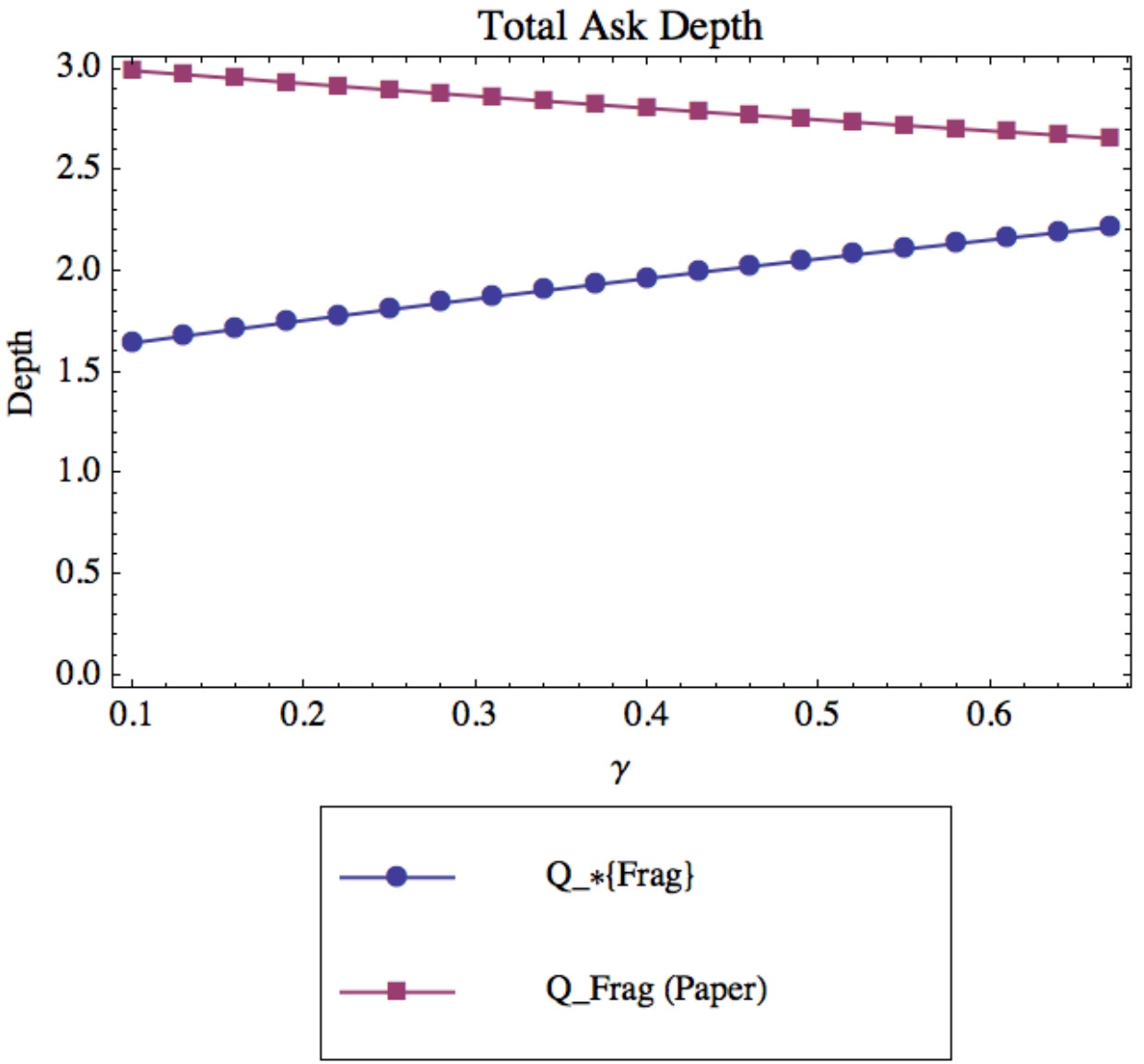
- Robustness to alternative specifications?
  - Is this optimal for an informed trader?
  - Asymmetry: Traders can submit orders to both markets, MM only get execution in one. Duplication?

Routing (Cont'd)

One Alternative

- SORT routes equal amounts to each venue simultaneously
- Why considering this assumption? Hidden Liquidity!
- Density may be affected
  - Example: $f(x) \sim U[0,1]$, N markets
  - Orders from sort traders are distributed $\tilde{f}(x) \sim U\left[0, N^{-1}\right]$

Measuring Aggregated Liquidity



Visible Liquidity

- As analyzed in Madhavan (1995) in fragmented markets:
  - Dealers are willing not to disclose trades to reduce direct price competition
  - Larger traders prefer less transparent mechanisms
- "Learning by trading": send small quantities to all venues to mine for hidden orders
  - Visibility is then an important strategic dimension
- Why not exploring (inferred) hidden orders in this context?
  - Different opaqueness across markets? What drives hidden orders for each asset?
  - Rich dataset can guide the theory here!

Food for Thought

- **Role of Competition**. Evidence shows c drastically decrease with N $\Longrightarrow$ Would strengthen
- **Make-Take Pricing**. Venues are not homogeneous here. Possibility of "desintermediation." Natural to explore in this setting
- **Going Beyond: Dynamic aspects**
  - Informed Liquidity (e.g. Goetler, Parlour, Rajan (2010), Pagnotta (2011), Rosu (2011)
  - Price behavior following limit orders?
  - MM actively consume liquidity (e.g. Brogaard 2011)
  - Order size less relevant now, due to order splitting, optimal execution algos,...

Empirics

- Very nice data set:
  - Consistent LOB records for each venue
  - Millisecond frequency
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- **Dependent Variable**

$$Chg\_DepthAsk(X)_{i,t} = DepthAsk\left(X, M_{t-1}\right)_{i,t} - DepthAsk\left(X, M_{t-1}\right)_{i,t-1}$$

- **Main Empirical Result** (ask side)

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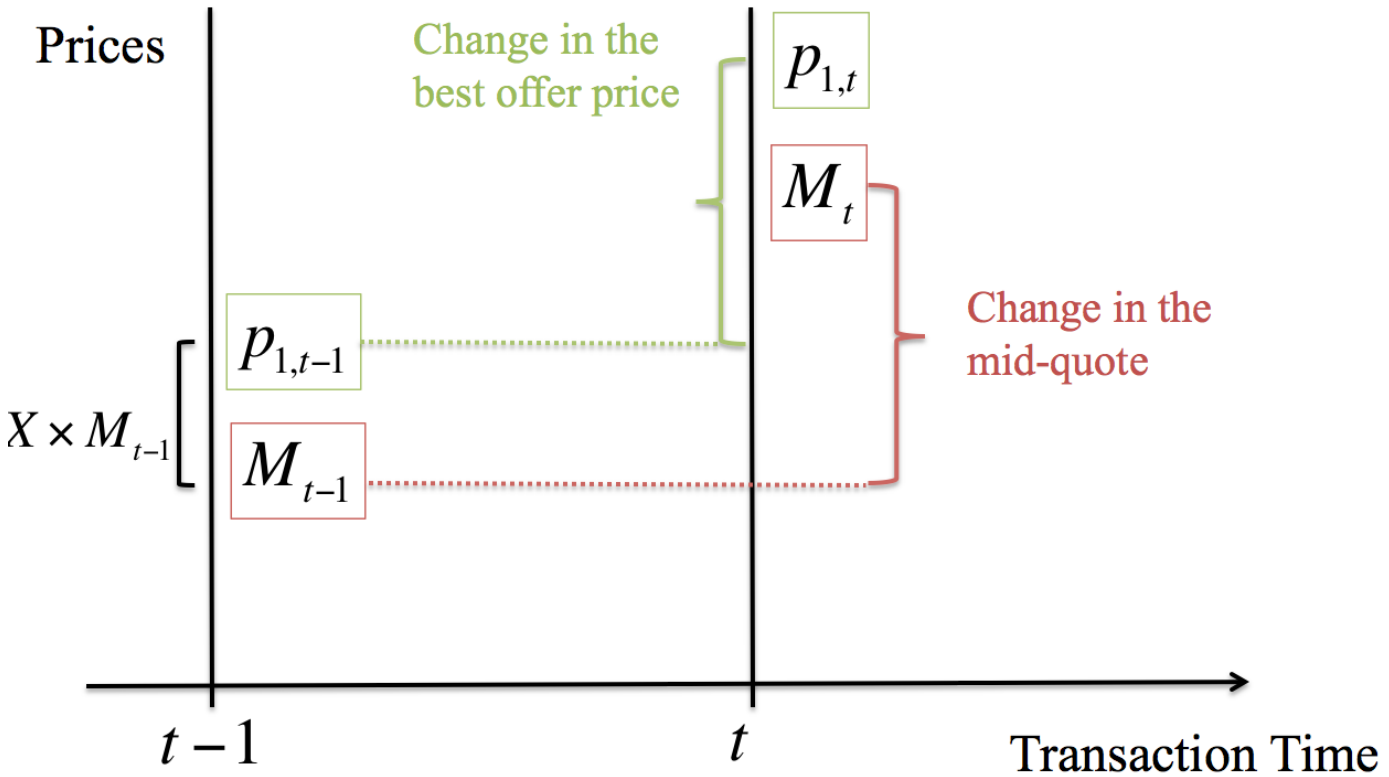
£ *Buys*	Sec	LSE	Chi-X	Bats
LSE	0	-0.83*	-0.25*	-0.09*
LSE	1	-0.80*	-0.30*	-0.14*
LSE	10	-0.67*	-0.18*	-0.05*
Chi-X	0	-0.21*	-1.31*	-0.18*
Chi-X	1	-0.52*	-1.47*	-0.46*
Chi-X	10	-0.61*	-1.29*	-0.37*
Bats	0	-0.27*	-0.58*	-1.26*
Bats	1	-0.46*	-0.79*	-1.21*
Bats	10	-0.54*	-0.83*	-1.01*
Turq	0	-0.04	-0.04*	-0.05*
Turq	1	-0.11*	-0.08*	-0.02
Turq	10	-0.13	-0.06	0.04
Nasdaq	0	-0.03	0.03	-0.01
Nasdaq	1	-0.08	0.08	0.04

Empirics: Interpretation 1

- Plausible Explanation: Duplication
  - Increasing chances of filling
  - Benefit from time priority
- But this would arise with inventory concerns: avoid trading "too much" in any direction
  - This is not what the model is about
- Not necessarily indication of asymmetric information (model)

EMPIRICS: INTERPRETATION 2

- $Chg\_DepthAsk(X)_{i,t} < 0$ may simply indicate learning (Kyle 1985, Glosten and Milgrom 1985), instead of duplication



Empirics: Interpretation 2

- I would like to see

$$Chg\_DepthA^{*}(X)_{i,t} = DepthA(X, M_t)_{i,t} - DepthA(X, M_{t-1})_{i,t-1}$$

- If pure learning one can expect $Chg\_DepthA(X)_{i,t} < 0$, $Chg\_DepthA^{*}(X)_{i,t} \approx 0$
- But this is not "bad"

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- More exploration needed

Empirics: Food for Thought

- Paper findings will be of interest to sell side investors
- Buy side seeks measures of liquidity that are likely to affect asset returns
- Look at lower frequency measures of liquidity (Amihud's, Hasbrouck's,...) for each asset
  - Before and after the entry of new venues (MiFID I)
  - DID control candidates: Spain, Italy, Poland,...

Regulation of Fragmented Markets

- **What to do?**
  - Market-wide Time priority?
  - Market-wide Price priority?

Regulation of Fragmented Markets

- **What to do?**
  - Market-wide Time priority? No predecent to my knowledge
  - Market-wide **Price** priority? Trade-through. Good idea?

Table: Regulations and Investor Protection

Economic Area	Reg. Agency	Regulation	Year	Investor Protection Model
USA	SEC	Reg.NMS	2005	Trade-through (top of the book)
Europe	ESMA	MiFID*	2007	Principles-based
Japan	FSA, FIEA	FIEA	2007	Principles-based
Canada	IIROC, CSA	OPR	2011	Trade-through (full book)
South Korea	FSC	FSCMA**	2011	To be determined
Australia	ASIC	MIR	2011	Principles-based

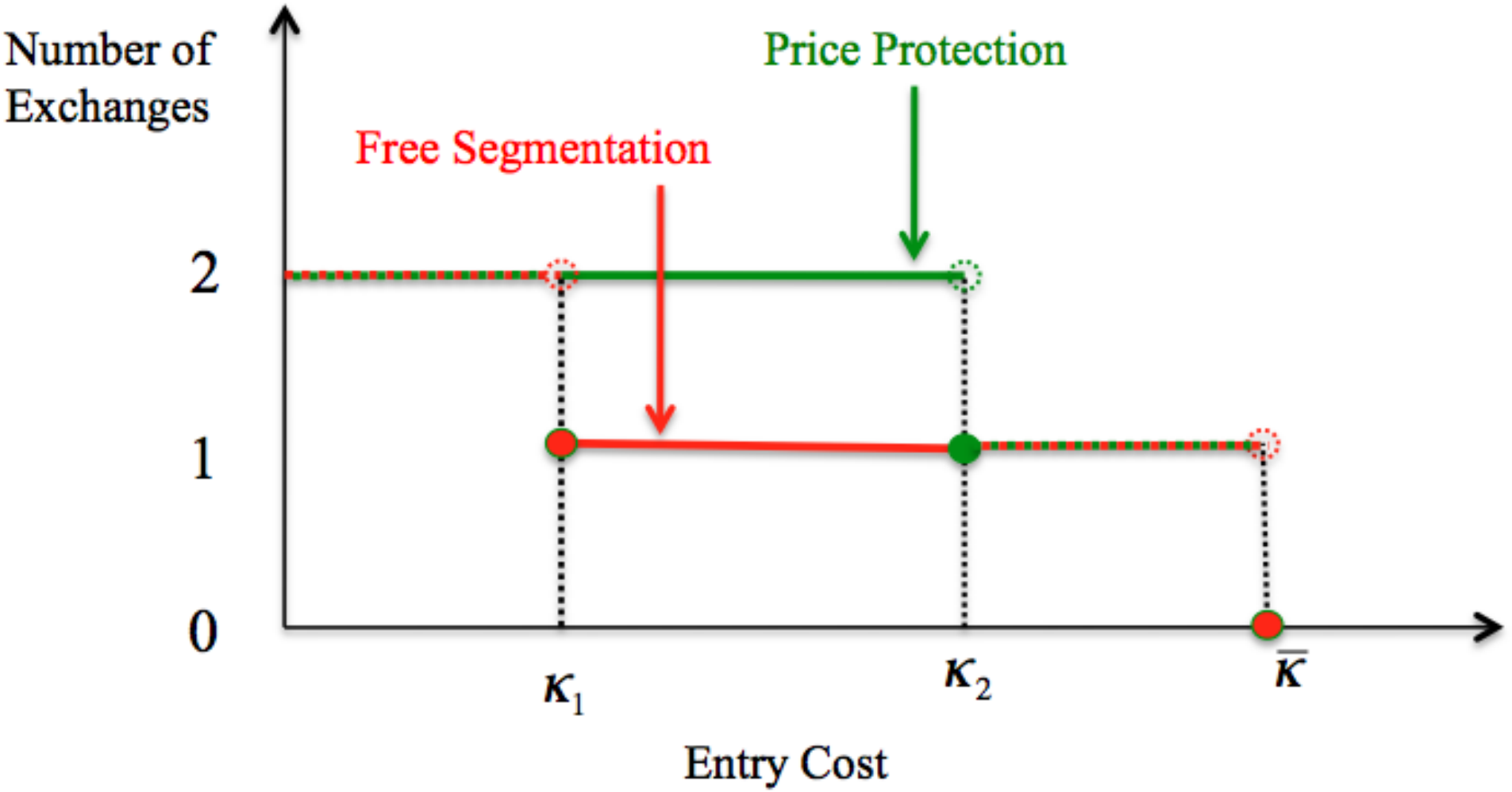
Source: www.fidessa.com
* Currently under revision

** Revision of 2009 version

Price Protection and Welfare

- Pagnotta Philippon (2012) focuses on liquidity in a market with two exchanges (A and B) and heterogeneous investors
- Vertical differentiation by speed (low execution latencies...)
  - Prevents Bertrand outcome
- Say B is faster. Agents β self select and have higher average valuations.
- **Key result**: price protection works as a subsidy to low-speed exchange $\Longrightarrow$ Affects equilibrium fragmentation and allocation efficiency

Price Protection and Entry



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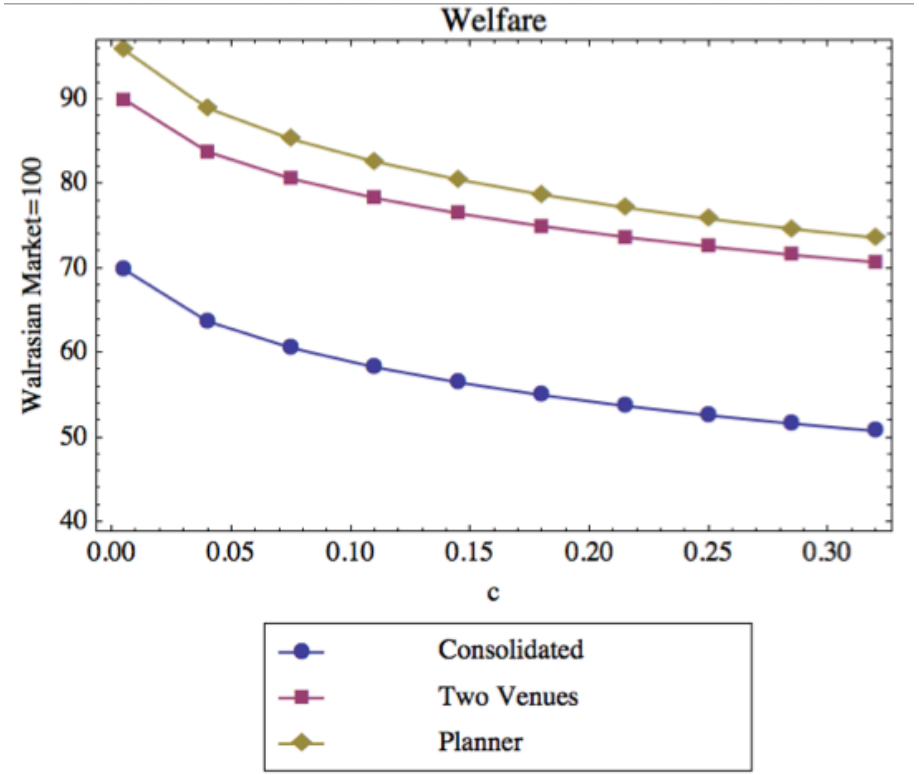

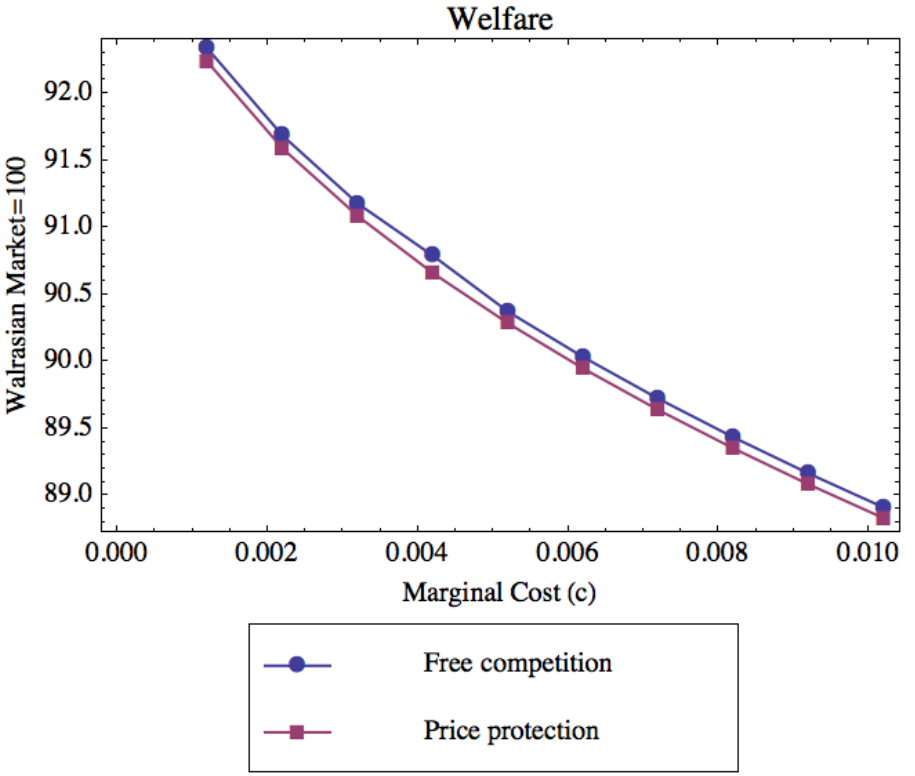

Conclusions

- **Very interesting empirical findings!**
- Not sure model contributes as much, unless used for some structural estimation
- **Good timing!**
  - Fragmentation has become a global phenomenon
  - Current global debate on regulation
  - Need more empirical work in this area
- Equity markets ahead of other asset classes
  - Lessons useful for options, futures, other newly exchange-traded assets