Price Controls, Non-Price Quality Competition and Unblocked Assignments as an Appropriate Generalization of Competitive Equilibrium

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Lee Center Seminar
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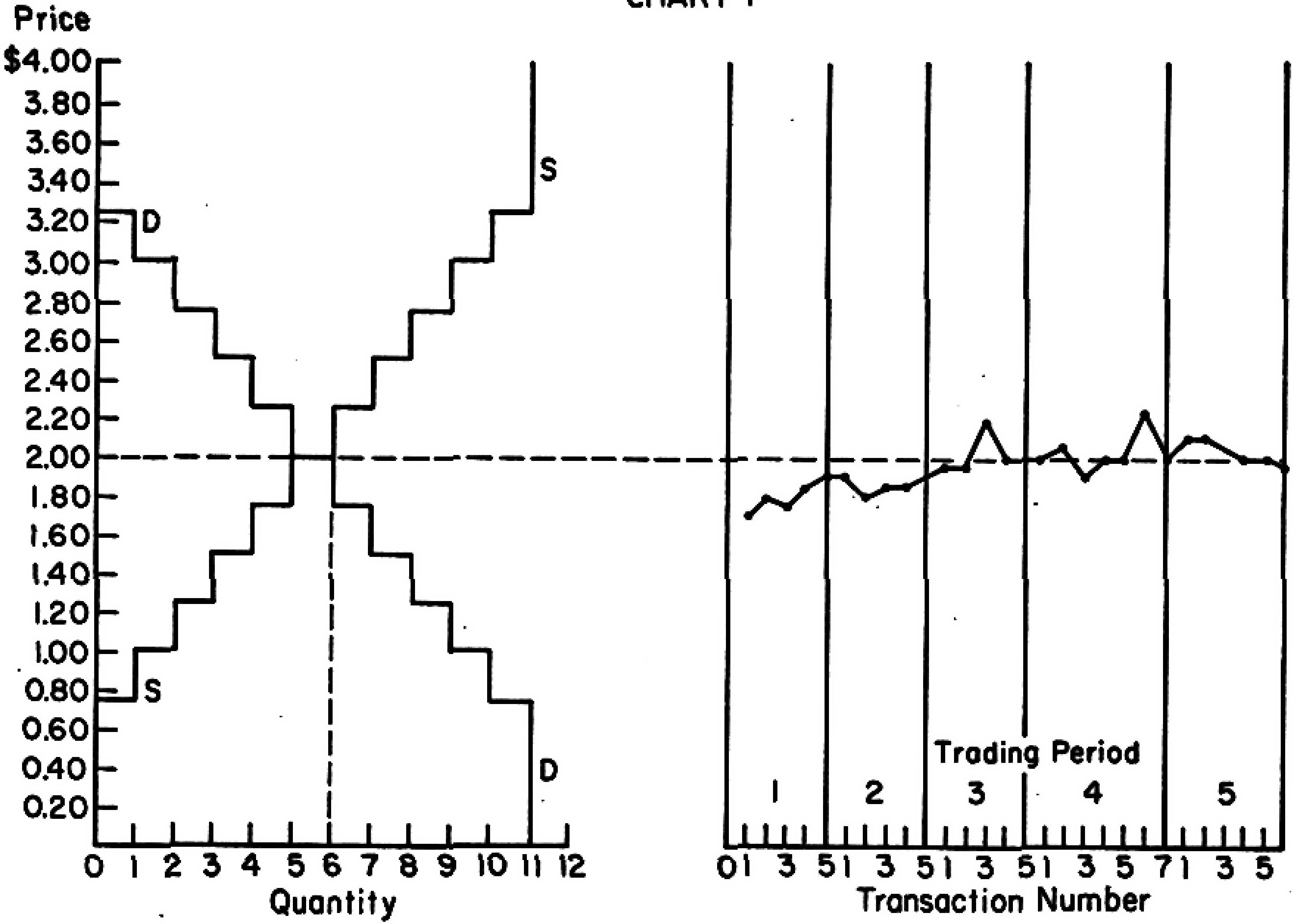
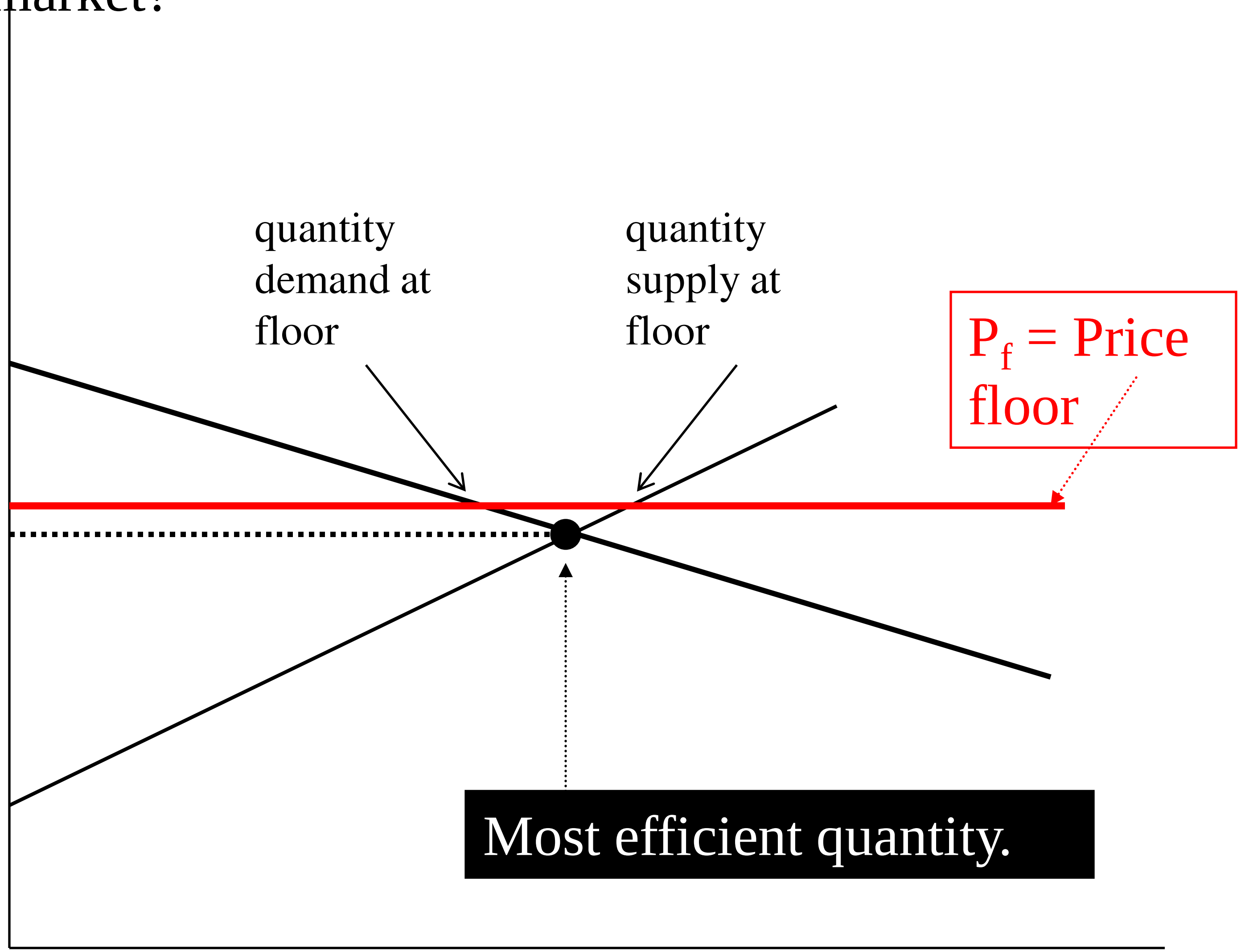
CHART 1

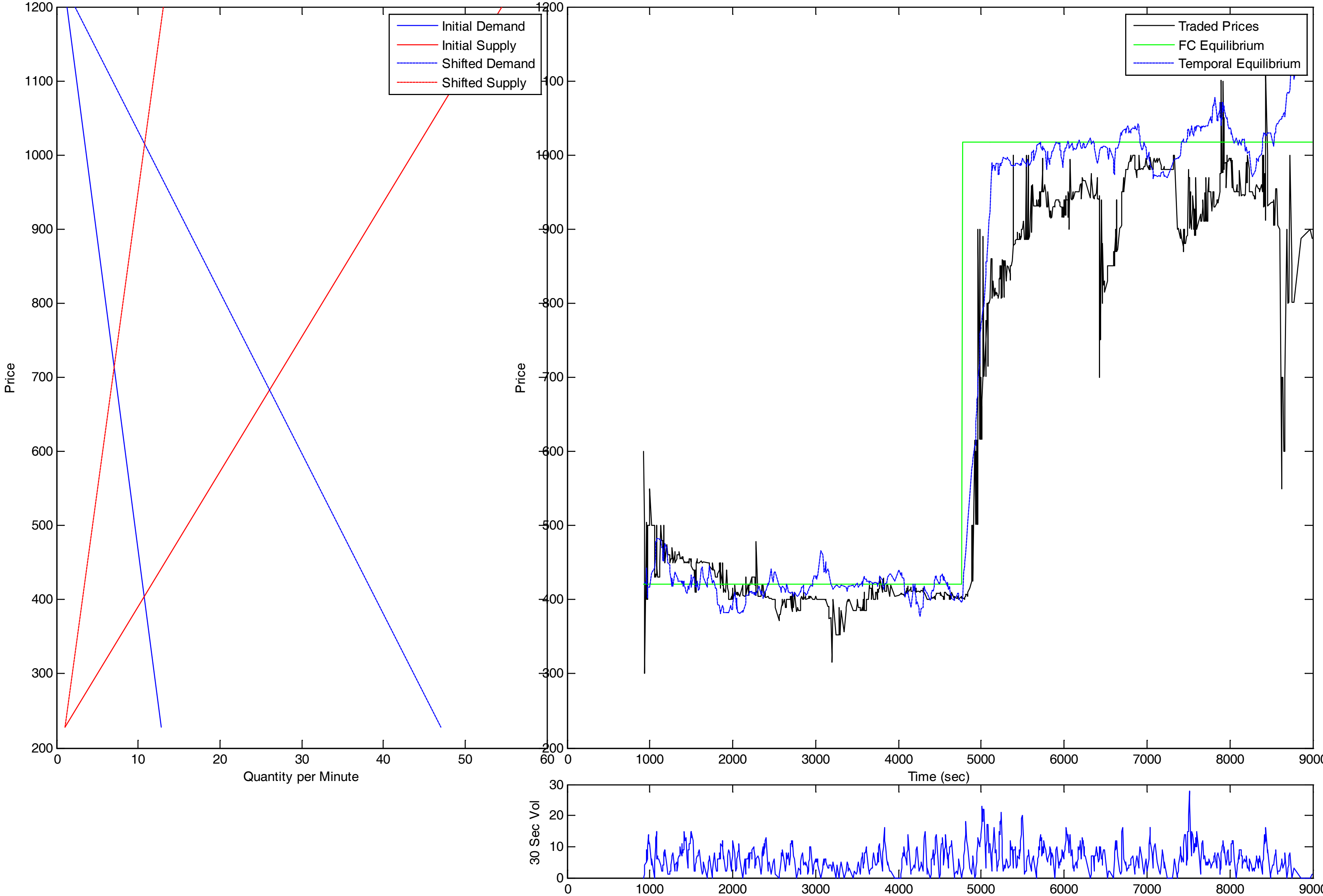


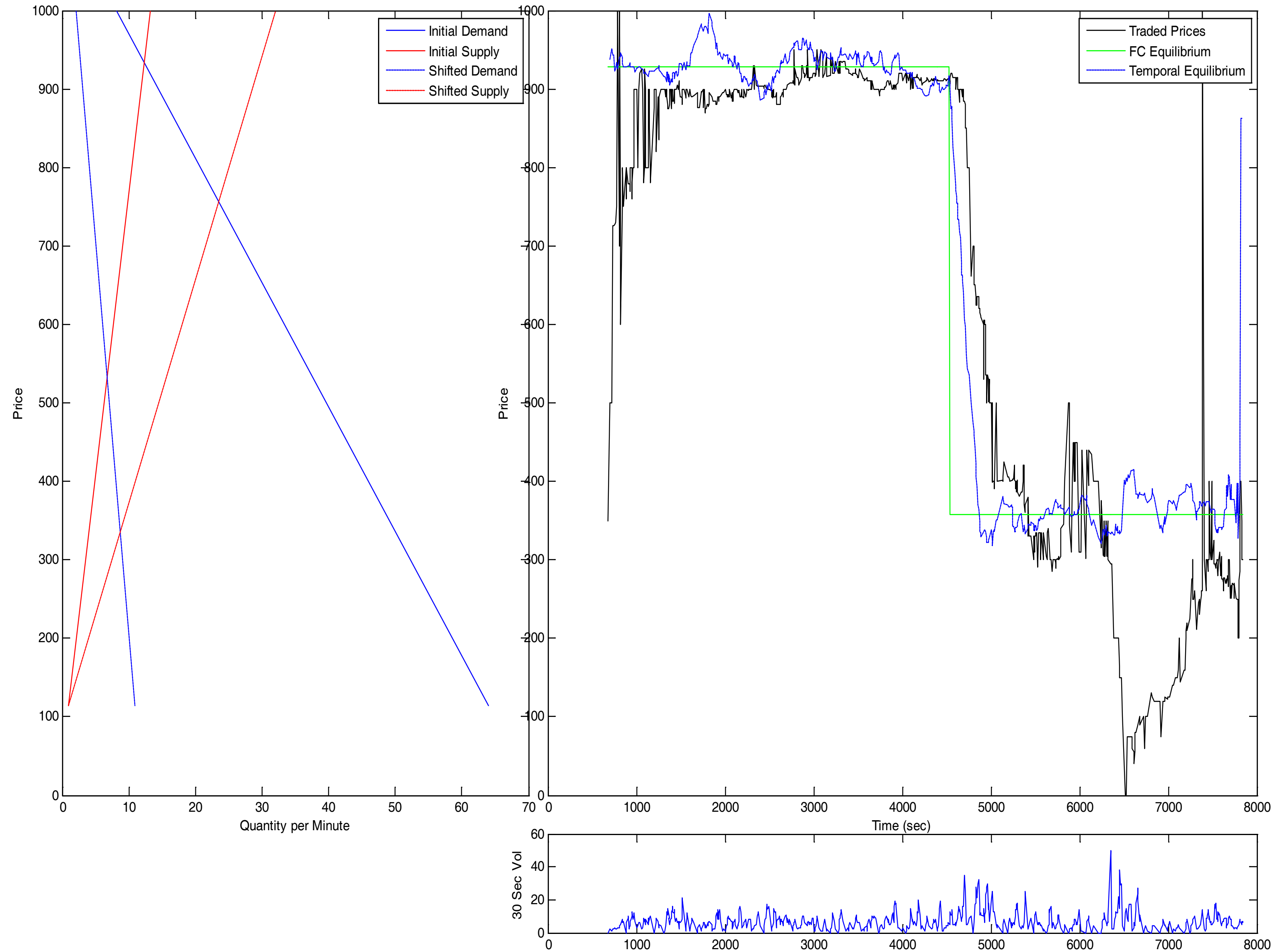
Price
$4.00
3.80
3.60
3.40
3.20
3.00
2.80
2.60
2.40
2.20
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
D
S
S
D
0 1 2 3 4 5 6 7 8 9 10 11 12
Quantity
Trading Period
1 2 3 4 5
0 1 3 5 1 3 5 1 3 5 1 3 5 7 1 3 5
Transaction Number

What do we expect if a price floor is imposed on a market?



$D(P_f) < S(P_f)$: The competitive equilibrium does not exist.


Initial Demand
Initial Supply
Shifted Demand
Shifted Supply
Price
Quantity per Minute
Traded Prices
FC Equilibrium
Temporal Equilibrium
Price
Time (sec)
30 Sec Vol

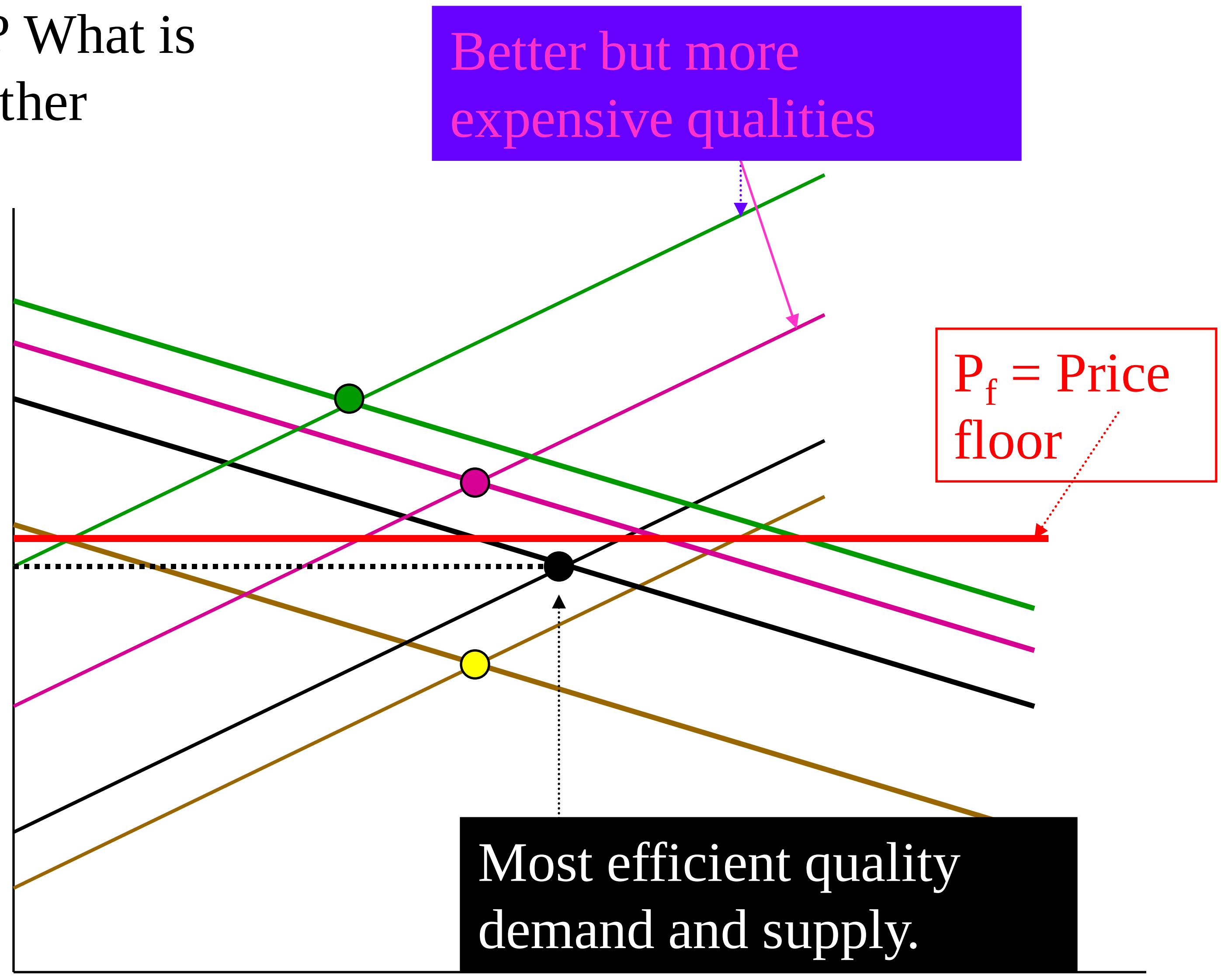


Initial Demand
Initial Supply
Shifted Demand
Shifted Supply
Price
Quantity per Minute
Traded Prices
FC Equilibrium
Temporal Equilibrium
Price
Time (sec)
30 Sec Vol

FEATURES OF EXPERIMENT

- multiple qualities of the same good
- In the competitive equilibrium only one quality will survive and that is the most “efficient” quality.
- The most efficient quality is the one that maximizes the “wealth” of the participants.

A price floor is imposed what happens? What is the effect on other markets?



$D(P_f) < S(P_f)$: The competitive equilibrium does not exist.

QUESTIONS

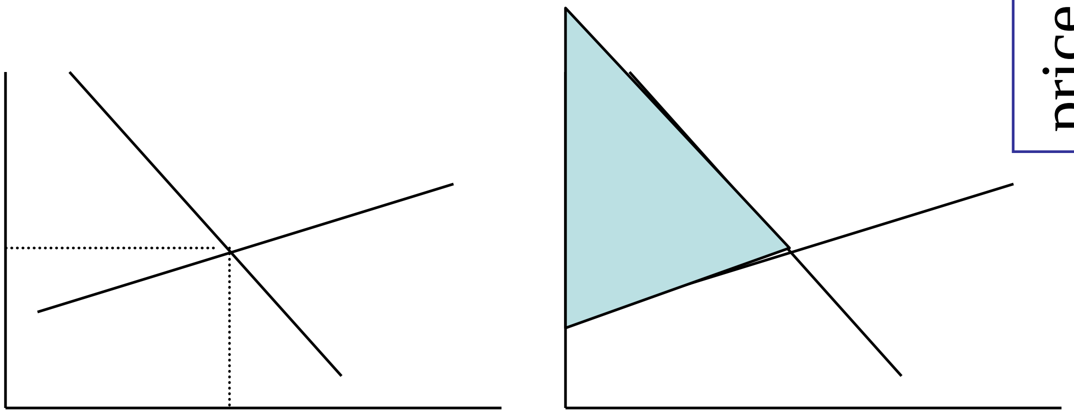
- **In an unconstrained environment, how do multiple qualities adjust?**

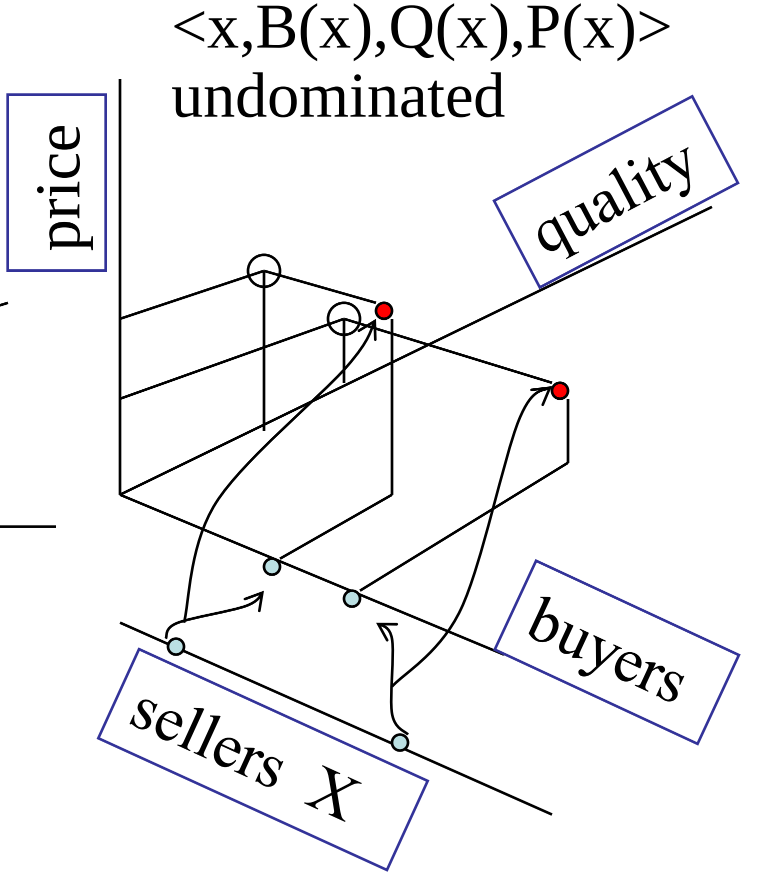
- **What is the impact of a price floor on product quality?**

- **What model works?**
  - **the efficiency seeking hypothesis**
  - **the neighboring quality hypothesis**
  - **the unblocked assignments**

COMPETING PRINCIPLES

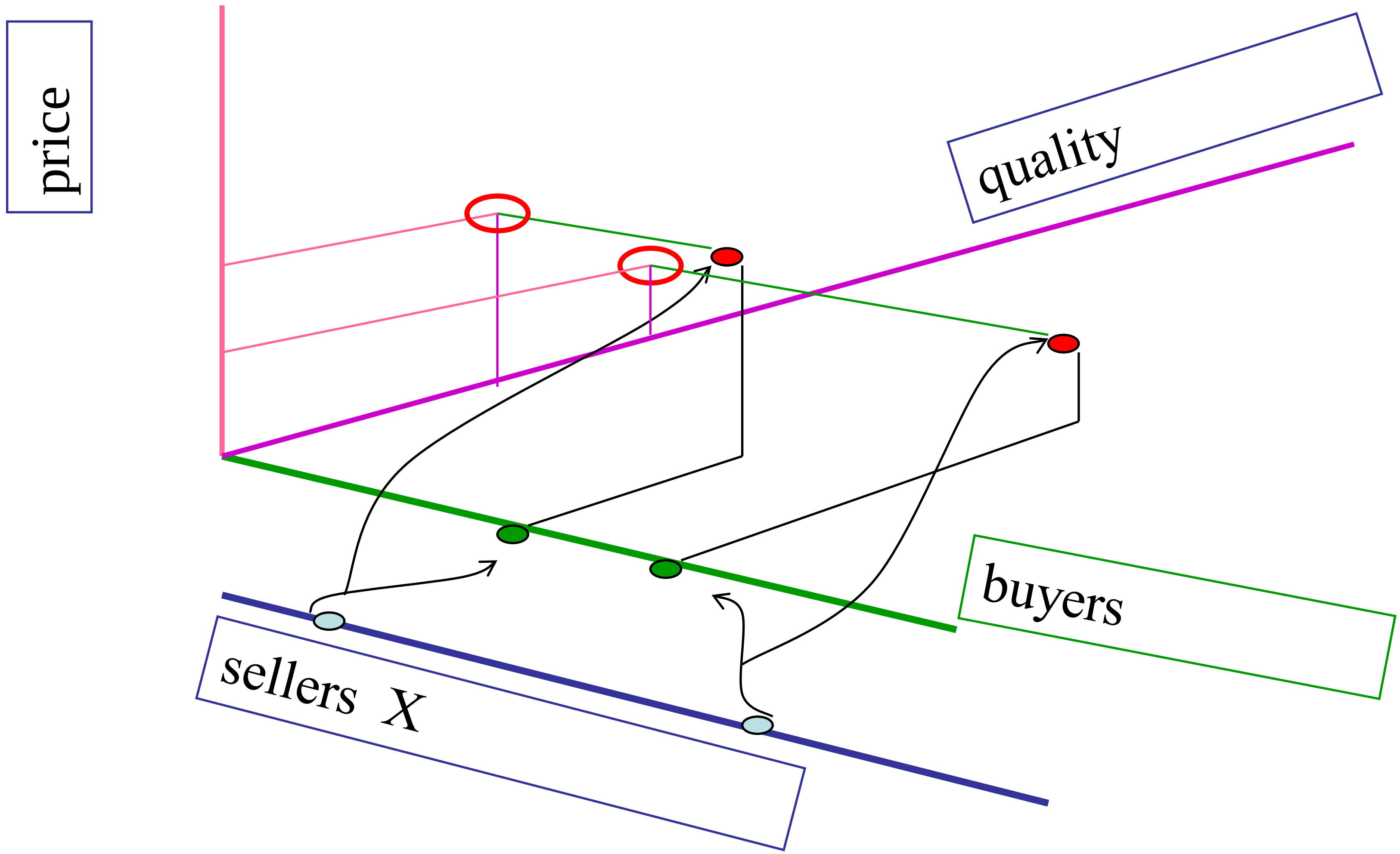
- THE COMPETITIVE EQUILIBRIUM
- EFFICIENCY SEEKING SYSTEMS
- THE ASSIGNMENT MODEL

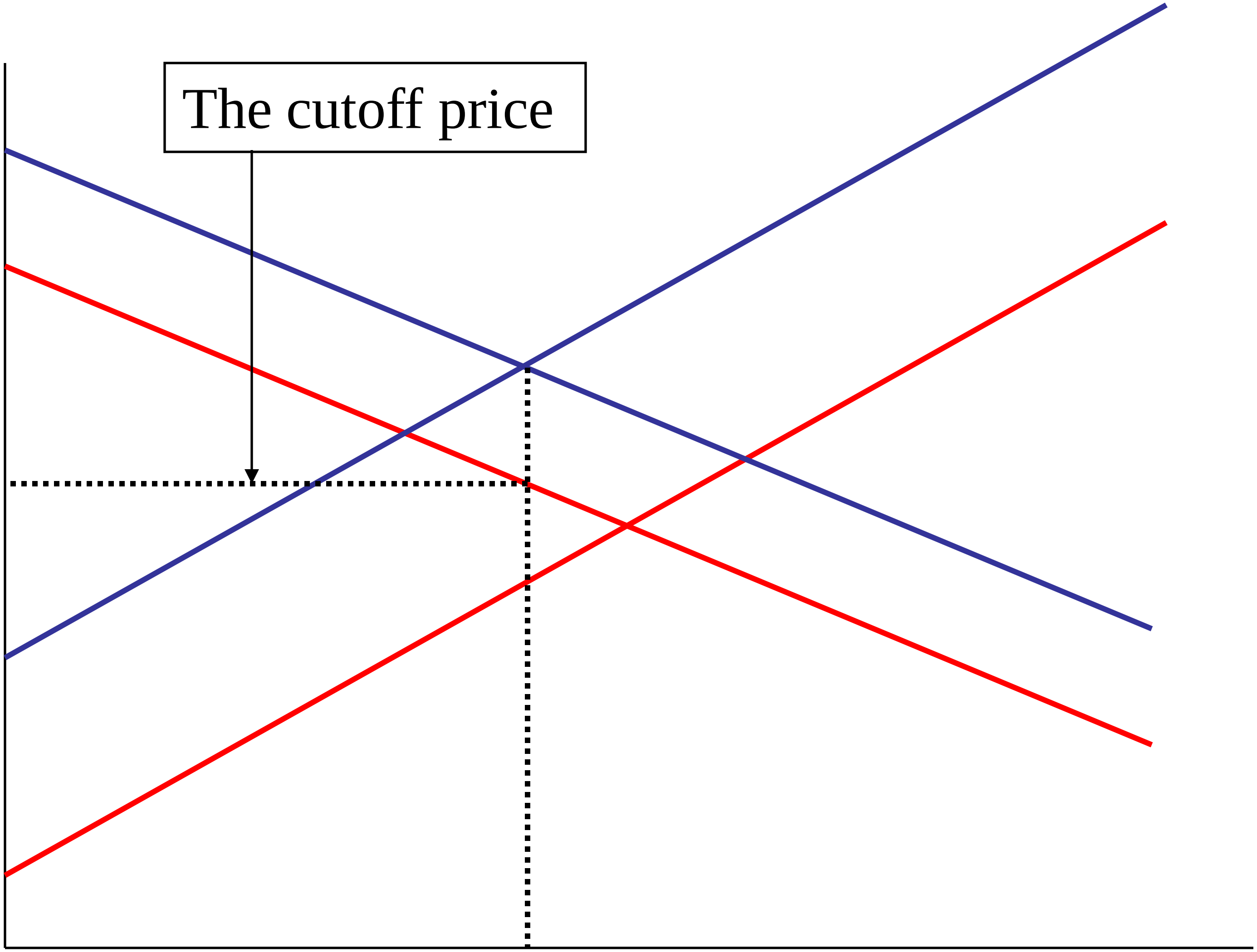


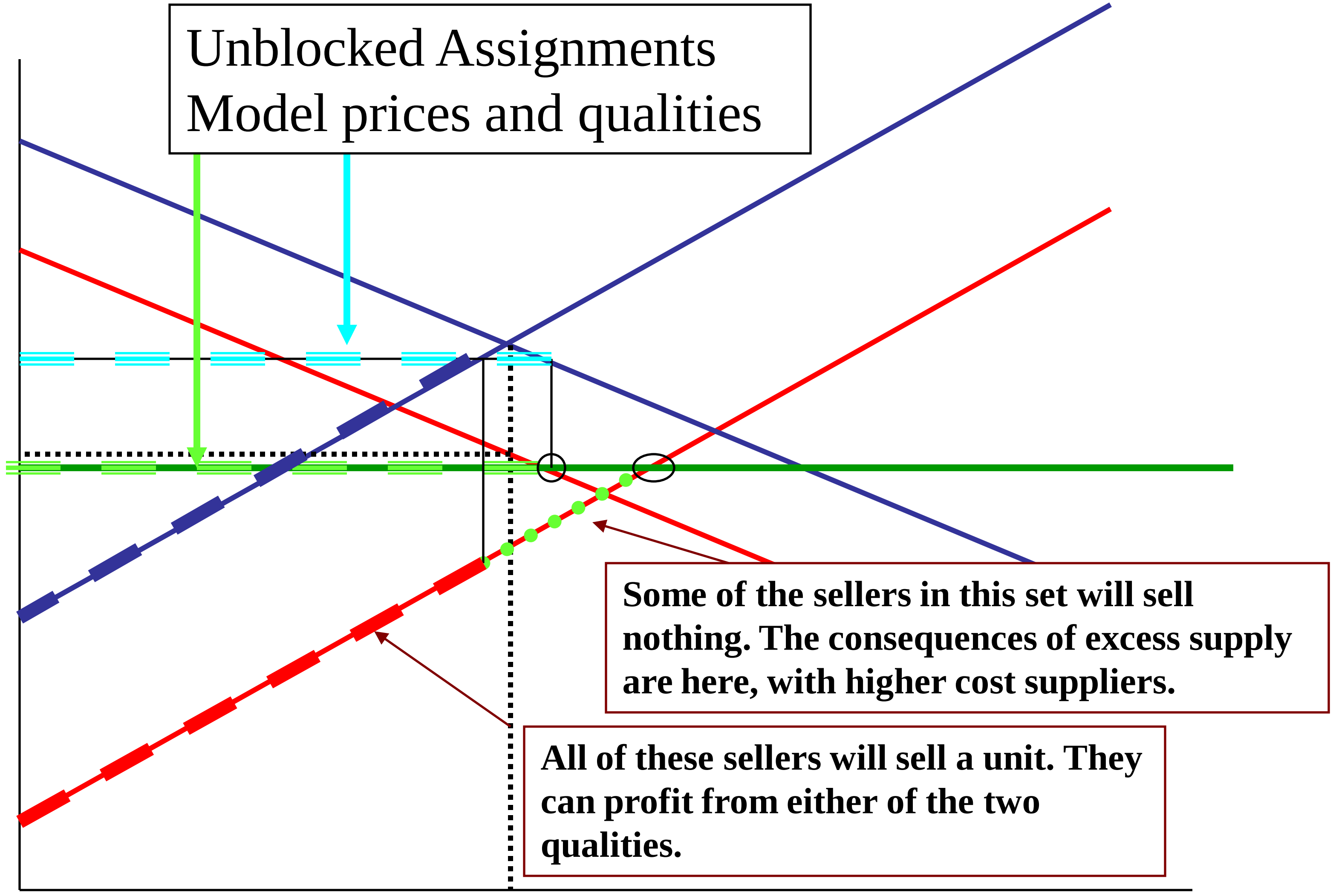


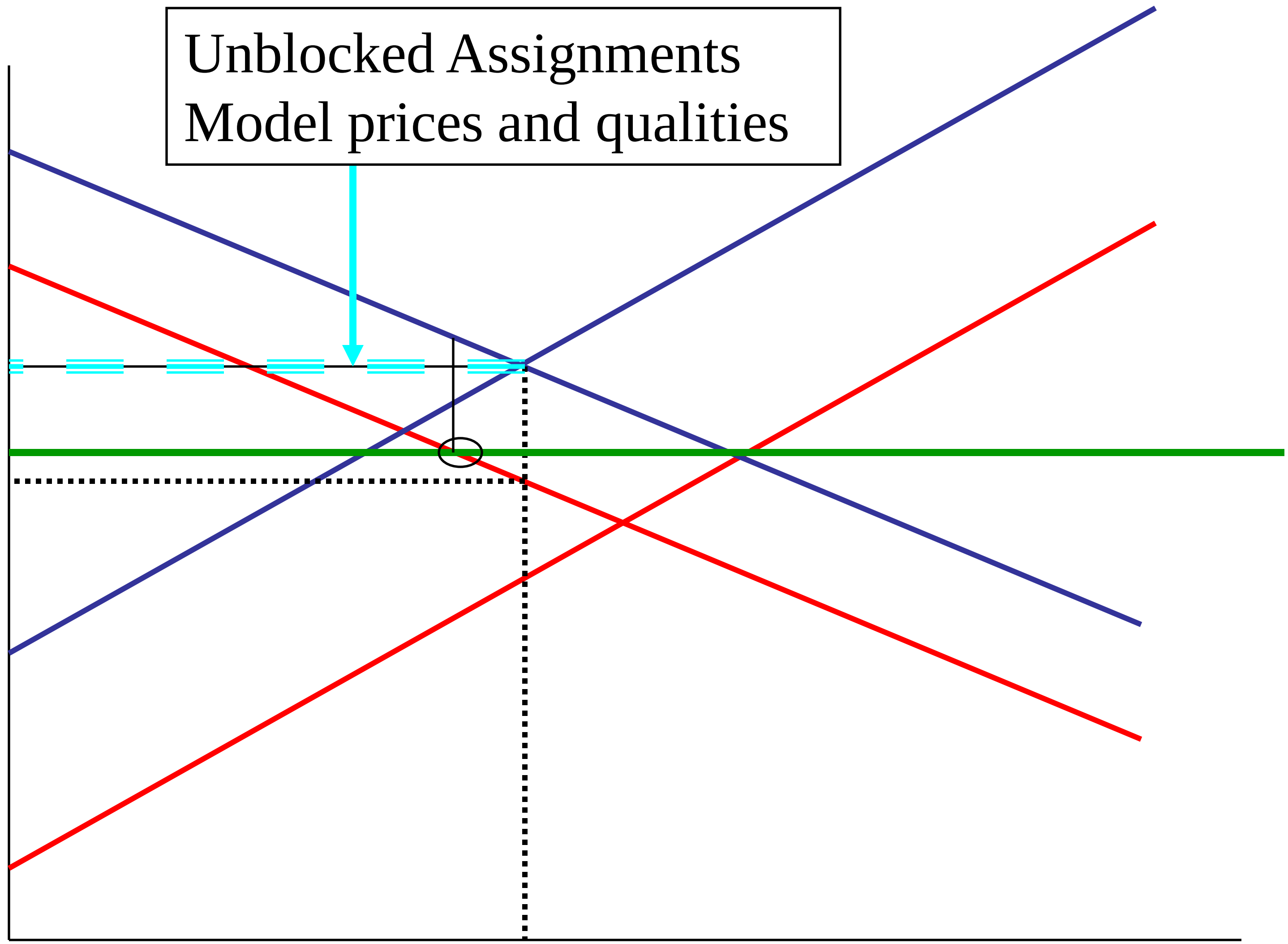
COMPETING PRINCIPLES:THE UNBLOCKED ASSIGNMENTS MODEL

<x,B(x),Q(x),P(x)>
unblocked

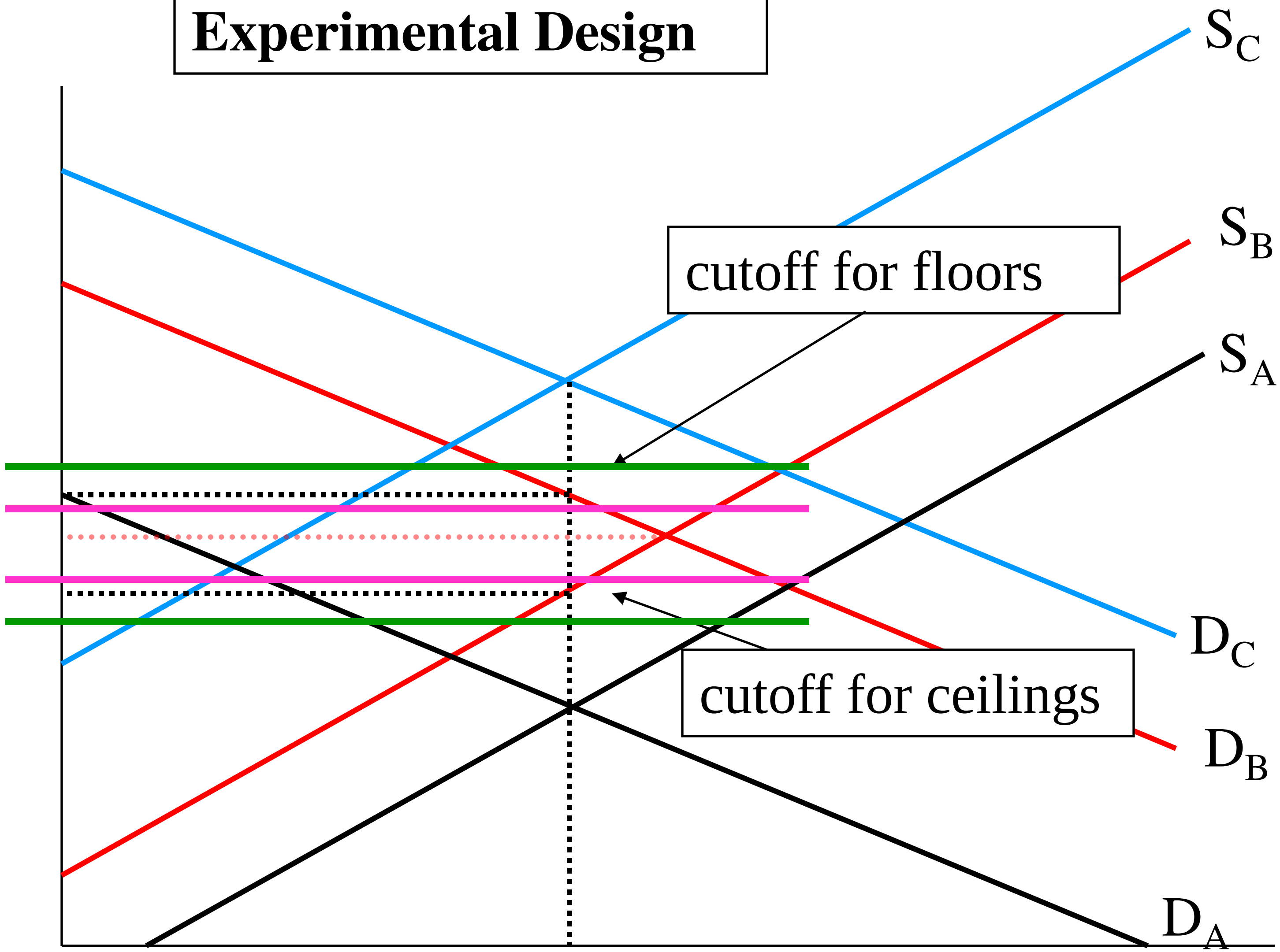


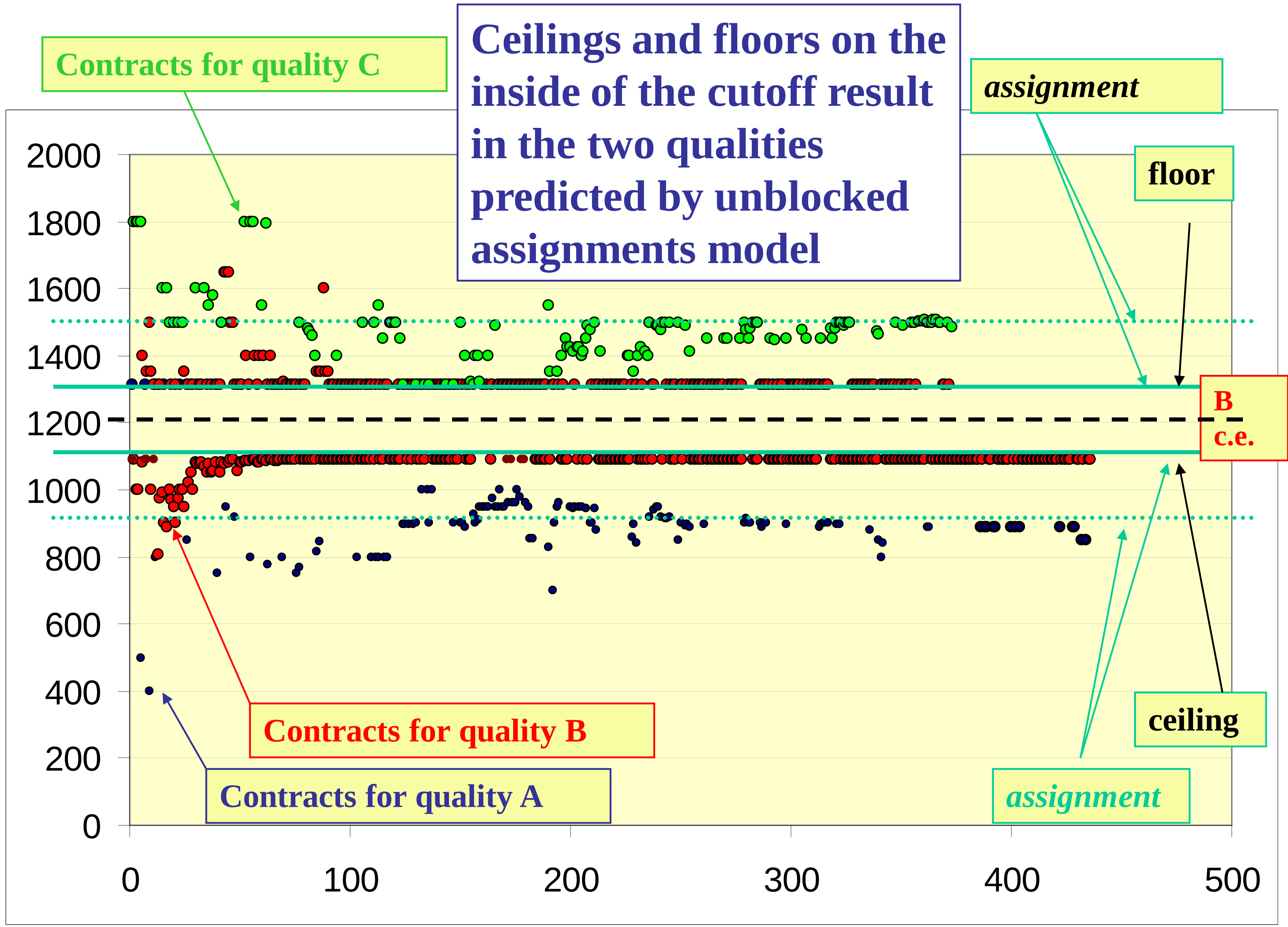

The cutoff price


Unblocked Assignments
Model prices and qualities
Some of the sellers in this set will sell nothing. The consequences of excess supply are here, with higher cost suppliers.
All of these sellers will sell a unit. They can profit from either of the two qualities.


Unblocked Assignments
Model prices and qualities

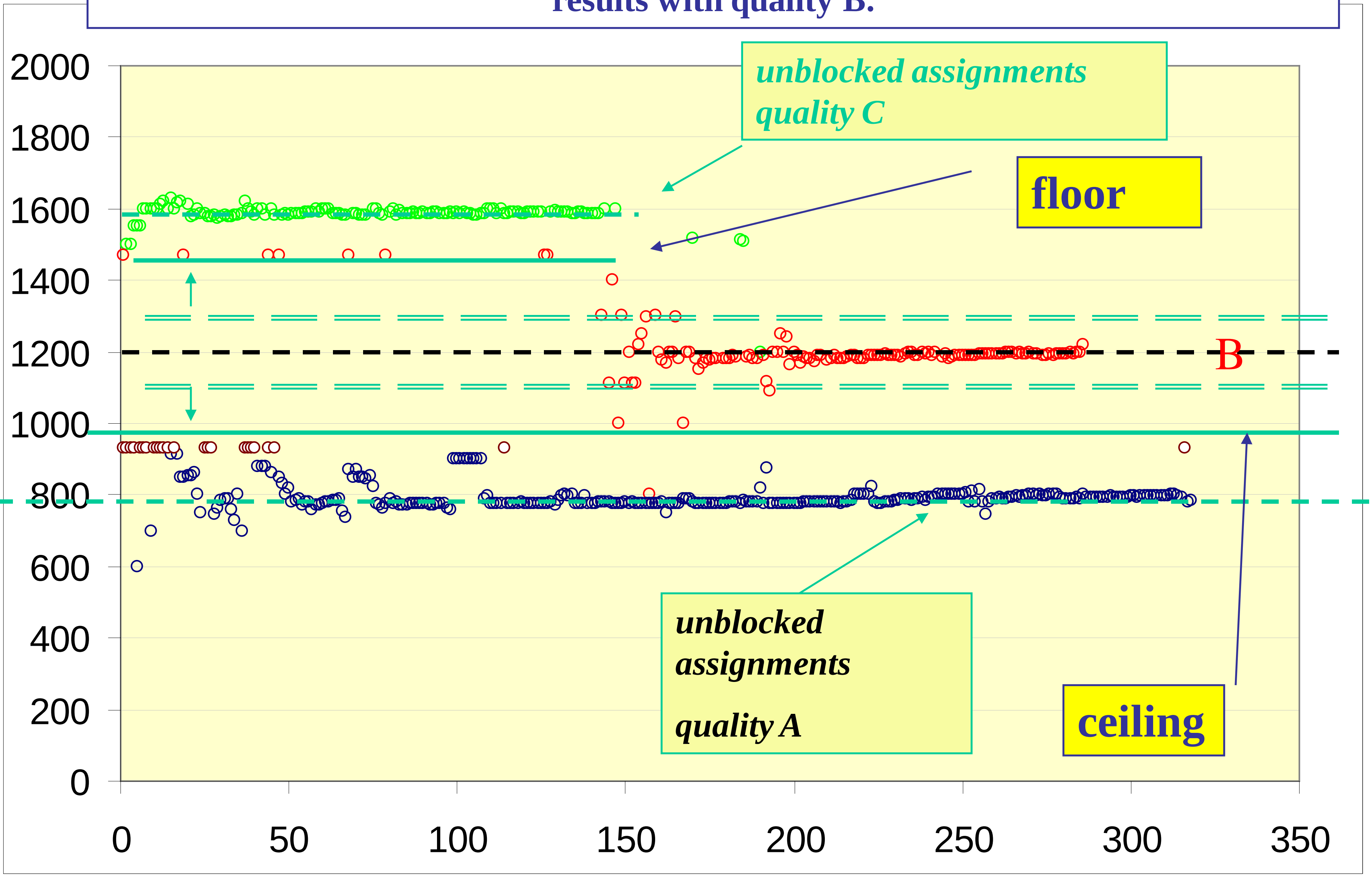
Experimental Design



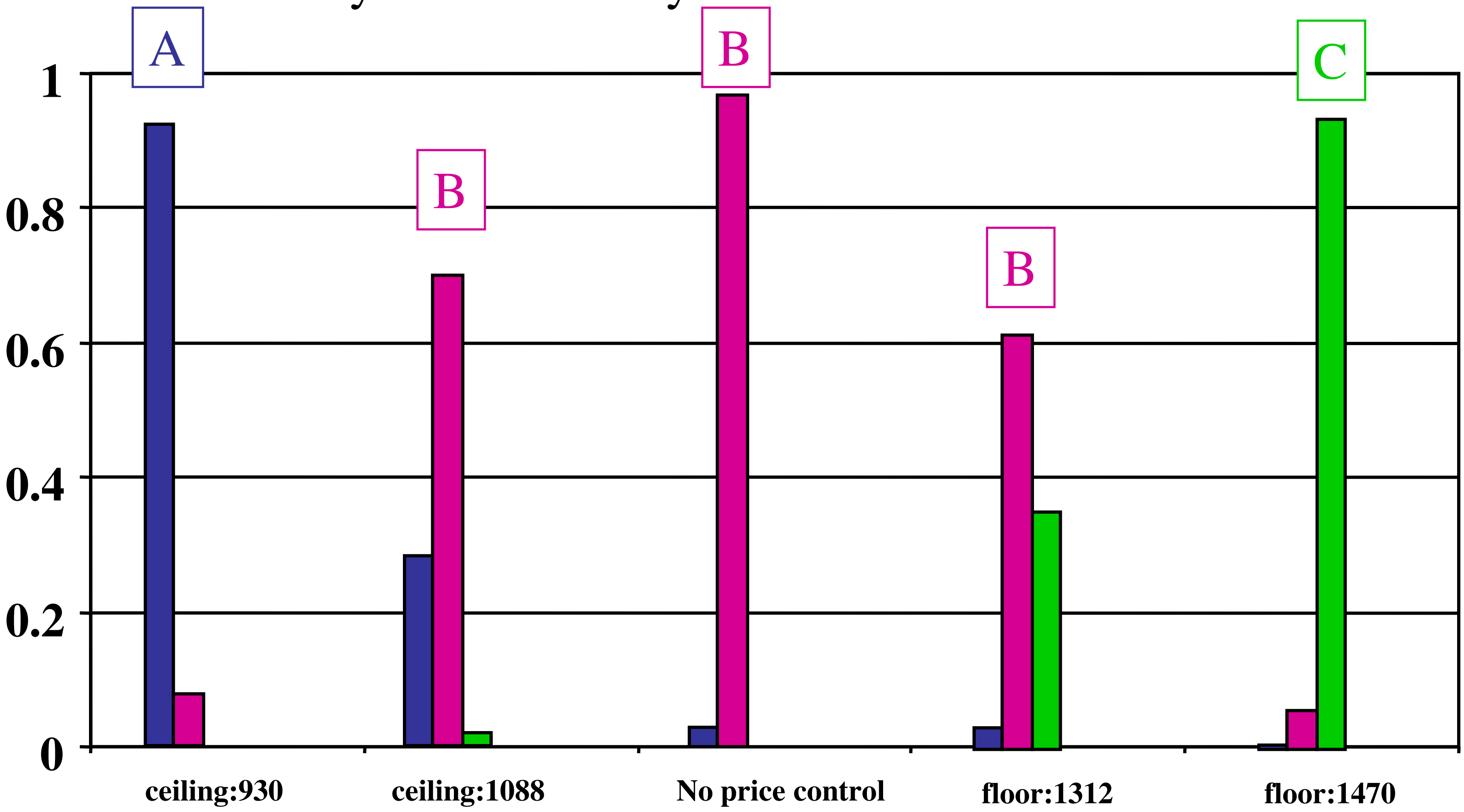


Ceilings and floors on the inside of the cutoff result in the two qualities predicted by unblocked assignments model
Contracts for quality C
assignment
floor
B
c.e.
ceiling
assignment
Contracts for quality B
Contracts for quality A
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
100
200
300
400
500

If ceiling is lowered to the outside the cutoff, it is no longer binding in the market and if floor is raised above the cutoff it is no longer binding in the market. One "inefficient" quality emerges. When floor is removed the general equilibrium results with quality B.



Quantity Volume: 100% B is the system efficiency allocation



Conclusions

Market respond to price floors and price ceilings through quality adjustments

The unblocked assignments model explains the patterns when the competitive equilibrium exists and when it does not..

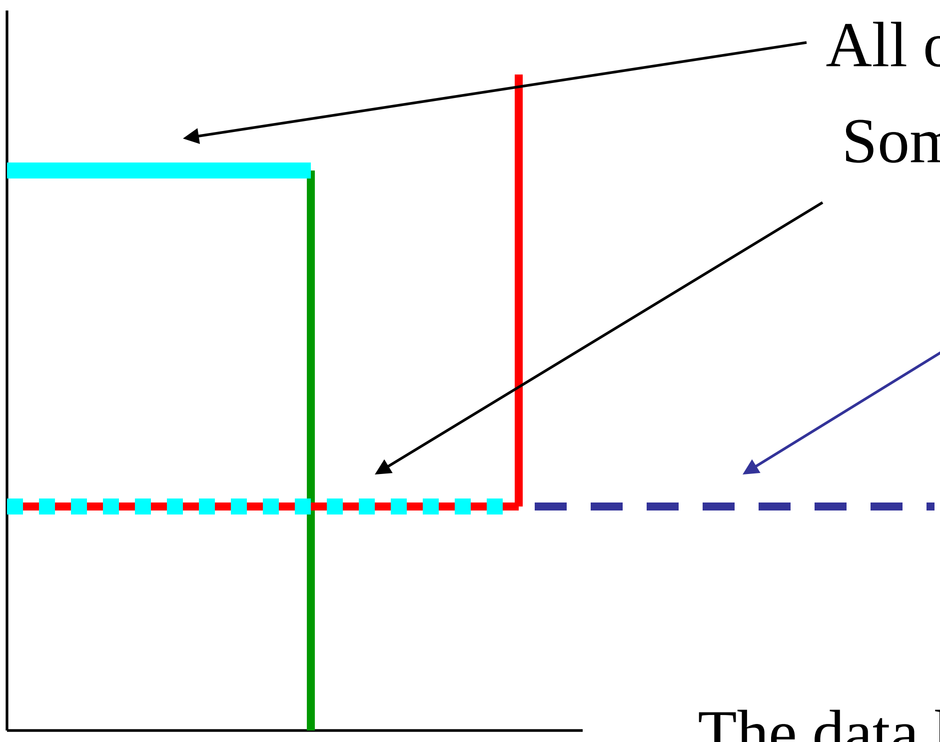
- **The optimal quality emerges from 10 competing qualities when markets are unconstrained.**

- **The path of multiple quality convergence is through the isolated equilibrium prices of independent qualities. Volume adjustment does not follow a "smooth quality adjustment" path.**

POSTSCRIPT: LONG STANDING PARADOX RESOLVED

The Walrasian Equilibrium- where quantity demanded equals quantity supplied- does not exist.

The unblocked assignments model does exist.



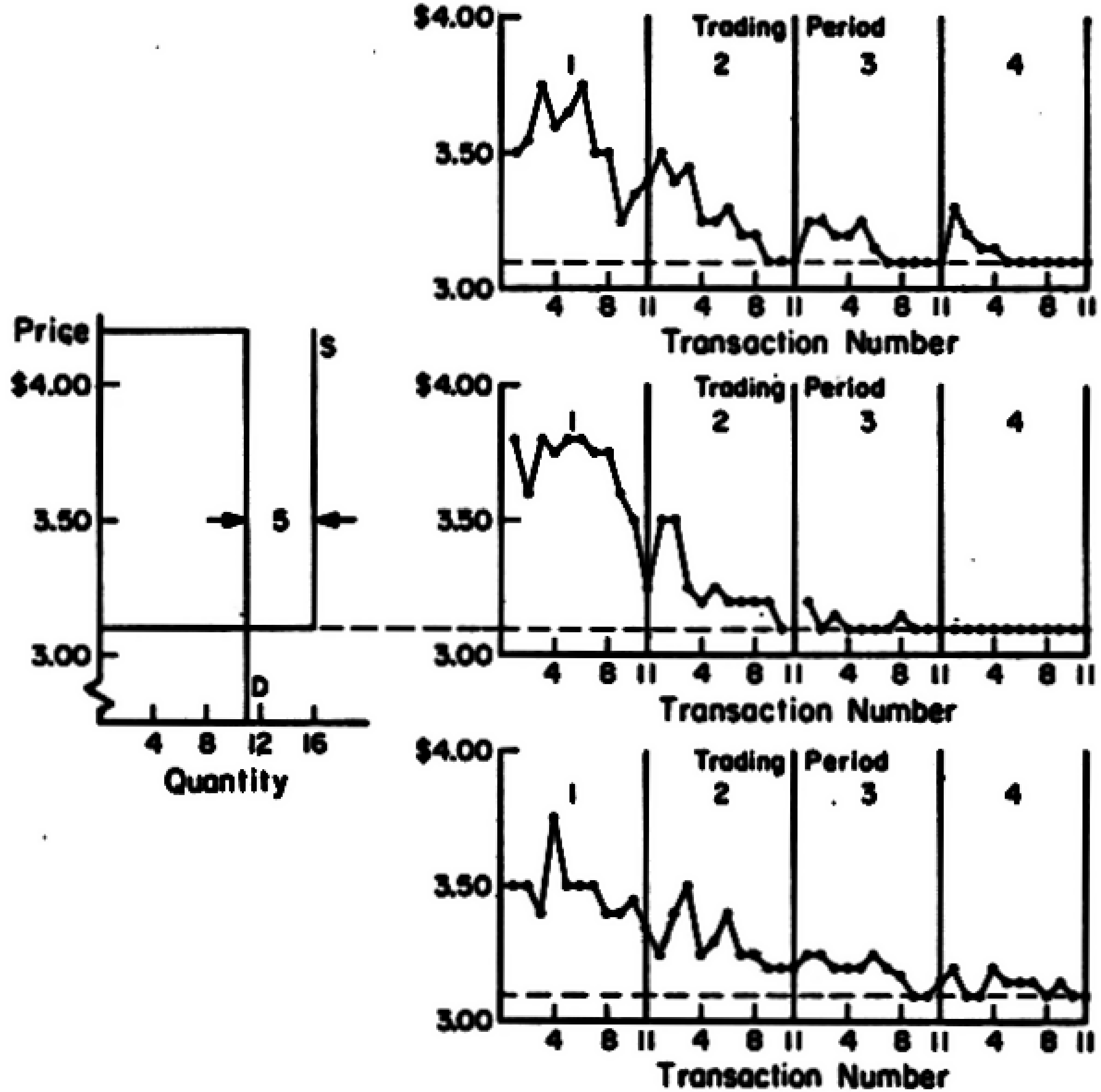
All of these demanders buy.

Some of these suppliers sell.

Trades are at this price. Any assignment with a sale price above this price is dominated by an allocation pairing the buyer and an excluded seller.

The data have such patterns.

CHART 7



Price
$4.00
3.50
3.00
S
5
D
4 8 12 16
Quantity
$4.00
3.50
3.00
Trading Period
1 2 3 4
4 8 11 4 8 11 4 8 11 4 8 11
Transaction Number

The

End

Efficiency (%)

Experiment	020524	021122
Period	w/o mi nprice	w/o mi nprice
1	82.3	81.5
2	85.9	87.5
3	91.3	95.2
4	91.8	93.7
5	93.4	94.0
6	92.6	98.1
7	93.6	95.6
8		96.9
9	□	
	90.1	

Efficiency by Periods (%)

021204	021210		030123	
with min price	with min price	w/o min price	with min price	w/o min price
59.7	66.8		64.4	
60.8	64.3		64.9	
53.1	64.1		62.6	
60.8		78.9	62.7	
59.0		95.3	64.7	
60.3		96.1	63.0	
64.0		98.8		87.9
64.8				93.5
-	-	92.3	-	90.7
60.3	65.0	-	63.7	-

In the absence of price controls the following two slides demonstrate how the laws of supply and demand work. Markets equilibrate over time to the equilibrium price and quantity. This happens even when the demands and supplies are subject to continuous shocks.

THE EXPERIMENTAL ENVIRONMENT

utility depends upon the number of units regardless of type...

plus value added by the numbers of particular types.

$$U^j(x) = M + V(\Sigma x_i) + \Sigma a_i x_i$$

$$C^k(x) = G(\Sigma x_i) + \Sigma b_i x_i$$

Marginal values go down with units

$$\partial U^j(x)/\partial x_i = V'(\Sigma x_i) + a_i$$

Marginal costs go up with units

$$\partial C^k(x)/\partial x_i = G'(\Sigma x_i) + b_i$$

Marginal rates of substitution are independent of volume

THE EXPERIMENTAL ENVIRONMENT

$$U^j(x) = M + V(\Sigma x_i) + \Sigma a_i x_i$$

$$C^k(x) = G(\Sigma x_i) + \Sigma b_i x_i$$

Marginal values go down with units

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Marginal costs go up with units

$$\partial C^k(x)/\partial x_i = G'(\Sigma x_i) + b_i$$

Marginal rates of substitution are independent of volume

Example of induced costs for a seller

Relative marginal costs are independent of sales but marginal cost goes up with volume of all sales

COST Table of Seller 101, Type 1

X	A	B	C	D	E	F	G	H	I	J
1	3413	3690	4013	4377	4781	5220	5693	6195	6725	7278
2	3433	3710	4033	4397	4801	5240	5713	6215	6745	7298
3	3453	3730	4053	4417	4821	5260	5733	6235	6765	7318
4	3473	3750	4073	4437	4841	5280	5753	6255	6785	7338
5	3493	3770	4093	4457	4861	5300	5773	6275	6805	7358
6	3513	3790	4113	4477	4881	5320	5793	6295	6825	7378
7	3533	3810	4133	4497	4901	5340	5813	6315	6845	7398
8	3553	3830	4153	4517	4921	5360	5833	6335	6865	7418
9	3573	3850	4173	4537	4941	5380	5853	6355	6885	7438
10	3593	3870	4193	4557	4961	5400	5873	6375	6905	7458
11	3613	3890	4213	4577	4981	5420	5893	6395	6925	7478
12	3633	3910	4233	4597	5001	5440	5913	6415	6945	7498
13	3653	3930	4253	4617	5021	5460	5933	6435	6965	7518
14	3673	3950	4273	4637	5041	5480	5953	6455	6985	7538
15	3693	3970	4293	4657	5061	5500	5973	6475	7005	7558

3690
4801
3730
3750
3493

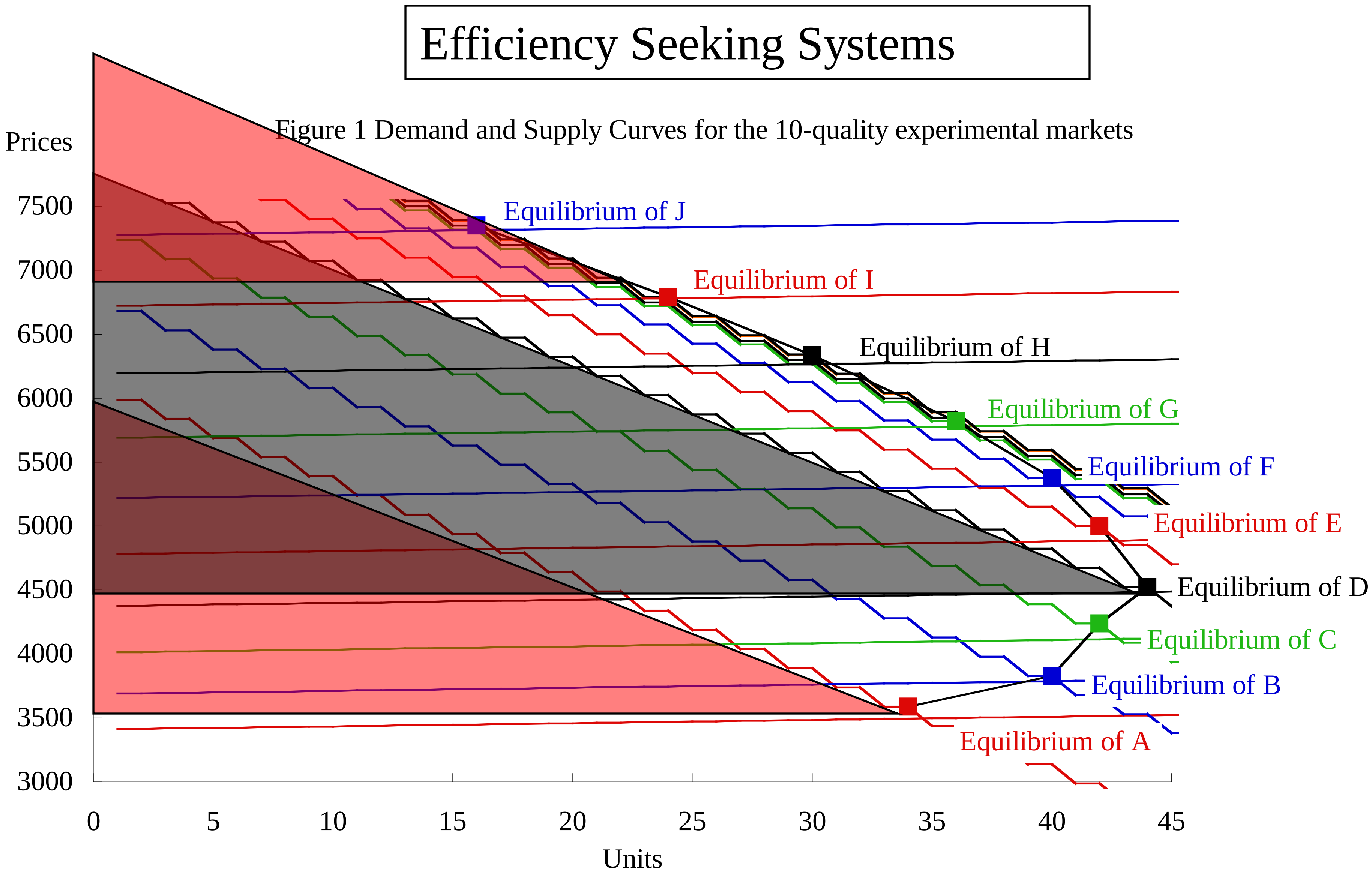
The **order** with which sales and deliveries are made does not effect costs.

The General Competitive Equilibrium Model

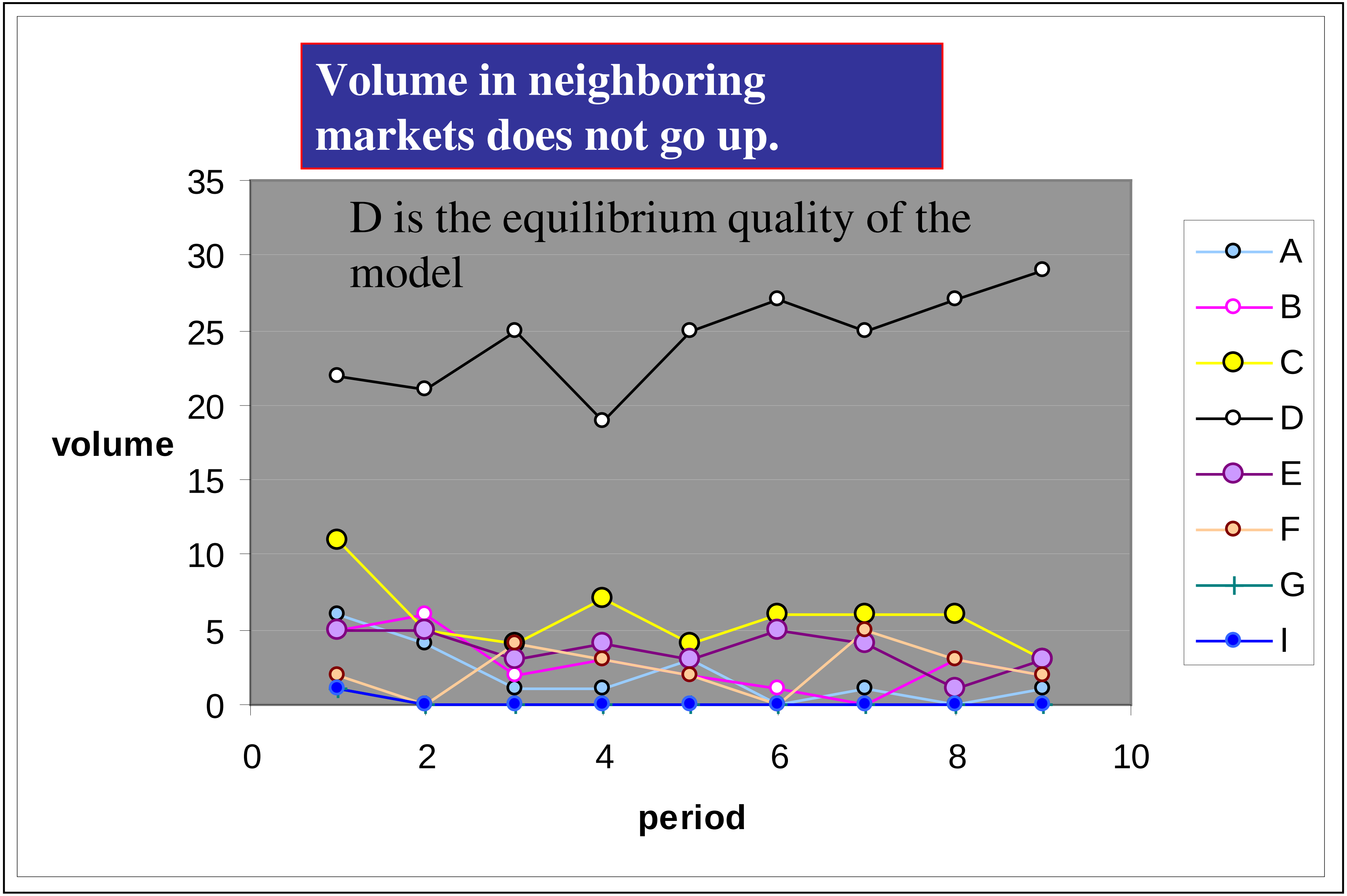
	General Competitive Equilibrium			Isolated Market Equilibria (each market treated as it is the only market that exists)		Isolated Market Surplus
Quality/ Market	Price	Volume		Price	Volume	
A	$P_D - 1686 < P_A < P_D - 946$	0		3493-3498	34	45,390
B	$P_D - 944 < P_B < P_D - 687$	0		3685-3790	40	60,700
C	$P_D - 436 < P_C < P_D - 364$	0		4113-4118	42	70,350
D	$4482 < P_D < 4488$	44		4482-4487	44	73,458
E	$P_D + 326 < P_E < P_D + 404$	0		4881-4886	42	70,098
F	$P_D + 554 < P_F < P_D + 843$	0		5315-5320	40	61,420
G	$P_D + 696 < P_G < P_D + 1316$	0		5778-5783	36	48,942
H	$P_D + 764 < P_H < P_D + 1820$	0		6265-6270	30	34,740
I	$P_D + 770 < P_I < P_D + 2350$	0		6780-6785	24	20,796
J	$P_D + 726 < P_J < P_D + 2903$	0		7313-7318	16	9,272

IN UNCONSTRAINED MARKETS

THE THREE MODELS PREDICT THE SAME AND ALL THREE ARE SUPPORTED



Efficiency Seeking Systems
Figure 1 Demand and Supply Curves for the 10-quality experimental markets
Prices
7500
7000
6500
6000
5500
5000
4500
4000
3500
3000
Equilibrium of J
Equilibrium of I
Equilibrium of H
Equilibrium of G
Equilibrium of F
Equilibrium of E
Equilibrium of D
Equilibrium of C
Equilibrium of B
Equilibrium of A
0
5
10
15
20
25
30
35
40
45
Units


Volume in neighboring markets does not go up.
D is the equilibrium quality of the model
volume
period
35
30
25
20
15
10
5
0
0
2
4
6
8
10
A
B
C
D
E
F
G
I

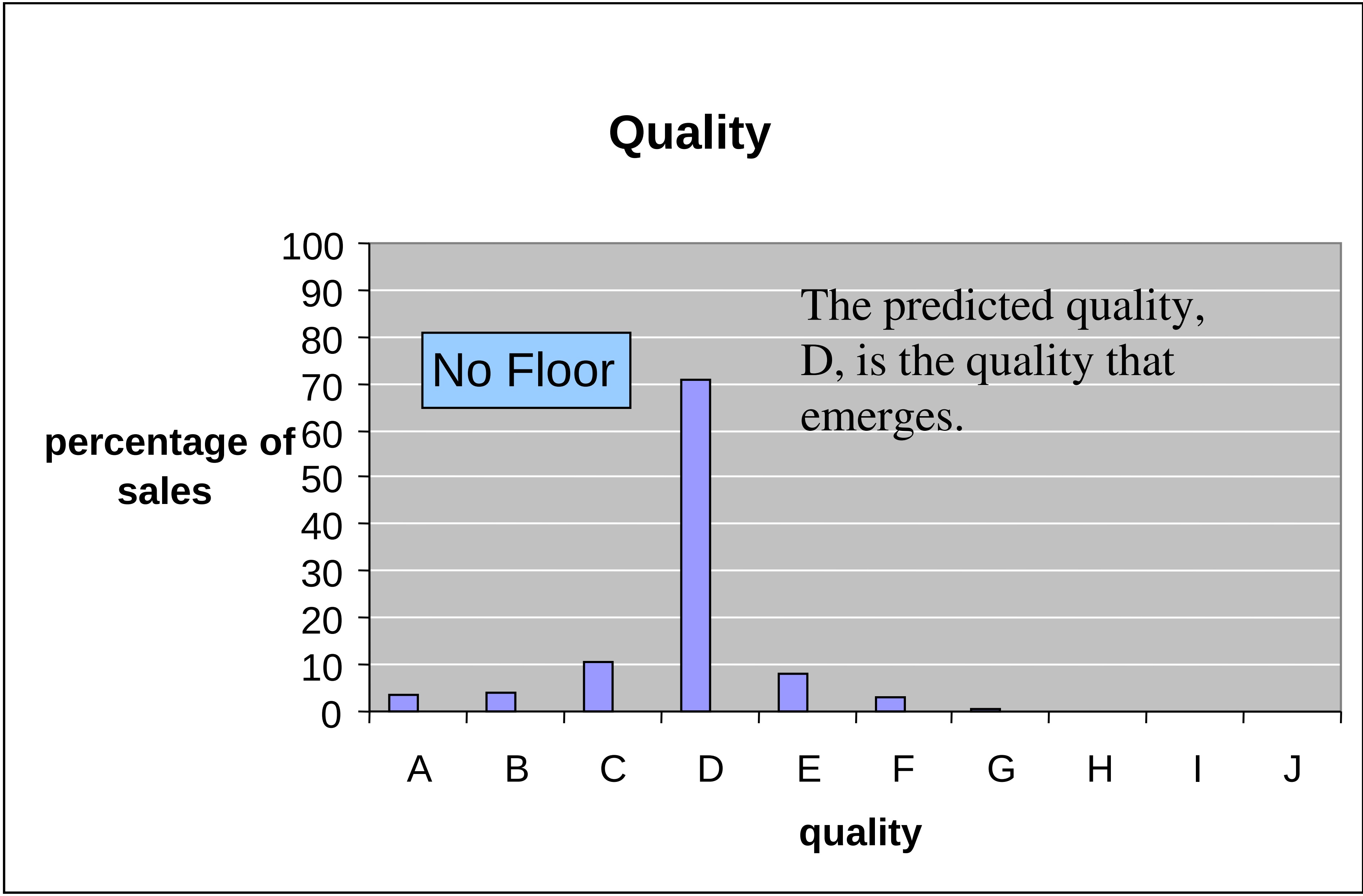
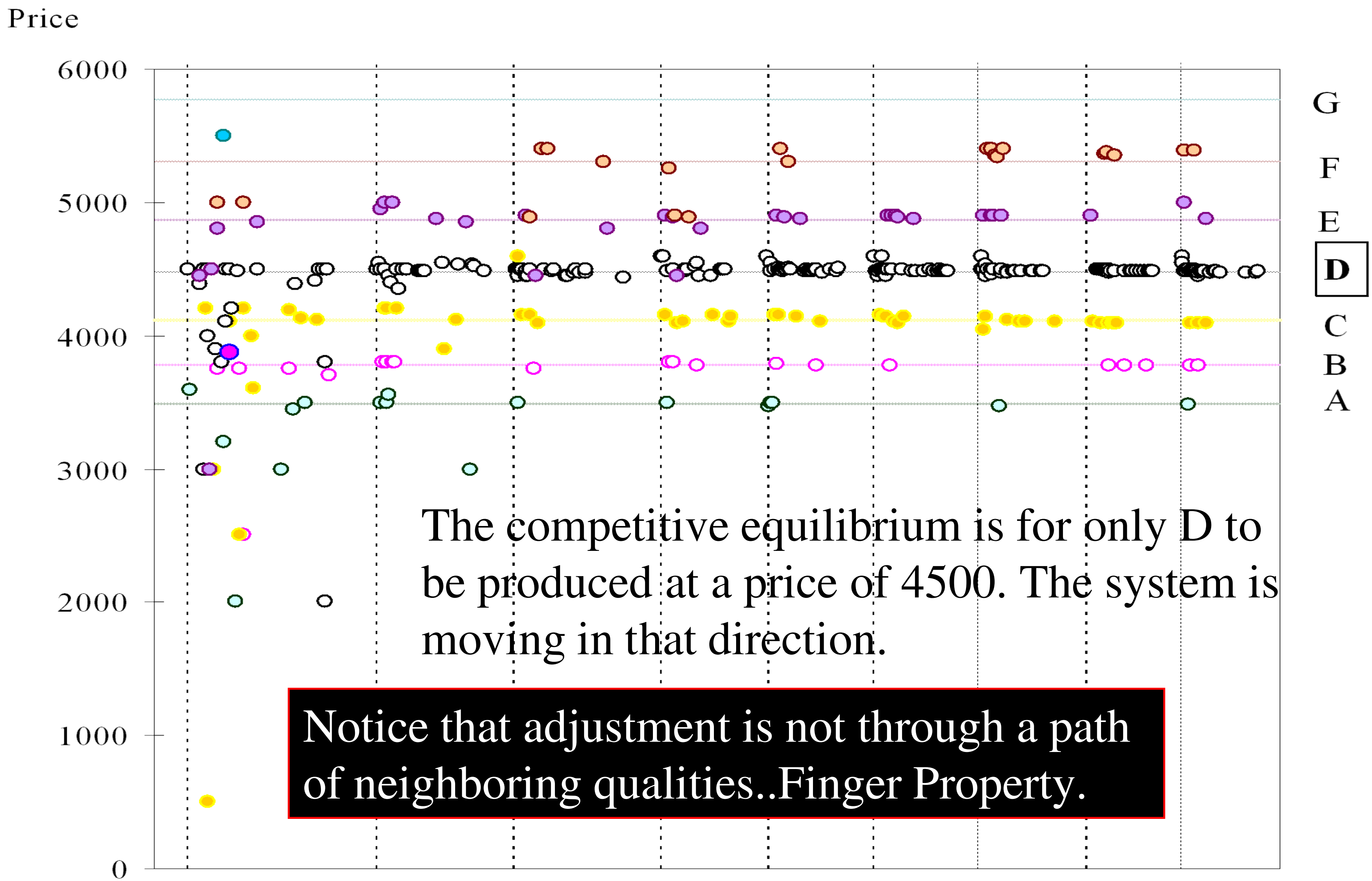

Quality
100
90
80
70
60
50
40
30
20
10
0
percentage of sales
No Floor
The predicted quality, D, is the quality that emerges.
A
B
C
D
E
F
G
H
I
J
quality

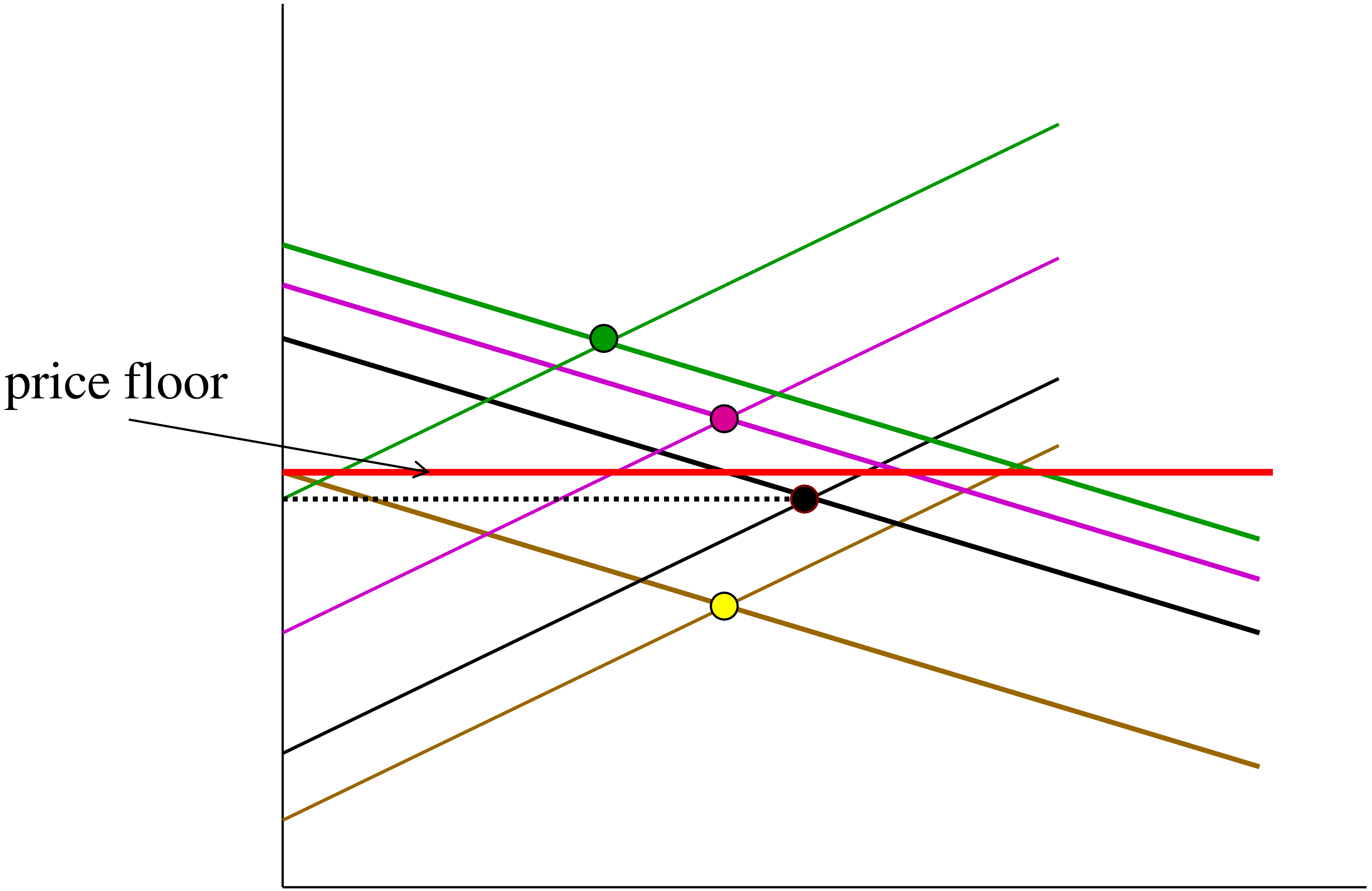
Figure 4 Traded Prices (Experiment 021122)



The competitive equilibrium is for only D to be produced at a price of 4500. The system is moving in that direction.

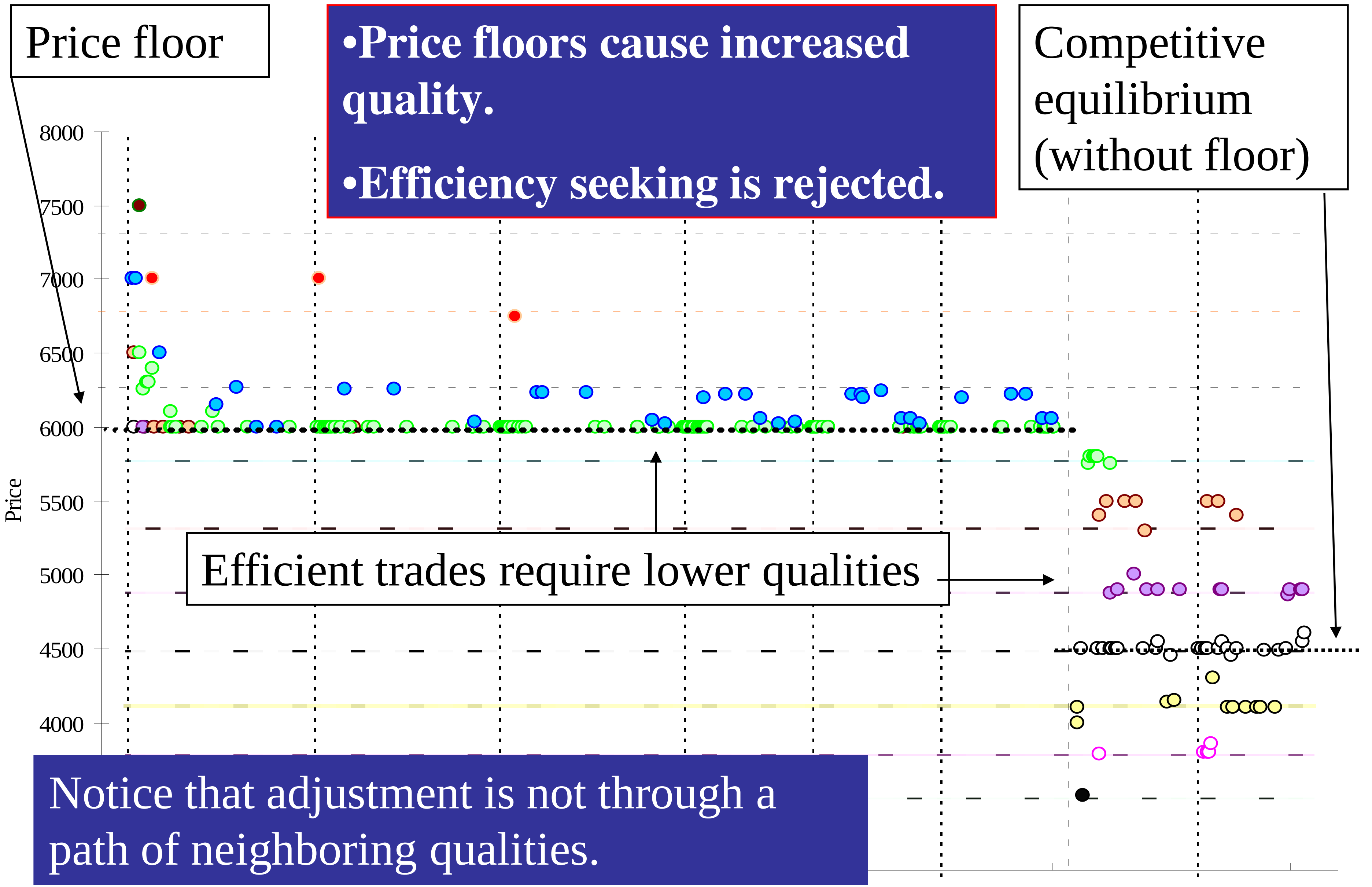
Notice that adjustment is not through a path of neighboring qualities..Finger Property.

A PRICE FLOOR IS IMPOSED

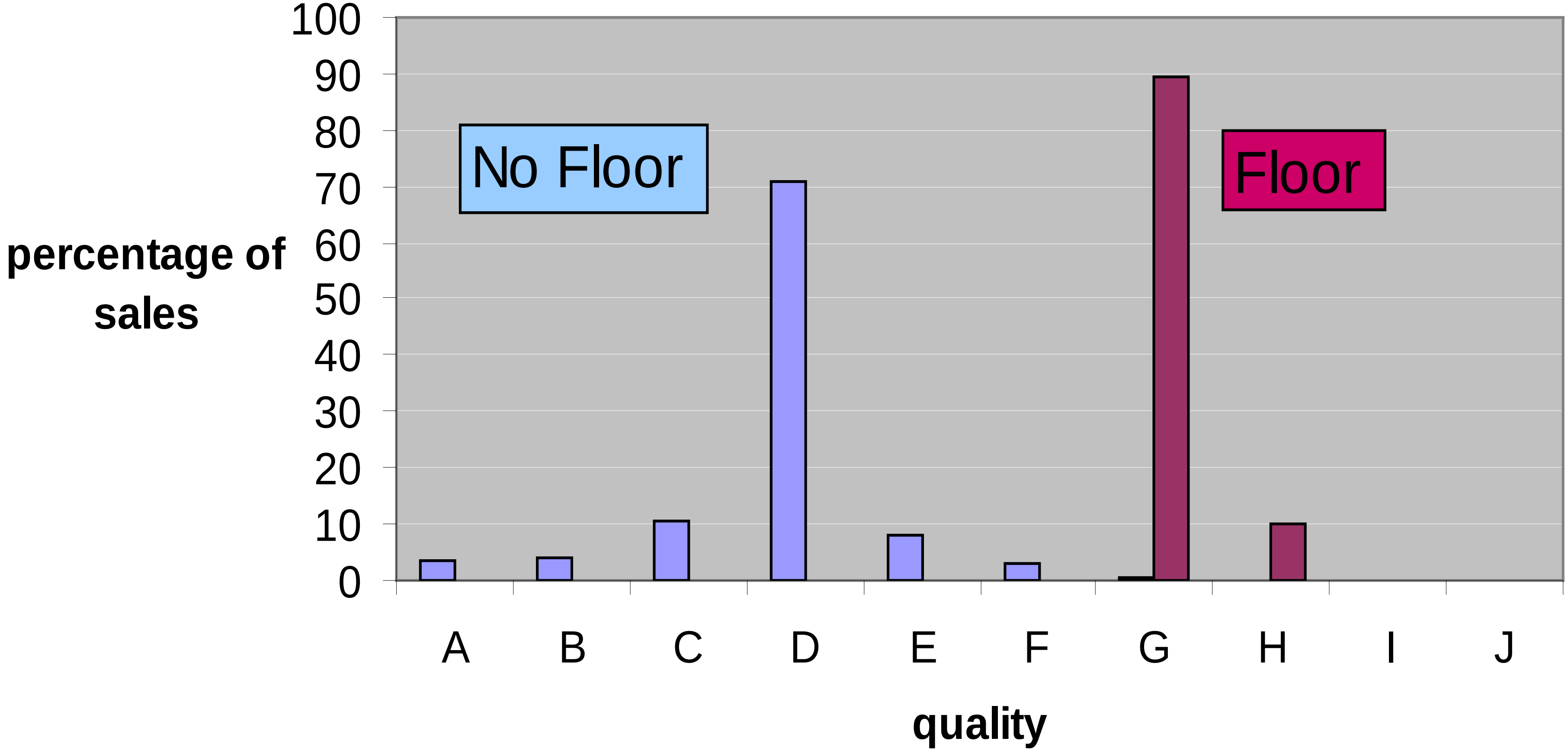


PRICE FLOORS ARE IMPLEMENTED

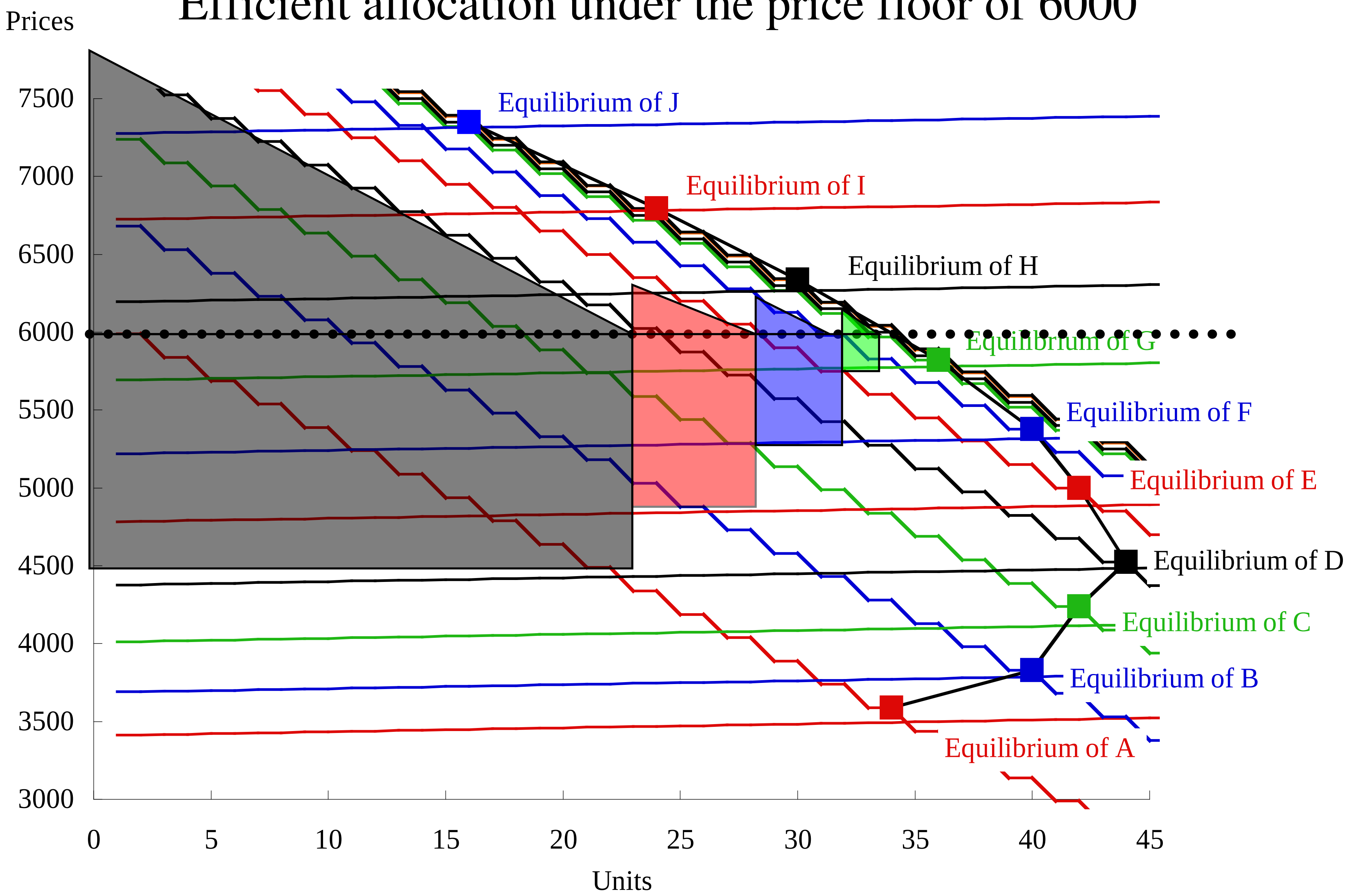
- Price floors foster non-price competition resulting in higher quality products.
- The efficiency seeking theory of markets does not explain the results.
- The unbloced assignments model has accurate predictions when price floors exist and when they do not exist.


Price floor
•Price floors cause increased quality.
•Efficiency seeking is rejected.
Competitive equilibrium (without floor)
8000
7500
7000
6500
6000
5500
5000
4500
4000
Price
Efficient trades require lower qualities
Notice that adjustment is not through a path of neighboring qualities.

Quality Volumes: The Impact of Price Floors on Quality



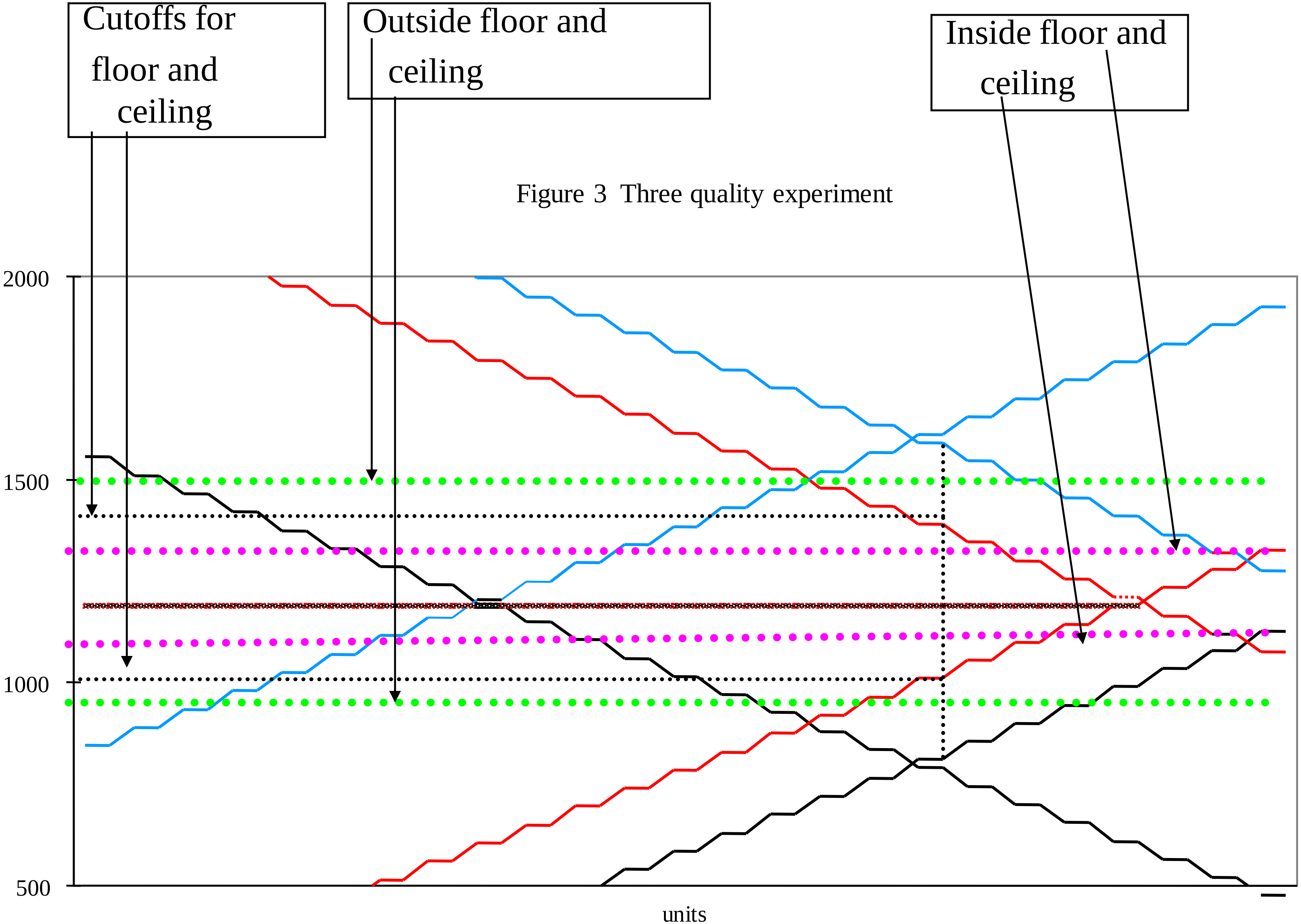
Efficient allocation under the price floor of 6000



A CLOSE LOOK AT THE

UNBLOCKED ASSIGNMENTS MODEL

SOME COMPLEX AND DELICATE PREDICTIONS


Cutoffs for floor and ceiling
Outside floor and ceiling
Inside floor and ceiling
Figure 3 Three quality experiment
2000
1500
1000
500
units

Summary: Floors below and above cutoff – Ceilings above and below cutoff.