Competition and Stability in Banking Markets.

With a model of the Charter Value Hypothesis.

by

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An essay submitted to the Department of Economics

in partial fulfillment of the requirements for

the degree of Masters of Arts

Queen's University

Kingston, Ontario, Canada

December 2009

Abstract

Competition between banks has stabilized and also destabilized a variety of markets, in terms of insolvency risk and Contagion. Competition can destabilize banking markets; risk shifting occurs when banks compete for deposits. Yet, competition can also reduce predatory lending, and increase efficiency in the industry.

The first half of this essay discusses banking literature covering the relationship between competition and stability. The second half develops a model for the Charter Value Hypothesis. Reviewing literature published since John Bryant's (1983) "A model of reserves, bank runs, and deposit insurance" reveals several externalities in the industry. Therefore commenting on the optimal market structure is more complicated than in classical micro-economics. Further, comments are complicated by the need to balance stability with efficiency in banking markets. Yet, a growing body of research suggests banking markets can be stabilized as they become concentrated *and* competitive.

After examining all arguments for the stabilizing, and destabilizing, effect of competition the Charter Value Hypothesis (CVH) is identified for further research. The CVH consolidates many concepts used to justify financial regulation around the world. To determine causation in financial stability the CVH needs to be articulated. A credit spread in banking markets is found to model the CVH, in terms of reproducing the behaviour predicted by this hypothesis. For an economic model to reproduce the fundamental conclusions and weakness of the CVH, a credit spread is necessary.

Keywords: competition, financial stability, Charter Value Hypothesis, banking crisis, bank lending, portfolio risk, risk shifting, Contagion, depository, savings and loan, bailout, fractional reserve banking system and bank capital.

JEL codes: G210, G28

Acknowledgements

The Economics department at Queen's University in Kingston has provided a rigorous and rewarding education. In addition there are a number of people I would like to thank. First of all my mother, Helen Forrest, and family for encouraging and believing in my work. Secondly, Professor Thorsten Koeppl for his advice, feedback and for asking the most important questions to improve this research. Further, I am indebted to Professor Michael Benarroch, for showing me the wisdom in Economics, early in my first year of undergraduate studies. Also my understanding of mathematics would be incomplete with out learning Calculus from Mr. John Enns. In addition I want to thank my peers for their support through the academic year and for sharing with me this amazing experience in graduate school.

Any errors are my own responsibility.

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Part 1. A summary of banking literature

The research question

Does competition destabilize a banking system? More specifically, is there a consistent relationship between competition and stability, across banking industries in developed countries? Can competition increase systemic in the banking industry? Would a social planner find an optimal level of systemic risk? Despite the complexity of the banking industry, current research provides evidence that clarifies apparent contradictions. Yet current literature has not conclusively established a relationship between competition and stability for savings and loan institutions in financial markets.

This essay will answer two questions. What has academic research concluded on stabilizing banking markets? What can academic Economists concluded by modeling the Charter Value Hypothesis?

Banking literature has shown competition to increase, and in other cases to decrease financial stability, through a variety of market mechanisms and incentives. Through out this essay *stability* and *financial stability* are used interchangeably. Stability is a reference to the frequency and/or magnitude of a financial crisis, or money run. Also, *banks* are some times referred to as *financial institutions* (FI).

The Charter Value Hypothesis (CVH) is a description of stability in the banking industry. According to the CVH, stability increases with the opportunity cost of exiting the industry, *ceteris paribus*. Market power creates a profitable banking industry. Rents

in the industry are said to reduce the turn over of banks, and therefore increase stability. This is why competition and stability are, according to the CVH, negatively related. The CVH is widely refereed to (directly or indirectly) in literature where competition does not increase stability. Smith (1984), Keeley (1990), and Repullo (2004) find competition and risk of bankruptcy are positively correlated. Allen and Gale (2004) find less concentrated markets are more likely to experience a crisis. Also Hellman, Murdock and Stiglitz (2000), Matutes and Vives (2000), Boot, Greenbaum and Thakor (1993), and Morrison (2000) show profits can induce, and increase, prudent risk management in banking.

Yet there are market forces that logically cause competition to stabilize a banking industry. Mishkin (1999) shows increasing concentration can lead regulatory bodies to strengthen "to big to fail" policies. These policies create perverse market incentives and a moral hazard, unnecessarily increasing risk in the industry.[1] Further there is a strong micro-economic foundation for this principle. In theory, a competitive equilibrium is proven to be pareto optimal. Also, competition can prevent predatory lending, reducing default risk since borrowers enjoy consumer surplus in their loans. In theory competition can reduce the moral hazard of a high cost of credit.

[1]Matutes and Vives (1996) also suggest there maybe no relationship between competition and stability, because vulnerable banks have been observed in all markets and under every observed market structure, from competative to monopolized.

Banks are fundamentally defined by their balance sheet. Banks produce illiquid assets (loans) from liquid liabilities (deposits). This asymmetry of liquidity creates a fragile industry. Yet marginal improvements to stability are important.

Two significant bodies of research have shown competition to stabilize, and yet destabilize banking markets. Boyd and De Nicolo (2005) question the empirical and theoretical basis of research suggesting competition destabilizes banking markets.

In the pursuit of stability, regulators around the world have sponsored State run deposit insurance schemes. These have created a lender of last resort, preventing wide spread bankruptcies during banking crises. Insurance also affects the lending market. For any bank, the payoff structure of loan based assets is distorted when deposits are insured. A State run insurance scheme effectively implies the State will consume significant asset losses that precede, or cause a money run. A basic theoretical analysis of the profit maximizing objective, for any bank, shows asset management and lending behaviour under insurance, *ceteris paribus*, is shifted to a risk taking extreme.

To increase stability regulators can address conflicting interests in the market. An equity holder's objective is to maximize banking profits, whereas the objective of a benevolent government is to maximize society's welfare. Investor's direct bank's to maximise their short run return to equity. This conflicts with the government's implicit objective of long term sustainability for FI's. To increase stability, regulators can mandate a cash reserve ratio. This increases stability in the presence of net

withdrawal/deposit shocks. Yet reserve ratios do not unify the conflicting short/long term interests in the industry.

Alternatively, regulation can be used to create economic profits in the industry. Assuming a negative relation between risk taking and profits, as made in the CVH, then stability will increase with banking profits. Short run and long run incentives are converging because a credible expectation of earning sustained profits lengthen the time horizon of an investor's profit maximising objective.

Allen and Gale (2000), Hellman, Murdock and Stiglitz (2000), Keeley (1990) and Repullo (2004) all find profits earned in the deposit market can increase the risk of a banking failure. Allen and Gale (2000) find risk in the industry is increasing with competition for deposits. Hellman, Murdock and Stiglitz (2000) construct an exogenous upper bound on the return to deposits and find this reduces systemic risk in their model.

Surveying banking literature leads to a theoretical paradox in the lending market for banks. Competition is desired to reduce the cost of credit, and prevent lenders from extracting excessive rents from borrowers. At the same time an industry of small-specialized banks is not desired because of the systemic risks created, such as Contagion. Further, a positive correlation between concentration and profits from loans is not desired. Such a degree of concentration creates a moral hazard for borrowers, reducing their incentive to repay loans, creating a destabilizing force in banking markets. Therefore, concentration is desired for its capacity to stabilize, but competition is also

desired for the same reason, creating an apparent contradiction for banks in lending markets.

According to the CVH market power can provide stability; but concentration can increase the cost of credit. Increasing the cost of credit can induce greater risk/return in lending. For a borrower to smooth net returns, this weakly implies risk shifting. Boyd and De Nicolo (2005) find competition for deposits will increase the cost of credit, if the loan market is held *ceteris paribus*. Therefore stability is said to be decreasing in competition, since systemic risk is increasing.

Yet, by modeling the loan and deposit markets simultaneously Boyd and De Nicolo (2005) can relax the prior *ceteris paribus*. This extension shows risk shifting is strictly decreasing in competition; increasing stability. Here competition is measured by the number of banks in a market. Further, theoretical work by Boyd, De Nicolo and Smith (2004) shows the probability of a crisis can increase depending on the rate of inflation, while being independent of the market structure. Therefore, determining whether a monopoly or a competitive market will optimally mitigate risk maybe dependent on inflation. This implies the probability of a crisis is not independent of monetary policy.

Empirical research has clarified theoretical inconsistencies in the relationship between competition and stability. What have empirical tests of the competition-stability relationship found?

Using concentration as a proxy for competition, De Nicolo (2004) observes concentrated industries experience more crises. Boyd and De Nicolo (2005) replicate and confirm this result. Yet the exact opposite is found by Beck, Demirgüc-Kunt and Levine (2005 and 2006). They find concentration decreases the probability of a crisis. Also, restrictions over entering the banking industry are found to be destabilizing.

Claessen and Laeven (2004) empirically find concentration is a poor proxy for competition. Their results suggest competition and concentration describe different characteristics of banking markets, since both are significant empirical determinants of stability. Further Bikker and Haaf (2004) outline measurement problems when using concentration as a proxy for competition. Concentration ratios are found to exaggerate the level of concentration in small countries, and are progressively unreliable measures for cross market comparisons.

Rhoades and Rutz (1982) find a negative relationship between concentration and several proxies of risk; such as volatility of profits, debt-to-assets and the non-performing loan ratio. Their research uses American data from the 1960's and 1970's. Jayaratne and Strahan (1998) find sharp reductions in loan losses across banks after financial deregulation in the United States, during the 1980's. Dick (2006) observes deregulation in the 1990's had "increased charge-off losses and loan loss provisions"[2]

[2] Boyd and De Nicolo. (2005) "Theory of Bank Risk Taking Revised". *The Journal of Finance.* pp 1333.

A Discussion of Market structure

The micro-economic proof that a competitive (general) equilibrium is pareto optimal, has been widely recognised by Economists. Yet the pareto optimality of a competitive equilibrium is (by necessity) based on assumptions, including qualitative properties of the industry in question. These assumptions will be refereed to collectively as classical assumptions. The wide recognition of this rigorous proof requires any comment on an optimal industrial structure to include a reference, or comparison, to the classical (perfectly) competitive equilibrium. Further, in this research a deviation from a perfectly competitive market is found to be pareto efficient. This is sufficiently justified by an externality.

The Agency Problem

Banks are inherently burdened with a Principle-Agent Problem. Financial institutions are highly leveraged; and do not fully internalize risk in the assets they manage. This is the result of deposit holders (not the FI) bearing the direct cost of loses in the event of "down side risk" (when deposits are not insured). Further, as the difference between liabilities and assets increases, insolvency risk increases.

Yet, risk in the industry can depend on the transmission of this information. When insolvency risk increases, an agent's survival incentive (the self interest of bank managers), can induce asset management that is risk loving. Under these conditions banks behave as gamblers. The resulting negative expected return on assets represents

a moral hazard. Further, in a perfect information scenario deposit holders may rationally run a bank, instantly, as soon as assets are any fraction, less than one, of liabilities. This causes the bank to collapse in the presence of volatile asset prices. This is destabilizing and can be inferior ex-ante.

Ultimately, the welfare of risk-averse depositor-holders is unnecessarily decreasing in the Agency Problem. Further, the Principle-Agent Problem is self reinforcing, since marginal loses are amplified by risk-loving asset management. This dilemma can cause the banking industry to change from risk neutral to risk loving, and therefore Agents can fail to act in the best interest of depositors.

Additionally, deposit insurance reduces the survival incentive for Agents (bank managers), and the surveillance incentive for Principles (depositors). Insurance therefore increases adverse selection and enhances the moral hazards in the industry, theoretically amplifying the Agency Problem. This is why Cartelli and Hartmann (2002) conclude that welfare does not necessarily increase in a market with deposit insurance; rather the impact on welfare is uncertain.

The Free Riding Problem

Güner (2008) empirically tests the relationship between screening[3] and the performance of a loan. Güner (2008) finds costly technologies for screening borrowers produces an inverse "u" relationship between the credit quality of borrowers (on the x-

[3] To reveal the credit quality of a borrower.

axis) and the performance of a portfolio of loans (on the y-axis); representing a bank's assets. This suggests "empirically, that a bank's portfolio quality [performance] can be decreasing at high [highly desirable] levels of bank lending opportunities." [4] In other words, a profit maximizing portfolio can "under" perform in a population of high quality borrowers. Güner finds a positive relation between screening and performance to be conditional on the distribution of the credit quality of applicants, and non-satiation in the loan market. Under varying credit conditions, a banks screening process will effectively convert uncertainty into risk, producing valuable information from a costly screening process.

The Free Riding Problem is caused by the relatively lower cost of observing loan offers (from competitors) than the direct cost of screening borrower. Clearing the loan market requires banks to make private information public. This creates an opportunity for arbitrage from competing banks, since identifying a loan offer is less costly than screening. As competition increases, banks rationally reduce expenditures on screening, this increases uncertainty on their balance sheet. Therefore competition creates a destabilizing force in the market, yet this is conditional on the credit quality of borrowers. In theory, market power mitigates the Free Riding Problem, providing a stabilizing force in the market.

[4] Güner. (2008) "Bank lending opportunities and credit standards". *Journal of Financail Stability.* pp 84.

The Contagion Problem

Prices affect supply and demand in a market; the Walrasian definition of a competitive equilibrium shows clearing depends on prices. Under the classical assumptions, prices provide competitive markets with self correcting forces. Yet in the banking industry, a shortage of liquidity is self reinforcing. When a bank defaults this creates a liquidity vacuum in the market. The collapse of a competing bank is an external risk.

A crisis of expectations can be self fulfilling. A negative shock in expectations can cause a run on deposits, regardless of the fundamentals on a bank's balance sheet. Further, a run on deposits can occur regardless of prudent risk management by Agents. Likewise, "A shock to one bank can lead to shocks for other banks (Contagion). This can greatly increase the [economic] cost of a crisis."[5]

The risk of illiquidity spreading in the industry is similar to the risk of a virus spreading, it is proportional to the number of banks already affected. An externality is generated by the interdependence of banks due to the exclusive interbank credit market and the financial payment system. Interdependence is proportional to the connections in a market. A financial system's resilience to a collapse may significantly be affected by the stability of the weakest FI in the market. A financial system is considered

[5] Northcott (2004) "Compeition in Banking: A Review of the Literature". *Bank of Canada Working Paper 2004-24*. pp 2.

fully integrated ("complete") when each bank maintains full and complete connections with every other. If one FI collapses, while maintaining complete connections, the forgone revenue is smaller when partitions decrease with the number of banks. This is possible only when complete connections are maintained. The reduced burden on each bank reduces the probability of any single bank collapsing, this reduces the likelihood of *internal insolvency spreading,* Contagion. If full connections are not maintained the market is considered incomplete. In an incomplete market the burden of a collapse increases on the remaining connected banks, while others are unaffected.

Any bank perceived to have a shortage of liquidity will find competitors leave them autonomous. Therefore a potentially destabilizing bank should be relatively easier to identify in a complete (and competitive) market. This creates an access to credit puzzle, where the bank with has the greatest need for credit has the least access. When a bank has limited access to credit, especially in the inter-bank lending market, solutions to illiquidity are limited. This is the self reinforcing, not self correcting, problem behind illiquidity.

Over all, the number of banks that maintain complete connections is a measure of the financial system's resistance to contagion. Practical constraints make complete connections more likely in smaller markets. Current literature is inconclusive on the optimal market structure to minimize Contagion. Unfortunately, a competitive market can not account for insolvency risk from contagious illiquidity.

An Economist can qualitatively differentiate a banking industry from the classical industry described in micro-economics. A banking industry is distinguished from a market in classical micro-economics due to the Free Riding Problem, the enhanced Agency Problem and the risk of Contagion.

The Effect of Regulation

Hellman, Murdock and Stiglitz (2000) create a model that predicts an ambiguous relationship between financial regulation and risk management. Increasing the reserve ratio, in this model, will increase loses in a bankruptcy. This provides a stabilizing incentive for banks, with a profit maximizing objective. Therefore, the reserve ratio affects a moral hazard in over the bank's portfolio choice when lending.

Theoretical models of the industry focus on revenue from loans, not user fee's. Increasing the reserve ratio will put downward pressure on an FI's revenue; requiring a higher return on assets if the nominal profit is held constant. Increasing the reserve ratio either reduces the industry's charter value (CV) or increases portfolio risk. In theory both effects are destabilizing. Therefore, can increasing reserves destabilize a banking market?

In theory Modigliani and Miller (1958) show the capital structure of a firm will not affect value. Yet this result is conditional on a competitive market, and a tax free environment. None the less Hellman, Murdock and Stiglitz (2000) find CV is negatively related, and risk taking is positively related, to the reserve ratio. Yet, their result is

conditional on a competitive return to deposits.

Repullo (2004) extends this model to show extreme risk preferences exist under monopolistic, and also under competitive market structures. For banks the asset management behaviour observed in this model is either rigorous prudence or gambling. Yet, under regulation the prudent equilibrium is found to be unique and stable. This result does not change when reserves are indexed to the risk in assets. Therefore, market structure will affect stability. Repullo (2004) shows the necessity of basing responsible financial regulation on theory and data.

Further, regulation is particularly important in the loan market. Lending decisions maybe made under asymmetric information. Banks who compete for loans while operating with incomplete information on the population of borrowers can suffer a "winners curse". This curse is the result of acquiring borrowers, and therefore holding assets, that are qualitatively deteriorating. As competition increases these assets are deteriorating with respect to their credibility of repaying. Shaffer (1998) shows the number of loans made in any given market will increase with the number of banks. As the credit quality of assets decrease, across the industry, expected losses are increasing. Cordella and Yeyati (2002) show this undesirable effect of competition (modeled by increasing the number of banks) can be mitigated with regulation. Regulation leading to transparent and public disclosure of risk in assets will increase prudent risk management among FI's in their model.

An alternative policy is to adjust deposit insurance premiums to reflect the risk in assets. Even though market power will increase screening of borrowers, resent research has shown regulation can induce equivalently effective behaviour. This result is conditional on competition in the deposit market. The effect of strategic policies regarding capitalization, disclosure and risk adjusted insurance premiums are therefore important.

Efficiency versus stability in banking markets

A fractional reserve bank is said to be fragile because of asymmetric liquidity on its balance sheet; the asymmetry is between assets and liabilities. A natural reason for studying financial stability is to stabilize banking markets. At first, this field of research may appear to be trivial, given full reserve banks are perfectly stable. Yet, full reserve banks distort the savings-investment relationship in banking markets and the macro-economy. If a bank holds 100% of cash deposits as reserves, this will affect the circular flow of money in the economy. Savings from deposits can no longer fund investments, through loans. Therefore, full reserve banking systems reduce the supply of credit, restrain capital accumulation, and create illiquidity. The Solow-Swan Growth Model has shown physical capital can significantly account for the empirical facts of long run growth patterns in developed countries[6]. Cetorelli and Peretto (2000) show the banking industry is an important determinant of capital formation and economic growth.

[6] Barro, R. and X. Sala-i-Martin. 2005. Economic Growth [Second Edition]. p 44-60.

Cetorelli and Peretto (2000) find a non-linear relation between competition and GDP. This relation is derived from a dynamic general equilibrium model. In this model competition reduces the Free Rider Problem. Also, capital accumulation is affected by the Free Rider Problem. Cetorelli and Peretto (2009) extend this model and find the pareto optimal market structure is conditional on the probability of borrowers defaulting. This extension uses a dynamic general equilibrium model that includes an optimal screening choice for banks, where screening has a constant cost. The pareto optimal market structure for the banking industry is found to be monopolistic if the economy's population is strongly skewed such that (nearly) every person has a high probability of defaulting (low credit quality is uniform). On the other hand, if the population is strongly skewed in favour high credit quality borrowers, then a competitive market structure is pareto optimal. Yet, in a mixed population, with a comparable number of low and high credit quality borrowers, the optimal market structure is an oligopoly. Therefore, the pareto optimal market structure prescribes increasing competition with improvements in the credit quality of a representative borrower. This implies there is a non-linear relationship between GDP (output on the y-axis) and competition (on the x-axis) in banking markets. Further this relationship is conditional on the credit quality, and the distribution of this quality, within an economy. Also, this model replicates empirical observations showing the supply of credit will increase with the number of banks.

Martinez-Miera and Repullo (2008) construct a model studying competition and

the risk of a bank failing (bankruptcy). A quadratic relationship between the risk of failure (on the y-axis) and competition (on the x-axis) is found. Here competition is measured as the logarithm of "n", were "n" is the number of banks in a market. In this model loans are made to entrepreneurs, who endogenously determine the probability of defaulting on their loan. Also, this model replicates risk shifting as identified by Boyd and De Nicolo (2005). Also, this shows competition can provide stability, even though the default probabilities are not perfectly correlated across loans. Further, competition reduces the cost of credit, decreasing revenue from performing (non-defaulting) loans. Downward pressure on income from performing loans decreases a bank's revenue. This revenue helps stabilize a bank after a negative asset shocks. Downward pressure on revenue increases the risk of bankruptcy, and of a crisis. Martinez-Miera and Repullo (2008) call the downward pressure on earnings a *marginal effect*, and in a perfectly competitive market the net effect is destabilizing in their model. They also find a *risk shifting effect* dominates in monopolized markets, presenting another destabilizing force. Therefore Martinez-Miera and Repullo (2008) find a "u" relationship between risk (on the y-axis) and competition (on the x-axis) in banking markets.

Cetorelli and Gambera (2001) find concentration has a first order negative effect on growth. This is consistent with theoretical research showing a negative relation between concentration and the supply of credit. The negative relation between concentration and the supply of credit is observed across all industries. But the relation is heterogeneous across the life cycle of firms; the relation is weakest in industries with

an abundance of young firms. Cetorelli and Gambera observe industries with an abundance of young firms experience an increase in growth. This result occurs in concentrated banking markets, and increases the economy's growth rate.

Demirgüc-Kunt, Laeven and Levine (2003) find an insignificant relation between concentration and the cost of credit; after controlling for regulation, property rights and democratic institutions. They also find a positive relation between the cost of credit and regulations. The regulations studied include restrictions on entry into the industry, business operations and open banking.

Beck, Demirgüc-Kunt and Maksimovic (2003) find concentration decreases access to credit. Yet the effect of concentration is insignificant when controlling for institutions. The institutions studied covered generic pillars of Western democracies and capitalist societies; an efficient legal system, relatively less corruption in public services (and the private sector), and a high level of financial and economic development.

To summarize, a banking industry can benefit from increasing efficiency, but causation is debatable; regardless of the presence of scale economies. To determine efficiency what remains uncertain is the net effect of the competing forces that result from concentration. Other things equal, efficiency decreases as prices exceed marginal costs. Also, when average costs are declining (the shape of the LRACC curve for the industry) efficiency increases with concentration, *ceteris paribus*.

Summary of the Literature

It has been shown that the banking industry is qualitatively more complicated than the classical industry in micro-economics. The industry is complicated by the Free Rider Problem, the Agency Problem and Contagion. These problems are sufficient to question the pareto optimality of perfect competition in banking markets.

Further, regulations such as risk-adjusting deposit insurance, capitalization ratio's and transparent disclosure of risk in assets can induce prudent risk management in banks, and increase stability in a competitive market. This is important when competition maximizes capital accumulation, along with the industry's contribution to economic growth. Yet productive efficiency in the industry may require concentration, to minimize the partitioning of fixed costs. Also a review of allocative efficiency in banking markets shows this measure of efficiency can increase with concentration.

Current research has shown a non-linear relationship between competition and stability. This research has also shown market concentration is not an accurate measure of competition. Further the optimal market structure for the industry is complicated by the need to balance efficiency with stability. Allen and Gale (2004) conclude *all* theoretical and empirical factors must be carefully considered when developing responsible banking policy.

In 2001 the Bank for International Settlements argued the economic implications of competition in the banking industry are inconclusive, "the net impact of consolidation

on individual firm risk is unclear, … (and) on systemic risk is also uncertain… a case by case assessment is required."[7]

The Netherlands Bureau of Economic Policy Analysis also reports "many forms of competition do not endanger financial stability."[8] There are critical reasons to reconsider the significance of consolidation as a determinant of stability; further research may show significance is conditional. Carletti and Hartmann (2002) conclude "there does not appear to be a single ever-valid relationship between competition and stability in the banking system."[9] This research appears to suggest significant determinants of financial stability are currently not measured, or are unobservable.

A growing body of empirical research has emphasised financial crises are less common in concentrated, but competitive, markets. This is articulated by Beck, Demirgüc-Kunt and Levine (2003) who find fewer crises in more competitive, but concentrated markets; with less regulation over entry and activities, and in economies with relatively stronger legal systems. None the less, there is no consensus on the optimal market structure for banks, or over causation in the relationship between competition and stability.

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[7] Group of Ten. 2001. "Report on consolidation in the financial sector." *Bank for International Settlements: G10 Publications (January 2001).* ch. 02, p. 3

[8] Canoy, M., M. Dijk, J. Lemmen, R. Mooij, and J. Weigand. "Competition and Stability in Banking." *Netherlands Bureau for Economic Policy Analysis: CPB Document No. 15*. p. 161.

[9] Carletti, E. and P. Hartmann. 2002. "Competition and stability: what's special about banking?" *European Central Bank Working Paper 146.* p. 24.

Theoretical models of representative bank's have evolved over the past three decades. Currently banking models summarize fragile liabilities as an optimal contracting problem, and asset management is summarized by an optimal portfolio choice problem.

Part 2 – Modeling the Charter Value Hypothesis

The origin of the Charter Value Hypothesis

The Charter Value Hypothesis (CVH) is rooted in the intuition that excessive competition in banking markets can destabilize the industry. "The legislative reforms adopted in most countries as a response to the banking and financial crises of the 1930s shared one basic idea; in order to preserve the stability of the banking and financial industry, competition had to be constrained."[10]

It can be shown that banks with market power (may) have incentives to minimize risk-taking behaviour, and improve screening. Such prudent behaviour can result from economic profits. For a bank, the opportunity to earn a profit tomorrow may put downward pressure on risk shifting today.

The concept of a 'Charter Value' in the industry was first formalized and analyzed by Dr. Michael Keeley. This work was published by the American Economic Review, in December 1990, with the title *Deposit insurance, risk and market power in banking.* Dr. Keeley finds a Charter Value is a significant determinant of the positive relationship

[10] Padoa-Schioppa, T. 2001. "Bank Competition: A Changing Paradigm". *European Finance Review*. 5: p 14.

between competition and risk in the industry; which is empirically observed in the United States after financial deregulation during the 1980's.

Demsetz, Saidenberg and Straham (1996) extend Keeley's empirical work. They find growth in the value of a Charter is associated with increasing the reserve ratio, and decreasing portfolio risk. Also, Salas and Saurina (2003) find (relatively) a greater Charter Value is associated with lower levels of default risk, for assets based on loans. Yet De Nicolo (2004) finds market power does not decrease lending risk. De Nicolo's work suggests market power itself may not create the value of a Charter. Yet, market power increases screening. These simultaneous events can complicate an analysis of stability in banking because of the competing effects, distorting causation; therefore causation may be elusive.

Mishkin (1999) shows concentration can create "to big to fail" policies; this is not accounted for in the CVH. A bank that is too big (or important) to fail, can induce a deposit insurer to cover portfolio loses and fund the withdrawals of their depositors, based on the potential for a coordination failure. Therefore a bank that is "too big to fail" can shift their (private) 'down side risk' onto the (public) deposit insurer, with out any accountability for their risk taking behaviour. The bankruptcy of a "to big to fail" bank is expected to create an economic crisis, that is presumed to be more costly than the 'bail out'. Therefore the CVH is not a complete explain of stability for banking markets.

Keeley (1990) observed financial deregulation increased competition; he also observed a greater number of insolvent, liquidated, and therefore failed banks. Observing the increase in the frequency of bank failures was clear, but the market forces causing this phenomenon were not. After deregulation, and increased competition, why had risk in the industry increased? The risk Keeley observed was in the loan portfolio of banks. The expected risk/return had increased in each dollar lent. Post deregulation, Keeley also observes fewer banks restructuring once insolvent. Given a bank was insolvent, a greater number of banks were liquidated; resulting in fewer banks staying in the industry. Therefore the industry was destabilized by the increased turn over of financial institutions.

James Saxton's "great liberalization"[11] of American financial regulation involved removing entry barriers and geographic banking restrictions. Reducing rents in the industry may reduce the opportunity cost of exiting the market, since future profits were reduced. Keeley suggests a stream of future profits represents an opportunity cost of bankruptcy. Further, the sum of this series is said to be comparable to an intangible asset, providing a Ricardian rent in the share holder's return on assets. Limiting franchises is said to create Charter Value. Keeley finds investment banks, brokers, insurance companies and non-banking financial firms increased direct and indirect competition in operations that were traditionally exclusive to banks. This put downward pressure on profit margins in traditional banking markets. Research by Hellman,

[11] Keeley, M. (1985) "The regulation of bank entry." *Economic Review*. Federal Reserve Bank of San Fransico. Summer 1985, p. 5-13.

Murdock and Stiglitz (2000), and an extension by Repullo (2004) identifies regulations are necessary for a stable equilibrium when competition is increased.

Keeley (1990) suggests the downward pressure on profits decreased the opportunity cost of bankruptcy, decreasing the continuation value of the industry. When a profit maximizing bank is faced with decreased future earnings, the rational response is to increase short run return, since the cost of forgone future profits has decreased. A profit maximising bank is faced with an optimal portfolio choice. It is proposed that the optimal combination of risk and return will be influenced by a bank's Charter Value. A valuable Charter induces an inter-temporal optimization for banks, balancing the short run and long run returns in their portfolio. An optimizing bank will take risks in the loan market to increase the short run return on their assets. The cost of taking a risk is represented by the change in a bank's odds of realizing future earnings; also referred to as the change in expectations over their continuation in the industry over the long run. Increasing risk/return over the short run is shifting risk, and destabilizes the market. An industry with valuable Charters, can bring convergence of conflicting interests in the market, between the short run goals bank owners and the long run interests of a social planner. This is achieved simply by lengthening the equity holder's time horizon for their profit maximizing calculation, based on costs and now benefits from a continuation value. Also, valuable Charters hold banks accountable for the risk in their portfolios, creating a stabilizing mechanism with market based operations. According to the CVH, devaluing a Charter through deregulation and

promoting competition in the industry, will rationally increase systemic risk, and risk in lending (the loan market) for every bank.

A Charter Value is not a book-value asset, it is intangible. Further, insolvency is calculated using book-values, and not a bank's mark-to-market value. An insolvent bank, with a valuable Charter, will rationally recapitalize or restructure, provided the CV is greater than the costs of refinancing debt. On the other hand, an insolvent bank with a decreased Charter Value has a relatively weak self interest in its stabilization. Therefore this bank is more likely to liquidate its assets, or arrange a liquidation sale to the deposit insurer. For deposit insurance to protect deposit holders, insolvent banks can not sell their Charter to other potential firms entering the market, banks must make a whole sale to the insurer. Therefore a valuable Charter will reduce the liquidation of insolvent banks and the moral hazard of insurance.

In conclusion Keeley (1990) suggests a valuable Charter can explain greater cash reserves in banks, as a rational response to the new opportunity cost in a bankruptcy. Also, increasing the value of a Charter can explain declining portfolio risk, as an optimal hedge, securing continuation profits. Keeley (1990) describes a valuable Charter as an intangible asset that stabilizes the industry. A valuable Charter is said to create a cost for excessive risk taking, and produces a self interest in banks to hold cash reserves. The value of a Charter can also induce prudent risk management and fewer bank failures, reducing turn over in the industry.

A model of the Charter Value Hypothesis (CVH)

To model the Charter Value Hypothesis the behaviour of banks, consumers and the investments made with deposits we need to be studied. To model the value of a Charter, the price making power of a representative bank will be varied. Changing the pricing power implies the market structure is being varied. This allows for a study of the relationship between competition and stability. Competitive banks are price takers; while price makers earn profit's that are proportional to their Charter Value.

Representative Consumers

Consumers maximize utility over a two period life. The utility function used is assumed to be well behaved, $U'_{c_i}(c_1, c_2) > 0,\ U''_{c_i}(c_1, c_2) < 0,\ U(0) = \infty,$ and $U(\infty) = 0$. Consumers have a life time wealth that is dependent on their endowment (received at birth) and the prices of consumables. The endowment, and population, is held constant for every generation. Consumers are price takers in the consumption market and the deposit market.

Since consumers are homogeneous there is a representative utility optimization problem bellow.

$$Max\ U(c_1, c_2) \quad s.t.\ (1)\ p_1 \bullet c_1 + p_2 \bullet c_2 = M$$
$$(2)\ M = (I - p_1 \bullet c_1) D_t + p_1 \bullet c_1$$

M = life time wealth
I = endowment
p_i = period i price in consumtion market
c_i = quantity of consumption
D_t = return on deposits

$$Lagrangian = U(c_1, c_2) + \lambda(\frac{ID_t}{p_1 \bullet c_1} - \frac{p_2 \bullet c_2}{p_1 \bullet c_1} - D_t)$$

The Consumer's endowment is a nominal cash inheritance; therefore this problem identifies the savings choice that will maximize lifetime utility. This solution will be uniform for all Consumers because of the homogeneity of Consumers, and between generations. There are an infinite number of discrete periods in this model.

Representative Banks

Banks are savings and loan (investment) institutions. If a profit is earned, this is from a credit spread. Loans are made to exogenous lending opportunities. We assume these exogenous lending opportunities do not place any limit on the risk and return the bank can choose to invest in. The lending decisions of the bank are modeled with an optimal portfolio choice.

The number of banks in the market will implicitly change with the price making power; a bank's pricing power is defined by its Charter Value. Banks are homogeneous, therefore the industry can be modeled by a representative bank.

Banks attract deposits when they offer Consumers a return that dominates cash. When profits are earned, they are held as cash reserves. A bank's lending capital is

restricted by the net cash flow from deposits and withdrawals. The maximization problem for the representative bank is bellow.

$$\underset{L_t}{Max} \ \left[\pi_t = L_t(r_t - D_t)\right] + \left[S_t^{\text{cash reserves}} - L_t\right]$$

$$s.t.\ (1)\ L_t \le a_t$$

$$L_t = \text{cash lent}$$

$$\mathrm{d}_t = \text{deposits}$$

$$w_t = \text{withdrawals}$$

$$a_t = d_t - w_t = \text{net cash in-flow}$$

$$S_t^{\text{cash reserves}} = \text{cash in reserve}$$

Every finite credit spread defines a unique and finite Charter Value. This implies each market structure is differentiable by the competitive environment, ceteris paribus.

Conditional deposits

To a Consumer, the return on deposits will strictly dominate cash only if deposits provide a preferred lifetime consumption bundle. The consumption bundle for deposit holders will be dominant if their lifetime wealth strictly dominates the wealth of cash holder's, because Consumers are price takers. The lifetime wealth of a Consumer holding cash is equivalent to their endowment, $M_{cash} = I_{endowment}$. If a consumer makes a deposit this will adjust their lifetime wealth. Stochastic dominance provides a corner solution. Therefore the life time wealth for a deposit holder is $M_{bank} =$ $p_1 \bullet c_1 + D_t(I - p_1 \bullet c_1)$. We assume a deposit is made even if the Consumer is indifferent to holding cash, simply because this provides security from theft. Therefore a bank can

attract deposits if the return offered to the Consumer is $D_t \geq 1$ for each period a dollar is deposited. If $D_t \geq 1$, then $M_{bank} \geq M_{cash}$.

Profits, cash reserves and stability

If the banking market is competitive the representative bank does not earn a profit and the rent a Charter Value provides is zero. The banking market is competitive only when $r_t - D_t = 0$. If $r_t - D_t = 0$ banks may not exist because $L_t = 0$ can result from the indifference of Consumers, since $\pi_t^{bank} = (r_t - D_t)L_t = 0$. The more interesting case for studying stability in the deposit market is when $L_t > 0$.

An exogenous shock that results in any cash outflow will destabilize a competitive bank. A crisis occurs because the sum of withdrawals will exceed cash reserves, for a competitive bank during a shock. The industry is destabilized because banks can not accommodate any additional withdrawals beyond the inter-temporal savings choice of the representative Consumer, with out foreclosing loans. Foreclosing loans is expected to be productively inefficient ex-post. Further a fire sale of assets is assumed to yield less cash than the sum of respective liabilities. Therefore, this model predicts banks are fragile in a profitless market because shocks automatically create a run on deposits, destabilizing the industry.

If regulators implement a policy requiring banks obtains a licence before entering the industry this will create value for each franchise. As the value of a Charter increases,

so will the profits for a representative bank. The increase in cash flow that is associated with valuable Charters will improve a bank's odds of surviving a withdrawal shock. Further, given a bank has survived a shock, the length of time to recapitalize will decrease as the Charter Value increases. Recapitalizing is important because this closes the window of vulnerability for the bank, reducing the risk of insolvency and Contagion. In the event of a second shock before the bank has recapitalized will make the FI insolvent. In this model banking profits are not added to the pool of lending capital, profits are held as cash reserves. Profitable banks increase the industry's resistance to crises and the probability of surviving shocks.

The population of Consumer's, and their endowments, is constant. Therefore the banking behaviour (net deposits/withdrawals) of Consumers is inter-temporally constant. With exception to exogenous shocks the banking behaviour of Consumers is predictable. Therefore supply of lending capital instantly reaches its steady state, making $L_{t+1} = L_t \ \forall \ t$.

The cash reserves at the representative bank will equal deposit liabilities after a critical number of (stable) profitable periods. The condition for this window of instability is bellow.

$$L_j \leq \sum_{t=1}^{j} \pi_t$$

$$L_j = \sum_{t=1}^{j} (r_t - D_t) L_t$$

were $L_{t+1} = L_t$

$$j = {}^{1}\!/_{(r_t - D_t)} = {}^{1}\!/_{\overline{CV}}$$

If the credit spread is 10%, this bank requires $j = {}^{1}\!/_{r_t - D_t} = {}^{1}\!/_{.1} = 10$ stable periods to acquire cash reserves sufficient for surviving a run on deposits. For this result two assumptions are made. First, a credit spread provides a constant return, defined by $\overline{CV} = r_t - D_t$. Second, profits are held as cash assets.

The cost of bankruptcy – a geometric series

To calculate the opportunity cost of exiting the industry we will need to value the stream of forgone profits. The sum of future profits is equal to $\beta\pi_{w+1} + \beta^2\pi_{w+2} + \ldots + \beta^w\pi_{w+t} + \ldots (1)$, were $\pi_w = \pi_{w+t} = (r_t - D_t)L_t \,/\, n > 0 \;\forall t \;\; (i)$ is nominal and $\beta = {}^{1}\!/_{1+ \text{ rate of inflation + risk premium}} < 1 \;\; (ii)$ is the inter-temporal discount rate[12]. This is a geometric series of the form $r(a + ar + ar^2 + \ldots \; + ar^t + \ldots) = r(S_t)$, were

[12] The first term in equation (1) is $\beta\pi_t$ because π_t does not effect the value of continuing to operate in the industry. The value of future profits in banking does not include the current period profit.

$\lim_{t\to\infty} S_t = \sum_{t=0}^{\infty} ar^t = \frac{a}{1-r}$, if and only if $|r|<1$ and $a>0$[13]. The conditions for convergence of the geometric series are satisfied by (i) and (ii). The cost of bankruptcy in the model is $r(S_t) = \frac{\beta\pi_t}{1-\beta} = \frac{\beta(r_t - D_t)^{L_t}/_n}{1-\beta}$. Therefore the infinite summation of future profits has a finite present value. This cash flow is similar to the coupon payments from a perpetuity, therefore a valuable Charter can be called an intangible asset.

The CVH predicts an increase in the value of a Charter will induce a bank to increase their reserve ratio. Secondly, this will reduce the risk and return in each dollar lent. This implies a bank will analyze the costs and benefits of the risks and returns taken with each dollar in their loan portfolio. Harberger, Jenkins and Kuo (2009) show the cost and benefit analysis is completed with a Net Present Value (NPV) calculation because the only benefit is monetary. Maximizing a bank's NPV requires equating the marginal cost and benefit of the last dollar lent, since the opportunity cost is positive. The marginal cost of taking a risk will depend on the nominal value of a Charter and the marginal probability of a bank defaulting. The probability of a borrower defaulting will affect the probability of a bank becoming insolvent. Therefore the marginal cost of

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[13] were π_t is a common factor $\forall t$, and β is a common ratio. The cash in-flow from the profit earned in period t will be π_t, and the present value of expected/future cash in-flows is found by multiplying the respective profit by β^t, because π_t is a nominal number.

increasing risk in a bank's portfolio will be $MC^{risk} = \frac{\beta\pi}{1-\beta} \bullet \left(\triangle \phi^{\text{bank}} \right)$, were ϕ is the probability of losing a Charter (due to insolvency).

On the other hand the marginal benefit from increasing risk will be driven by an increase in the return on assets and the size of the loan portfolio. Therefore the marginal benefit of increasing risk in a bank's loan portfolio is equal to $MB^{risk} = \left(\triangle r_t \right) \bullet \left(L/n \right)$, were $\triangle r_t$ is the change in return on assets. If $MB^{risk} - MC^{risk} > 0$ the representative bank will increase risk and return in their portfolio. Adjustments to risk and return will affect access to capital, along with the efficient allocation of loans and will impact economic growth. Therefore each Charter Value $\left(\overline{CV} \right)$ in this model creates a unique market structure, varying the balance between competition and stability, in the representative economy. The representative bank acquires risk in its loan portfolio according to the decision rule $\triangle\theta \leq \frac{\triangle r_t \bullet (1-\beta)}{\overline{CV} \bullet \beta} = \frac{\triangle r_t \bullet (1-\beta)}{(r_t - D_t) \bullet \beta}$. This condition is the risk tolerance for the representative bank. Therefore Valuable Charters place an upper bound on the optimal risk taking behaviour, and return, with in a profit maximizing bank; essentially creating accountability in risk management using a profit incentive.

The Social Planners Decision

If a social planner can systematically form probabilistic beliefs over the frequency of money runs, then it has the opportunity to increase social welfare. There are many difficulties in gathering information for this statistical analysis. Diamond and Dybvig (1984) have that shown saving and loan shocks can cause money runs, along with coordination failures. Yet, this research also shows that catalysts for money runs are exogenous to banking models, suggesting financial crises are random events. Further, a Social Planner is better off identifying a trend in the frequency of critical events, rather than predicting the timing of financial crises. With probabilistic beliefs the Planner can identify the frequency of money runs, in terms of x, an average number of years between runs. Using regulatory authority a Social Planner can vary the competitive structure of a banking market to establish a socially optimal level of pricing power for banks. A Planner can identify the optimal Charter Value by its unique window of instability. The window of instability could be optimally set by regulators, as $j^* \equiv x$. This defines a solution for $r_t - D_t$ since $j = 1/(r_t - D_t)$. At the same time monetary policy remains capable of responding to inflation shocks because $r_t - D_t$ only defines a credit spread for the Social Planner. For the central bank the overnight-inter-bank lending rate is not a null instrument for public policy since the nominal interest rate is not predetermined, only $r_t - D_t$ is. Further, this allows banks to hold enough reserves to cover 100% of deposit liabilities, and survive a money run just-in-time. A socially optimal

Charter Value will balance stability with efficiency in an economy, therefore maximizing society's welfare in the long run.

Conclusions

A credit spread in banking markets has replicated the fundamental predictions of the Charter Value Hypothesis. For example, market based operations are seen to increase the cash reserves held by a representative bank. Also, banks are induced (from their self interest) to recapitalize as their Charter Value increases. Further, a credit spread is shown to create a supremum over the risk that any rational bank will engage in, within the lending market. It is critical that this supremum is decreasing with the value of a Charter.

Yet, this model does not predict the destabilizing effect of financial institutions deemed too important to fail. Descriptions of the Charter Value Hypothesis, and this model, share this weakness.

The Charter Value Hypothesis predicts banks are willing to forgo high returns in the short run, for an increase in their long run return on assets. In this model, profits are increasing with the credit spread. Increasing the credit spread requires a change in the structure of the market, implying the number of competitors has decreased. The pricing power of a Charter directly increases a bank's return on assets. At the same time, the CVH clearly states risk has not increased in the bank's portfolio. Therefore, if the credit spread has increased, and a bank has not acquired riskier investments, this bank will

have to extract consumer surplus from the original portfolio of loans. This behaviour is representative of predatory lending. The likelihood of borrowers defaulting is known to increase from the moral hazard created when the cost of credit increases. Alternatively, the law of diminishing marginal returns dictates the supply of credit will contract when portfolio risk is held constant and a representative bank's credit spread increases. The contraction in the supply of credit will reduce investment in the economy, and economic growth will be effected. Therefore, under the Charter Value Hypothesis an increase in the credit spread requires either a decrease in the consumer surplus from a loan, or alternatively a decrease in investment along with a decrease in economic growth.

Both of these outcomes have mixed implications for social welfare. Yet, Boyd and De Nicolo (2005) find the Charter Value Hypothesis has a historical precedent of influencing public policy and regulation. The Charter Value Hypothesis is found to be the basis for regulatory supervision that is stability-oriented in many countries.

The banking industry makes significant investments into capital formation, and is a critical determinant of economic growth. How can a representative bank decrease the risk in their portfolio, while increasing the return on their asset's? This research introduces the idea that banking markets may be an anomaly to the positive relationship between risk and return, as identified in the Efficient Market Hypothesis when arbitrage is not possible.

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