PhD Topics in Macroeconomics

Lecture 19: aggregate gains from trade, part three

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This lecture

1- Atkeson/Burstein (2008 AER) model of endogenously variable markups in closed economy setting

- nested CES
- oligopolistic competition
- implications for markup dispersion and aggregate productivity

- simple examples to build intuition

2- Edmond, Midrigan and Xu (2014wp) two-country model with various ‘bells and whistles’

- calibration
- implications for gains from trade
- importance of head-to-head competition

Atkeson/Burstein

- Key features
  - *nested CES*, finite number producers within a sector
  - *oligopolistic competition* within a sector
  - endogenous demand elasticities, decreasing in market share
- Market share reallocations induce changes in markup dispersion and hence in aggregate TFP

Nested CES

- Output from a continuum of sectors

$$Y = \left(\int_0^1 y(s)^{\frac{\theta-1}{\theta}} \, ds \right)^{\frac{\theta}{\theta-1}}, \qquad \theta > 1$$

- Finite n competitors per sector

$$y(s) = \left(\sum_{i=1}^{n} y_i(s)^{\frac{\gamma-1}{\gamma}} \right)^{\frac{\gamma}{\gamma-1}}, \qquad \gamma > \theta$$

Final good producers

- Choose intermediates $y_i(s)$ to max profits

$$PY - \int_0^1 \sum_{i=1}^{n} p_i(s) y_i(s)\, ds$$

- Implies demand curves facing intermediate producers

$$y_i(s) = \left(\frac{p_i(s)}{p(s)}\right)^{-\gamma} \left(\frac{p(s)}{P}\right)^{-\theta} Y$$

with price indexes

$$p(s) = \left(\sum_{i=1}^{n} p_i(s)^{1-\gamma}\right)^{\frac{1}{1-\gamma}}, \qquad P = \left(\int_0^1 p(s)^{1-\theta}\, ds\right)^{\frac{1}{1-\theta}}$$

Intermediate producers

- Finite n producers per sector

- Producer-level production function

$$y_i(s) = a_i(s) l_i(s)^{\alpha} k_i(s)^{1-\alpha}$$

- Productivity $a_i(s)$ is IID Pareto

$$\text{Prob}[a_i(s) \geq a] = a^{-\xi}$$

with shape parameter ξ (thick tails if ξ low)

- No *ex ante* sectoral heterogeneity,
but *ex post* sectoral heterogeneity because finite sample (n draws)

Pricing

- Price is markup over marginal cost

$$p_i(s) = \frac{\varepsilon_i(s)}{\varepsilon_i(s) - 1} \frac{c(w, r)}{a_i(s)}$$

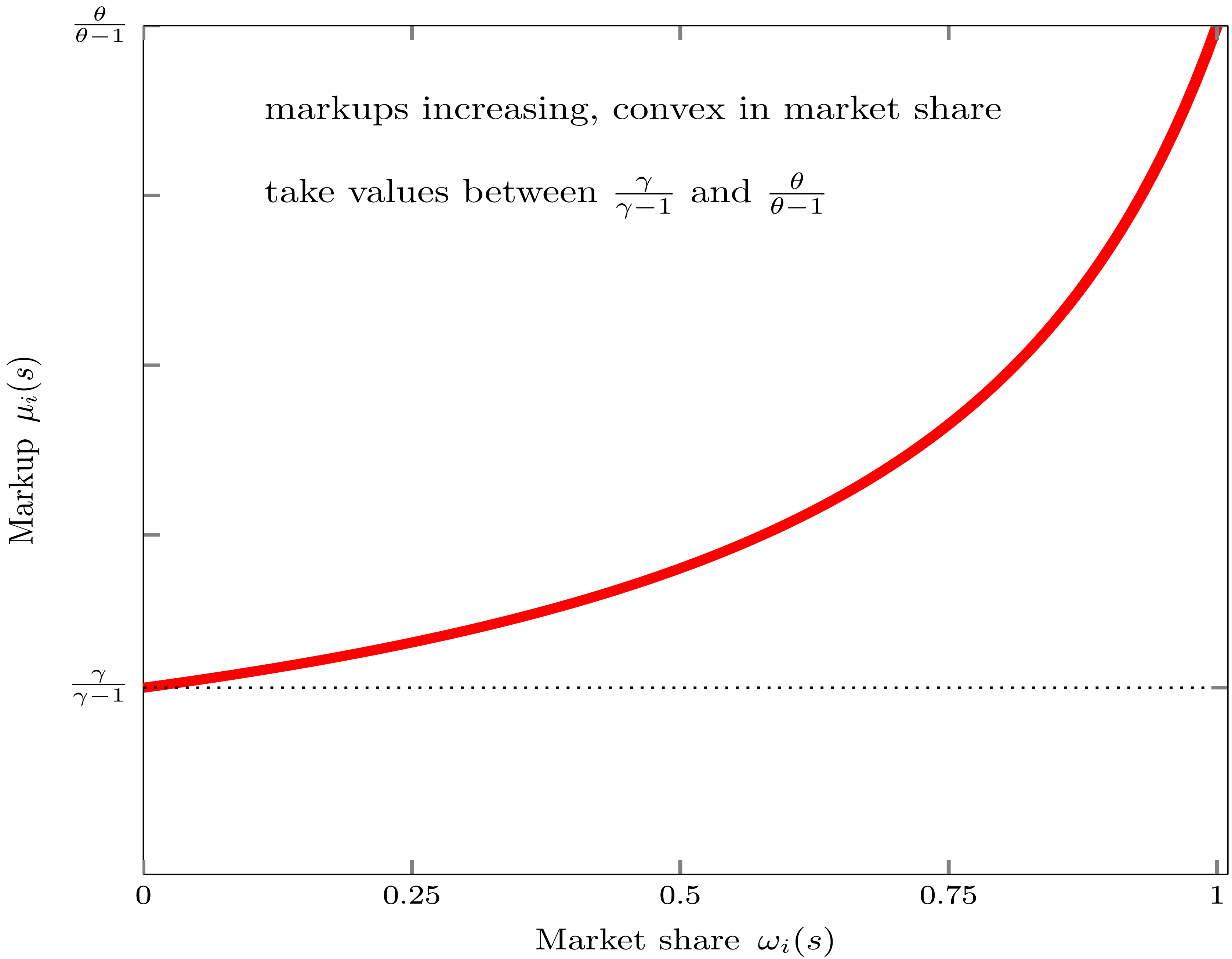
- Demand elasticity is decreasing in market share

$$\varepsilon_i(s) = \left(\omega_i(s) \frac{1}{\theta} + (1 - \omega_i(s)) \frac{1}{\gamma} \right)^{-1}, \qquad \text{(Cournot competition)}$$

- Hence markups increasing in market share

$$\omega_i(s) := \frac{p_i(s) y_i(s)}{\sum_{i=1}^n p_i(s) y_i(s)} = \left(\frac{p_i(s)}{p(s)} \right)^{1-\gamma}$$

Markups $\mu_i(s)$ and market shares $\omega_i(s)$



Fixed point problem (sketch)

- Let $\mathbf{a} := [a_i(s)]$, $\mathbf{p} := [p_i(s)]$, $\boldsymbol{\omega} := [\omega_i(s)]$, $\boldsymbol{\varepsilon} := [\varepsilon_i(s)]$

- Market shares

$$\boldsymbol{\omega} = f(\mathbf{p})$$

- Demand elasticity

$$\boldsymbol{\varepsilon} = g(\boldsymbol{\omega}) = g(f(\mathbf{p}))$$

- Prices

$$\mathbf{p} = h(\boldsymbol{\varepsilon}\, , \mathbf{a}) = h(g(f(\mathbf{p}))\, , \mathbf{a}) =: \phi(\mathbf{p}\, , \mathbf{a})$$

- Equilibrium prices $\mathbf{p}^*(\mathbf{a})$ solve this fixed point problem

- Recover equilibrium market shares, equilibrium markups

Solution (sketch)

- Solve fixed point problem by function iteration

- Initial guess $\mathbf{p}_0 = \frac{\gamma}{\gamma-1}/\mathbf{a}$, numeraire $c(w,r) = 1$

- Iterate on

$$\mathbf{p}_{k+1} = \phi(\mathbf{p}_k\,,\,\mathbf{a}), \qquad k = 0, 1, \ldots$$

- Stop when

$$\left\|\mathbf{p}_{k+1} - \mathbf{p}_k\right\|_\infty < 10^{-7}$$

- Gives $\mathbf{p}^*(\mathbf{a})$ hence market shares $\boldsymbol{\omega}^*(\mathbf{a})$ and markups $\boldsymbol{\mu}^*(\mathbf{a})$

Aggregate TFP

- *First-best*

$$A = \left(\int_0^1 a(s)^{\theta-1} \, ds \right)^{\frac{1}{\theta-1}}$$

$$a(s) = \left(\sum_{i=1}^{n} a_i(s)^{\gamma-1} \right)^{\frac{1}{\gamma-1}}$$

- *With variable markups*

$$A = \left(\int_0^1 \left(\frac{\mu(s)}{\mu} \right)^{-\theta} a(s)^{\theta-1} \, ds \right)^{\frac{1}{\theta-1}}$$

$$a(s) = \left(\sum_{i=1}^{n} \left(\frac{\mu_i(s)}{\mu(s)} \right)^{-\gamma} a_i(s)^{\gamma-1} \right)^{\frac{1}{\gamma-1}}$$

Markup dispersion

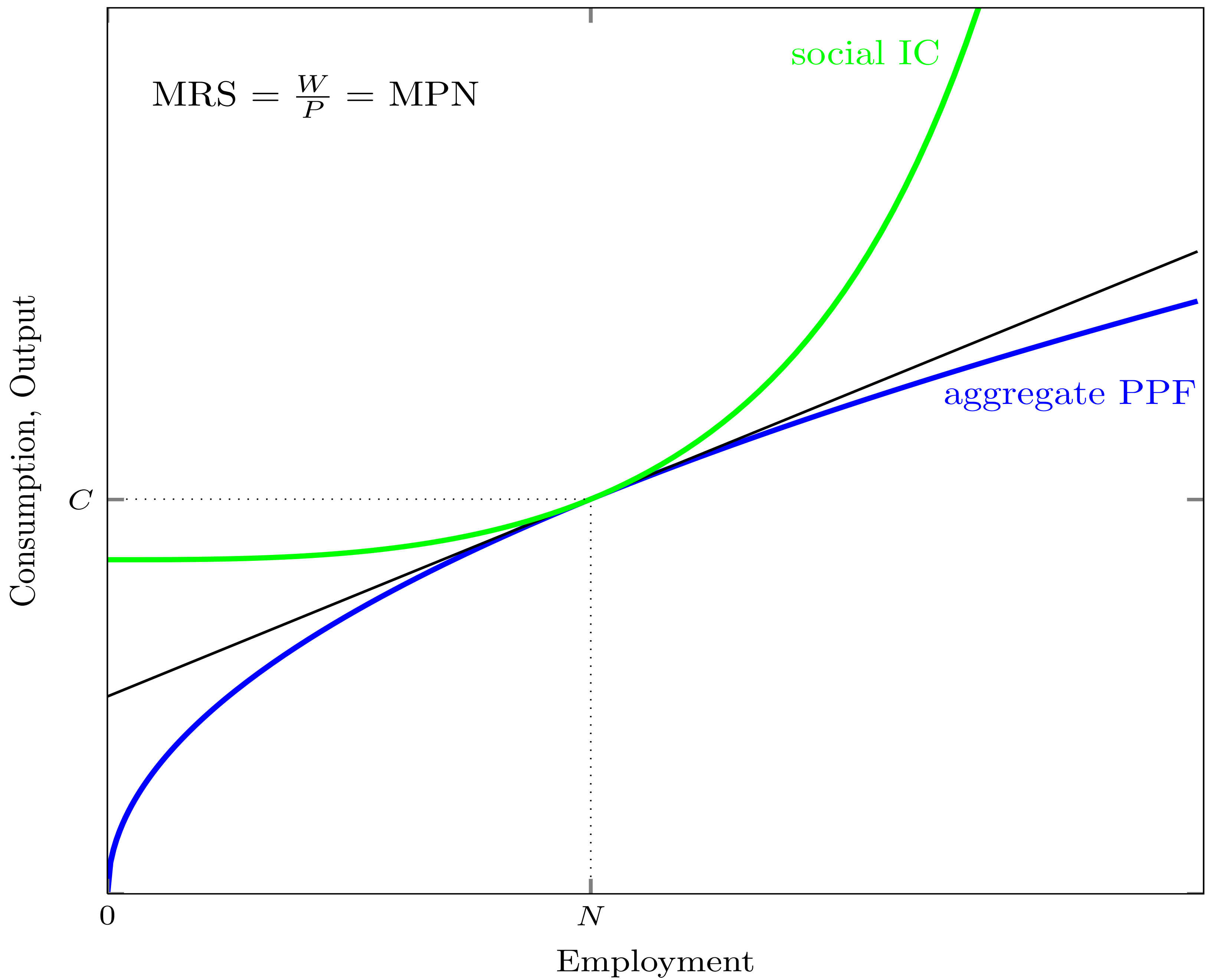
- Markup dispersion reduces aggregate TFP below first-best level

- With common markup, say μ, aggregate TFP is at first-best (relative prices still reflect relative marginal costs)

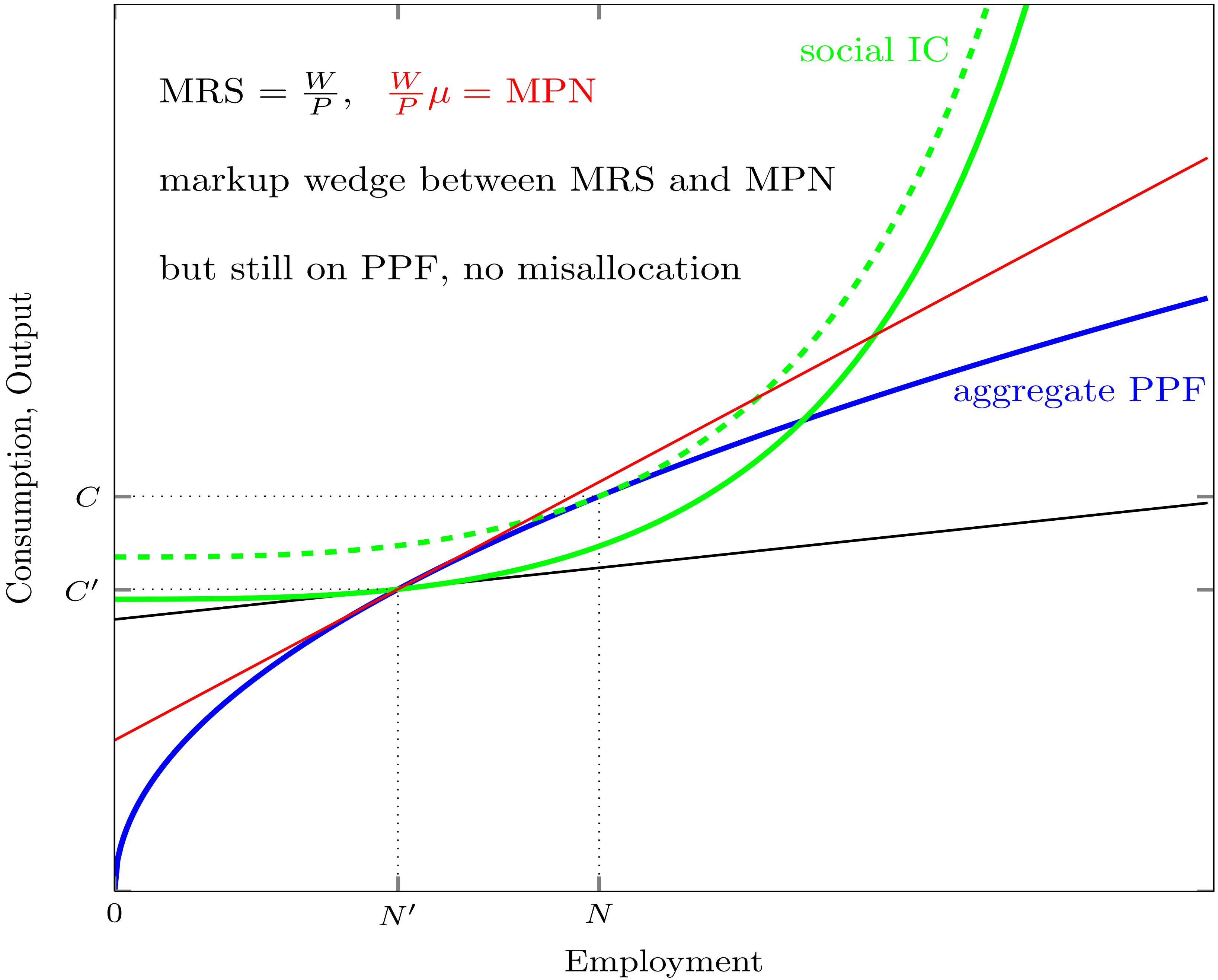
$$\frac{p_i(s)}{p_j(s)} = \frac{\mu \frac{c(w,r)}{a_i(s)}}{\mu \frac{c(w,r)}{a_j(s)}} = \frac{a_j(s)}{a_i(s)}$$

- So, in this case, no misallocation

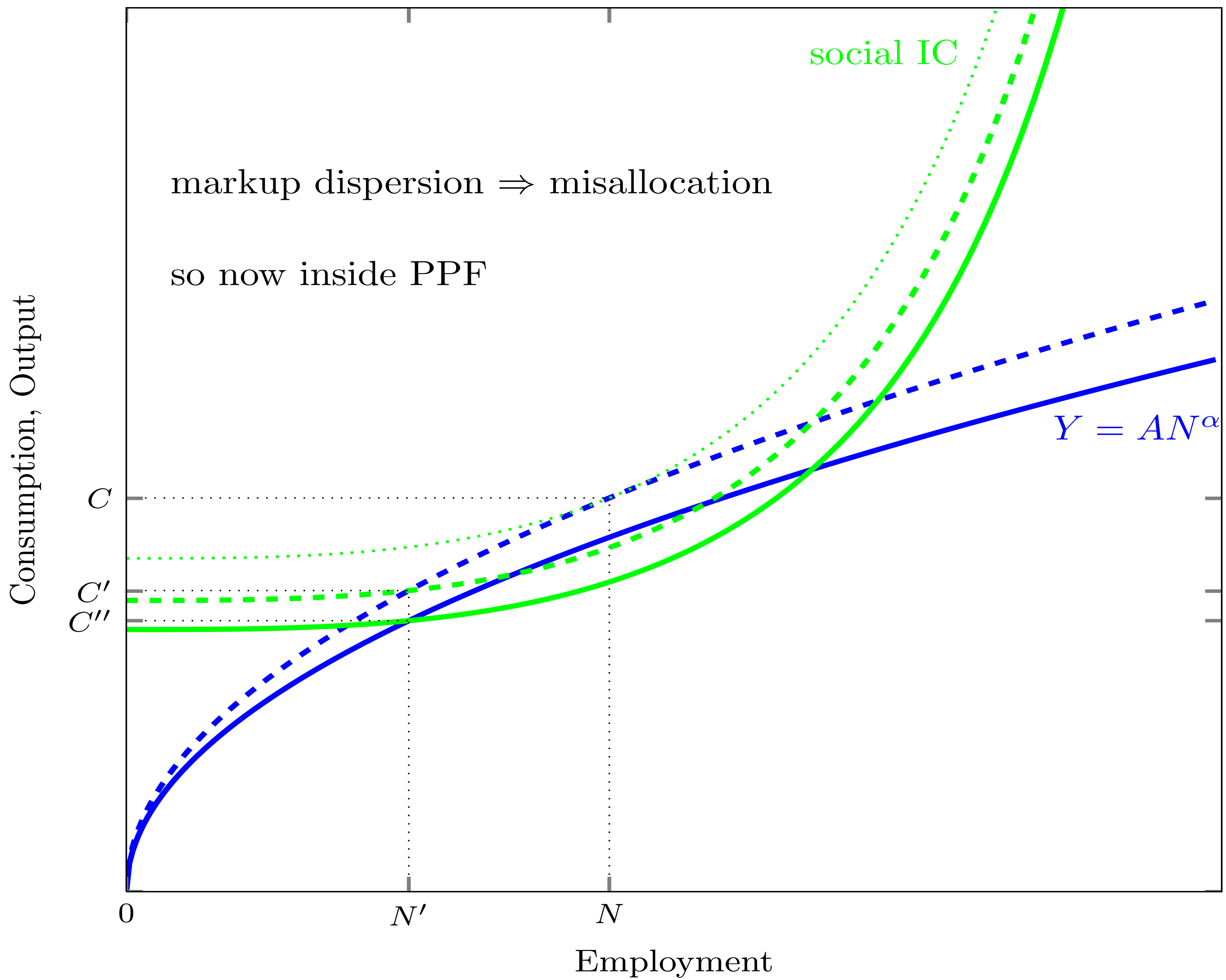
First-best levels



Aggregate markup μ



Markup dispersion $\mu_i(s)$



Homogeneous firms

- Suppose $n \geq 1$ producers per sector, identical productivity

- Identical market shares, $\omega_i(s) = 1/n$ each

- Identical markups

$$\mu_i(s) = \mu = \frac{n}{\left(\frac{\gamma-1}{\gamma}\right)n - \left(\frac{1}{\theta} - \frac{1}{\gamma}\right)}$$

  declining from $\frac{\theta}{\theta-1}$ at $n = 1$ to $\frac{\gamma}{\gamma-1}$ as $n \to \infty$

- Markup level distorts allocations, but TFP at first-best

Heterogeneous firms

- Suppose $n = 1$ producers per sector

  Monopoly markup $\frac{\theta}{\theta-1}$ (large) — but no misallocation

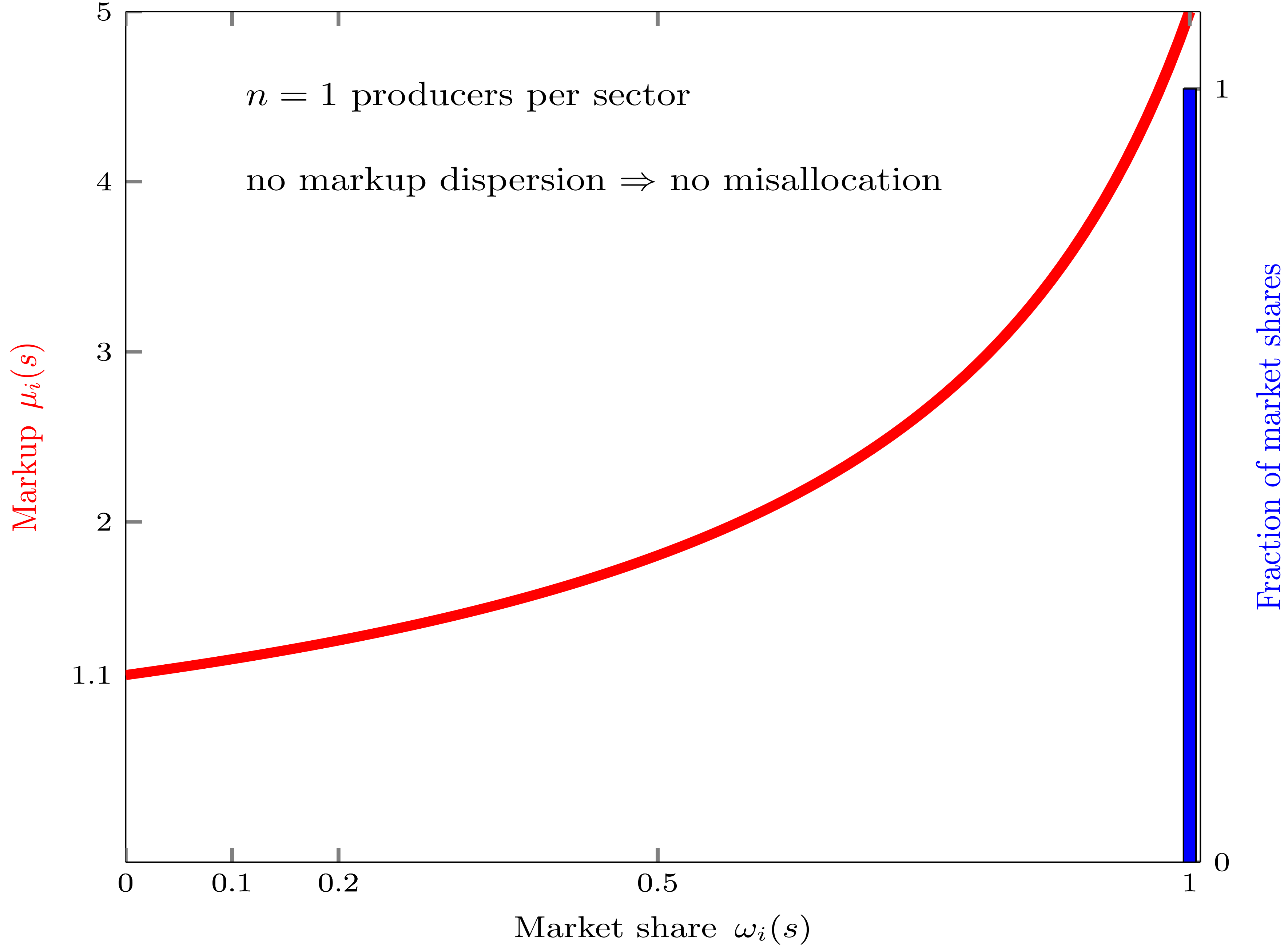
- Increase to $n = 2$ producers per sector

  Aggregate markup falls — but now markup dispersion

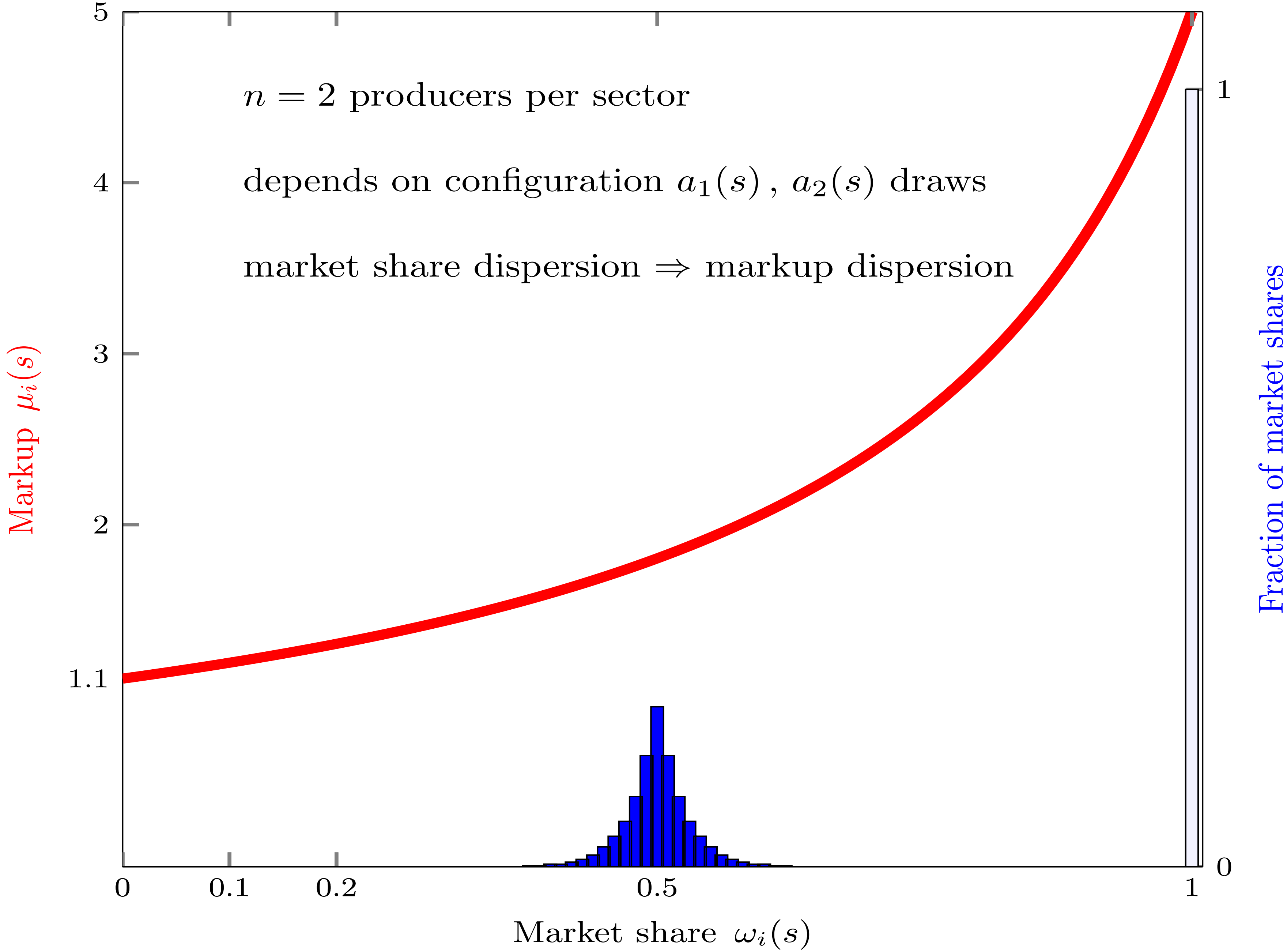
  Extent of markup dispersion depends on productivity dispersion

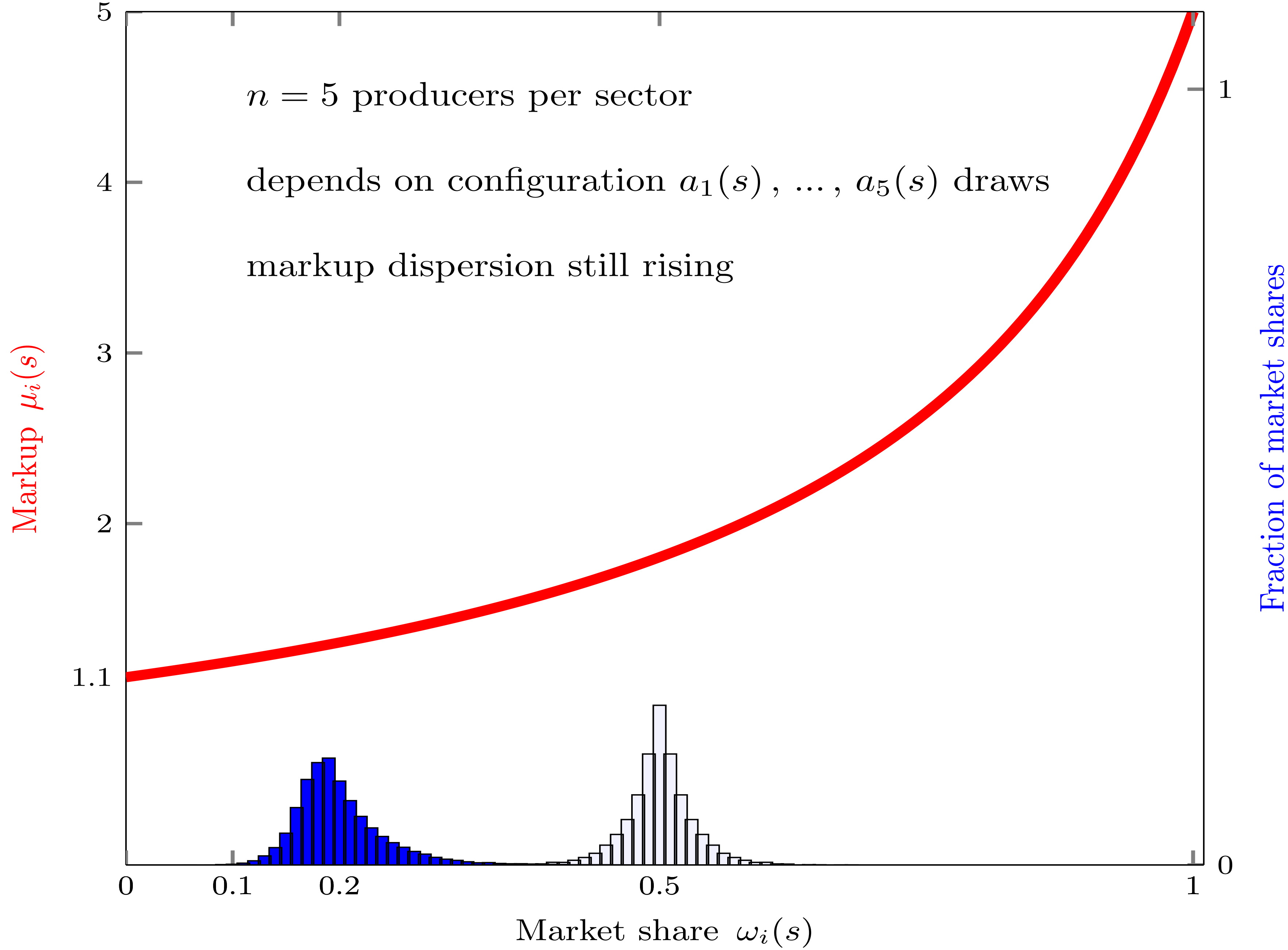
  Moreover, extent of fall in aggregate markup depends on markup dispersion (Jensen's ineq.)

Monopoly: high markup but no misallocation

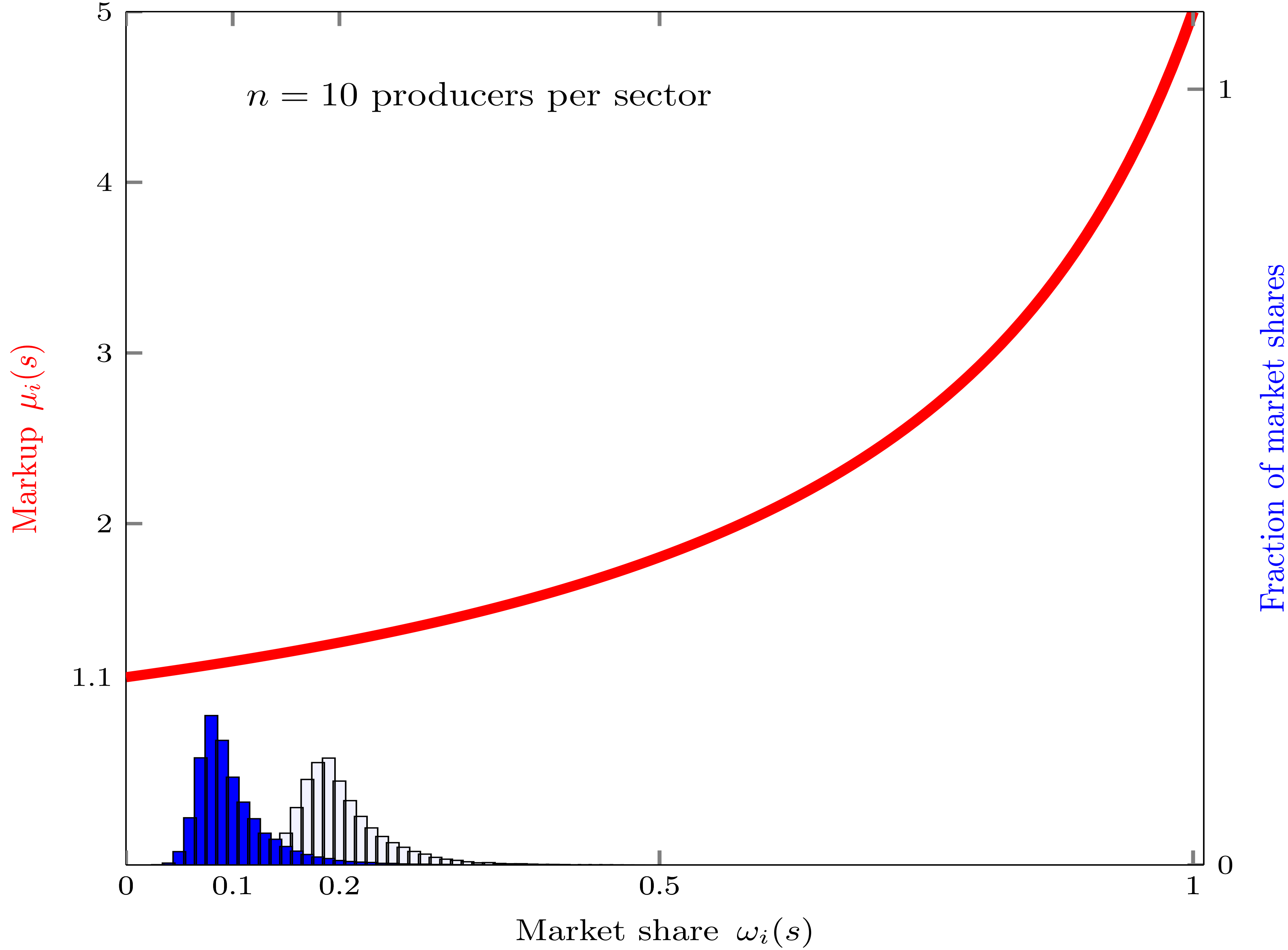


Duopoly: lower markups, but now misallocation

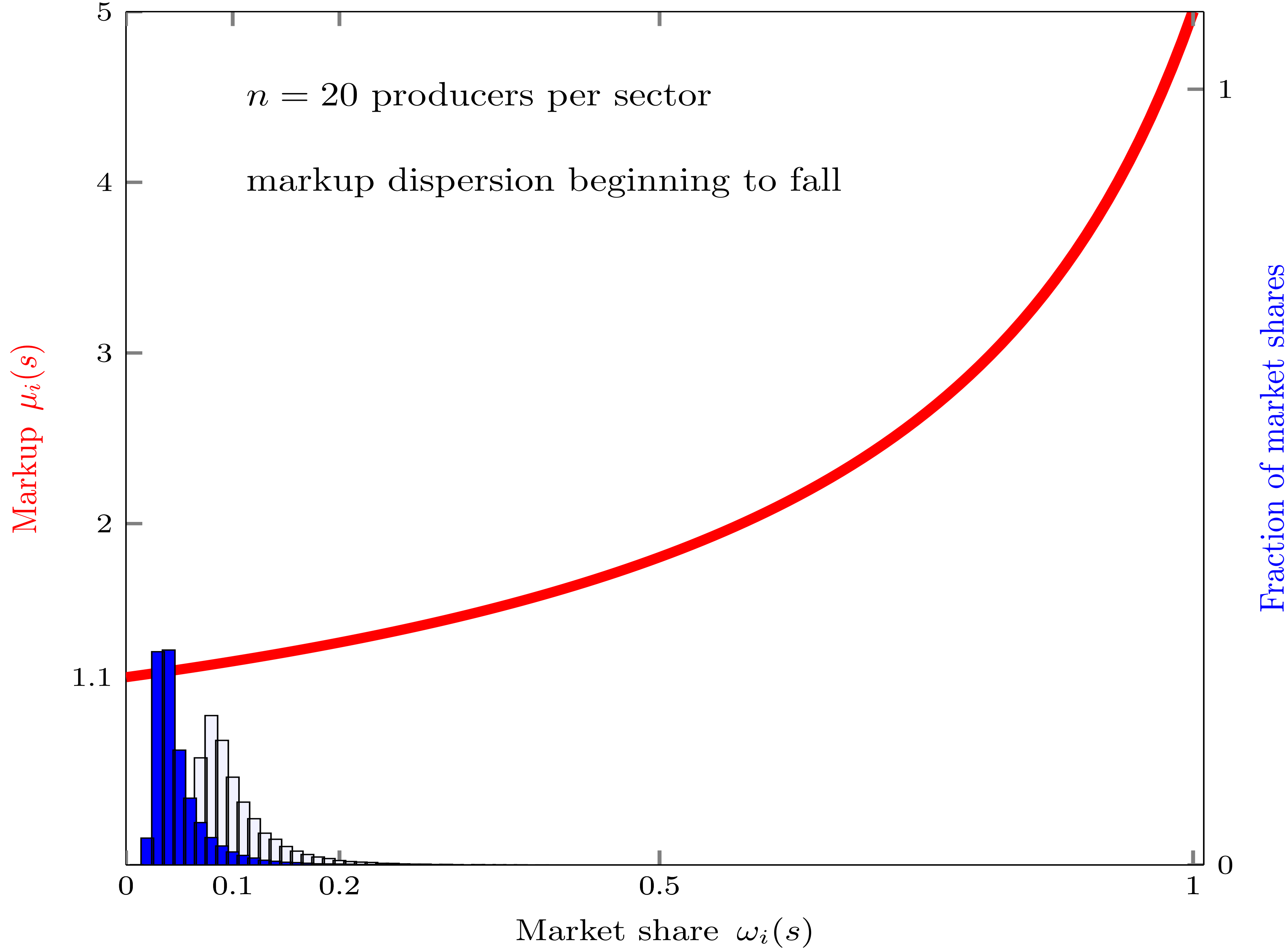




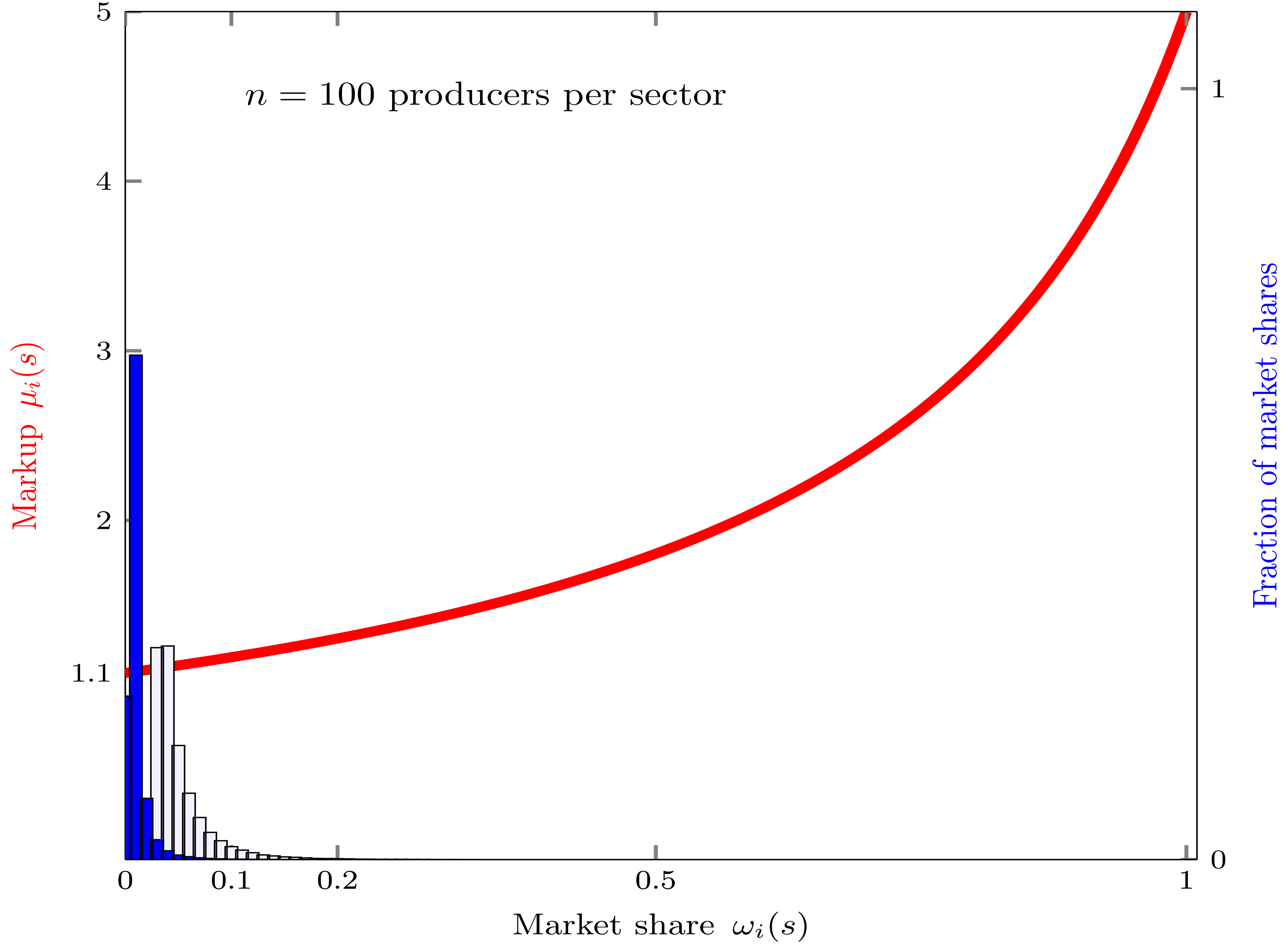
n = 5 producers per sector
depends on configuration a1(s) , ... , a5(s) draws
markup dispersion still rising
Markup μi(s)
Fraction of market shares
Market share ωi(s)
5
4
3
2
1.1
0
0.1
0.2
0.5
1
1
0



n = 10 producers per sector
Markup $\mu_i(s)$
Fraction of market shares
Market share $\omega_i(s)$
5
4
3
2
1.1
1
0
0
0.1
0.2
0.5
1

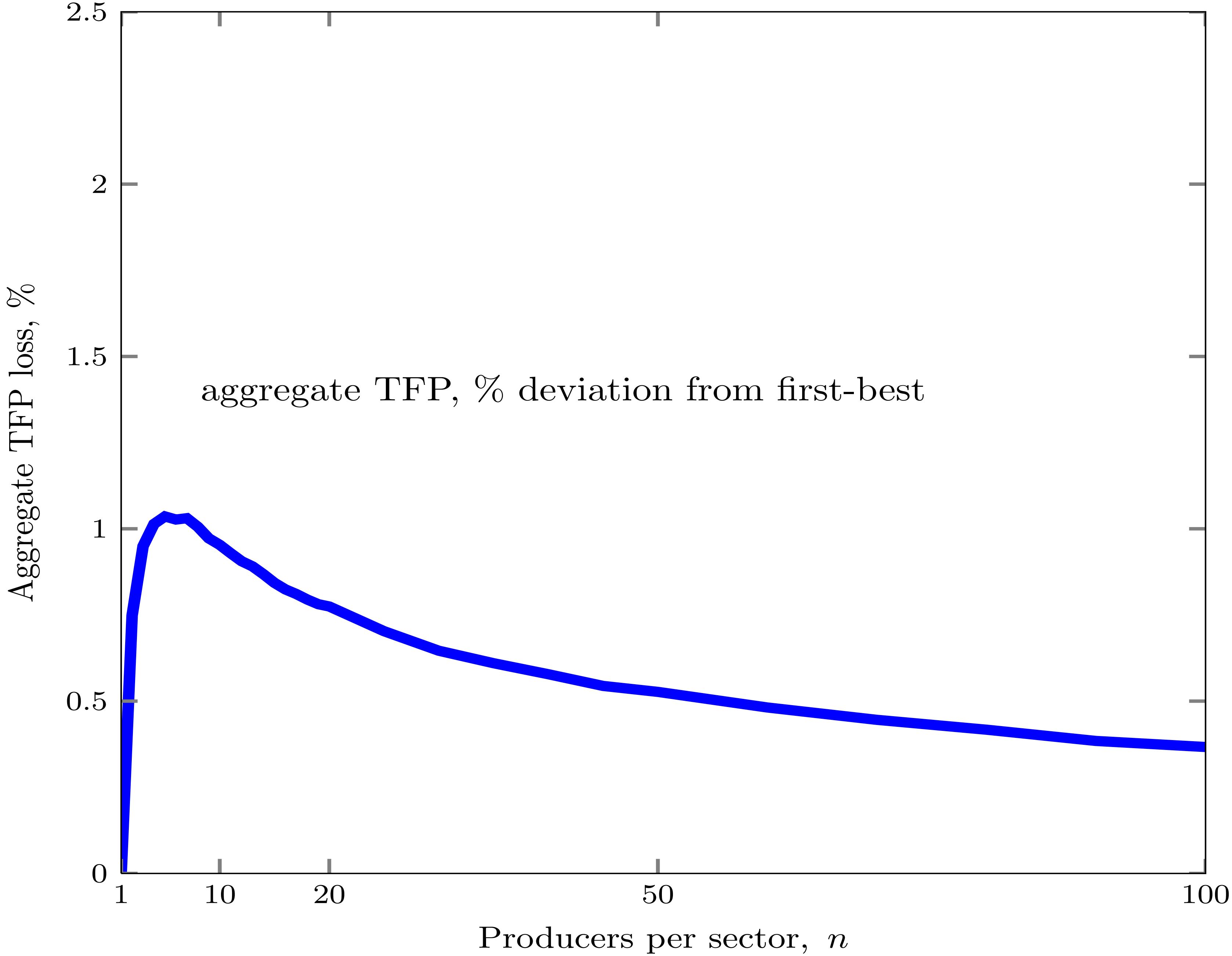


$n = 20$ producers per sector
markup dispersion beginning to fall
Markup $\mu_i(s)$
Fraction of market shares
Market share $\omega_i(s)$
5
4
3
2
1.1
1
0
0
0.1
0.2
0.5
1

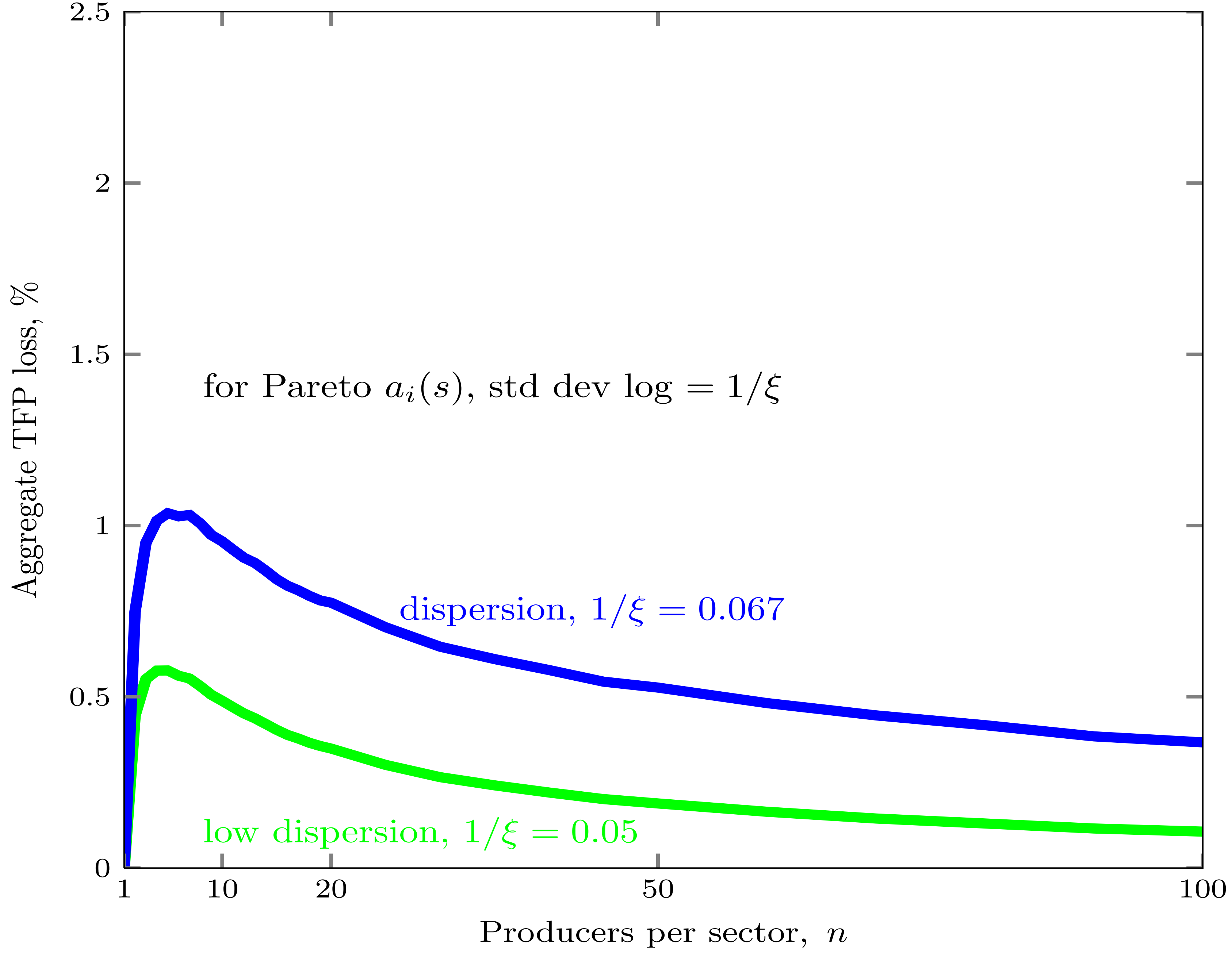


$n = 100$ producers per sector
Markup $\mu_i(s)$
Fraction of market shares
Market share $\omega_i(s)$
5
4
3
2
1.1
1
0
0
0.1
0.2
0.5
1

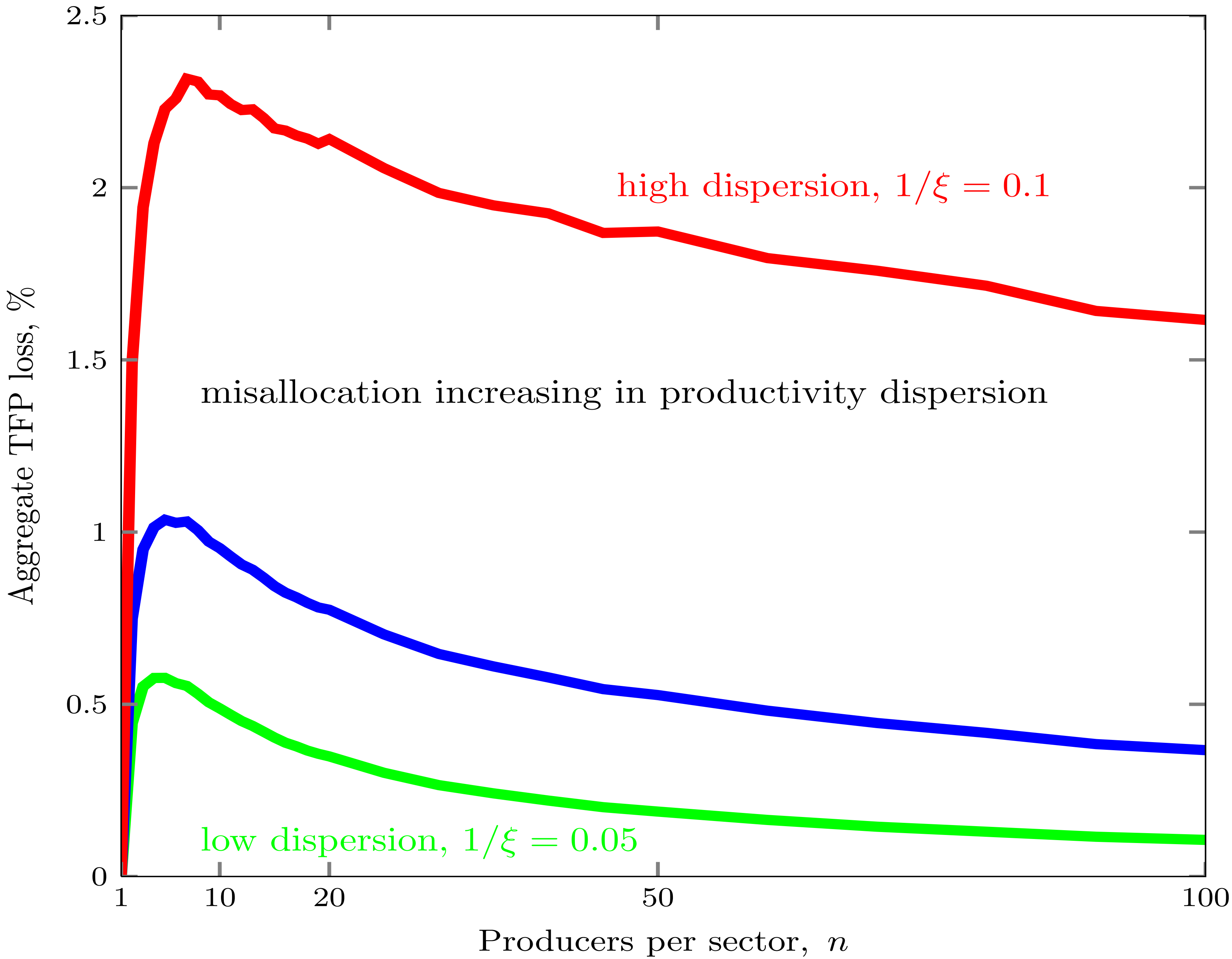
Misallocation and competition



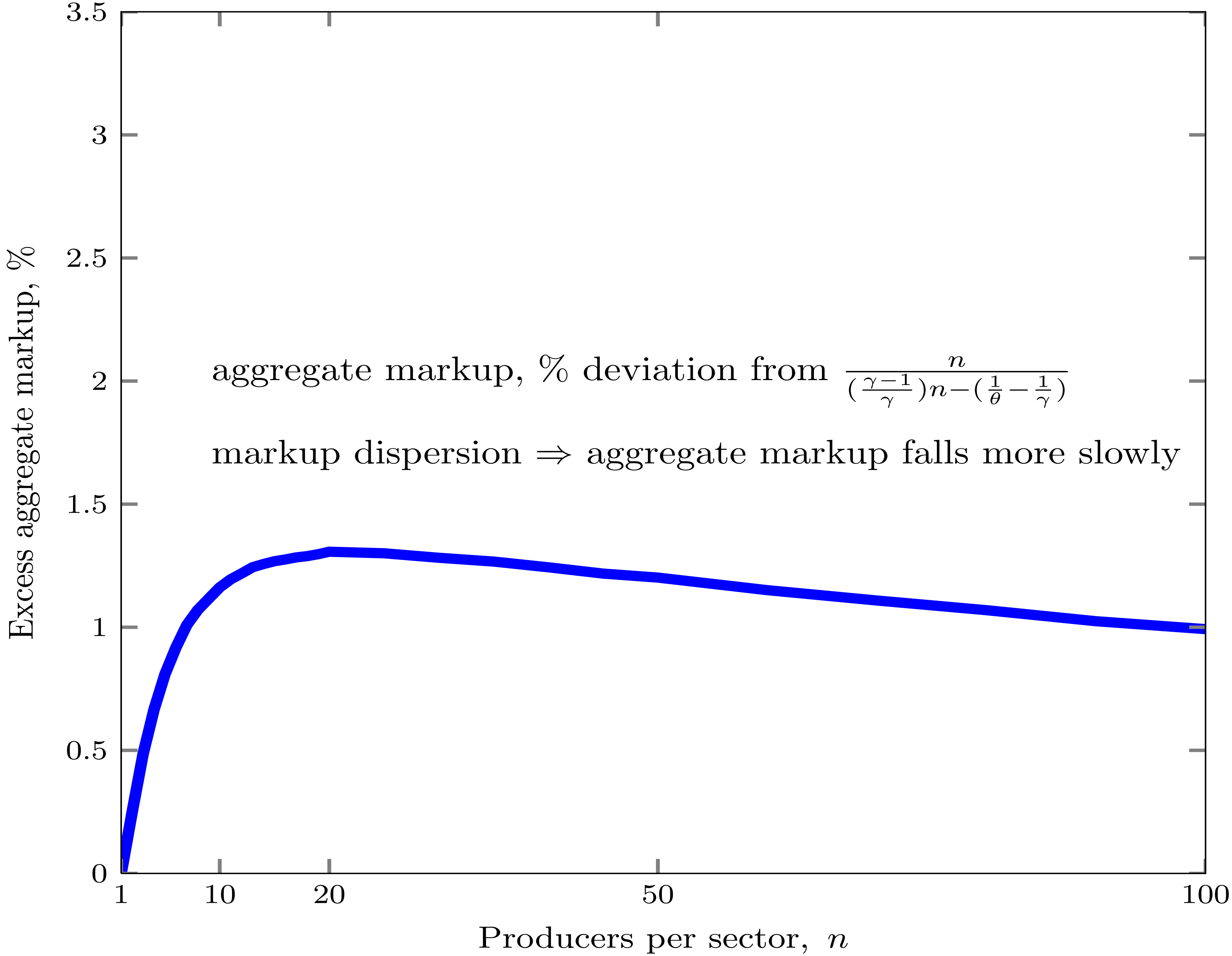
Misallocation and productivity dispersion



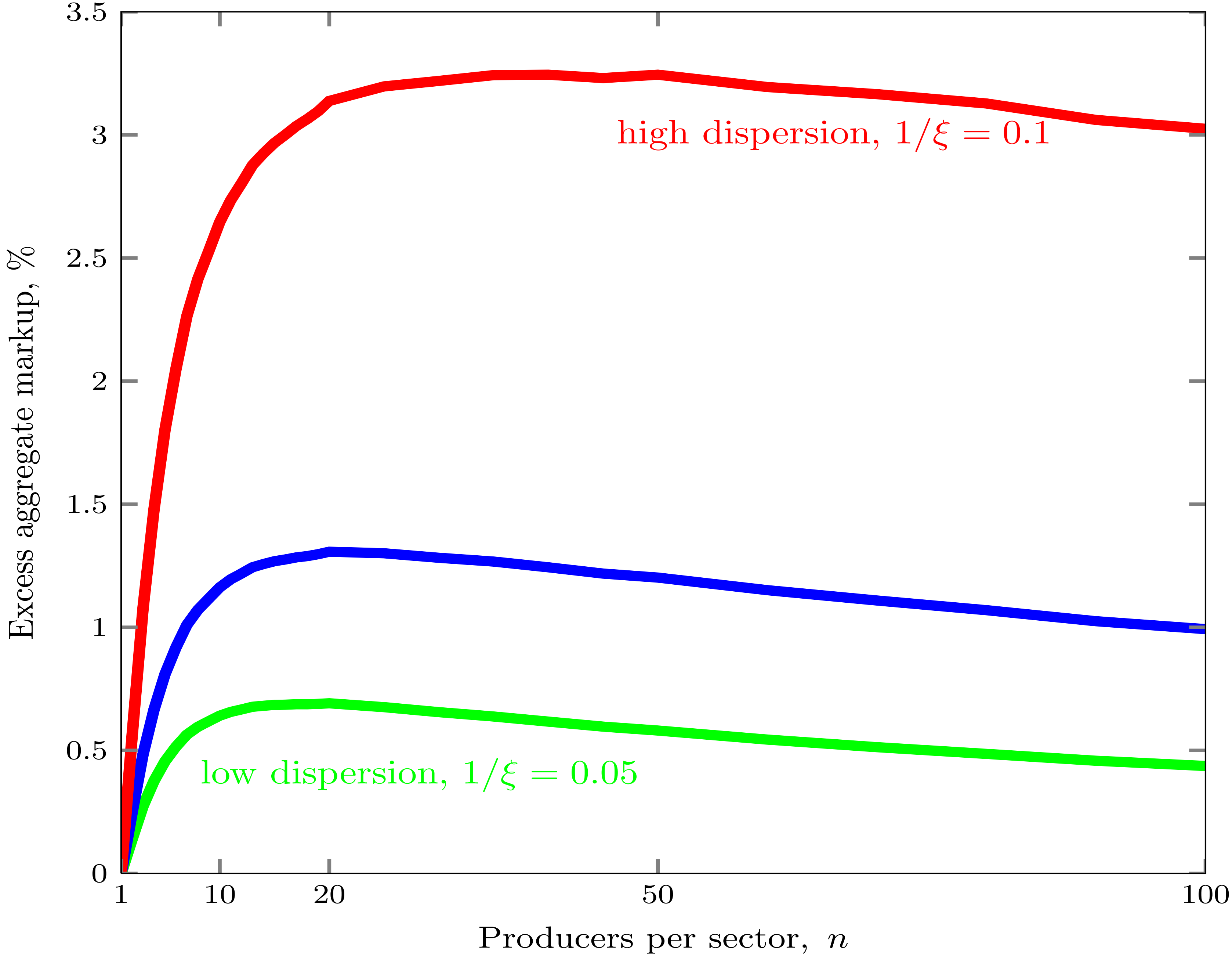
Misallocation and productivity dispersion



Aggregate markup relative to homogeneous case



Aggregate markup relative to homogeneous case



Summary

- Misallocation

  - increasing in n for low n, then decreasing
  - level is higher the higher is productivity dispersion

    (high dispersion $\Rightarrow$ more chance of dominant producer)

- Aggregate markup

  - decreasing in n
  - decreases more slowly the higher is productivity dispersion

    (high dispersion and convex $\omega \mapsto \mu \Rightarrow$ bigger Jensen's ineq. effect)

Edmond/Midrigan/Xu

- Gains from international trade, 2-country model

- How much does trade increase competition, reduce misallocation?

- Further bells and whistles

  - sector-level heterogeneity
  - fixed costs to operate
  - fixed and variable costs to export
  - translog micro production functions, CRS to variable factors

- Choose productivity dispersion to match within and across-sector concentration facts

- Applied to Taiwan, 7-digit manufacturing data

Edmond/Midrigan/Xu

- Can trade significantly reduce product market distortions?
- Trade affects welfare via two channels

  (i) 'pro-competitive' effects
  (less markup dispersion $\Rightarrow$ less misallocation)

  (ii) 'standard' effects
  (comparative advantage, love-of-variety, selection)

- Goal is to quantify strength of pro-competitive channel

Background

- Pro-competitive effects of trade a very old idea
  - and suggestive evidence from trade liberalization episodes

- But models provide conflicting results, even with variable markups
  - Bernard, Eaton, Jensen and Kortum (AER 2003)
    no pro-competitive effects
  - Arkolakis, Costinot, Donaldson and Rodríguez-Clare (2012wp)
    negative pro-competitive effects

- What matters is response of *joint distribution of markups and market shares* to trade liberalization

Our findings

- Two key determinants of pro-competitive effects

  (1) extent of initial *markup dispersion* determines potential gains from reduced misallocation

  (2) extent of *head-to-head competition* determines extent to which those gains are realized

- For quantitative illustration, use Taiwanese micro data to pin down parameters governing these effects

Misallocation

- In turn, two key determinants of misallocation

  (i) extent of *concentration*, both within and across sectors

  (ii) size of *across-sector elasticity of substitution*
  (ease with which dominant producers can increase markups)

- Taiwanese data characterized by extensive concentration and low across-sector elasticity of substitution ⇒ extensive misallocation

Head-to-head competition

- Determined by *cross-country correlation* in productivity draws

  – high correlation $\Rightarrow$ weak pattern of comparative advantage

  – hence *trade elasticty* is relatively high
  (a given change in trade costs implies large change in trade flows)

- High cross-country correlation required to reproduce standard 'gravity equation' estimates of trade elasticity

Our findings

- For Taiwan, extensive misallocation and head-to-head competition
- Hence significant pro-competitive effects
- *Total gains from trade*: 12% increase in aggregate productivity
- *Pro-competitive gains*: 20% decrease in misallocation

Two-county model

- Output from a continuum of sectors

$$Y = \left(\int_0^1 y(s)^{\frac{\theta-1}{\theta}} \, ds \right)^{\frac{\theta}{\theta-1}} \qquad \theta > 1$$

- Finite number of competitors per sector

$$y(s) = \left(\sum_{i=1}^{n(s)} y_i^{\mathrm{H}}(s)^{\frac{\gamma-1}{\gamma}} + \sum_{i=1}^{n(s)} y_i^{\mathrm{F}}(s)^{\frac{\gamma-1}{\gamma}} \right)^{\frac{\gamma}{\gamma-1}} \qquad \gamma > \theta$$

Final good producers

- Choose intermediates to max profits, face trade cost $\tau \geq 1$

$$PY - \int_0^1 \left(\sum_{i=1}^{n(s)} p_i^{\mathrm{H}}(s) y_i^{\mathrm{H}}(s) + \tau \sum_{i=1}^{n(s)} p_i^{\mathrm{F}}(s) y_i^{\mathrm{F}}(s) \right) ds$$

- Implies demand curves facing intermediate producers

$$y_i^{\mathrm{H}}(s) = \left(\frac{p_i^{\mathrm{H}}(s)}{p(s)} \right)^{-\gamma} \left(\frac{p(s)}{P} \right)^{-\theta} Y$$

and

$$y_i^{\mathrm{F}}(s) = \left(\frac{\tau p_i^{\mathrm{F}}(s)}{p(s)} \right)^{-\gamma} \left(\frac{p(s)}{P} \right)^{-\theta} Y$$

Intermediate producers in domestic market

- Price is markup over marginal cost

$$p_i^{\mathrm{H}}(s) = \frac{\varepsilon_i^{\mathrm{H}}(s)}{\varepsilon_i^{\mathrm{H}}(s) - 1} \frac{c(w,r)}{a_i(s)}$$

- Demand elasticity is decreasing in market share

$$\varepsilon_i^{\mathrm{H}}(s) = \left(\omega_i^{\mathrm{H}}(s)\frac{1}{\theta} + (1 - \omega_i^{\mathrm{H}}(s))\frac{1}{\gamma}\right)^{-1}, \qquad \text{(Cournot competition)}$$

- Hence markups increasing in market share

$$\omega_i^{\mathrm{H}}(s) := \frac{p_i^{\mathrm{H}}(s) y_i^{\mathrm{H}}(s)}{\sum_{i=1}^{n(s)} p_i^{\mathrm{H}}(s) y_i^{\mathrm{H}}(s) + \tau \sum_{i=1}^{n(s)} p_i^{\mathrm{F}}(s) y_i^{\mathrm{F}}(s)} = \left(\frac{p_i^{\mathrm{H}}(s)}{p(s)}\right)^{1-\gamma}$$

- Fixed point problem for prices. Operate if cover fixed cost f_d

Intermediate producers in export market

- Same marginal cost, but typically different demand elasticity

$$p_i^{*\mathrm{H}}(s) = \frac{\varepsilon_i^{*\mathrm{H}}(s)}{\varepsilon_i^{*\mathrm{H}}(s)-1}\,\frac{c(w,r)}{a_i(s)}$$

$$\varepsilon_i^{*\mathrm{H}}(s) = \left(\omega_i^{*\mathrm{H}}(s)\frac{1}{\theta} + (1-\omega_i^{*\mathrm{H}}(s))\frac{1}{\gamma}\right)^{-1}$$

- Since trade costs, will often have smaller market share in export market. If so, face more elastic demand and charge lower markup

- Operate abroad if cover fixed export cost f_x

Aggregate productivity

- Aggregate productivity can be written

$$A = \left(\int_0^1 \left(\frac{\mu(s)}{\mu} \right)^{-\theta} a(s)^{\theta-1} \, ds \right)^{\frac{1}{\theta-1}}$$

with sector-level productivity

$$a(s) = \left(\sum_{i=1}^{n(s)} \left(\frac{\mu_i^{\mathrm{H}}(s)}{\mu(s)} \right)^{-\gamma} a_i(s)^{\gamma-1} + \tau^{1-\gamma} \sum_{i=1}^{n(s)} \left(\frac{\mu_i^{\mathrm{F}}(s)}{\mu(s)} \right)^{-\gamma} a_i^*(s)^{\gamma-1} \right)^{\frac{1}{\gamma-1}}$$

- Markup dispersion reduces aggregate productivity

- Constant markups $\mu_i(s) = \mu(s) = \mu$ gives usual CES benchmark

Trade elasticity

- Determines welfare gains in standard trade models

- Response of trade to q-fold increase in foreign prices

$$\sigma_{\text{relative prices}} := \frac{d \log \frac{1-\lambda}{\lambda}}{d \log q}$$

where λ denotes share of spending on domestic goods

$$\lambda := \frac{\int_0^1 \sum_{i=1}^{n(s)} p_i^{\mathrm{H}}(s) y_i^{\mathrm{H}}(s)\, ds}{\int_0^1 \left(\sum_{i=1}^{n(s)} p_i^{\mathrm{H}}(s) y_i^{\mathrm{H}}(s) + \tau \sum_{i=1}^{n(s)} p_i^{\mathrm{F}}(s) y_i^{\mathrm{F}}(s) \right) ds} = \int_0^1 \lambda(s) \omega(s)\, ds$$

Trade elasticity

- Evaluates to

$$\sigma_{\text{relative prices}} = (\gamma - 1) - (\gamma - \theta)\frac{\text{Var}[\lambda(s)]}{\lambda(1-\lambda)}$$

- Takes values in $[\theta - 1, \gamma - 1]$, decreasing in import share dispersion

- We are actually interested in

$$\sigma_{\text{trade costs}} := \frac{d\log\frac{1-\lambda}{\lambda}}{d\log\tau}$$

- Constant markups $d\log q = d\log\tau$, then no difference

- Variable markups, *incomplete passthrough* and $d\log q < d\log\tau$

- Variable markups dampen response of trade flows to trade costs

Empirical strategy: overview

- Three key ingredients

  (i) within-country productivity distribution $a_i(s)$
  (ii) gap between θ and γ
  (iii) correlation between $a_i(s), a_i^*(s)$

- Our strategy

  (i) within-country distribution $a_i(s)$ to match concentration

  (ii) set $\gamma = 10$ (Atkeson-Burstein and many others)
  choose θ to match relationship between market shares and markups

  (iii) choose correlation $a_i(s), a_i^*(s)$ to match trade elasticity

Within-country productivity $a_i(s)$

- For producer i in sector s

$$a_i(s) = z(s)x_i(s)$$

with *sector productivity*

$$z(s) \sim \text{IID Pareto (shape } \xi_z), \qquad s \in [0,1]$$

and *idiosyncratic productivity*

$$x_i(s) \sim \text{IID Pareto (shape } \xi_x), \qquad i = 1, ..., n(s)$$

- Number of competitors per sector

$$n(s) \sim \text{IID Geometric } (\zeta), \qquad s \in [0,1]$$

Cross-country distributions

- Let $F_X(x), F_Z(z)$ denote within-country marginal distributions

- We suppose idiosyncratic productivity draws are independent across countries, i.e., with joint distribution

$$H_X(x, x^*) = F_X(x)\, F_X(x^*)$$

- But we allow sector productivity draws to be correlated across countries, with joint distribution

$$H_Z(z, z^*) = \mathcal{C}(F_Z(z), F_Z(z^*))$$

where the *copula* $\mathcal{C}(u, u^*)$ controls dependence

Copula $\mathcal{C}(u, u^*)$

- *Gumbel copula*, the 'CES' of copulas

$$\mathcal{C}(u, u^*) = \exp\left(-\left[(-\log u)^\rho + (-\log u^*)^\rho\right]^{\frac{1}{\rho}}\right), \quad \rho \geq 1$$

- *Kendall's tau*, a robust measure of correlation given by

$$\tau(\rho) = 1 - 1/\rho$$

- We choose $\tau(\rho)$ to match trade elasticity
  - high dispersion in import shares if $\tau(\rho) = 0$, low trade elasticity
  - low dispersion in import shares if $\tau(\rho) = 1$, high trade elasticity

Data

- Taiwan Annual Manufacturing Survey, 2000-2004
  - universe of establishments engaged in production
- Product-level information
  - 7-digit products (Taiwan classification, $\approx$ 5-digit SIC US)
  - sales by product by establishment
- Establishment-level information
  - employment, labor, materials, energy, total revenue

Concentration

Within-sector concentration among domestic producers.

	median	mean
# producers/sector	10	25
inv. Herfhindhal	3.9	7.3
share top producer	0.40	0.45
sales top to median	17	42

Concentration

Unconditional concentration. Size distribution of producers.

	sales	wages
fraction accounted by top 1%	0.41	0.24
fraction accounted by top 5%	0.65	0.47

Estimating θ: main idea

- Model predicts linear relation between inverse markup and market share in cross-section

$$\frac{1}{\mu_i} = \frac{\gamma - 1}{\gamma} - \left(\frac{1}{\theta} - \frac{1}{\gamma}\right)\omega_i$$

- Use DeLoecker-Warzynski (AER 2012) method to estimate μ_i

- Given γ, slope coefficient pins down θ

- In data, slope coefficient ≈ -0.68 so with $\gamma = 10$ need $\theta = 1.28$

Calibration results

	Data	Model
median inverse HH	3.9	3.8
median share top producer	0.40	0.41
median share	0.005	0.006
p75 share	0.02	0.03
p95 share	0.19	0.27
p99 share	0.59	0.59
inverse markup on market share	-0.68	-0.68
aggregate import share	0.38	0.38
aggregate fraction exporters	0.25	0.25
trade elasticity	4	4

Parameters: $\gamma = 10, \theta = 1.28, \xi_x = 4.5, \xi_z = 0.6, \zeta = 0.04,$
$f_d = 0.004, f_x = 0.21, \tau = 1.13, \tau(\rho) = 0.93$

Markup distribution

	Data	Model	Autarky
aggregate markup		1.31	1.35
mean markup	1.13	1.14	1.15
median markup	1.11	1.12	1.12
p75 markup	1.12	1.14	1.14
p90 markup	1.15	1.21	1.23
p95 markup	1.20	1.31	1.35
p99 markup	1.48	1.67	1.76
std dev log	0.06	0.08	0.10
log p95/p50	0.08	0.16	0.19

Gains from reducing trade costs

change import share	0 to 10	10 to 20	20 to 30	$\cdots$	0 to Taiwan
change A, %	3.1	2.8	3.3		12.0
change markup, %	-1.6	-0.6	-0.4		-2.8
change dispersion, %	-0.9	-1.1	-0.7		-2.8
trade elasticity (ex post)	4.2	4.1	4.0		4.0

How much is due to pro-competitive effects?

- Standard model with constant markups
  - productivity always at first-best level
  - gains only from increase in first-best productivity
- Our model with variable markups
  - gains from increase in first-best productivity
  - *and* from reductions in misallocation
- Pro-competitive gains are *total gains less first-best gains*

Gains from reducing trade costs

change import share	0 to 10	10 to 20	20 to 30	⋯	0 to Taiwan
change A, %	3.1	2.8	3.3		12.0
change first-best A, %	1.9	2.5	3.1		10.2
pro-competitive gains, %	1.2	0.3	0.2		1.8
misallocation / autarky	0.86	0.83	0.80		0.79
change markup, %	−1.6	−0.6	−0.4		−2.8
change dispersion, %	−0.9	−1.1	−0.7		−2.8

Pro-competitive gains account for about 1/6 of total, relatively more important near autarky. Misallocation reduced by 20%.

Domestic vs. import markups

- Overall sign of pro-competitive effect depends on markup responses both in domestic and export markets

- Home lose domestic market share: lower markups, dispersion

- Foreign gain market share: higher markups, dispersion

- Looking at domestic markup responses alone insufficient to determine overall change in misallocation

Gains from reducing trade costs

change import share	0 to 10	10 to 20	20 to 30	$\cdots$	0 to Taiwan
change A, %	3.1	2.8	3.3		12.0
change first-best A, %	1.9	2.5	3.1		10.2
pro-competitive gains, %	1.2	0.3	0.2		1.8
misallocation / autarky	0.86	0.83	0.80		0.79
change markup, %	−1.6	−0.6	−0.4		−2.8
domestic	−1.4	−0.5	−0.5		−2.7
import	15.8	0.2	0.3		16.5
change dispersion, %	−0.9	−1.1	−0.7		−2.8
domestic	−1.6	−1.6	−1.4		−5.8
import	23.4	0.3	−0.5		23.2

Importance of head-to-head competition

- To match trade elasticity 4 requires correlation $\tau(\rho) = 0.93$
- High correlation implies *weak pattern of comparative advantage*
- Genuine head-to-head competition following liberalization
- What if less correlation?

Importance of head-to-head competition

$\tau(\rho)$	Trade elasticity	Pro-competitive, %	Total gains, %
1.0	4.41	2.0	11.1
0.9	3.77	1.7	12.6
0.8	2.91	1.4	16.5
0.7	2.22	1.2	21.3
0.6	1.77	0.9	26.7
0.5	1.44	0.7	32.9
0.4	1.19	0.5	39.8
0.3	1.01	0.2	47.8
0.2	0.86	−0.1	57.4
0.1	0.74	−0.5	69.3
0.0	0.66	−0.9	86.1

When low correlation, strong pattern of comparative advantage:
Large total gains but weak or negative pro-competitive gains.

Pinning down $\tau(\rho)$: further evidence

$\tau(\rho)$	Trade elasticity	Import share dispersion	Intraindustry trade	Share imports wrt share sales
1.0	4.41	0.15	0.64	0.93
0.9	3.77	0.28	0.44	0.69
0.8	2.91	0.46	0.28	0.40
0.7	2.22	0.60	0.18	0.24
0.6	1.77	0.69	0.12	0.15
0.5	1.44	0.76	0.09	0.08
0.4	1.19	0.81	0.07	0.03
0.3	1.01	0.85	0.05	0.00
0.2	0.86	0.88	0.04	−0.03
0.1	0.74	0.90	0.03	−0.05
0.0	0.66	0.92	0.02	−0.04

Pinning down $\tau(\rho)$: further evidence

$\tau(\rho)$	Trade elasticity	Import share dispersion	Intraindustry trade	Share imports wrt share sales
1.0	4.41	0.15	0.64	0.93
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0.4	1.19	0.81	0.07	0.03
0.3	1.01	0.85	0.05	0.00
0.2	0.86	0.88	0.04	−0.03
0.1	0.74	0.90	0.03	−0.05
0.0	0.66	0.92	0.02	−0.04
data	4.00	0.38	0.37	0.81

Discussion

- Evidence suggests correlation $\tau(\rho)$ between 0.8 and 1.0
- But in fact, correlation *per se* is not the issue
  - real question is, will trade liberalization increase competitive pressure on hitherto dominant firms? or simply provide new opportunities to charge large markups abroad?
  - latter is more likely if strong pattern of comparative advantage, a 'trade off' between standard gains and pro-competitive gains
  - correlation is sufficient for weak pattern of comparative advantage, but not necessary
  - e.g., if country is *small* relative to rest of world, greater chance face strong competition even if no correlation in draws

Extensions

Some extensions we consider in the paper

- *Asymmetric countries*: less correlation required if large economy-wide differences in productivity

- *Free-entry, endogenous number of competitors*: similar results if similar initial misallocation

- *Capital accumulation and elastic labor supply*: amplify pro-competitive gains

Conclusions

- Gains from trade in model with variable markups

- Large pro-competitive gains if

  (i) extensive initial misallocation

  (ii) trade exposes dominant producers to head-to-head competition (i.e., weak pattern of comparative, most trade is intra-industry)

- Taiwanese micro-data consistent with large pro-competitive gains