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Economics of the Mortgage and Mortgage Institutions: Differences between Civil Law and Common Law Approaches

Robert Van Order
Stephen M. Ross School of Business
at the University of Michigan

Lynn Fisher
Massachusetts Institute of Technology

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Law and Common Law Approaches**

Lynn M. Fisher*

Massachusetts Institute of Technology

Building 31-310

77 Massachusetts Ave.

Cambridge MA 02139

617-252-1685

617-258-6991 (fax)

lfisher@mit.edu

and

Robert Van Order

Aberdeen University and

University of Michigan, Finance Department

202 230 1002

rvo@umich.edu

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ABSTRACT

We examine the history of U.S. mortgage as a means of illustrating the influence of different aspects of the U.S. common law system on financial development. We hypothesize that the value of common law to financial development is with respect to the flexibility that the system provides market participants as they attempt to respond to shocks. This is in contrast to civil law, which tends to specify particular contracts as admissible. The model is an application of the Le Chatelier Principle, which suggests that adding constraints to system makes it's responses less elastic. We consider a special case of restrictions on mortgage type (fixed vs adjustable rate) to illustrate the principle.

I. Introduction

Over the past 10 years interest in the interaction between legal systems and economic growth and financial markets has exploded. Starting with La Porta et al. (1997,1998), empirical evidence suggests that the countries with a common law legal origin are more financially developed relative to countries with other legal systems. However dissenting opinions have emerged, largely arguing that legal origins do not preempt the development of alternate governance structures that yield similar financial functions but different measures of success (Berglof and von Thadden 1999; Holmen and Hogfeldt 2000; Allen et al. 2005). Representing another view, Rajan and Zingales (2003) argue that legal origins may have an indirect effect due to each legal system's propensity to rein in political interest groups that affect the rate of financial development and innovation. These investigations largely take place in the context of corporate finance markets, although the impact of legal origin on alternate contracting scenarios has recently been considered (Lerner and Schoar 2005). In this context, we seek to contribute to the debate about why legal origins may matter by suggesting a reason for different outcomes and an alternate way of testing the linkages between legal origins and financial development. We also examine a different financial market, mortgage markets.

We examine the history of U.S. mortgage as a means of illustrating the influence of different aspects of the U.S. common law system on financial development. We hypothesize that the value of common law to financial development is with respect to the flexibility that the system provides market participants as they attempt to respond to shocks. This is in contrast to civil law, which tends to specify particular contracts as admissible.

We formalize this by invoking the LeChatelier principle, first developed by Samuelson (1947). The essence of the principle, as we apply it, is that adding quantity constraints to a profit maximizing problem lowers all (demand and supply) own-responses to price changes; supply and demand curves, both, are less elastic. Our stylized versions of the two systems are that civil code imposes quantity constraints on the system, whereas common law imposes costs, but does not impose fixed quantities. Given transaction and information costs the civil law approach may well be optimal for a given set of parameters, but it introduces some inflexibility. The Le Chatelier Principle suggests that this inflexibility is more than the obvious observation that constraints limit expansion of the item constrained; for instance limiting the use of adjustable rate mortgages obviously limits their use in the future when the demand for them may be higher. It implies that the constraints will lower supply responses along *all* dimensions of mortgage supply; for instance the supply curve for fixed rate mortgages will be steeper. To the extent that responsiveness to price (and other parameter) changes is conducive to growth, this suggests a reason for the results that common law appears to be more conducive to growth. We develop a particular model of mortgage choice, fixed versus adjustable rate, to illustrate our points.

II. Literature

Almost all studies of financial development attempt to test the implications of legal origins by examining level, static measures of financial development across countries, (Beck and Levine 2004; Beck et al. 2003a, 2003b, 2005; La Porta et al. 1997, 1998, 2002; La Porta, Lopez-de-Silanes and Shleifer 2006; Fisher 2002). In order to investigate claims about flexibility, however, it seems a more direct approach to investigate the responsiveness of the financial system to shocks.

A main difference between common law and civil law is the extent to which the law is intended to be comprehensive. Glaeser and Shleifer (2004) contend that sovereigns employed the comprehensive codes that characterize modern civil law in order to restrict the influence of *judges* in making law. That is, civil law codification was intended to prevent the creative interpretation and application of law by making the law quite precise. In the model of Glaeser and Shleifer (2004), the use of a comprehensive civil code is seen to be more efficient when local judges are more likely to be bullied. On the other hand, when judges and juries are less likely to be corrupted, common law is more desirable since local rule making and adjudication are likely to be more efficient than enforcement achieved by a more distant judicial system controlled by the state.

Bright line rules, as Glaeser and Shleifer call codes, are explicit about what actions are prohibited. In contrast, many laws at common law tend to be framed as looser standards. Consider a hypothetical traffic law regarding automobile speed on highways. A rule would hold that an individual may not drive over 55 miles per hour, while a standard would state that a driver may not drive at excessive speeds. In the first, the prohibited action is explicit, while in the second a judge may need to consider the specific situation including road conditions and weather in order to apply the standard to the specific case and make a determination about whether the driver's speed was excessive. As Glaeser and Shleifer (2004) contend, the former requires less discretion by judges while the latter approach requires judicial input.

While all legal systems consist of a mixture of rules and standards, one distinction between common law and civil law is the degree to which one mechanism is preferred to the other. It may be said that in common law, standards are more common than rules, whereas at civil law, rules are more common than standards. Kaplow (1992) identifies the differences between rules and standards not in terms of complexity, but in terms of when the content of the law is determined. With rules, the content of the law is made explicit *ex ante*. With standards, the exact application of the law to a particular circumstance is only determined *ex post*.

Despite the increase in the use of rules, statutes and regulation in common law systems during the twentieth century, Glaeser and Shliefer (2004, p. 1212) also point out that

a common law judge, to the extent that he can focus on the differences between the case under review and specific provisions of the code, has some flexibility to disregard these provisions when they conflict with the basic principles of common law. In civil law countries, in contrast, judges are not even supposed to interpret the codes very much, and in principle must seek not to differentiate a specific situation, but to fit it into the existing provisions of the code. As a restraint on the judge, codes are much more powerful in civil than in common law countries.

In addition, the extent to which equitable considerations can be introduced into legal reasoning by judges varies systematically between common law and civil law countries (Djankov et al. 2003). Therefore the role of equity can be viewed as introducing additional flexibility into the enforcement of contracts.

While it is often argued that codes as opposed to standards should be less costly to enforce (Kaplow 1992), Djankov et al. (2003) find that procedural formalism is much higher in civil law countries which therefore makes enforcement more costly. This finding is consistent with the history of the civil codes in which sovereigns wanted control and therefore required legal procedures that could be easily observed and monitored. Glaeser and Shliefer (2002) note that some of the legacies of civil law include a greater reliance on written argument and evidence as opposed to common law where oral arguments and evidence are often admissible.

We contend that in general the use of rules or codes may restrict financial markets by constraining the variety of financial contracts that can be written at any point in time. While ostensibly market participants should possess a freedom to contract as they choose, their ability to write a credible contract depends on their ability to enforce its provisions. To the extent that modern legal systems involve an intricate web of laws and regulations, we expect that the ways in which the law is framed matters. If civil codes and regulation explicitly rule out some contracts by being precise about the particular form or content of a class of contracts, by explicitly prohibiting other actions, or by omitting some potential variations of contracts, the market may lose flexibility in adjusting to financial or

economic shocks. In particular, the often assumed ability of individuals to contract around inefficient laws may be inhibited.

It is important to draw attention to the differences between the distinction that we draw between common law and civil law and those normally drawn in the law and finance literature largely concerned with corporate finance. In particular, Beck and Levine (2003a, 2003b, 2004) survey the literature on legal origins and argue that the legal origins affect financial development either through a *political* route in which variation in the protection of private property rights *vis a vi* the state affects financial development, or due to the *adaptability* of the legal system through time. Their notion of adaptability is one in which the rules or standards of the legal system can change over time, and in addition to the work of Hayek (1960) and Merryman (1969), it draws from the common law efficiency literature beginning with Posner (1973). In contrast, our notion of flexibility focuses on the ability of individuals at a particular point in time to write a non-standard financial contract given the nature of the legal system. While the notions of flexibility and adaptability are not completely distinct, in what follows we do not focus on how legal systems evolves over time, but on how the ability to enforce a variety of contracts or contractual provisions at a particular point in time affects the elasticity of the supply of financial capital.

While many observers suggest that legal systems have converged in terms of the function of the law over time, most would concede that the manner of response to new circumstances is quite different (Coffee 2000). Mattei (2000), for example, notes that the way in which the law approaches negligence is quite different, but that the ultimate function of the law is quite similar between civil law and common law. On the other hand, he observes that “[d]espite what can be seen as common, it remains true that the deep difference in the leading actors of the system plays a role in the way in which legal systems at similar stages of economic development react to new problems” (Mattei 2000, p. 20).

Our approach is most closely related to recent work in financial contracting by Lerner and Schoar (2005) and Bergman and Nicolaievsky (2004). In these papers, the authors

provide evidence about how legal origins impact financial development through a “contractual channel” in which legal systems influence the cost of enforcement of private contracts, and in particular, complex or precise contracts. Lerner and Schoar test whether their results linking better enforcement to greater complexity in contracts is robust to the fact that different countries place explicit restrictions on private equity contracts. Their robustness check “suggests that our findings reflect the investors’ contracting *choices* and not just the constraints imposed by different legal regimes” (Lerner and Schoar 2006 p. 13). In other words, in places without restrictions on security types, the effectiveness of enforcement in part determines the complexity of contracts. Our notion of contractual flexibility focuses on the restrictions that they set aside, however, because we suspect that civil codes systematically restrict contracts more than common law and that this reduction in contracting possibilities, even if short term, has consequences for financial markets.

The value of private contracting is also related to recent work on securities regulation by La Porta et al. (2006) who find that regulation that facilitates private contract enforcement is more valuable and regulation that necessitates public enforcement is less valuable in explaining the size of public securities markets around the world. Their results suggest that financial markets in countries with common law legal origins benefit from a focus on private litigation and market discipline. It may be that their finding is related to the dichotomy between rules and standards developed above, in that regulation that lowers costs of contract enforcement makes a system that relies on standards more efficient which in turns makes innovation more likely.

We focus on the example of mortgages in this paper for several reasons. First, mortgage markets provide a natural way to examine the elasticity of supply of mortgage capital, namely, by examining a change in interest rates or housing demand. Second, mortgage markets are typically highly regulated due perhaps to the fact that a mortgage typically involves both a contract and a conveyance of real property rights. Across countries, Nasarre-Aznar (2005) notes that the degree to which these two parts of a mortgage are separable varies. Sometimes the mortgage must follow a very particular form. While in other places the terms can be varied separately from the collateral. Lerner and Schoar

(2006), for example, note that the ability to separate cash flow rights and control rights in a private equity contract is particularly valuable. Nasarre-Aznar (2005) among others argues that the inability to separate cash flows from control in the context of the mortgage creates difficulties for the development of secondary mortgage markets in particular. Recent work on mortgage markets in the European Union, for example, highlights the wide variation in laws and regulation that exists across markets (Mortgage Credit Forum Group 2005).

In U.S. mortgage markets private litigation, statute-making and regulatory oversight all influenced the development of the mortgage. In the 17th and 18th centuries, private litigation resulted in the courts of equity establishing several legal doctrines that affect modern mortgage contracts. Likewise, court cases over the right of a mortgagor to prepay a mortgage occurring in the early 19th century led to a precedent regarding prepayment. Many state legislatures introduced laws in the 19th century to facilitate the use of a contractually specified power of sale at a mortgage foreclosure. In addition, the Federal Home Loan Bank Board and its successors in the 20th century have regulated various covenants and provisions in residential mortgage contracts issued by their charter members like the use of variable interest rates, prepayment penalties and due on sale clauses. These institutions and other consumer oriented laws have also regulated a wide range of information disclosure concerning mortgage products.

We examine the recent history of adjustable rate mortgages in the U.S. as a case in which common law precedent and regulation intersect in the governance of the U.S. mortgage market. The example helps to motivate the model that follows. Recent examinations of EU mortgage markets suggest that similar tensions exist between the law of obligations or contracts and those designed specifically for mortgage markets in continental Europe, and so we use this simple example as a starting point for further, cross-country investigation.

III. Adjustable Rate Mortgages in the U.S.

The legacy of the severe turmoil in U.S. mortgage markets at the beginning of the 20th century is found throughout modern regulations governing the savings and loan banking

system. Given that the savings and loans were the primary originator of mortgages, these regulations in turn had profound impacts on the nature of mortgage contracting in the 20th century in the U.S. It appears that following the banking crisis of the 1930s, the Federal Home Loan Bank Board (FHLBB) carefully restricted the types of mortgage instruments that their members could originate. In particular, the institutions were not allowed to originate “balloon” mortgages, which had caused the Depression-era wave of foreclosures. Through its underwriting standards for the provision of mortgage insurance, the Federal Housing Administration (FHA) made the long-term fully amortizing loan with a fixed rate of interest (FRM) ubiquitous in the U.S. starting in the 1930s.

By the 1960s, the banking system was once again being stressed by a combination of regulations that limited the interest that banks could pay on deposits and their long positions in relatively low-yielding, long term, fixed rate mortgage assets in the face of rising market interest rates. As summarized by Robinson (1972, p. 766):

[d]uring the last half of 1969, long-term interest rates advance to levels higher than any that had been reached during the past century. For almost six months, prime commercial paper rates were between 8 and 9 per cent. The “Fed” fund rate clung at 9 per cent for several months. In the first month of 1970 the U.S. Treasury bill edged up toward 8 per cent.

Although the fixed rate mortgage (FRM) was the standard of the day, at the Variable Rate Mortgage Hearings held before the Senate in 1975, the FHLBB chairman reported that 19% of all outstanding conventional mortgages were had adjustable rates in 1969 (Variable Rate Mortgages 1975). These loans were made by both state and federally chartered banks at the time.

It is unsurprising that the market would introduce the adjustable rate mortgage to address a particular contracting need. It turns out that the concept of an adjustable rate mortgage (ARM) is easily handled and enforced at common law in the U.S. according to doctrines regarding contracts. In the U.S. starting in the 19th century, the creation of the debt or obligation in a mortgage was increasingly treated as a contract separate from the creation of the lender’s rights to the real estate collateral. Therefore, with respect to the specification of an adjustable rate in the mortgage, so long as the language of the note

establishes the variable interest rate in a way that is not arbitrary or strictly under the control of an adverse party, it is likely to be enforceable.

In several court cases examining adjustable rate mortgages, the court clearly applied the tenets of contract law in different states to determine the validity of this mortgage feature during the 1970s. In particular, the promise to pay a floating interest rate must not be indefinite or “illusory” (see for example, *Constitution Bank and Trust Company v. Robinson*, CT 1979 citing a 1928 contract case). In *Powell v. Central California Federal Savings and Loan* (CA, 1977) which cites a prior California contract case, the court established that “a contracting party's discretionary power to vary the price or other performance does not render the agreement illusory if the party's Actual exercise of that power is reasonable.”

It appears that in 1972 the FHLBB changed the definition of an installment loan to clearly restrict the ability of federally chartered institutions to originate adjustable rate mortgages by restricting the overall payment to remain unchanged over the life of the loan. It appeared that prior to 1972, only the principle portion of the payment must remain unchanged, restricting the use of balloon mortgages. Prior to 1972,

the term 'installment loan' was defined in 12 Code of Federal Regulations section 541.14 (23 Fed.Reg. 9890) as follows: 'The term 'installment loan' means any loan repayable in regular periodic payments, equal or unequal, sufficient to retire the debt, interest and principal, within the contract period: Provided, however, That the loan contract shall not require any subsequent periodic principal payment to be greater than any previous periodic principal payment' (Powell CA 1977).

However,

[e]ffective April 10, 1972, 12 Code of Federal Regulations section 541.14 was amended as follows: 'The term 'installment loan' means any loan repayable in regular periodic payments sufficient to retire the debt, interest and principal, within the loan term. However, no required payment after the first payment shall be more, but may be less, than any preceding payment.' (37 Fed.Reg. 5118.) (Powell CA 1977).

The FHLBB attempted to write regulations to explicitly allow and regulate variable rate mortgages (VRMs) in 1971 and 1974 (Landers and Chandler 1976) before finally

succeeding in 1979 (Cassidy 1984). We suspect, but have not confirmed, that the first attempt to regulate adjustable rate mortgages (which were largely accommodated by common law precedent) resulted in a Congressional directive to restrict the existing loop hole in the definition of an installment loan illustrated above. It appears that many state-chartered banks, including those in California, retained the ability to right to originate variable rate mortgages.

One issue that arises in this example of the U.S. mortgage markets is the potential complexity of adjustable rate mortgages and the costs to consumers of acquiring high quality, systematic information about the product and their subsequent ability to sue lenders if that information was not good. Landers and Chandler (1976) argue that historically, residential mortgages were not treated as consumer credit transactions and that the relatively new Truth in Lending legislation from 1968 was ill-prepared to assist in the regulation of standard fixed-rate mortgages, let alone variable rate mortgages. The Real Estate Settlement Procedures Act (1974) also did not initially include provisions for variable rate mortgages.

The variable rate regulations of the FHLBB, once adopted in 1979, went through a quick series of changes evolving from the complete prohibition on ARMs prior to 1979 to a very restricted set of product options to a much more standards-like approach reflecting common law precedent by 1982. Cassidy (1984, p. 1) notes that from the perspective of the FHLBB, “as the restrictions and constraints on ARMs were eased over the 1978-1982 period, the disclosure requirements were made more burdensome, primarily because the ARM itself became more complex.” He goes on to note that “the disclosure requirements, substituting in a sense for the fewer restrictions on the ARMS itself, became more detailed and extensive.”

By 1982, the regulations dealing with variable rate and other non-standard mortgages terms by the FHLBB were rewritten to highlight prohibited terms, but to otherwise allow broad latitude to savings and loans to introduce new mortgage contracts:

[s]ince 1979, when the Board permitted the issuance nation-wide of variable-payment loans, each alternative mortgage instrument involving

payment adjustment has been authorized as a specific exception to the prohibition in subparagraph (a)(1). The loan types so authorized are the graduated payment mortgage (GPM), the variable-rate mortgage (VRM), the reverse-annuity mortgage (RAM), the renegotiable-rate mortgage (RRM), the adjustable mortgage loan (AML), the graduated payment adjustable mortgage loan (GPAML) and the balloon-payment loan.

On April 28, 1982, in response to a number of requests to authorize the issuance of new and viable types of mortgage instruments, the Board proposed to revise its home lending regulations to broaden and simplify federal associations' authority to make home loans (FHLBB Res. No. 82-310; 47 FR 19711 (1982)). To avoid the proliferation of new regulations that would be required to authorize such mortgage instruments, and based on its view that lenders and borrowers should have broad flexibility to use instruments suitable to their individual needs, the Board proposed to replace both the prohibition against increased payments on loans secured by borrower-occupied homes and the regulations authorizing the use of specific types of mortgage instruments with a general authorization to make home loans on which the interest rate, the payment, the loan balance and the term to maturity could be adjusted (FR 36612-01).

The example of the ARM in U.S. history is interesting because it explicitly struggles with the tradeoffs between supply restrictions and regulation aimed at standardizing information flows and lowering transactions costs for private litigation. We now examine these tradeoffs more formally.

IV. The Le Chatelier Principle and the Development of Mortgage Markets: An Example using Fixed Rate vs Adjustable Rate Mortgages

The Le Chatelier Principle was introduced to economics by Samuelson (1947). A survey of the proposition is in Hatta (1987). The principle, for our purposes, can be put simply: Putting constraints on quantities in optimizing problems that involve maximizing or minimizing a sum of prices multiplied by quantities lowers own-price elasticities.

For instance, consider a firm that is maximizing profits. Under the usual convexity conditions there are well-behaved solutions to the problem, with output supply and input demand as functions of price. Now imagine the problem with an additional constraint on the level of one of the inputs or outputs, with corresponding solutions for demand and supply curves. The theorem is that all demand and supply responses to price changes are at least as great (in absolute value) in the unconstrained case as in the constrained case.

That is, supply response will be more positive and input demand responses will be more negative. If there are several constraints on quantities, responses will increase as each is relaxed.

Milgrom (2006) discusses extensions to whole systems and provides an example of a case with two variables determined by a system of two equations, where removing a constraint on one variable increases the response of the other variable to a change in a parameter of the system. We examine system response as well as own-price response in our model.

This provides a tool for analysis of the effect of the two legal systems. Our contention is that Civil Law can be viewed as restricting the technology of a financial systems profit function by limiting what is and what is not an acceptable contract, whereas common law allows contracts to evolve more easily. As is discussed above, there may be very good reasons for restricting contracts. For instance, if information is costly and consumers have difficulty choosing among a wide range of contracts or if very complicated contracts are difficult to enforce. For instance, Civil Law with a narrow menu of options tends to take control away from judges, which may be welfare enhancing. Our point here is that along with such restrictions comes a change in the system; it becomes less elastic along all dimensions.

A Model of Restricted Mortgage Contracts

For mortgage and other financial contracts we can view the bank (financial firm) as supplying a bundle of services, which can be characterized as having prices, for instance for credit risk, interest rate risk etc. Demand and supply curves come from maximizing profits in a multiple output and input context. We now turn to a simple example where there are two types of contract, fixed rate mortgages and adjustable rate mortgages. For the consumer FRMs have no risk, but ARMs open the consumer to interest rate risk. For banks, however, FRMs entail interest rate risk because they raise money with variable rate deposits; ARMs lead to matched funding, and no interest rate risk.

We assume that all mortgages are the same size, so the only issue is their composition (the lenders portfolio mix) and the number of loans. We will assume below that borrowers are identical, so that the FRM-ARM mix is here interpreted as a blend of fixed and adjustable rates that applies to each mortgage. Banks (and later households) maximize utility in a mean variance context, so that choice variables are means and variances of the relevant random variables. Banks' utility depends on expected profit and risk, which in our model comes only from interest rate risk. That is, banks maximize

$$(1) \quad U = \pi - 1/2wR^2$$

where R is the risk of the portfolio, and π is expected profits, which come from mortgage revenue net of deposit costs. We assume increasing marginal costs of raising money in the deposit market, which are represent by $(c/2)D^2$.¹ Then

$$\pi = r_f F + r_a A - r_d D - (1/2)cD^2,$$

where r_f , r_a , and r_d are the rates on FRMs, ARMs and deposits, respectively.

Therefore,

$$(2) \quad U = r_f F + r_a A - r_d D - (1/2)cD^2 - (1/2)wR^2.$$

We assume that ARMs are match funded with deposits and so have no interest rate risk, and letting σ_f be the interest risk caused by holding FRMs,

$$(3) \quad R = \sigma_f F.$$

Finally, it is assumed that assets are funded with deposits,² so the wealth constraint is

$$(4) \quad F + A = D.$$

¹ The model requires some sort of increasing costs to avoid very simple results with perfectly elastic supply curves. This seems appropriate to the extent that we are discussing markets as they emerge.

² Clearly there is no difference if some of the funding is from equity. Our underlying assumption is there is some special, either by subsidy or regulation, reason for deposit funding, so that other long term funding sources like bonds and equity are not allowed.

Absent constraints the banks problem is to maximize (2) subject to (3) and (4).

Substituting (3) and (4) into (2), the firm's constrained optimization problem can be written as,

$$(5) \max_{F,A} d_f F + d_a A - (1/2)c(F + A)^2 - (1/2)w\sigma_f^2 F^2,$$

where $d_f = r_f - r_d$ and $d_a = r_a - r_d$.

First order conditions imply (assuming no corner solutions) the supply curves,

$$(6) F_s = \frac{d_f - d_a}{w\sigma_f^2}, \text{ and}$$

$$(7) A_s = \frac{d_a(w\sigma_f^2 + c) - cd_f}{cw\sigma_f^2}.$$

The total supply of credit is given by

$$(8) M_s = F_s + A_s = \frac{d_a}{c}.$$

Equilibrium and System Response

We begin by finding a system-wide equilibrium. The system can be solved for levels of mortgage lending by adding a demand for credit side, derived from the demand for housing. Assume that demand for mortgages is given by a representative household maximizing

$$(10) W = y - (1/2)vS^2,$$

where y is the expected imputed profit from housing. It is assumed that housing is entirely debt funded so that expected profit is given by

$$(11) y = \rho H - r_f F - r_a A,$$

where ρ is the return to housing. There are diminishing returns to housing, which is represented by

$$(12) \quad \rho = a - bH .$$

In addition, S is household risk. The only source of risk is from ARMs, and S is given by $S = \sigma_a A$.

Households fund all of their housing with mortgages, which if unconstrained can be a mix of ARMs and FRMs. Then

$$y = (\rho - r_f)F + (\rho - r_a)A ,$$

and

$$(13) \quad W = (\rho - r_f)F + (\rho - r_a)A - (1/2)v\sigma_a^2 A^2 .$$

Maximizing (13) yields:

$$(14) \quad A_d = \frac{r_f - r_a}{v\sigma_a^2} , \text{ and}$$

$$(15) \quad F_d = \frac{a - r_f}{2b} - \frac{r_f - r_a}{v\sigma_a^2} .$$

with total supply given by

$$(16) \quad M_d = H = \frac{a - r_f}{2b} .$$

Next we equate demand with supply for both FRMs and ARMs. It can be shown that in equilibrium, the supply of FRMs is given by

$$(17) \quad F = \frac{(a - r_d)v\sigma_a^2}{(c + 2b)(v\sigma_a^2 + w\sigma_f^2) + v\sigma_a^2 w\sigma_f^2} ,$$

and the equilibrium of ARMs is given by

$$(18) A = \frac{(a - r_d)w\sigma_{fa}^2}{(c + 2b)(v\sigma_a^2 + w\sigma_f^2) + v\sigma_a^2w\sigma_f^2}$$

The levels of housing and mortgage supply are given by

$$(19) H = M = F + A = \frac{(a - r_d)(v\sigma_a^2 + w\sigma_f^2)}{(c + 2b)(v\sigma_a^2 + w\sigma_f^2) + v\sigma_a^2w\sigma_f^2}$$

Restrictions on ARMs

Now suppose that there are costs to evaluating loans. For instance, assume that consumers have difficulty evaluating ARMs because they bring them interest rate risk, which requires knowledge of interest rate movements, the yield curve, etc. Assume that these are fixed costs. A legal structure that prescribed the FRM-ARM mix (e.g, set ARMs equal to zero) would save costs. That is, under current conditions a civil code that specified what contract is permissible would save these costs. We assume that is the case, and we examine the implications of this tradeoff.

We assume that contracts are restricted, by setting $A = 0$. We then find the new supply curve for FRMs (and total credit supply) by solving (13) with A set equal to 0. This gives

$$(20) F_s^R = \frac{d_f}{w\sigma_f^2 + c},$$

where the superscript R refers to the restricted case. With respect to the model's parameters, both the supply of FRMs and the overall supply of credit are less elastic than in the unconstrained case above. This outcome is simply our version of the Le Chatelier principle. Next we turn to system response.

Solving for the new equilibrium we have

$$(21) \quad H^R = M^R = \frac{(a - r_d)}{(c + 2b + w\sigma_f^2)}.$$

It is straightforward to show that the coefficient on $a - r_d$ in (19) is larger than that in (21) for positive values of FRM risk. Hence, the unconstrained system is more elastic in the response of total mortgage supply to the two major parameter changes: an increase in housing demand, a , and an increase in market rates (deposit rates), r_d . The unrestricted and restricted total supply are equal when $w\sigma_f^2 = 0$.

We have however, ambiguous system results for the effects of FRM elasticity. It turns out

that, $0 \leq \frac{\partial F}{\partial a} \leq \frac{\partial F^R}{\partial a}$ and $0 \geq \frac{\partial F}{\partial r_d} \geq \frac{\partial F^R}{\partial r_d}$. Milgrom (2006) shows that this result is

possible (and reasonable) if FRMs and ARMs are sometimes complements and other times substitutes. For the results of the Le Chatelier Principle to hold globally for system responses we need FRMs and ARMs to be (globally) *complements*. To see this consider the following. If both F and A are decreasing in the deposit rate, then for $r_d \leq \bar{r}_d$ we need,

$$(22) \quad F(r_d, A(r_d)) \geq F(r_d, A(\bar{r}_d)) \geq F(\bar{r}_d, A(\bar{r}_d)),$$

in order for the Le Chatelier principle to hold system wide. Since the supply function for FRMs in the unconstrained case is dependent upon the risk of ARMs to borrowers, that at least in part, these two products are substitutes even though both products respond in the same direction to a change in the deposit rate or demand for housing.

As with the history of ARMs in the U.S., an alternative to restricting the type of mortgage contract directly is to impose regulations on lenders that force them to standardize aspects of their business thereby lowering the information and enforcement costs to consumers from new products. Our model suggests that this sort of regulation may have a different impact on mortgage market outcomes as compared to supply restrictions.

V. Conclusions

Our model has the result that restrictions on the level of ARMs lower the supply response of FRMs by lenders to increases in FRM rate. It also decreases the overall system response to changes in demand and market rates. Because the LeChatelier Principle is broadly valid we expect that results like these hold for a wide range of cases. Hence, if we accept basic idea that civil law is more like a system of quantity restraints on contracting, then we should expect the general result that common law systems have more elastic supply curves and perhaps more elastic system responses.

Our model is testable, albeit with some difficulty. That is, we can compare supply elasticities across systems and/or before and after law and regulatory changes. An example of using the LeChatelier Principle in empirical work is Griffin (1992) which finds that affirmative actions tend to lower firm supply responses.

We have not as yet made the step from elasticity to growth. Our tentative hypothesis is that more responsive supply elasticities tend to produce more growth, but that remains to be developed. What we suggest here is that an important and so far neglected difference between civil law and common approaches is that civil law is likely to make supply curves flatter.

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