On the welfare cost of bank concentration

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3rd Conference on Banking Development, Stability, and Sustainability

Bank concentration: the debate

- With the recent crisis, people have questioned the welfare consequences of bank concentration
  - Dodd-Frank Wall Street Reform and Consumer Protection Act in the US
  - Independent Commission on Banking in the UK
  - Maximum interest rate fixed in Chile

Bank concentration: the debate

- Yet, the empirical literature suggests an ambiguous relation between bank concentration and economic performance
  - Berger et al. (JMCB, 2004) and Degryse et al. (Oxford U Press, 2009) review the empirical literature
  - Concentration may raise the profitability of some banks to the detriment of others, with negative consequences for social welfare
  - But, some banks may produce at more efficient scales than others, justifying high concentration
  - (Financial stability)

▸ Bank conc. definition

Bank concentration introduced in a search model

- We study bank concentration in a search model of credit allocation
- Search frictions are modeled as in e.g. Wasmer and Weil (AER, 2004)
- Two elements are introduced to allow for bank concentration:
  - Large banks and their implications for price determination:
    - Stole and Zwiebel (AER 1996 and REStud 1996)
    - Bertola and Caballero (REStud, 1994), Smith (RED, 1999), Cahuc et al. (IER, 2008) etc...: "intrafirm bargaining"
    - This generates *scale inefficiency*
  - Bank heterogeneity: Hopenhayn (ECMA, 1992), Melitz (ECMA, 2003)
    - This generates a distribution of 'TFPs" across banks

The inefficiency in the model

- The repayment rate is negotiated between banks and entrepreneurs
- With Nash negotiation: part of the marginal cost of credit is passed on to the repayment rate
- With increasing marginal cost of credit, banks have incentives to allocate too much credit
  - This allows them to negotiate higher repayment with other partners
  - Thus, banks are too large
- The financial sector is inefficient, forcing some banks out of the market.
- Hence, there is too much concentration (few large banks)

▸ Overbranching ▸ Renegotiation

Bank concentration and firm concentration

- Bank concentration also generates concentration on the goods market
  - Larger firms and lower mass of firms
  - This increases the welfare cost
- Difficulty to raise funds: less entrepreneurs
- Intuition for firm size:
  - Entrepreneurs are pushed to become workers,
  - Labor supply increases
  - Labor becomes cheap
  - Firms have incentives to increase their size
- Empirical literature shows that financial development eases competition and entry of small firms: Midrigan and Xu (AER, 2014), Guiso et al (QJE, 2004), Cetorelli and Strahan (JoF, 2006), Beck et al (JMCB, 2008), Aghion et al (EP, 2007)

Quantitative results

- We use data on the distribution of branches across banks in the US and estimates on X-efficiency in the banking sector to calibrate the model

- Absent the scale inefficiency:
  - Output would be 2.4% higher
  - The loan rate would be 120 basis points lower
  - Welfare would be 4.7% higher

- The scale inefficiency quantitatively accounts for most of the inefficiencies present in the economy. In the constrained-efficient equilibrium:
  - Output would be 2.6% higher
  - Welfare would be 4.8% higher

Workers

- A unit mass of agents, who can choose to be
  - Workers and earn lifetime income W
  - Entrepreneurs and earn lifetime income E
  - No arbitrage condition: $W = E$.

- Workers earn the competitive wage

$$rW = w,$$

where r is the discount rate and w satisfies

$$w = g'(n)$$

in equilibrium, with $g(n)$ the common production function across firms.

Entrepreneurs

- Entrepreneurs transit through two states
  - Fund raising
  - Production

- No arbitrage implies

$$\frac{g'(n^*)}{p(\phi)} = \frac{\pi(n^*) - \rho}{r + \lambda}, \tag{1}$$

where

$$\pi(n) = g(n) - g'(n)(n+1)$$

and $n^* = \arg\max_n \pi(n)$, with $\pi'(n) = -(n+1)g''(n) > 0$.

- The LHS of (1) is the search opportunity cost

- The RHS is the sum of discounted profits of an active entrepreneur

Banks

- Funds are offered by banks to entrepreneurs
- There is free entry of banks
- Entry requires the payment of a sunk cost ν
- Banks first have to open *branches* K in order to be matched to entrepreneurs at a unitary cost η per branch
- We denote by M the mass of active entrepreneurs from which a bank receives payments
- Default occurs at an exogenous rate λ (the firm death rate)

Banks

- Banks face a fixed operating cost c
- Agency cost *à la* Lucas (1978) $C_\varphi(M) = \frac{C(M)}{\varphi}$
- C is homogenous of degree $\alpha > 1$
- φ is the idiosyncratic efficiency of a bank

Banks

- The optimal mass of branches opened by a bank is:

$$\kappa + \frac{\eta}{\phi p(\phi)} = \frac{\rho + \frac{\partial \rho}{\partial M} M - C'_{\varphi}(M)}{r + \lambda} \tag{2}$$

- The LHS of (2) is the the cost of matching a branch to an entrepreneur
- The RHS is the sum of discounted profits from the match to an active entrepreneur
- Remark: by changing its size, the bank will influence the outcome of the bargain with the entrepreneur.

Repayment

- When a branch and an entrepreneur meet, they negotiate ρ a la Nash
- Renegotiation is allowed once the relation is established
- For production to occur, they need to agree on a value for ρ
- The solution is

$$\rho = (1-\beta)\Delta C'_{\varphi}(M) + (1-\beta)(r+\lambda)\theta\kappa + \beta\pi(n^*)$$

with

$$\Delta = \frac{1}{\beta + \alpha(1-\beta)} \in (0,1)$$

which is an overlending factor

▸ Renegotiation

Repayment

- The FOCs can be rewritten as

$$[1 + (1 - \beta)\theta]\kappa + \frac{\eta}{\phi p(\phi)} = \beta \frac{\pi(n^*) - \varsigma}{r + \lambda} \tag{CC}$$

and

$$\frac{g'(n^*)}{p(\phi)} = (1 - \beta)\left[\frac{\pi(n^*) - \varsigma}{r + \lambda} - \theta\kappa\right] \tag{FC}$$

- Remark: all banks share the same $\varsigma \equiv \Delta C'_{\varphi}(M)$, a measure of credit performance

Distribution of banks

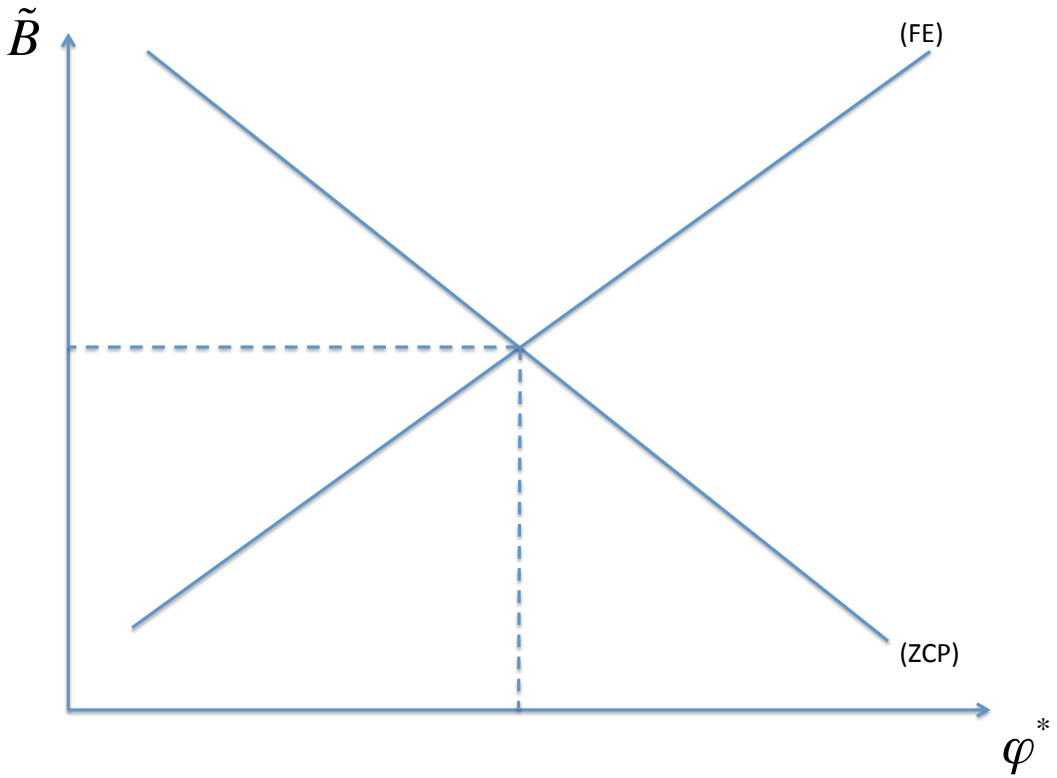
- To determine ς, we need to know the distribution of allocations across banks
- This requires understanding banks' entry and exit decisions
- Free-entry condition:

$$\nu = [1 - F(\varphi^*)]\, B(\tilde{\varphi}), \tag{FE}$$

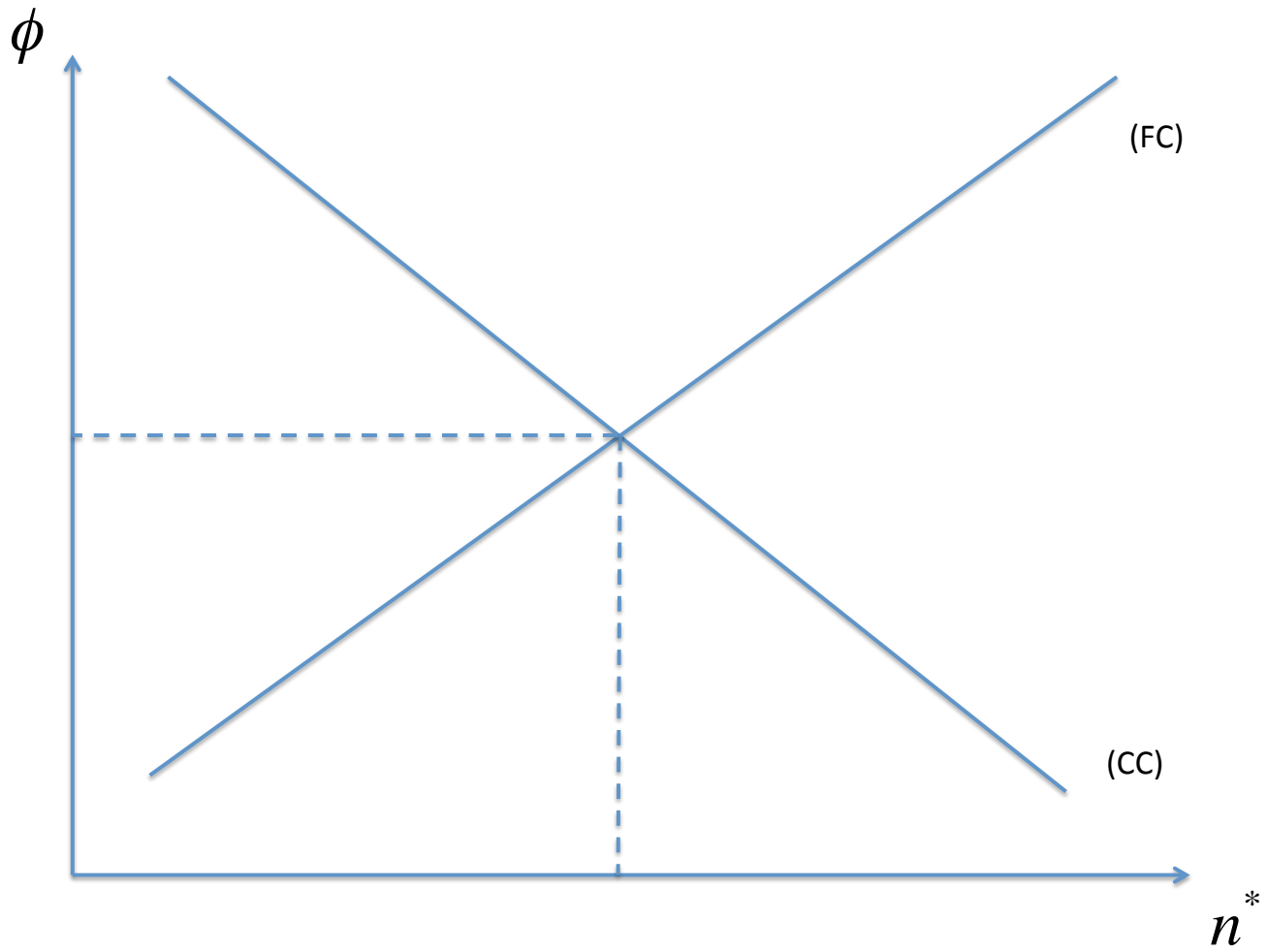
- Zero-cutoff profit condition:

$$B(\tilde{\varphi}) = \frac{c}{r}\left[\left(\frac{\tilde{\varphi}}{\varphi^*}\right)^{\frac{1}{\alpha-1}} - 1\right] \tag{ZCP}$$

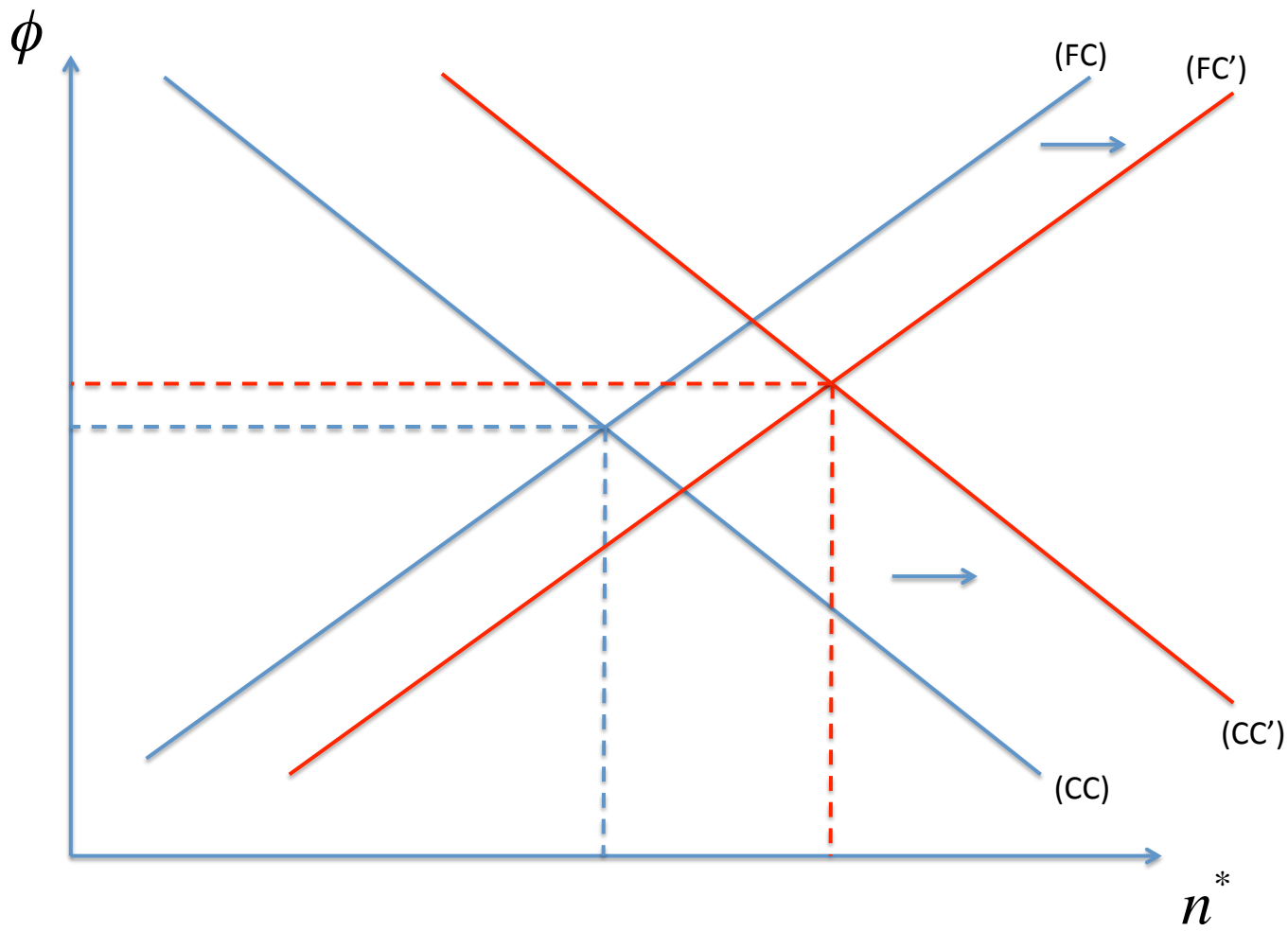
Distribution of banks



Determination of ϕ and n^* for a given ς



Effect of a higher ς



Calibration: functional forms

- A unit interval of time represents a year
- Cobb-Douglas matching function:

$$m(\mathcal{E}, \mathcal{K}) = m_0 \mathcal{E}^{1-\chi} \mathcal{K}^{\chi}$$

- Production function:

$$g(n) = n^{\gamma}$$

- Pareto distribution for bank efficiency parameter:

$$F(\varphi) = 1 - \left(\frac{\varphi_0}{\varphi} \right)^{\varepsilon}$$

- Agency cost function:

$$C(M) = \frac{1}{\alpha} M^{\alpha}$$

Calibration: targets

- X-efficiency: ratio of a shift parameter of the cost function of the most efficient bank to the shift parameter of a given bank i. We target the mean X-efficiency parameter to be 85.59% (Evanoff and Ors (JMCB, 2008))
- Average number of branches per bank: 15.03 (FDIC data for 2014)
- Gini coefficient of the distribution of branches: 0.81 (FDIC data for 2014)
- Search duration for entrepreneurs: 1/3
- Loan rate: 12% (Asea and Blomberg (Journal of Econometrics, 1998))
- Firm size: $n^* = 17$ (Guner, Ventura and Xu (RED, 2008))

Table : Calibration: parameter values

Parameter	Description	Value
β	Bank's bargaining power	0.0875
α	Agency cost function convexity	1.1182
ε	Pareto distribution shape	9.4535
φ_0	Pareto distribution lower bound	1
c	Bank fixed operating cost	0.0125
ν	Bank entry cost	1
η	Branch opportunity cost	0.2593
κ	Firm set-up cost	10.7430
θ	Hold-up parameter	1
m_0	Matching function scale parameter	9.6879
χ	Matching function elasticity	0.5
r	Discount rate	0.04
λ	Firm death rate	0.0602
γ	Labor income share	2/3

Table : Concentration of branches: model versus data

Percentile	Data	Model
10%	0.67%	1.10%
50%	6.01%	7.018%
75%	13.90%	13.54%
90%	23.41%	21.47%
95%	29.63%	26.98%
99%	43.89%	38.33%

Concentration of branches: model versus data

- We estimate economies of scale of 0.99 in the average bank in line with available evidence
- We estimate a scale inefficiency index of 87.3% in the calibrated economy.
  - Berger (1995) estimated 81.5%.

Table : Calibration of an economy without scale inefficiency: moments

	Target	Calibration
X-efficiency	0.856	0.977
Average mass of branches per bank	15.03	14.94
Gini coefficient	0.810	0.812
Loan rate	0.120	0.121
Firm size	17.00	17.04
Search duration for firms	0.333	0.333

Table : The impact of the scale inefficiency

	Scale inefficiency		Constrained-eff. allocation
	included	excluded	
Loan rate	0.12	0.108	n.a.
Wage*	1	1.029	n.a.
Firm size	17.0	15.59	15.55
Mass of firms*	1	1.085	1.089
Average mass of branches per bank	15.03	1.55	1.55
Mass of banks*	1	10.50	10.54
Search duration for firms	0.333	0.329	0.101
Search duration for banks	0.032	0.032	0.105
Aggregate output*	1	1.024	1.026
Welfare*	1	1.047	1.048

Conclusion

- We develop a search model of bank concentration, where banks are large and there is bank heterogeneity
- Because of search frictions, the scale at which banks operate is inefficiently too large
- This creates a direct cost on fund raising
- Negative impact on goods market performance through more firm concentration
- Future work: policy evaluation of cap on the number of branches per bank

Bank concentration

- By bank concentration, we mean larger and fewer banks
- Data: deposits or loans
- Typically measured by the Herfindahl-Hirschman Index (the sum of squared market shares)
- Performance is measured at both micro level:
  - by bank profitability, deposit rates or loan rates, pass-through of monetary interest rates
- and macro level
  - aggregate growth, credit availability to SMEs
- The literature has moved towards a more structural approach over the last years

Return

Evidence on renegotiation: Roberts and Sufi (JFE, 2009)

- Data on private credit agreements between US publicly traded firms and financial institutions
- Over 90% of long-term debt contracts are renegotiated prior to their stated maturity
- Renegotiation occurs relatively early
- Renegotiations are rarely a consequence of distress or default

Return

Some evidence on 'overbranching'

- "Overbranching" in Berger et al (JME, 1997):
- *Banks prefer to open extra branches and operate on the upward-sloping portion of their average cost curve, experiencing scale diseconomies, because they receive extra revenues that offset the extra costs.*

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On renegotiation

Renegotiation is common:

- Roberts and Sufi (JFE, 2009) show that over 90% of long-term debt contracts between firms and financial institutions are renegotiated prior to their stated maturity.
- This figure increases to 96% for contracts with stated maturity in excess of three years.
- Renegotiation occurs relatively early and is typically not related to default or financial distress.

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