NEITHER A BORROWER NOR A LENDER BE: AN ECONOMIC ANALYSIS OF INTEREST RESTRICTIONS AND USURY LAWS

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ABSTRACT

Interest rate restrictions are among the most pervasive forms of economic regulations. This paper explains that these restrictions can be explained as a means of primitive social insurance. Interest rate limits are Pareto improving because agents borrow when they have temporary negative income shocks -- interest rate restrictions transfer wealth to agents who have received those negative shocks and whose marginal utility of income is high. We assume that these shocks are not otherwise insurable because of problems related to asymmetric information or the difficulties inherent in writing complex contracts. The model predicts that interest rate restriction will be tighter when income inequality is high (and impermanent) and when growth rates are low. Data from U.S. states' regulations supports a connection between inequality and usury laws. The history of usury laws suggests that this social insurance mechanism is one reason why usury laws persist, but it also suggests that usury laws have had different functions across time (eg. rent-seeking, limiting agency problems within the church, limiting overcommitment of debts, and attacking commerce generally).

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I. Introduction

Restrictions on the taking of interest are among the oldest and most prevalent forms of economic regulation. Three passages in the Pentateuch explicitly forbid the charging of interest. In India (at the same early period) Vedic law controlled interest rates and condemned usury as a major sin.[1] Plato and Aristotle both viewed money lending as a morally questionable act. Dante placed the usurers of Cahors in the same area of hell as the denizens of Sodom. Shakespeare, reacting perhaps to his own father's time in debtor's prison, cast a negative view of borrowing in his most prominent plays (e.g., *The Merchant of Venice* and *Hamlet*).

Interest regulations are still with us in the late 20th century. Regulation Q, which controlled the interest rates on demand deposits, was only finally phased out in the early 1980s. A majority of states now have controls on the interest rates on credit cards; the senate passed a bill regulating the interest rates on credit cards (which did not become a law) in 1991. Many of the Southeast Asian countries (including Japan and Korea) have severely restricted interest rates. Most famous of all are the Islamic restrictions on lending at interest.

As wide ranging as these rules have been and remain, they are also potentially of great economic significance. The intrusion of government into the credit markets obviously creates economic distortions. Interest rate controls may limit the financing of capital intensive projects or trade; the controls also limit the ability of the credit markets to smooth shocks to income. The first cost of interest rate controls was generally recognized by moral arbiters (from the writers of the Talmud to Aquinas) who tried to create exceptions on usury laws for the financing of new projects. Weber and Tawney both argue that investment lost from usury restrictions stemmed economic growth. Baumol (1991) also stresses this important social cost of usury laws; he argues that the social norms conducive towards lending to entrepreneurs are a cornerstone of growth. The second cost of interest rate

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[1] Dicussion of Mauryan finance laws occur in Gopal (1935).

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controls (that these controls limit the ability of the temporarily poor to borrow) has not been as well discussed historically.

The costs of restricting interest rates are obvious. The benefits are more obscure. The most popular explanation of why these restrictions exist is that they benefited certain powerful borrowers. Ekelund, Hebert and Tollison (1989) argue that usury restrictions survived the middle ages because the Church, a prominent borrower, wanted to lower the price of goods it faced. It is certainly a valid argument that the purchasers of a commodity (in this case, credit) might want the community to keep the price somewhat lower than the competitive price. The ideal price for the borrower will, however, be non-zero, since the lender must still be induced to lend. Ideally, they will want the price of credit restricted to the monopsony level.

As much as we appreciate the view that social institutions are created by rent-seekers (like the medieval Church) who try to lower the prices they face and raise the prices they offer, we believe that there are many reasons to believe that usury laws had a more widespread appeal. After all, there was no medieval church in Palestine 1000 years before the common era. There was no medieval church in India 1000 B.C.E. or Babylonia a millennium before, but there were usury laws in both societies. More generally, usury laws are immensely common, and, for a rent-seeking theory to be generally applicable, one would have to argue that borrowers universally possessed more political power than lenders. We find this claim implausible at best. Furthermore, given the opportunities for the influential to engage in all sorts of rent seeking, it is surprising that this costly and indirect form of regulation would be such a common expression of rent seeking activity.

This paper takes a different approach and tries to justify usury laws as (under certain conditions) Pareto improving institutions. We believe that only an institution with significant social benefits could have existed for so long and in so many different places. Our goal is also to present a formal theory with enough comparative statics so that it can potentially explain the large variation across time and place in the strength and existence of usury laws.

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Our model of usury laws explains these regulations as a primitive means of social insurance. In the model, agents are faced with temporary, idiosyncratic income shocks. These agents are assumed to be unable to insure themselves through credit markets (or through sufficient savings)[2] against these negative income shocks. Agents can only respond to bad shocks by borrowing from their luckier neighbors.

Since agents know that they will be borrowing when their income is low and lending when their income is high, agents would like to redistribute income from the states of nature when they are lending to the states when they are borrowing. The marginal utility of income of an agent in the event that he is borrowing will be higher than the marginal utility of income to an agent in the event that he is lending. Agents would *ex ante* prefer an income transfer contingent upon being in the state of borrowing or lending. If a direct transfer is infeasible (perhaps because of informational or incentive problems), artificially low interest rates can also serve to transfer income. By guaranteeing that interest rates will be low, agents redistribute income between states of nature when they are rich to states of nature when they are poor.[3]

Our model gives conditions under which usury laws can act as an (admittedly imperfect) substitute for complete contingent markets. Essentially we need that (1) income shocks not to be completely permanent but to still represent a shock to long run wealth, and (2) the supply of loans to be relatively inelastic. In cases where income shocks are completely permanent, agents will not borrow when they receive negative income shocks. If the supply of loans is elastic, then much of the gains to the poor from lowering the interest rate will be offset by the losses they face in a lessened ability to borrow.

This model predicts that usury laws will be stricter when wealth inequality is bigger. It also predicts that usury laws will be looser (1) when the growth rate

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[2] There will be no storage in our theory – agents must consume their endowments are trade it with their neighbors.

[3] An alternative model that we do not address is that lenders had local monopoly power and that under those conditions limiting prices may be efficient. We believe that this may have been one rationale for usury laws, but these laws applied in many environments where no monopoly could have existed.

is higher, (2) when income shocks are more permanent and (3) when lenders are more powerful in society than borrowers. We find the comparative static on the growth rate even in a pure endowment economy. This effect would grow even stronger if, during high growth periods, the marginal returns to investment and thus the marginal social cost of investment lost due to usury laws were particularly high.

We test these comparative statics with data on U.S. interest rate laws from 1950 (a date chosen because it is modern enough for reliable data collection but old enough so that interest rate restrictions were still binding). We find that, even holding median income constant, poverty increases the restrictions on interest rates (as predicted by the model). This effect continues even when controlling for a crude measure of political power of the poor. The future growth rate is positively correlated with looser usury laws (again as predicted), but this correlation is extremely weak.

We also present discussions of usury laws in history. We discuss the evolution of the Biblical to Talmudic restrictions on usury and find that these restrictions seem at least to confirm the basic relevance of the model. The Biblical origins of usury laws strongly support our model of interest rate restrictions as primitive social insurance. The Jewish laws on usury, which seem to be motivated as income smoothing, are compared with the Socratics' (Plato and Aristotle mainly) views on usury. The philosophers are much less interested in usury specifically then they are in attacking all commercial activities.[4] We also look at the period where usury laws were greatly loosened in the post medieval period. Following Tawney (1926), we argue that economic growth (and the lessening of political power for borrowers) in Holland and Switzerland caused their societies to drop their restrictions on usury.

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[4]We find anti-commercialism much harder to rationalize than usury laws. Hopefully subsequent work will do a better job at explaining why commerce itself has been attacked so often in human history.

II. Model

This section presents a model of usury restrictions where usury restrictions provide a form of social insurance.[5] In this model individuals agree to a fixed interest rate before endowment shocks are revealed. The interest rate desired by society is below the free market rate so that individuals who receive negative income shocks will receive loans at less than the free market rate. This low rate distributes income from the fortunate to the unfortunate and cushions some of the endowment risk. At first, we assume that the single policy instrument is the state-mandated maximum interest rate. Later we will compare this policy instrument with the "first best" situation of complete social insurance and with the situation where the interest rate is determined by the free market.

In particular, we assume a three period model. In the period zero, the interest rate is set by the community to maximize expected social welfare. In period one, shocks to individual's endowment income are revealed. Agents respond to these shocks by consuming, borrowing and lending. We will not allow storage or any other form of physical investment in this economy.[6] In period two, agents repay their loans, consume the remainder of their incomes and perish. Agents maximize a time-separable concave utility function.

We will normalize the size of the total population to one and the first period wealth of the economy to one. There is no aggregate uncertainty, and the only shocks to this economy are revealed to agents in the first period. We let these shocks take the form of making one-half of the population "wealthy" and the other half of the population "poor." The first period endowment of the wealthy agents is I_1. The first period endowment of the poor agents is $1-I_1$. Total second period wealth of the economy will be $G \geq 1$ and the wealthy agents will receive GI_2. Poor agents in the second period will receive $G(1- I_2)$.

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[5]The idea that usury restrictions provide social insurance is far from new -- the original moral injunctions against interest justified these restrictions with insurance-style arguments. The formalization is, to our knowledge, new to the literature.

[6]If storage existed in this economy then 0% would be the lower bound that existed on interest rates, which might help explain why 0% is a particularly common interest rate across societies.

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We will be assuming throughout that $I_1 > 1/2$, $I_2 \geq 1/2$, and $I_1 > I_2$, so that an increase in either I parameter can be referred to as an increase in inequality.

Both wealthy and poor agents maximize:

(1) $U(C^i_1) + \beta U(C^i_2)$,

where $U(.)$ is a three times continuously differentiable function that is strictly increasing and strictly concave in its argument, where $i = W,P$ (i's index wealthy and poor agents' consumption). We will be considering situations where the interest rate ceiling is below the free market rate and, thus, where loan demand is greater than loan supply.[7] In that case the actual quantity of loans is determined by the willingness of the rich to lend. The wealthy agent's quantity of lending is determined by maximizing:

(1') $U(I_1 - L) + \beta U(GI_2 + RL)$,

which has first order condition:

(2) $U'(I_1 - L) = \beta R U'(GI_2 + RL)$, or $U'(C^W_1) = \beta R U'(C^W_2)$.

We assume that the second order conditions hold so equation (2) gives us a function $L(R)$ which determines the actual quantity of loans supplied in the community. We assume that there is no coercion of the wealthy so that this loan supply equation always gives us the total amount of loans available to the poor; we assume that these loans are then allocated equally across the poorer agents.[8]

Occasionally, we will consider a market clearing equilibrium. In that case a first order condition must hold for the poorer agents as well, or:

(3) $U'(1 - I_1 + L) = \beta R U'(G - GI_2 - RL)$, i.e. $U'(C^P_1) = \beta R U'(C^P_2)$.

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[7] We will be assuming throughout the paper that the demand for loans falls with the interest rate and the supply of loans rises with the interest rate. Both of these assumptions of the slopes are non-trivial as their are significant regions of parameter values for which the slopes move in the oppositie directions.

[8] Loan sharing across poorer agents is, of course, optimal in this model.

We will assume that the parameters are such that at free market interest rates, wealthy agents will want to smooth consumption between the first and second periods by lending a positive quantity to poorer agents. Likewise poor agents will want to smooth consumption by borrowing from rich agents. Starting from an autarky position, the rich will always lend to the poor as long as:

(4) $U'(1-I_1)/U'(I_1) > U'(G-GI_2)/U'(GI_2)$

As long as $G=1$, or if $U(.)$ is homogeneous of any degree, then this inequality follows from $I_1 > I_2$ and concavity. There is no social insurance function for usury laws when the poor loan to the rich, so we will assume that (4) holds and that the quantity of loans is always positive.

In period zero, we assume that agents in the community (or the benevolent social planner) will set R, the maximum interest rate, to maximize their expected utility:

(5) $V = .5[U(I_1 - L(R))+\beta U(GI_2+RL(R))] + .5[U(1-I_1+L(R))+\beta U(G-GI_2-RL(R))]$,

which is the expected welfare of every resident of the community as of time zero. Since rules are set at the beginning of time, before any heterogeneity is revealed, every member of the community shares a common objective function, V, and shares a common preferred maximum rate of interest. The derivative of (5) with respect to R is :

(6) $\partial V/\partial R = L'(R)[-U'(C^W_1)+R\beta U'(C^W_2)+U'(C^P_1)-R\beta U'(C^P_2)]$
$$+\beta L(R)[U'(C^W_2)-U'(C^P_2)]$$

times 1/2. From (2), $-U'(C^W_1)+R\beta U'(C^W_2)$ must equal zero, so (6) can be rewritten as:

(6') $\partial V/\partial R = L'(R) [U'(C^P_1)-R\beta U'(C^P_2)] + \beta L(R) [U'(C^W_2)-U'(C^P_2)]$.

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Equation (6'), the derivative of social welfare with respect to the legal maximum on interest, has an economic interpretation. The first term $((L'(R) [U'(C^P_1)-R\beta U'(C^P_2)])$ is positive as long as loans supplied rise with the interest rate $(L'(R)>0)$,[9] and as long as the interest rate ceilings binds so that the poor would like to borrow more than they can at the interest rate maximum. This term captures the fact that lowering the maximum interest rate causes a redistribution from the poor citizens' first period consumption to the poor citizens' second period consumption. This redistribution comes about because the level of loans supplied falls as the interest rate falls (as, by assumption, $L'(R)>0)$; this redistribution is undesirable because poor agents are credit constrained and would like to shift income from the second period to the first period $(U'(C^P_1)>R\beta U'(C^P_2))$. This redistribution, captured in the first term of (6') is the social cost of reducing the maximum interest rate.

The second component in (6'), $\beta L(R)[U'(C^W_2)-U'(C^P_2)]$, represents the social benefit of lowering interest rate maxima. This second term reflects the income redistribution from the rich to the poor that comes from lower interest rates. Since the poor citizens have a higher marginal utility of consumption $(U'(C^W_2)>U'(C^P_2))$ this effect is desirable. The socially optimal interest rate occurs when (6') equals zero, i.e. when the social benefit of a further reduction in the maximum interest rate is exactly offset by the marginal social cost of that reduction.

At the market-clearing equilibrium, the first component of (6') equals zero. At that equilibrium, the poor consumers are not credit constrained and they do not want to borrow more than they have at the free market rate. Only the second component of (6'), or:

(6") $L(R)\beta R(U'(C^W_2)- U'(C^P_2))$,

remains. This term will be negative under all circumstances from the concavity of U(.), because $I_2 \geq 1/2$ and we are only examining the situation where the rich lend positive quantities to the poor (i.e. $C^W_2=GI_2+RL>G-GI_2-$

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[9] As mentioned earlier, L'(R) need not be positive. However, around the social optimum it must be negative for (6') to equal zero, which it must when (5) is maximized.

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$RL=C^P_2$).[10] Because there is a gain from redistribution, there is always a gain from bringing the interest rate below the free market rates. The crucial ingredients of this result is that the richer agents are the lenders and that U(.) is strictly concave so that redistribution from agents with positive wealth shocks to agents with negative wealth shocks is socially optimal. If these conditions did not hold and, for example, the rich were borrowers, then the social optimum would be to set interest rates above the free market rate so that the poor lenders could receive an income transfer.

Figure 1 shows the basic setup for an exponential utility function. Here we have graphed four functions. The willingness of the rich consumer to lend is already incorporated into these functions. The function labeled Loan Value gives the marginal utility of first period income for the poorer consumer. This function declines with the interest rate, because as the interest rate rises the rich consumer lends more and first period marginal utility for the poorer consumer declines.

The function labeled Cost C gives the marginal cost to the borrower of an extra loan (i.e. $\beta RU'(C^P_2)$). This function rises with the interest rate because R is rising and because C is falling as loans rise. The intersection of Cost C and Loan Value gives the free market interest rate where the poorer consumer is indifferent between borrowing and lending.

Cost A gives the marginal utility of the second period income for the poorer consumer scaled by the interest rate and by loan elasticity (i.e. $\beta(R+L/L'(R))U'(C^P_2)$). In that curve higher interest rates raise the cost both because they raise the interest rate on the marginal loan and lower second period consumption but also because a higher interest rate raises the amount the consumer has to pay on all preexisting loans. Cost A will always lie above Cost C because Cost A incorporates how higher interest rates on the marginal loan will hurt the borrower by raising costs on all pre-existing loans. This Cost A is the monopsony borrower's cost of borrowing and represents the interest rate that would be charged if the borrower had all the political power.

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[10] As mentioned earlier, we are essentially assuming that the rich will be lending to the poor. Sufficient conditions for this are that $I_1 \geq 1/2$, $I_2 \geq 1/2$ and G is close to one.

Cost B is the cost function used when estimating the social optimum. Cost B is the monopsony cost of capital but it is reduced because the benefits to the borrower of a higher interest rate are incorporated in the cost. Cost B will always lie between the monopsony borrowers cost of capital and the free market cost of capital.

In fact there are also a variety of comparative statics on the socially optimal rate of interest that can be derived by simple differentiation. In the appendix we prove the following proposition which gives the comparative statics on the socially optimal interest rate (usury restriction) gained from taking the derivative of equation (6'). In general we are interested in whether a parameter shift moves the function in (6') up or down. Since the function in (6') moves down with the interest rate (as required for second order conditions to hold), a parameter change causing an upward shift in the function in (6') must mean that the interest rate falls so that the equality still holds.

Figure 2 shows a comparative static which holds in many cases but which will not be proven by us for a general utility function. In Figure 2 we have increased the linearity of the basic utility function. In that figure, Cost B comes closer to Cost C causing the interest rate to rise (relative to the free market rate of interest). More linear utility functions make it more difficult to induce the wealthy to lend so the interest rate must rise. In the graph this effect works by raising the marginal utility of consumption for the rich closer to the marginal utility of consumption for the poor. This closening means that incorporating the rich's utility into costs means that Cost B comes closer to Cost C.

Proposition 1: As long as (1) second order conditions are satisfied, (2) loans supplied by the rich are nonnegative and rise with the interest rate ceiling, and either (3a) $U'''(X)$ is sufficiently close to zero (for all X), or (3b) G is sufficiently close to one and $U'''(X) \leq 0$ or (3c) G is sufficiently close to one and the interest rate ceiling is sufficiently close to the free market equilibrium interest rate, then the optimal interest rate ceiling falls with initial inequality (I_1). Furthermore, when conditions (1), (2) and (3a) are met and when (4)

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$\beta R^2 > 1$, then the optimal interest rate ceiling rises with the growth rate and rises with second period inequality.

Figure 3 shows the comparative static on initial inequality graphically. Low degrees of initial inequality mean that the marginal utility of the wealthy is close to the marginal utility of the poor. As in the case of low risk aversion, this higher marginal utility for the wealthy (in comparison to the marginal utility of the poor) means that incorporating the wealthy's concerns into the maximization problems lowers the costs of high interest rates significantly.

The comparative static $\partial R^*/\partial G \geq 0$ (found only under stringent conditions) means that the interest rate ceiling is rising in the growth rate of the economy. The first component of (6') does not move much with initial inequality. Less initial endowment for the poor raises $(U'(C^P_1) - \beta R U'(C^P_2))$, but the gap falls because lending rises with initial inequality -- this lending both causes $U'(C^P_1)$ to fall and $U'(C^P_2)$ to rise so it narrows the gap. The conditions in the proposition guarantee that the lending effect is larger than the initial inequality effect. The second term in (6') falls clearly with initial inequality. More lending widens the gap between the marginal utility of the rich in the second period and the marginal utility of the poor in the second period. More lending also means that L(R) rises.

Figure 4 shows that a higher growth rate makes all of the costs of borrowing lower. As growth rates rise, the marginal utility of consumption in the second period falls; and as it falls, the willingness to pay for loans today also rises. The free market interest rate and the socially optimal interest rate both rise as this willingness to pay rises.

We also find that $\partial R^*/\partial I_2 \geq 0$ under fairly stringent conditions. Higher inequality in the future means that the wealthy have less desire to lend money. The gap between first period marginal utility of income for the poor and second period marginal utility of income for the poor can narrow if this lending effect dominates the straight income inequality effect on second period marginal utility of income. That effect occurs only rarely, and we found it easier to make the assumption so that the changes in the first term of (6') were negligible. The second part of (6') will fall with second period

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inequality as long as the negative effect of second period inequality on loans dominates the positive effect of second period inequality on the gap between the marginal utilities of income for the poor and the wealthy in the second period.

There are natural interpretations of these comparative statics. We expect interest rate restrictions to be tougher in stagnant economies where growth is low. In this model, that effect occurs because of a lower marginal utility of income for the wealthy in the second period. In more complex models, where growth is endogenous, where money was invested in physical capital, then growing economies would have the highest benefits from physical investment so the social costs of restrictions would be higher in growing economies.

The inequality connections tell us that as the amount of overall inequality in the economy rises, the gains from redistributing through income restrictions also rises; but income inequality only acts to make usury restrictions more stringent if endowment shocks do not repeat over time. The wealthy must have an incentive to invest their endowment; that incentive will disappear if the rich agents' endowments shocks persist perfectly. If the income inequality is totally permanent, then lending, and the use of income restrictions, will disappear. The most stringent interest restrictions will occur in economies with high degrees of wealth inequality but with little permanent income inequality.

Extension to a Rent-seeking Setup

Here we include a new population at time zero. Here we assume that as of time zero that there are two groups of citizens -- those who have observed their income shocks, and those who have not observed their income shocks. We assume that measure N of the population have observed their income shocks.[11] Now we know that there will be conflict within society over the interest rate.

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[11]Alternatively we could think of the population at time zero as incorporating old citizens, who know if they are borrowers or lenders, and young citizens, who have yet to experience their income shocks, so that we have one piece of an overlapping generations setup.

The presence of an informed section of the populace means that there are three groups in the population: the uninformed (or the young), the informed rich and the informed poor. The Pareto problem now depends on the relative weights given to these three groups. We assign Pareto weights of λ_U, λ_W, and λ_P to the uninformed, wealthy and poor citizens respectively. With these Pareto weights the new social planner's problem becomes to maximize:

(4') $(1-N)\lambda_U(.5(U(I_1-L(R))+\beta U(I_2+RL(R)))+.5(U(1-I_1+L(R))+\beta U(G-GI_2-RL(R))))+N(.5\lambda_W(U(I_1 - L(R))+\beta U(I_2+RL(R))) + .5\lambda_P(U(1-I_1+L(R))+\beta U(G-GI_2-RL(R))))$.

Taking comparative statics off of this equation we prove in the appendix that:

Proposition 2: The optimal interest rises with the political power of the wealthy (λ_W) and falls with the political power of the poor (λ_P). If $\lambda_W > \lambda_P$, then an increase in the power or number of the young (1-N) lowers the interest rate ceiling. If $\lambda_W > \lambda_P$, then an increase in the power of the young (or ignorant) lowers the interest rate ceiling. If $\lambda_W < \lambda_P$, then the comparative statics on the number and political power of the young are reversed.

The first set of results are fairly intuitive and tell us that the interest rate moves with the political power of borrowers and lenders. The set of results on the number (or political power) of the ignorant are slightly more interesting. The intuition is simply that there are two reasons why agents want interest rate ceilings (1) rentseeking and (2) social insurance. As long as there are some informed agents, the interest rate ceiling will diverge slightly from its perfect social insurance rate. As the number or political power of the uninformed (or more broadly, those expecting income shocks) rises, then the interest rate ceiling will move back towards its optimal social insurance rate. This proposition tells us that as shocks and income streams become more predictable, i.e. as the number of the informed rises, we expect interest rate restrictions to become more of an outcome of rentseeking and less a form of social insurance. In times of high uncertainty, interest rate restrictions will be more often a piece of social insurance.

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Comparison with Perfect Social Policy

In this section we return to the basic model and examine the value of interest restrictions more thoroughly. While we have proven that limiting interest rates is optimal when other forms of risk sharing do not exist, we have not given any indication about how useful interest rate restrictions are in eliminating risk to individuals. This question both shows the comparative statics with some functional forms and also shows a case when interest rate restrictions are an ineffective means of social insurance as well as a case when interest rate restrictions are effective in eliminating individual risk.

We are interested in comparing interest rate restrictions with a first best perfect risk sharing model. In that model, in time zero agents perfectly insure themselves against becoming wealthy or poor and receive the same income (1/2 and G/2) in either case. We believe that the standard adverse selection and moral hazard problems may make that risk sharing infeasible, but for our purposes we are only interested in whether interest rate restrictions (which are free from these moral hazard or adverse selection problems) come close to the first best.

We have considered two utility functions for this exercise: the first utility function is the logarithmic function. Using parameter values documented in Table 1a, we can see that there are extremely large gains from risk sharing but little gains from limiting interest rates. We compare four possible scenarios: (1) autarky (no borrowing -- which is always utility normalized to zero), (2) free market borrowing and lending, (3) interest rate restrictions, and (4) perfect social insurance.

Table 1a shows the free market lending and optimal interest rates both serve to increase social welfare more than 50% of the distance between complete autarky and free markets. Table 1a also shows that the optimal interest rate moves significantly with changes in parameter values and that these movements are in the manner predicted above. More initial inequality causes the optimal interest rate to fall. More second period inequality causes the optimal interest rate to rise. More growth causes the optimal interest rate to rise as well. These comparative statics work for the free market interest

rate as well. However, never does the interest rate restriction manage to move social welfare anywhere near the first best.

The failure of interest rate restrictions to create much social insurance in this case occurs because of the logarithmic utility function. With logarithmic utility, lending is highly sensitive to changes in the interest rate (the elasticity is minus one). Attempts to artificially lower the interest rate quickly choke off lending so that interest rate restrictions accomplish less for social welfare.

To show that there are conditions under which interest rate restrictions are good social policy, we consider a second utility function. The second utility function is piecewise linear:

(7) $U(X)=ax+bMin[x-\underline{x}, 0]$,

with a and b greater than zero. This piecewise linear function induces some concavity into the utility function, but allows us to show conditions under which usury restrictions are efficient social policy. With this utility function (under certain parameter values) the free market rate of interest will be $1/b$ as long as the consumption of the poor is less than $\underline{x}$ in both periods and the consumption of the rich is more than $\underline{x}$ in both periods. However if $I_2<\underline{x}$ it will be possible to set the interest rate at $b/a\beta$ and still have positive quantities of lending. The reasons why this utility function yields large social gains from lending policy is that (1) lending quantities are fairly inelastic over certain ranges of lending (the elasticity is zero in many places), and (2) there is a large difference in the marginal utility of income for the poor and income for the rich. Two features are necessary for usury laws to be highly effective: (1) that the rich must need to save (here to avoid consumption dropping below $\underline{x}$) and (2) that the poor benefit a lot from lower interest rates.

Table 2b shows the results for this piecewise linear function. Again the comparative statics agree with those in the model. However, we see here that the optimal interest rate significantly improves the situation over the free market interest. Interest rate restrictions eliminate more than 33% of the distance between the free market equilibrium and the first best under several sets of reasonable parameter values. Interest rate restrictions eliminate more

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than 50% of the distance between the autarky social welfare and the first best risk sharing social welfare.

Extension A -- Inflation

There has been no discussion of inflation in this model because all values discussed herein have been real. However, it is obvious that there is a major historical interaction between inflation and interest rate ceilings. The simplest way to incorporate inflation into the model and to think about the nominal interest rate ceiling is to ignore all other monetary phenomenon and to note that changes in the inflation rate should not affect the real interest rate ceiling. If they do change this ceiling in practice, then the interest rate is moving from its first best rate, in the socially constrained optimum. For the first best to be maintained, the nominal interest rate ceiling must move with inflation. Fixed nominal interest rate ceilings will become less appealing in periods of highly volatile inflation, since these ceilings will frequently be far from the social optimum.

Extension B -- Other Growth Projects

Another simple extension to the model, alluded to above, would be to give all agents access to a technology that transformed one unit of output in the first period of the model to K units of output in the second period of the model. Since no one would lend if the interest rate fell below K, this amount would provide a natural floor to the interest rate restriction. In scenarios when storage (i.e. K=1) is the only technology of this kind available, then we would expect to see (as we do) interest rate restrictions of zero to occur commonly.

A richer treatment of growth projects is beyond the scope of this model. There are however some simple implications of the model for interest rate restrictions when loans are related to new project financing. Obviously there will be little social welfare gains from limiting the interest rates that can be paid on new projects themselves. However, any attempt to have two tiered interest rate restrictions where project loans occur at a higher rate will mean that no one will loan at the lower rate to consumers (except if there is default

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risk see below). As a result, in many situations, a single interest rate restriction will have to exist. The only change will be that in the presence of new project financing, the interest rate restriction will be higher since there is a greater social cost (coming from neglected new projected) of artificially stemming interest rates.

Extension C -- Default Risk

We have so far ignored the issue of default risk and assumed that lenders can always recollect their loans. In the presence of default risk of the form that sometimes borrowers simply do not repay any of their loans, the willingness of the rich to lend will fall and the interest rate restrictions will have to rise to keep the same quantity of loans.[12] Highly risky environments make interest rate restrictions more likely to stop lending.

However, when there is default risk heterogeneity across individuals, interest rate restrictions may play a second function of stopping high risk loans from occurring. If default has social costs either in court costs or because bankrupt individuals become wards of the state[13] then the state has an interest in stopping high risk loans. These risky loans do not incorporate the social costs of default as they are made. This elimination of high risk loans may be a second function of interest rate restrictions.

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[12] A more complete model would allow for the partial default that is far more common than complete default.

[13]This type of extreme is not necessary. If highly indebted, or poor agents, simply perform fewer unpaid services for the community than better off citizens, then the state may want to ban highly risky loans.

III. Evidence from U.S. Consumer Finance Laws in 1950

Usury laws have a long history in the United States and have varied significantly over time and space. The U.S. has restricted (and does restrict) and wide range of financial transactions. We have restricted our investigation to looking across states at laws affecting consumer financing in the 1950s. There are two primary reasons for this decision (sketched above): (1) our theory concerns consumption based on lending only, not production oriented lending and (2) consumer finance laws have a uniformity to them that makes interstate comparisons easy. We have looked at 1950 because that date is late enough to have good data availability and early enough so it is before the financial innovations of the 1960s that made many consumer lending regulations obsolete.

Consumer finance (and, in fact, most usury laws) are written by the states. However, most consumer finance regulation is based on the Uniform Small Loan Law of 1916. This law greatly influenced almost all states which adopted versions of this law. For our purposes, the interesting part of the adoption is that the maximum interest rate allowed under the laws differed across states generally from 6 to 12%. These rates were significantly below the 3 and 1/2 % per month rate suggested in the Sage Foundation recommendation and it seems that these rates were binding in many cases.[14] Since there is a great deal of variation in these interest rates across space, in this section we see if the comparative statics from the previous section predict the movements in the usury restriction.

It is worthwhile considering how stringent these rate restrictions were. In 1950, the treasury bill rate was 1.218% which was a pegged rate during that period. The commercial paper rate was 1.45% during that year. (As a comparison Table 2 shows those rates in 1991 and shows that today the gap is still small). If we take 1.45% as the risk free cost of capital, this means a six percent interest rate cap will eliminate any lending to borrowers whose default risk is over 4.3%.[15] This default rate (4.3%) is approximately the

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[14]Little default risk is needed to make 6% a binding interest rate.
[15]This default rate again assumes counterfactually that defaults are 100% of the loans.

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default rate that justifies the gap between the prime rate (8.46%) and the "risk-free" treasury bill rate in 1991.

Data Description

Our interest rate restriction data comes from Barrett (1952) who compiled all of the states' consumer finance laws. Our primary dependent variable is the maximum interest rate allowable on written contracts. Five states had no interest rate restriction. Rhode Island had an interest rate restriction of 30% per annum (effectively not a restriction, although this was the restriction recommended in later Sage Foundation recommendations). For those states we used the 12% per year rate, which was the maximum rate allowed in all of the other states, as the interest rate regulation.[16]

From this report we also included the "legal rate of interest." This interest rate was the default rate of interest on those contracts that were written without an explicit interest rate. This rate represents an alternative measure of interest rate restrictions. It also represents the law's estimate of an average interest rate in the state.

Our other data for this exercise come from the county and city data book (for variables from 1950 or later) or from the Statistical Abstract of the U.S. for 1930 income variables. Our primary variables are (1) % of population living in substandard housing in 1950, (2) median years of schooling, (3) income growth 1930-1950,[17] and (4) Democratic governorship in 1950. The first two measures are meant to capture poverty or income inequality in 1950. The third measure is meant to capture the growth rate of income. The third measure is meant to capture political forces that might favor borrowers over lenders (Republicans have historically been more interested in lender's rights than democrats).

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[16] Dropping those obervations made little qualitative difference to our results. Precision fell, but the point estimates were relatively constant.

[17] Our income growth is the difference between the log of median income in 1950 and per capita income in 1930. Data availability required this combination.

The means and standard deviations of these variables are given in Table 3, Panel A. The mean of the maximum legal rate of interest was 8.67%. Our two poverty measures are dilapidated housing and schooling. We prefer both of these measures to income based measures because these measures are based on physical units and are free of the local price index problem. The share of the state's population living in dilapidated housing ranged from 14% to 74.8% with an average of 42.7%. The median years of schooling in the state ranged from 7.6 years to 12 years with an average of 9.5 years.

Our income growth averaged 101.7%[18] and ranged from -41.6 to 49%. 23 (out of 48) of our states had Democratic governors. Finally employment growth from 1950 to 1980 ranged from 1% to 180% with an average of 53.9%.

Correlations

The correlations are given in Table 2, Panel B. All of our measures of interest are correlated with the maximum legal rate of interest; none of our measures are correlated with the default legal rate of interest, which suggests to us that these effects are working more through demand for usury restrictions rather than on the pure demand for credit. The housing measure of poverty and the schooling measure of poverty are both strongly related to tighter usury restrictions. This finding is particularly surprising since defaults should be more prevalent in states with low income; this default effect (high poverty means more defaults) makes the net of default maximum interest law even lower in high poverty states.

The Democrat dummy works as expected with more Democratic statics having tighter usury restrictions. The income growth effect is particularly weak but also supports the model. We also found it interesting that the maximum legal rate of interest is strongly positively correlated with the states' later growth. States with more lenient interest regulations had greater employment growth over the post-war period.

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[18]Over the twenty year period which included the great depression.

Regression Results

Table 3 gives our results in regression format. Regression 1 regresses usury laws on percent living in housing poverty with no other regressors. Regression 2 repeats these results, controlling for the share of families earning more than $5,000 per year, so that percent living in deficient housing measures inequality more than the poverty of the state. The significant correlation between poverty and usury restrictions survives this control.[19] This result is economically as well as statistically significant. A one standard deviation increase (16.4%) in the population living in substandard housing lowers the maximum interest rate by 1.2%, or .56 of a standard deviation.

Our third regression includes a Democrat variable and the lagged income growth of the state. The democratic control is meant to capture the political power of the poor (albeit poorly). The income growth measure is meant to capture the growth rate of income in the model. Neither a Democrat nor income growth has a significant effect on the maximum interest rate when we have controlled for housing poverty. These results do not confirm our comparative statics but they do suggest that the inequality results are capturing more than the political enfranchisement of the poor.

Regression four includes the median years of schooling as an alternative measure of inequality (again since we have held wealth constant). This median years of schooling effect is particularly strong. The t-statistic is over four, and a one standard increase in schooling (1.095 years) increases the maximum legal rate of interest by 1.5% (.7 standard deviation). This result can be interpreted as a further indication that the maximum rate of interest is trying to deal with social inequality. An alternative interpretations is that some states have long horizons and some states have short horizons. Long horizon states invest in schooling and have free markets conducive to long term growth. Short horizon states have little investment and also more redistributive financial regulations.

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[19]However the overwhelming correlation (83.1% plus) between housing poverty and this other income measure makes us doubt the robustness of these results.

Finally regression (5) suggests that financial regulations are correlated with long term state growth. We find that those states with more lenient usury laws grew faster in the post-war period. This result does not survive including more controls so usury laws should not be seen as a major determinant of state growth. However, the finding does suggest that lenient interest regulations were one part of the regulatory environment of growing states.

Overall the empirical results suggest that income inequality and poverty are linked to maximum rates of interest. We found that this result holds for both controlling for the political situation in the state and controlling for the wealthy in the state. The maximum rate of interest seems to be correlated with later employment growth in the state.

IV. Biblical and Talmudic Interest Restrictions

The idea that usury laws are a piece of social policy meant to redistribute income between rich and poor is hardly new. One piece of evidence suggesting that this social policy role was a major aim of usury restrictions is the excess of verbiage to that effect found in the original biblical and talmudic sources of interest rate restrictions. This section of our paper recalls some of the major pieces of biblical and post-biblical writing on usury laws.[20]

The Biblical Origins

The ban on interest occurs three times in the five books of Moses. Talmudic biblical commentary tended to place particular significance on the importance of thrice repeated restrictions (as in the case of the ban on milk and meat). In any case, the repetition does suggest the important role of this restriction in Israelite society. The first appearance of the ban is in Exodus 22:25, where it is written that "if you lend money to any of my people with you who is poor, you shall not be to him as a creditor and you shall not exact interest from

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[20]We will not cover the Indian or Vedic usury laws. Rangaswami (1927) describes many of these laws and the admonitions given by the Indian political sage Kautilya. These rulings are similar to the western regualations in that they specifically restrict interest on loans to the poor.

him." There are two important features of this ban as written here (1) it only applies to the poor and (2) it only refers to loans to "my people," which was initially interpreted as the Hebrews. The verse immediately follows an admonition not to wrong widows or orphans which further suggests that the ban on usury is a form of social policy. The verse precedes a ban on usage of garments as collateral.

The second appearance of the ban on usury is in Leviticus 25:35: "And if your brother becomes poor, and cannot maintain himself with you, you shall maintain him ... Take not interest from him or increase, but fear your God; that your brother may live beside you. You shall not lend him your money at interest, nor give him your food for profit." Once again the ban on usury is clearly connected to consumption loans related to poverty. In this case, we have the ban on usury restricted to brothers (perhaps meant metaphorically) and joined with a general ban on profits. Anti-usury laws were often connected with a general distaste for commerce (as in Aristotle). This is the first time this connection occurs in the Bible.

The final appearance of the usury ban, which is its most cited form, is in Deuteronomy 23:19: "You shall not lend upon interest to your brother, interest on money, interest on victuals, interest on anything that is leant for interest. To a foreigner you may lend upon interest ..." This passage extends the ban to any time contingent contract. No interest may be taken on any form of loan. The passage also eliminates the poverty requirement. In this (possibly later written) biblical sequence, no interest was allowed to be charged to "brothers" regardless of their economic status. Here, however, it is also made clear that to "foreigners" interest is certainly acceptable.

The usury restriction in biblical thought seems to have applied to all forms of loans between Hebrews, but primarily those loans that were related to temporary elimination of poverty. The biblical passages seem to mirror the argument in the above model. Interest rate restrictions are connected with social redistribution to the poor within the relevant group of the community. Given the results on the efficiency of usury, we must ask whether the elasticity of loans was high or low during this period. Highly elastic loan

supplies (as in the log utility case) makes this policy extraordinarily inefficient.

One contributor to elasticity -- the presence of efficient means of saving other than consumption loans -- seems to be relatively absent in the biblical economy. Finley (1974) suggests that prior to the Greek mercantile empire money lending was almost exclusively for consumption purposes. More importantly, how much did income rely on saved wealth and how much on current income? The more that saved wealth was a crucial ingredient in consumption, the less able were the rich to respond to lower interest rates by consuming in the first period. The evidence from the pre-modern economy suggests that the wealthy relied to a large extent on the returns from their savings or physical capital and little from their ongoing enterprises. This suggests that the earlier consumption was not that much of an option.

In general, commentaries on these sections have generally accepted the simple view of usury restrictions as a form of charity. Maimonides (1956) writes that "the laws concerning the relation between lender and borrower will be found, on being carefully examined, to be nothing but commands to be lenient, merciful and kind to the needy." Levine (1987) emphasizes that the Halakhah provides a mandate for social justice and he connects this mandate with Talmudic regulations against interest and complete profit maximizing behavior.

Neusner (1990), to our view somewhat mistakenly, sees in the Talmud a bias against even "the appearance of usury or profit." He points in particular to a passage in the Mishnah where an individual selling and then redeeming his house within a 12 month period is indicted for usury. To our eyes, this passage has simply attempted to eliminate the possibility that a trade of the use of property for a loan (which is implicitly a form of interest payment) occurs. This passage by no means suggests to us a widespread anti-profit bias.

Comparison with Hammurabi's Code

We believe that the Biblical mandate against usury was intended as a form of social insurance for temporarily down and out members of the community.

The biblical passage does not seem to represent a desire for full scale redistribution within the community. Even less so does the Biblical mandate suggest a full scale anti-commercial bias (as the Greek anti-commercial laws did). Many of the great Patriarch's were shrewd traders (Jacob in particular) and little is said against mercantile actions generally.

The Biblical mandate should be compared with the discussion of interest rates in Hammurabi's code. In that document, there is a segment allowing debtors who have suffered do to an act of nature to delay repayment of debts. Furthermore, Hammurabi's code limits the extent to which individuals can commit their assets as collateral (as does Halakhah). Hammurabi's code also emphasizes that debts should be made in the presence of witnesses. However, there is no explicit restriction on interest rates.

So, despite the extensive Hammurabic treatment of interest charges, there is no specific usury regulation in this earlier document. Johns (1904) provides an extensive discussion of loans in Assyrian and Babylonian society. The loans he finds documented have a strong variety of interest rates ranging from interest-free loans to loans at 400% interest per year. Interest rates are specifically distinguished from penalty rates which apply to debts that are past due. The primary moral control of Babylonian society clearly does not act to eliminate interest rates, probably because there is little concern for social insurance issues in Hammurabi's code. There is little reason to understand why the social insurance role of usury laws was less needed in Babylonia. We suspect that the differences between Mosaic and Hammurabic interest rate restrictions came about because codes of this nature were harder to enforce in the bigger and less homogeneous Babylonian society.

Related Biblical Prohibitions

Restricting interest was only one of the Bible's major restrictions on intertemporal lending contracts. An entire series of restrictions concerns various forms of collateral which were not permitted. Immediately after the usury restriction in Exodus, it follows that: "if you ever take your neighbor's garment in pledge you shall return it to him before the sun goes down." This one-day restriction on garment pledges is repeated in Deuteronomy as well.

The restriction on collateral seems also to be a form of reducing the effective interest rate either because the borrower can renege on the loan more freely or because giving the borrower the use of the pledge was a form of interest payment.

The pattern on forms of collateral also appears in the Jubilee year restrictions. In the Jubilee Year (which happened every fifty years), property sold (and in particular sold under duress) was returned to its original owner. This Jubilee Year restriction made, in effect, all land sales leaseholds but more importantly it also indicated, perhaps, an attempt to lower the ability of the poor to alienate their future earnings for current consumption. Since the poor could not actually sell their land, this restriction may have (1) raised the price of land the poor could receive (by reducing aggregate supply of land on the market) and (2) limited the extent of commitments the poor could make.

This goal of the Jubilee Year -- the limit on alienation of future rights -- is also an element of the usury laws which, in a sense, prevent a degree of future impoverishment. Perhaps one goal of the biblical restrictions was to make sure that agents did not reduce themselves to a level of poverty where they would be complete burdens on the community. In the Hebrew community, agents could no longer fulfill many of the basic social and religious obligations if their poverty became too extreme.[21] The rise of usury laws, and other restrictions, designed to stop agents from overcommiting themselves can then be explained by the rise of social responsibility required by Mosaic law.

We discussed earlier in the theory section that one purpose of interest rate restrictions might be to limit the amount of default. Here in particular we get a sense that the Bible is trying to limit the extent to which individuals end up as burdens on society because of default on excessive debt. The earlier

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[21]A similar argument can be made for why slavery is also biblically forbidden for Israelites who have become destitute. Once again, the most basic economic reasoning would tell us that the poor would be better off if they had the option to sell themselves into slavery. Perhaps these actions were forbidden (1) to keep the price of labor higher so that again the state acts as a monopolist for the poor, and (2) because once they became slaves, the poor could not be counted on to fulfill their obligations in society. Since early Judaism relied on a fair amount of communal services, excessive debts or enslavement created circumstances where some individuals were unable to carry out their commitments to society.

Hammurabic code had similarly tried to limit the extent to which debtors could overcommit their assets. In any society where extreme poverty creates a negative externality on society, then extreme risk-taking will be inefficiently overused and society will try to lesson the occurrences of high risk debt, perhaps by limiting the interest rate.

This default-based explanation of the difference between the Mosaic codes and earlier regulations on borrowing emphasizes the different costs bankruptcy imposed on the two societies. In Mosaic society, bankrupt citizens would have (1) been unlikely to fulfill their social obligations and (2) been a burden on the welfare system of the community. In earlier societies which had fewer quasi-voluntary social obligation and less of a social welfare system, the gains from eliminating bankruptcies would have been lower.[22]

Talmudic Extensions and Discussion

The central document of the Talmud is the Mishnah which was written between 100-250 C.E. based on Rabbinic rulings over that period and the two hundred years beforehand. Lending, and interest rates, are extensively discussed in the Mishnah. However, many other areas of lending (e.g. liability for borrowed goods, or when money changers can reuse coins deposited with them) are also treated. The Baba Mesia 5:1-5:11 deals directly with the problem of interest.

Baba Mesia 5:1 begins by stating that usury can occur in loans of money (denars) and loans of goods (wheat). It also suggests that certain types of commercial enterprises (speculative trading in wheat) are morally equivalent to usury. Finally, the interest rates described as usuries are 20% and greater (over an unspecified time period).

The Mishnah seems particularly concerned with eliminating various types of loopholes to the usury restriction. This concern surely represents Rabbis rulings against attempts by lenders (and borrowers) to avoid the anti-usury

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[22]This argument also explains the Judaic dislike for gambling.

restriction. Baba Mesia 5:2 forbids providing free longing to creditors (since it is a form of interest payment). Baba Mesia 5:11 forbids presents given to lenders or, most interestingly, interest in the form of insider information. It seems that the Rabbis had handled cases where lenders were paid for credit by information about future trade developments.

The Mishnah also rules quite clearly on the applicability of these laws to transactions with Gentiles. Baba Mesia 5:6 clearly allows both borrowing and lending to gentiles at interest. This limitation of the restriction is perhaps the strongest indication that lending at interest was not seen as intrinsically immoral by the Rabbis. Rather, lending at interest was only unacceptable when it was practiced towards individuals inside the social contract of the Torah. Lending at no interest is not required to those Gentiles who are not part of the arrangement.

Another development in the Mishnah is the distinction between production-oriented loans and consumption-oriented loans. Baba Mesia 5:8 allows the lending of wheat for seed (i.e. production) but not for consumption. Baba Mesia 5:4 even allows seed money for store owners in exchange for a share of the store owners' profits, as long as the store managers receives wages as well as his profit share. Already the Mishnah seemed to realize that restrictions on production based lending could be extremely costly.

A final primary emphasis of the Mishnah in loans (as in many transactions) is the importance of witnesses. As in the Hammurabic Code, the system required a need for formally signaling indebtedness. Witnesses, and the strong Rabbinic court system, served to lessen the transaction costs involved in basic lending (a strong argument against Neusner's view, which is discussed below, that the Rabbis were Aristotelian anti-commercialists).

The Babylonian Gemara (which is an extensive discussion of the Mishnah) greatly expands these rulings. The Gemara deals with some of the more difficult questions of interest. If loans are in goods, or other currencies, is it interest if prices change at the point of repayment? The Rabbis also confused the prohibition on dealing with Gentiles. Some discussions suggest only that

Jews have priority for interest free loans, not that Gentiles may charge interest on loans.

The Usury Prohibition in Hellenic and Christian Pre-Reformation Society

Early Judaism generally confined the obligation on usury to Jews. In some phrases it almost seems as if the restriction was held only to close family members. In general, this ban of usury on the tight-knit community supports the notion that usury laws provided a way of the group insuring itself. However, later Jewish thinkers, and, of course, Hellenic and Christian scholars extended the usury restriction to all of the larger groups (such as the Greeks or all Christians).

The Greeks

The Greeks, however, had their own anti-usury strand of thought which seems primarily part of Socrates' intellectual legacy. The Torah's prohibition against usury, which would eventually form the basis of Christian and Muslim bans on usury existed at the same time as a Greek philosophical opposition to lending money at interest. Aristotle writes in his politics that "very much disliked also is the practice of charging interest; and the dislike is fully justified, for the gain arises out of currency itself, not as a product of that for which the currency was provided." Aristotle argued that money-lending was the "most" unnatural form of production available.

This Aristotelian view of interest is based on a worldview where there are natural and unnatural forms of producing goods. Natural forms of production are those that produce goods from nature; unnatural forms are those that produce income from trade or moneylending -- methods that do not directly produce goods. It seems possible that Aristotle's anti-interest views were either (1) based on metaphysical arguments and unconnected to maximizing social welfare or (2) based on some notion where money lending is rent-seeking, not production, and simply based on a confusion about how social welfare is helped through lending and borrowing.

Plato similarly disliked usury. *The Republic* not only bans lending money at interest, but, in fact, is opposed to all credit transactions except those undertaken for purely friendship reasons. Trever (1916) provides a superb recounting of Platonic (and Greek) economic thought. Most of this thought seems firmly entrenched in a deeply anti-interest, and anti-commercial, view of the world.

Neusner attempts to connect the economic views in the Talmud with the Greek (and particularly Aristotelian) approach to economics. We find the differences between Talmudic anti-usury laws and the Greek dislike for interest more striking than any similarities. The Talmudic opposition to usury is clearly connected to a desire for social justice, but it is combined with a desire to facilitate many forms of commerce. The Greek opposition to commerce is connected to a view that commerce itself is evil or beneath the interest of a developed human being.

We find the Greek anti-commercial bias much harder to rationalize than the milder Talmudic anti-usury bias. Jacobs' (1992) has suggested that classical attacks on trade are motivated by a desire to lesson the likelihood that a war band (or a warring society) will be torn apart by greed. In general, the Greeks seem to have been opposed to commerce because (1) it was not conducive to "moral" behavior, and (2) it promoted inequality of wealth. Perhaps if the negative externalities related to income inequality and rentseeking in commerce are sufficiently high, then the extreme Greek view can be understood.

Another possible justification for the Socratic view is that the Greeks wanted to make sure that no one developed too high of a marginal utility of consumption for goods (as opposed to service to the state or thought). If there is habit persistence, then attempting to limit wealth accumulation might decrease, not increase, the marginal utility of consumption for goods. Finally it is possible that the Socratics were simply speaking for a group of citizens who were opposed politically to the commercial interests in society.[23]

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[23] The Romans also disliked interest particularly among the ruling classes. Roman law restricted the interest rates that Senators could charge to 6%, which was 1/2 the prevailing rate of interest.

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Usury and Pauline Christianity

Anti-usury arguments are also rife in early Christianity, perhaps because anti-commercialism was a particularly strong strain in Essene Judaism. Jesus himself showed a sharply anti-money lending attitude in his attacks on the money changing in the temple. Additionally, the anti-wealth statements in the Sermon on the Mount and in the famous statement that "it is easier for a camel to pass through the eye of a needle than for a rich man to enter the kingdom of heaven" both suggest that early Christianity was, more broadly, both anti-usury and anti-wealth accumulation more broadly. The early Christian society documented in the Acts of the Apostles suggests a socialist community with little formal lending and certainly no interest rates.

Simultaneous to early Christian opposition to usury and general anti-commercialism, Paul eliminated the power of Judaic law against usury. In the "Letter to the Romans," Paul, claimed that the "New Covenant" between Jesus and his people superseded the old covenant of the Laws of Moses. As a result, old Halakhic regulations on usury were no longer binding on Christian society even though there was a strong predilection against usury.

St. Jerome presented a major extension of the classic usury laws. Jerome argued that this laws should be universalized to all of society. A similar argument had been made earlier by Philo in Hellenic Alexandria,[24] but Jerome is the Christian universalizer of the regulation. Unsurprisingly, this ethical admonition to expand the usury law to all of society came just at the time when Christianity was becoming the dominant force in the West.

The Rise of Formal Usury Laws

Noonan (1957) describes the rise of formal prohibitions on usury in the 750-1150 C.E. period. The first formal Canon law ruling against usury was the Papal Encyclical *Nec hoc quoque* of Leo the Great. This epistle banned any

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[24]Philo argued that the ban on usury should extend not only to Jews or close family members but rather to all of the members of a nation. One explanation of Philo's argument is his desire to lessen any possible distinctions between Jew and Gentile.

clerical participation in usury; it did not ban interest charging for the general population. This ban on usury for clerics was eventually incorporated in the *Hadriana*, a primary collection of canons, in the early medieval period.

The specifically anti-cleric regulation suggests another possible use for usury laws. If we view the Church as a major claimant to society's productive resources (which may not be so inaccurate in the eighth century), and we believe that interest free loans were generally used by the church both to generate enthusiasm by the masses for religion and to eliminate excessive hardship, then any charging of interest by clerics would represent private profiteering by agents within the church at the expense of the church as a whole. Naturally the church would want to eliminate such behavior, just as any principal wants to eliminate this type of action from an agent. Viewed in such a light, usury laws become most similar to the simony laws (with which they were often grouped).

Charlemagne deserves the credit for extending the formal laws against usury within Western Europe to the laity. The definition of usury is particularly broad (i.e. it is defined by the Nynweger capitulary of 806 C.E. as "where more is asked than is given"). We can see that the anti-usury views of western Christendom have as much root in the anti-commercial biases of the Socratics and Jesus as they do in the social justice notions of the Torah and the Rabbis. The final word on medieval usury regulation is given by the Third Lateran Council of 1179 which excommunicates usurers.

It is difficult to understand why Church and state became much more firmly involved in banning usury between 750 and 1179. It is tempting to claim that a rise in inequality (as formal wealth rose) induced a benevolent response by the church, but this theory has only weak support. More plausible is the argument that this period saw (1) a rise in the formal power of the Church acting through the rise of the state so that the Church could enforce what they had always wanted to do and (2) a rise in formal lending that could be regulated. The period 400-700 C.E. in Western Europe was fairly chaotic, and it is hard to believe that social legislation of this type could be enforced or would be a priority of the Church or the state (such as it existed).

The other general explanation given for the rise of usury laws in the west (Ekelund, Hebert and Tollison (1989)) is that they were a form of rent-seeking for the church. This explanation argues that the Church was either a borrower (who wanted low interest rates) or a lender who could avoid usury regulations (who wanted other lenders out of the market). This explanation is somewhat difficult to accept because the church first enforced usury regulations on itself. No sensible lender would enforce usury laws on itself, while allowing the rest of society to function without usury laws. In addition, given the arsenal of tools at the medieval church's disposal, usury laws seem like an inefficient means of extracting rents (relative to selling indulgences or tithing).

V. The Post-Medieval Relaxation of Interest Rate Laws

The most famous of all changes in the usury laws is the relaxation of usury laws in the post-reformation period. It is over this period where the importance of usury laws is claimed to be most relevant and it is over this period where the causal link connecting economic growth with change in usury laws is most prevalent.

The Reformation was by no means a widespread rejection of prior restrictions on interest taking. The early reformers gained ammunition by attacking lending, particularly that done by the clergy. Tawney (1926) strongly points out the anti-money lending views of both Calvin and Luther, citing Luther's famous statement that it was necessary "to put a bit in the mouth of the holy company of the Fuggers." The Reformation in many places argued for a rebirth of early Christian anti-commercial ideology. Many reformers placed themselves in stark opposition to the commercial revolution of the 15th and 16th centuries.

However, the Reformation's relaxation of usury laws is much more often remembered than its spiritual reinvigoration of the fight against usury. Weber's (1930) is amongst the most famous statements connecting freedom from usury laws with the success of the Calvinist reformation. Nelson (1968) is particularly clear in his description of the connection of the reformation and elimination of usury laws. Luther it seems took several different stances

on usury. His early sermons (of 1519-1520) were strongly anti-usury. However, in 1525, during the peasant's revolt, he distanced himself from the poor uprisers and supported the creditors and the princes. He rejected the desires of the revolters for a "New Jerusalem" with Mosaic laws.

Calvin went even further and became the spiritual force behind the abandonment of usury laws. Calvin argues that the differences in community between Mosaic times and 16th century Geneva make usury laws no longer necessary. In Nelson's translation of Calvin: " I do not feel that usuries were forbidden to us simply, except in so far as they are opposed to equity or charity." Calvin's belief was that the fraternal tribal order of the Hebrews no longer exists, and, therefore, the usury restriction no longer binds. This statement became the excuse for the dispatch of usury laws throughout Protestant Europe. Eagerly governments grasped on to this excuse to rid themselves of the troublesome legislation.

Why were government so eager to eliminate usury laws when in the middle ages they were so eager to put these laws in place? Tawney first connected this shift of ethical standards with economic growth. Greater opportunities for investment made usury laws more costly. In our model, higher growth rates also caused the optimal interest rate to rise. Also inequality may have fallen somewhat which made the advantages of usury laws less obvious. It is also worth stressing that this period is one of high inflation. American gold, imported by the Spanish and Portuguese to Europe, caused a rapid rise in price levels. As mentioned, earlier rising price levels will make a fixed zero interest rate further from the social optimum.

An alternative explanation might stress the decline of the church's authority and perhaps the decline of other political groups that benefited from usury laws. However, it is hard to argue that the modern nation state is not arranged so that the debtors have political power. If anything, the modern nation state is more of a borrower than the medieval church and should support usury laws more strongly. There seems to be evaporation of usury laws following the reformation, providing some backing for the view that these usury laws were adapting to economic conditions and served some

function. The change in the laws provides little evidence for a pure rent-seeking view of usury laws.

It is still not obvious how important the relaxation of the usury laws was to economic growth. Weber (1930) argued that freedom from commercial restraints played a major role in fomenting Protestant economic growth. Sombart (1926) connected certain freedoms from lending with Jewish commercial strength. This connection is possible, but it seems even more obvious that usury laws responded to economic conditions, and, with the inflation and high economic growth of the 16th century, the costs of usury laws far outweighed their benefits.

VI. Conclusion

Usury laws provide a primitive means of social insurance. Individuals who receive negative income shocks appreciate low interest rates. Restrictions on interest rates are a way of redistributing income to those who have suffered from these shocks. The data confirms the major prediction of this model: income inequality is related to restrictions on interest rates.

However, the history of usury laws suggests that these laws have served other functions in other times. Even in Israel (and even earlier in Babylonia) interest rate restrictions seemed to have been intended to limit the degree to which an individual could indebt himself. If the community paid some of the price of bankruptcy (perhaps in having to care for the bankrupt), then the community sensibly wants to restrict the individuals' ability to overcommit himself to loans.

In Greece, the Socratics opposed interest because they opposed trade (and often large wealth generally). They believed that interest was unnatural and that the pursuit of money wasted time, distracted from service to the state and built up tastes for consumption. In the medieval church, usury laws may have been a form of rent-seeking as churches both borrowed and desired to keep the right to lend at interest to themselves (as Ekelund, Hebert and Tollison (1989) argue). Alternatively,   the medieval church may have

fought usury because usury was a method that wayward clerics used to allocate the resources of society to themselves.

Appendix: Comparative Statics

Proposition 1: As long as (1) second order conditions are satisfied, (2) loans supplied by the rich are nonnegative and rise with the interest rate ceiling, and either (3a) $U'''(X)$ is sufficiently close to zero (for all X), or (3b) G is sufficiently close to one and $U'''(X) \leq 0$ or (3c) G is sufficiently close to one and the interest rate ceiling is sufficiently close to the free market equilibrium interest rate, then the optimal interest rate ceiling falls with initial inequality (I_1). Furthermore, when conditions (1), (2) and (3a) are met and when (4) $\beta R^2 > 1$, then the optimal interest rate ceiling rises with the growth rate and rises with second period inequality.

We begin with equation (6'), the first order condition of the social planners' problem:

(6') $\partial V(R, I_1, I_2, G)/\partial R = L'(R) [U'(C^P_1) - R\beta U'(C^P_2)] + \beta L(R) [U'(C^W_2) - U'(C^P_2)]$.

$\partial V/\partial R$ is the derivative of the social value function with respect to the optimum interest rate ceiling. We define $R^*(I_1, I_2, G)$ implicitly as a function describing the optimal interest rate ceiling for a given set of parameter values, and using the implicit function theorem we know that:

(A1) $\partial R^*/\partial X = -(\partial^2 V/\partial R \partial X)/(\partial^2 V/\partial R^2)$.

Since second order conditions hold and $\partial^2 V/\partial R^2 < 0$, the sign of $\partial R^*/\partial X$ for all X, is determined by the sign of $\partial^2 V/\partial R \partial X$. The rest of this appendix derives the signs of $\partial^2 V/\partial R \partial X$, or the derivatives of (6').

The function $L(R)$ is more properly defined as $L(R, I_1, I_2, G)$ and it is defined from the first order conditions of the rich agent's loan supply:

(2) $U'(I_1 - L) = \beta R U'(G I_2 + RL)$, thus

(A2i) $L_R = -(\beta U'(C^W_2) + \beta R L U''(C^W_2))/(U''(C^W_1) + \beta R^2 U''(C^W_2))$,[25]

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[25] We use the standard conventions throughout the appendix that $L_X = \partial L/\partial X$ and $L_{XY} = \partial L/\partial X \partial Y$.

(A2ii) $L_G = -\beta RI_2U"(C^W{}_2))/(U"(C^W{}_1)+\beta R^2U"(C^W{}_2))<0$,

(A2iii) $L_{I1} = U"(C^W{}_1))/(U"(C^W{}_1)+\beta R^2U"(C^W{}_2))>0$, and

(A2iv) $L_{I2} = -\beta RGU"(C^W{}_2))/(U"(C^W{}_1)+\beta R^2U"(C^W{}_2))<0$.

Condition (2) in Proposition 1 gives us that (A2i) is positive. (A2ii) and (A2iv) are unambiguously negative and (A2iii) is positive.

At this point, it is useful to prove a lemma:

Lemma 1: When $U"'(X)$ is sufficiently close to 0, then L_{RI1} is positive. When, in addition, $\beta R^2 \geq 1$ then L_{RG} and L_{RI2} are positive.

Proof of Lemma 1: When $U"'(X)$ equals zero, then differentiating (A2ii), (A2iii) and (A2iv) yields:

(A3i) $L_{RI1} = -2\beta R(1+\beta R^2)^{-2}<0$,

(A3ii) $L_{RG} = (-\beta I_2 +\beta^2 R^2 I_2)/(1+\beta R^2)^{-2}$, and

(A3iii) $L_{RI2} = (-\beta G +\beta^2 R^2 G)/(1+\beta R^2)^{-2}$.

(A3ii) and (A3iii) are negative when $\beta R^2>1$. Since L_{RI1}, L_{RG}, and L_{RI2} are strictly negative, when $U"'(X)$ equals zero, sufficiently minor perturbations in the third derivative of $U(.)$ will leave the L_{RX} terms weakly positive.

Furthermore, we will use two more inequalities in the proof of Proposition 1:

(A4i) $U'(C^P{}_1) \geq \beta RU'(C^P{}_2)$, and

(A4ii) $U'(C^P{}_2) \geq U'(C^W{}_2)$.

The first inequality comes from the fact that poorer consumers would like to

follows from the concavity of $U(.)$, and because $I_2 \geq 1/2$ and $L \geq 0$ (from condition (1)).

The derivative of (6') with respect to any parameter, X, is:

(A5) $(U'(C^P_1) - R\beta U'(C^P_2))L_{RX}$ {Term 1} +

$\quad L_R(U''(C^P_1)C^P_1{}'(X) - R\beta U''(C^P_2)C^P_2{}'(X))$ {Term 2} +

$\quad L_X\beta(U'(C^W_2) - U'(C^P_2))$ {Term 3} +

$\quad \beta L(U''(C^W_2)C^W_2{}'(X) - U''(C^P_2)C^P_2{}'(X))$ {Term 4}.

When we are close to the free market equilibrium the first term equals zero. Otherwise, it is determined by the relationship between lending, the interest rate, and the parameter in question since $U'(C^P_1) \geq R\beta U'(C^P_2)$ from (A3i). The second term reflects how a change in parameter values changes the consumption of the poorer citizens in the first and second period. If the parameter change redistributes income from the second period to the first period for the poorer citizens, then the parameter change will reduce the need for a high interest rate (since it reduces the need to convince the richer citizens to lend). The third term reflects the extent to which the parameter change increases the amount of lending which increases the gain from lowering interest rates to the poorer citizens. The final term captures the extent to which a change in parameter values reallocates income between the rich and the poor citizen in the second period.

The Derivative with Respect to I_1 -- Initial Inequality

We find how the optimal interest rate moves with initial inequality by replacing X with I_1 in equation (A5):

(A5i) $(U'(C^P_1) - R\beta U'(C^P_2))L_{RI_1}$ {Term 1} +

$\quad L_R(U''(C^P_1)C^P_1{}'(I_1) - R\beta U''(C^P_2)C^P_2{}'(I_1))$ {Term 2} +

$\quad L_{I_1}\beta(U'(C^W_2) - U'(C^P_2))$ {Term 3} +

$\quad \beta L(U''(C^W_2)C^W_2{}'(I_1) - U''(C^P_2)C^P_2{}'(I_1))$ {Term 4}.

Term 1 is positive from (A4i) and Lemma 1, when $U'''(X)$ is close to zero. Term 1 is zero, or negligible, when R is close to the free market interest rate

because $U'(C^P_1)=R\beta U'(C^P_2)$ at the free market equilibrium interest rate. To show that Term 1 is negative when $U'''(X)\leq 0$, we need the general solution for L_{RI1} :

$$(A6) \quad \partial^2 L/\partial R\partial I_1 = U'''(C^W_1)C^W_1{}'(R)/[U''(C^W_1)+\beta R^2 U''(C^W_2)] -$$
$$U''(C^W_1) \ [U'''(C^W_1)C^W_1{}'(R)+\beta R^2 U'''(C^W_2)C^W_2{}'(R)+2\beta RU''(C^W_2))]$$
$$/(U''(C^W_1)+\beta R^2 U''(C^W_2))^2$$

Minor rewriting tells us that (A6) is negative if:

$$(A7) \quad \beta R^2 U'''(C^W_1)C^W_1{}'(R)U''(C^W_2) - \beta R^2 U''(C^W_1)U'''(C^W_2)C^W_2{}'(R)$$
$$-2\beta RU''(C^W_1)U'''(C^W_2)<0.$$

Since $U'''(C^W_1)<0$, and $C^W_1{}'(R)=-L_R<0$ the first term in (A7) is negative. As $-\beta R^2 U''(C^W_1)>0$, $U'''(C^W_2)<0$, and $C^W_2{}'(R)=L+RL_R>0$, the second term in (A7) is negative. The third term is also negative, from $U'''(C^W_2)<0$, ensuring that (A7) holds.

Term 2 in (A5i), $(L_R(U''(C^P_1)(-1+RL_{I1})-R\beta U''(C^P_2)(-RL_{I1})))$, can be rewritten as:

$$(A8) \quad L_R R^2\beta(-U''(C^P_1)U''(C^W_2)+U''(C^P_2)U''(C^W_1))/(U''(C^W_1)+R^2\beta U''(C^W_2)).$$

Since $L_R R^2\beta/(U''(C^W_1)+R^2\beta U''(C^W_2))<0$, as long as $U''(C^P_2)U''(C^W_1) \geq U''(C^P_1)U''(C^W_2)$, then (A8) will be weakly negative. When $U'''(X)=0$, this inequality holds. At the free market equilibrium, when $G=1$, $C^P_2=C^P_1$, $C^W_1=C^W_2$.[26] When consumption is equal across time, (A8) is zero, so, when we are sufficiently close to the free market equilibrium and G is sufficiently close to one, (A8) will remain negligible.

Alternatively, when interest rates are below the free market rate,[27] then from condition (1), we know that loans are lower than in the free market case. As consumption of the wealthy was equal across periods in the free market case where $G=1$, as G still equals 1 and the wealthy loan less and receive less

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[26]Once income levels have been revealed, the competitive equilibrium is the Pareto optimum.
[27] Interest rates ceilings above the free market rate are non-binding and will create the same results as those in the case that the interest rate ceiling is near the free market rate.

returns on their loans, it must now be the case that $C^W_1 > C^W_2$. This inequality implies $C^P_2 > C^P_1$, (as long as G=1) and with $U'''(X) < 0$, these three inequalities guarantee us that (A8) is negative for interest rate ceilings below the free market rate.

Term 3 in (A5i), $L_{11}\beta(U'(C^W_2) - U'(C^P_2))$, is negative since $L_{11} > 0$ (by A2iii) and by (A4ii).

Term 4 in (A5i), $\beta L(U''(C^W_2)RL_{11} + RL_{11}U''(C^P_2))$, is negative since U(.) is concave and $L_{11} > 0$ (by A2iii). Hence all four terms are either negative or zero and (A5i) is negative.

The Derivative with Respect to G -- the Growth Rate of Income

Replacing X with G in (A5) yields:

(A5ii) $(U'(C^P_1) - R\beta U'(C^P_2))L_{RG}$ {Term 1} +
$\qquad L_R(U''(C^P_1)C^P_1{}'(G) - R\beta U''(C^P_2)C^P_2{}'(G))$ {Term 2} +
$\qquad L_G\beta(U'(C^W_2) - U'(C^P_2))$) {Term 3} +
$\qquad \beta L(U''(C^W_2)C^W_2{}'(G) - U''(C^P_2)C^P_2{}'(G))$ {Term 4}

Term 1, $(U'(C^P_1) - R\beta U'(C^P_2))L_{RG}$, is positive or negligible, because from (A4i), $U'(C^P_1) \geq R\beta U'(C^P_2)$, and, since by assumption $U'''(X)$ is close to zero and $\beta R^2 > 1$, so the conditions of Lemma 1 are met and L_{RG} is positive or negligible.

Term 2 can be rewritten as $L_R(U''(C^P_1)L_G - R\beta U''(C^P_2)(1 - I_2 - RL_G))$. This term is positive because $L_R > 0, L_G < 0$, and $-(1 - I_2 - RL_G) < 0$.

Term 3 is positive because $L_G < 0$, and from (A4ii) $U'(C^W_2) < U'(C^P_2)$.

Term 4 can be rewritten as $\beta L(U''(C^W_2)(I_2 + RL_G) - U''(C^P_2)(1 - I_2 - RL_G))$. When $U'''(X) = 0$, $U''(C^W_2) = U''(C^P_2)$ and $L_G = -\beta R/(1 + \beta R^2)$, so Term 4 becomes: $\beta L U''(C^W_2)(2I_2 + 2I_2\beta R^2 - 1 - 3\beta R^2)/(1 + \beta R^2)$. Since $\beta R^2 > 1$, $1 + 3\beta R^2 > 2 + 2\beta R^2 > 2I_2 + 2I_2\beta R^2$, and Term 4 is positive.

The Derivative with Respect to I_2 -- Second Period Inequality

Replacing X with I_2 in (A5) yields:

(A5iii) $(U'(C^P_1)-R\beta U'(C^P_2))L_{RI2}$ {Term 1} +

$\quad L_R(U''(C^P_1)C^P_1{}'(I_2)-R\beta U''(C^P_2)C^P_2{}'(I_2))$ {Term 2} +

$\quad\quad L_{I2}\beta(U'(C^W_2)-U(C^P_2))\ + \beta L(U''(C^W_2)C^W_2{}'(I_2)-U''(C^P_2)C^P_2{}'(I_2))$ {Term 3}

Using Lemma 1, and (A4i), Term 1 is weakly positive.

Term 2 can be rewritten as $L_R(U''(C^P_1)L_{I2}-R\beta U''(C^P_2)(-G-RL_{I2}))$. Using $U'''(X)=0$, Term 2 becomes $L_R U''(C^P_1)(\beta RG-(1+\beta R^2)\beta RG/(1+\beta R^2))$ which equals zero. So close to $U'''(X)=0$, this term is small.

Term 3 can be rewritten as $L_{I2}\beta(U'(C^W_2)-U(C^P_2))\ + \beta L(U''(C^W_2)(G+RL_{I2})-U''(C^P_2)(-G-RL_{I2}))$. To prove that Term 3 is positive, we use the fact that when $U'''(X)=0$ (i.e. when the function is quadratic), $U'(Y)=U'(X)+(X-Y)U''(X)$, or in this case:

(A9) $\quad L_{I2}\beta(U'(C^W_2)-U'(C^P_2))=L_{I2}\beta U''(C^W_2)(2GI_2+2RL-G)=$
$$-\beta^2 RGU''(C^W_2)(2GI_2+2RL-G)/(1+\beta R^2).$$

Using $U''(C^W_2)=U''(C^P_2)$, and substituting for L_{I2}, we find that:

(A10) $\beta L(U''(C^W_2)(G+RL_{I2})-U''(C^P_2)(-G-RL_{I2}))=2\beta LGU''(C^W_2)/(1+\beta R^2)$.

Combining (A9) and (A10), tells us that Term 3 equals:

(A11) $U''(C^W_2)\beta G(2L-\beta R(2GI_2+2RL-G))$.

Since $2GI_2>G$ and $2\beta R^2L>2L$, (A11) must be positive.

Proposition 2: The optimal interest rises with the political power of the wealthy (λ_W) and falls with the political power of the poor (λ_P). If $\lambda_W >\lambda_P$, then an increase in the power or number of the young (1-N) lowers the interest rate ceiling. If $\lambda_W>\lambda_P$, then an increase in the power of the young (or

ignorant) lowers the interest rate ceiling. If $\lambda_W < \lambda_P$, then the comparative statics on the number and political power of the young are reversed.

We can use the convenient substitution that $Z = ((1-N)\lambda_U + N\lambda_W)/((1-N)\lambda_U + N\lambda_P)$ and rewrite equation (4'):

(4") $(U'(C^P_1) - R\beta U'(C^P_2))L'(R) + L(R)\beta(ZU'(C^W_2) - U'(C^P_2)) = 0.$

The new first order condition for the social planners problem is:

(A11) $(U'(C^P_1) - R\beta U'(C^P_2))L'(R) + L(R)\beta(ZU'(C^W_2) - U(C^P_2)) = 0 = \partial V/\partial R$

Taking the derivative of (5") with respect to Z shows that:

(A12) $\partial^2 V/\partial R\partial Z = L(R)\beta U'(C^W_2) > 0,$

which (using A1) tells us that the optimal interest rate ceiling rises with Z. Z rises with λ_W and falls with λ_P. Thus, the optimal interest rate ceiling rises with the social importance given to the wealthy and the optimal interest rate ceiling falls with the social importance given to the poor.

The derivative of Z with respect to N is:

(A13) $\partial Z/\partial N = (\lambda_W - \lambda_P)\lambda_U/((1-N)\lambda_U + N\lambda_P)^2,$

which is of course positive if and only if $\lambda_W > \lambda_P$.

Likewise the derivative of Z with respect to λ_U is:

(A14) $\partial Z/\partial\lambda_U = (\lambda_W - \lambda_P)N(1-N)/((1-N)\lambda_U + N\lambda_P)^2,$
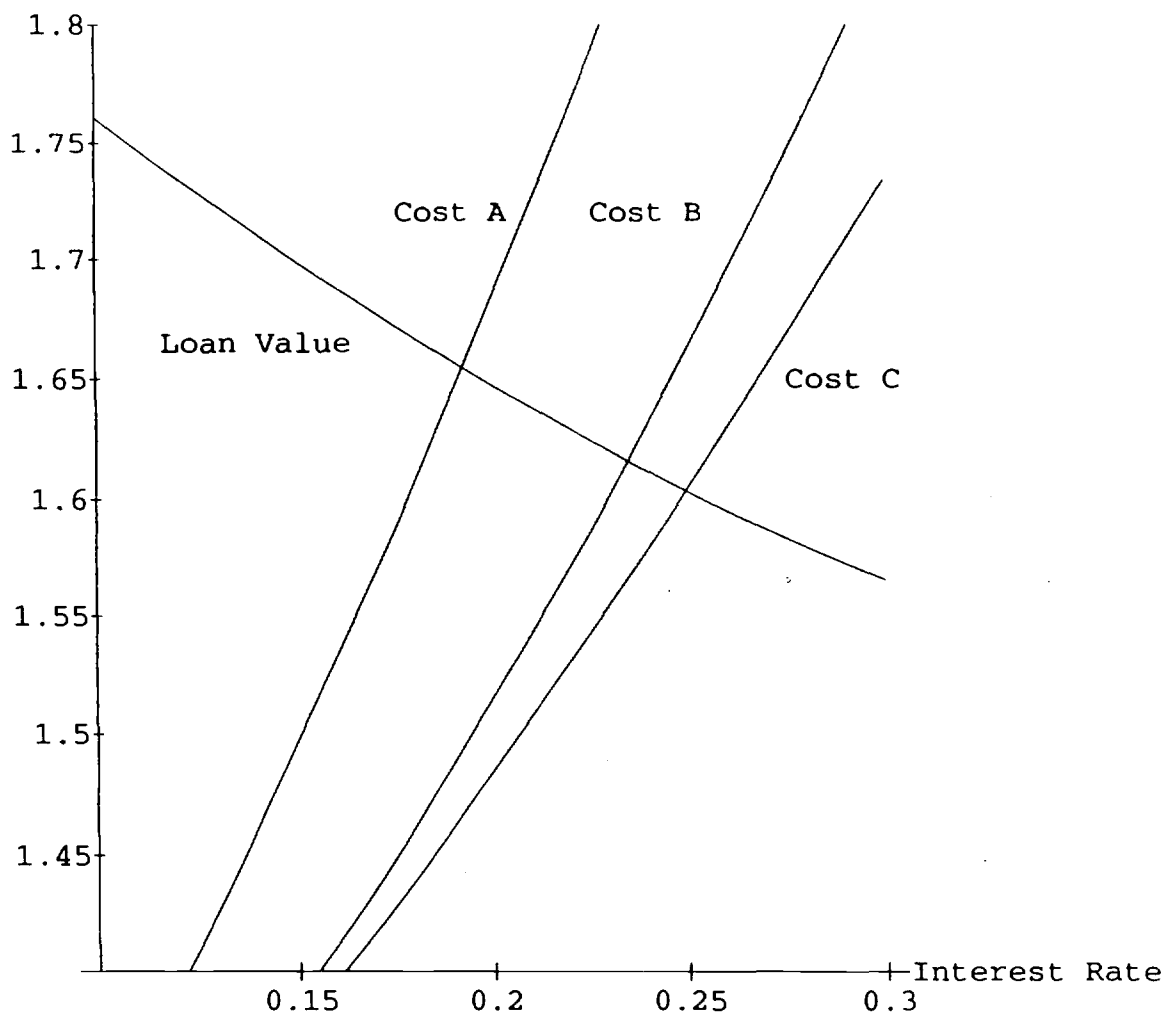
which again is positive if and only if $\lambda_W > \lambda_P$.

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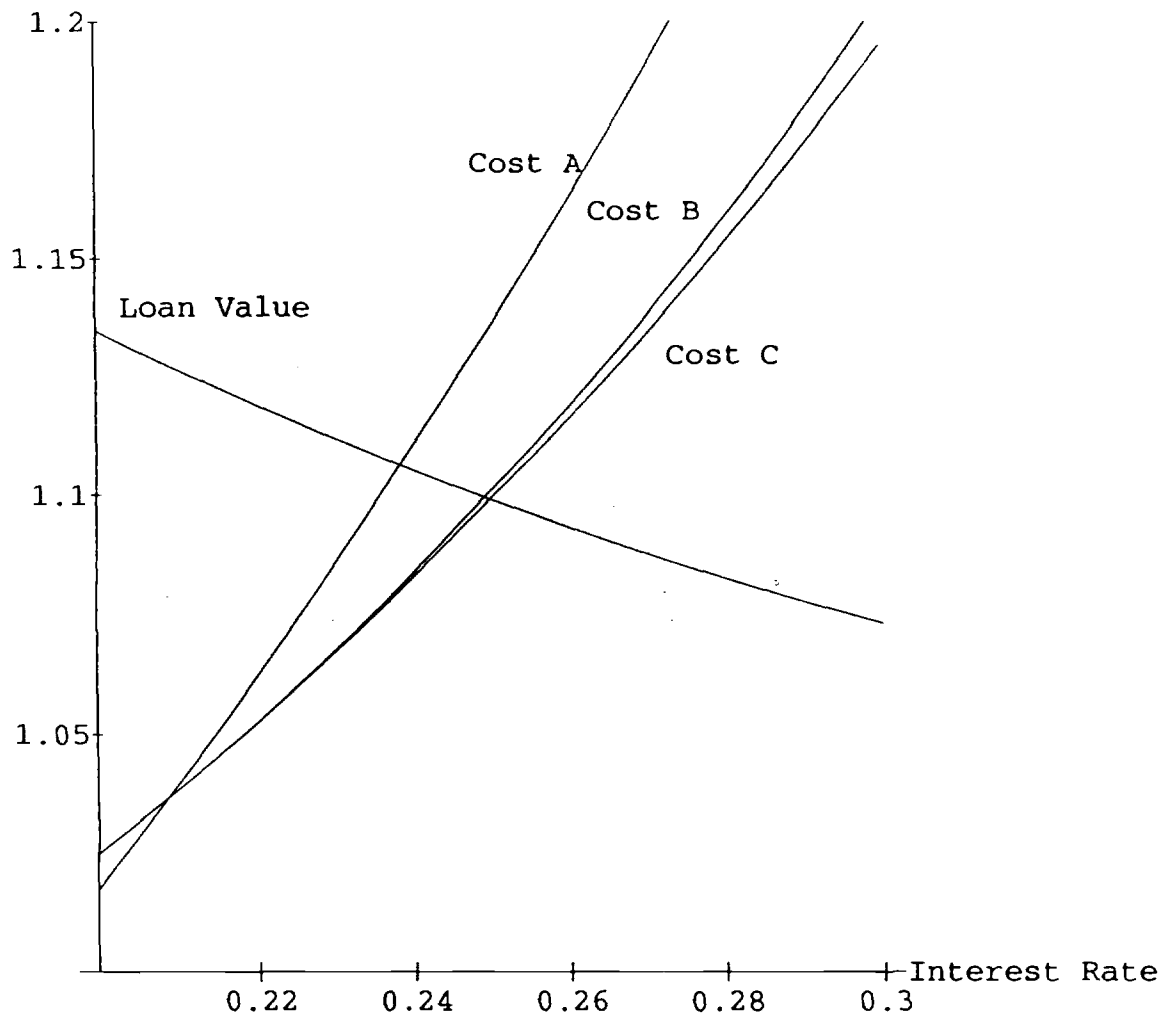
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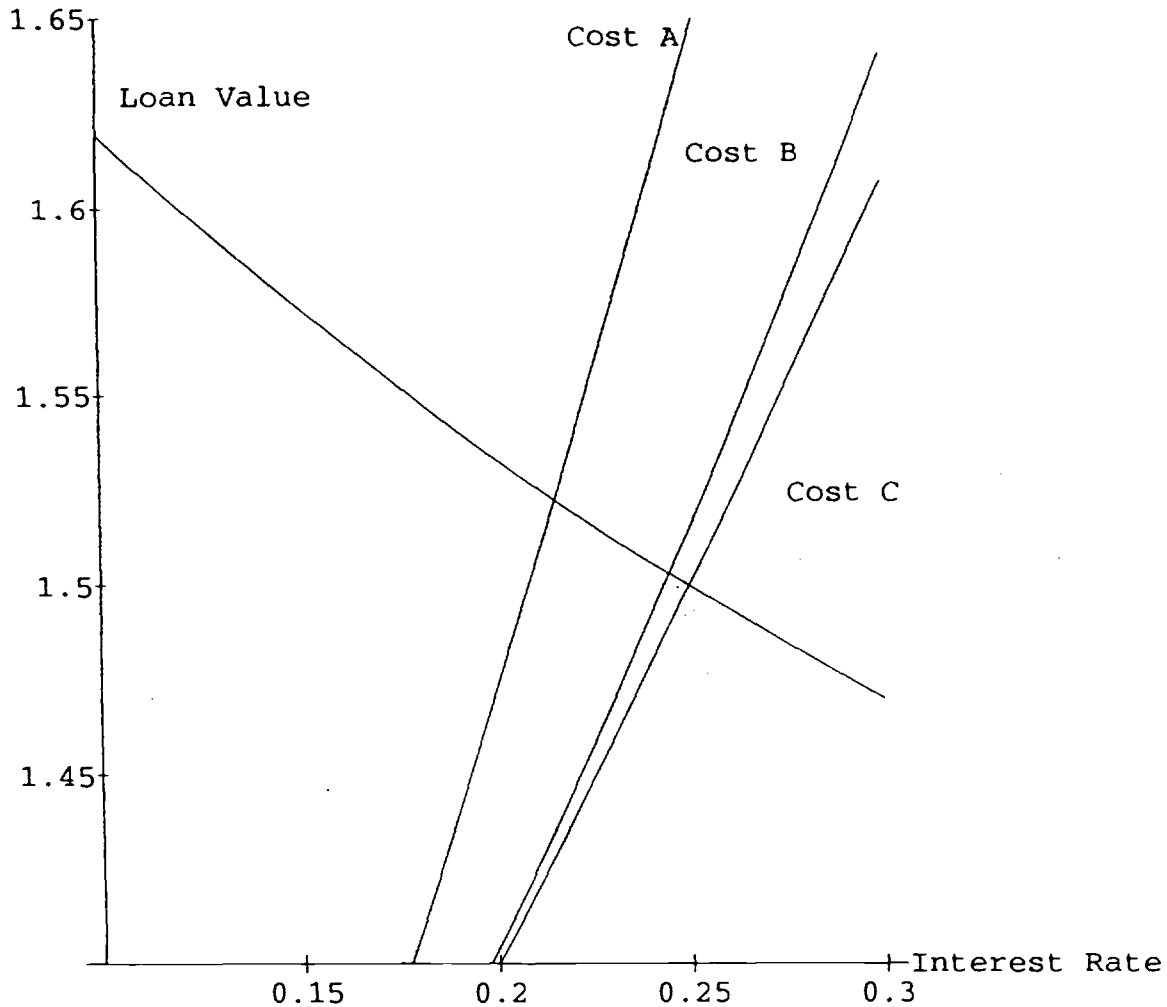
Figure 1: The Optimal Interest Rate

• "Loan Value" gives the marginal utility of first period income for the poorer consumer.

• "Cost A" is the discounted marginal utility of second period income for for the poorer consumer scaled by the interest rate and loan elasticity.
The intersection of Loan Value and Cost A gives the interest rate that maximizes the borrower's wellbeing -- the monopsonist's rate.

• "Cost B" is "Cost A" minus the scaled discounted marginal utility of second period consumption for the richer consumer.
The intersection of Loan Value and Cost B gives the optimal interest rate.

• "Cost C" is the discounted marginal utility of second period consumption for the poorer consumer times one plus the interest rate.
The intersection of Loan Value and Cost C gives the free market interest rate.

Figure 2: Low Risk Aversion

•"Loan Value" gives the marginal utility of first period income for the poorer consumer.

•"Cost A" is the discounted marginal utility of second period income for
for the poorer consumer scaled by the interest rate and loan elasticity.
The intersection of Loan Value and Cost A gives the interest rate that
maximizes the borrower's wellbeing -- the monopsonist's rate.

• "Cost B" is "Cost A" minus the scaled discounted marginal utility of second
period consumption for the richer consumer.
The intersection of Loan Value and Cost B gives the optimal interest rate.

• "Cost C" is the discounted marginal utility of second period consumption for
the poorer consumer times one plus the interest rate.
The intersection of Loan Value and Cost C gives the free market interest rate.

Figure 3: Low Inequality

•"Loan Value" gives the marginal utility of first period income for the poorer consumer.

•"Cost A" is the discounted marginal utility of second period income for for the poorer consumer scaled by the interest rate and loan elasticity.
The intersection of Loan Value and Cost A gives the interest rate that maximizes the borrower's wellbeing -- the monopsonist's rate.

• "Cost B" is "Cost A" minus the scaled discounted marginal utility of second period consumption for the richer consumer.
The intersection of Loan Value and Cost B gives the optimal interest rate.

• "Cost C" is the discounted marginal utility of second period consumption for the poorer consumer times one plus the interest rate.
The intersection of Loan Value and Cost C gives the free market interest rate.

Figure 4: High Growth

•"Loan Value" gives the marginal utility of first period income for the poorer consumer.

•"Cost A" is the discounted marginal utility of second period income for for the poorer consumer scaled by the interest rate and loan elasticity.

The intersection of Loan Value and Cost A gives the interest rate that maximizes the borrower's wellbeing -- the monopsonist's rate.
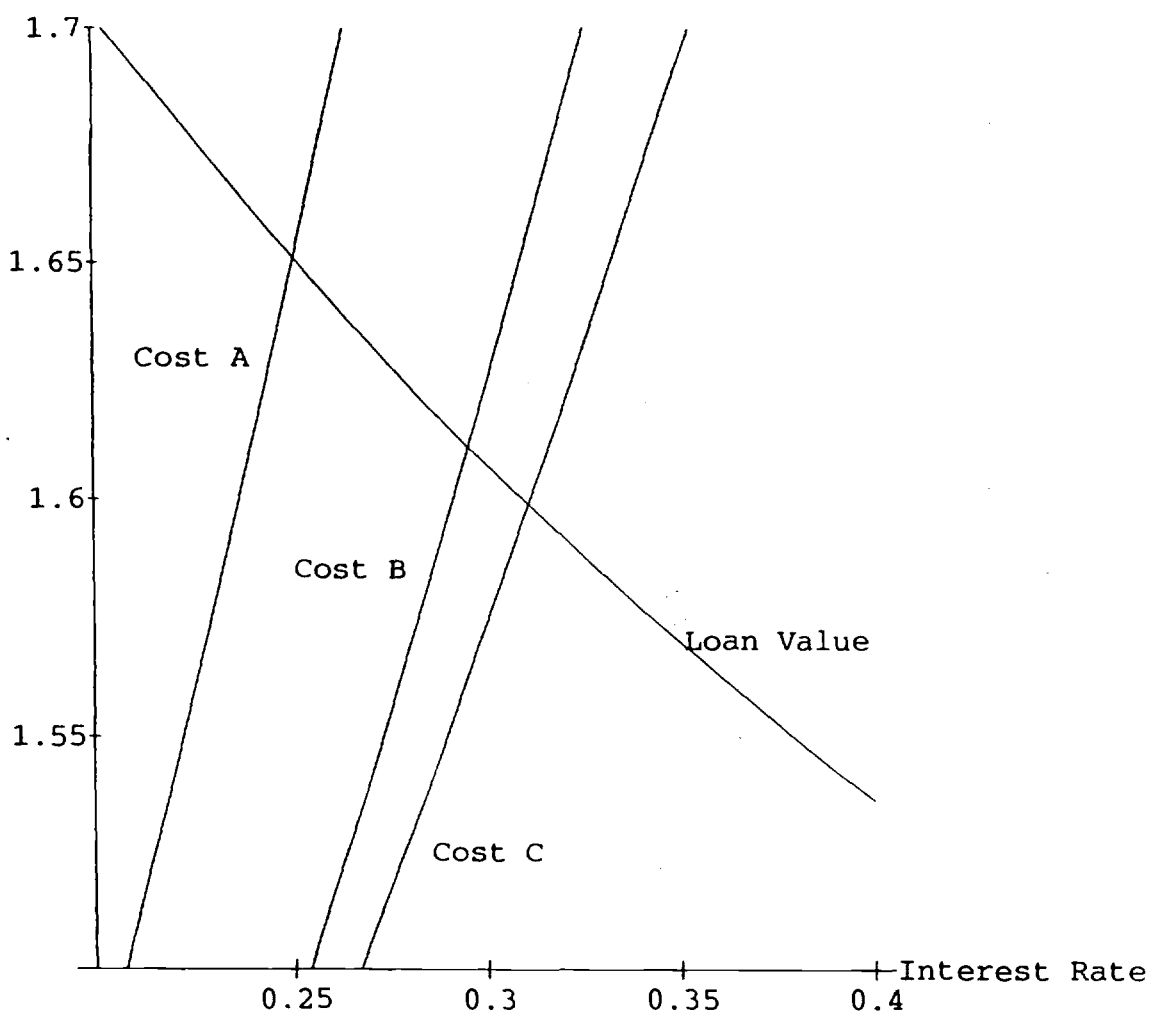
• "Cost B" is "Cost A" minus the scaled discounted marginal utility of second period consumption for the richer consumer.

The intersection of Loan Value and Cost B gives the optimal interest rate.

• "Cost C" is the discounted marginal utility of second period consumption for the poorer consumer times one plus the interest rate.

The intersection of Loan Value and Cost C gives the free market interest rate.

Table 1a
Simulations: Logarithmic Utility

Parameter Values	First-Best Social Welfare (1)	Optimal Interest Rate (2)	Optimal Social Welfare (3)	Free Market Interest Rate (4)	Free Market Social Welfare (5)
$I_1=.8, I_2=.5$ $\beta=.8, g=1$	.293	17%	.190	25%	.187
$I_1=.8, I_2=.6$ $\beta=.8, g=1$	.581	20%	.231	33%	.228
$I_1=.95, I_2=.5$ $\beta=.8, g=1$	1.800	14%	1.305	25%	1.282
$I_1=.8, I_2=.5$ $\beta=.6\ g=1$	.724	56%	.488	67%	.481
$I_1=.8, I_2=.5$ $\beta=.8, g=1.1$	.566	29%	.360	38%	.354

These simulations were performed with agents having an intertemporal utility function $K+Ln(c_1)+\beta Ln(c_2)$. The constant term is set so that the autarky social welfare in each case is set to zero. The first best welfare refers to the utility with perfect risk-sharing. The optimal interest rate is the interest rate chosen by the planner and the optimal social welfare is the social welfare with optimal interest rate. The free market interest rate and free market social welfare are the interset rate and social welfare level when the interest rate is set by the free market.

Table 1b

Simulations: Piecewise Linear Utility

Parameter Values	First-Best Social Welfare (1)	Optimal Interest Rate (2)	Optimal Social Welfare (3)	Free Market Interest Rate (4)	Free Market Social Welfare (5)
$I_1=.8, I_2=.5$ $\beta=.8, g=1$	.06	-12.5%	.034	25%	.024
$I_1=.8, I_2=.6$ $\beta=.8, g=1$	.06	25%	0	25%	0
$I_1=.95, I_2=.5$ $\beta=.8, g=1$	.105	-12.5%	.034	25%	.024
$I_1=.8, I_2=.8$ $\beta=.6\ g=1$	.060	16.7%	.025	66.7%	.01
$I_1=.8, I_2=.5$ $\beta=.8, g=1.1$	.060	-12.5%	.015	25%	.012

These simulations were performed with agents having an intertemporal utility function $K+(c_1- .3Max[0, c_1 - .6])+ b(c_2- .3Max[0, c_2 - .6])$The constant term is set so that the autarky social welfare in each case is set to zero. The first best welfare refers to the utility with perfect risk-sharing. The optimal interest rate is the interest rate chosen by the planner and the optimal social welfare is the social welfare with optimal interest rate. The free market interest rate and free market social welfare are the interset rate and social welfare level when the interest rate is set by the free market.

TABLE 2
Comparison of Interest Rates, 1950 and 1991

Description	1950 value	1991 value
Banker's Acceptance (90 day)	1.15%	5.70%
Treasury Bill (3 month)	1.218%	5.38%
Commercial Paper (3-6 month)	1.45%	5.87%
Prime Rate (Average for year)	2.18%	8.46%
Short-Term Business Loan (Average)	2.69%	9.93%

Source: *Statistical Abstract of the United States.*

TABLE 3a
Summary Statistics

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
Maximum Rate	48	8.667	2.147	6	12
Percent Dilapidated Housing	48	42.673	16.369	13.0	74.8
Median Years of Schooling	48	9.500	1.095	7.6	12.0
Democrat Governor Dummy	48	0.479	0.505	0	1
Percent of Families with Income over $5000	48	17.854	5.854	5.8	29.1
Income Growth 1930-1950	48	1.017	0.216	0.584	1.49
Employment Growth 1950-1980	48	0.539	0.358	0.01	1.809
Log of 1950 Employment	48	6.650	1.055	4.264	8.756

TABLE 3b
Simple Correlations

	Maximum Rate	Percent Dilapidated Housing	Median Years of Schooling	Democrat Governor Dummy	Percent of Families with Income over $5000	Income Growth 1930-1950	Employment Growth 1950-1980	Log of 1950 Employment
Maximum Rate								
Percent Dilapidated Housing	-0.300**							
Median Years of Schooling	0.568***	-0.757***						
Democrat Governor Dummy	-0.242*	0.458***	-0.531***					
Percent of Families with Income over $5000	0.150	-0.831***	0.582***	-0.391***				
Income Growth 1930-1950	-0.201	0.804***	-0.482***	0.311**	-0.572***			
Employment Growth 1950-1980	0.372***	-0.264*	0.413***	-0.246*	0.134	-0.044		
Log of 1950 Employment	-0.254*	-0.121	-0.272*	0.304**	0.166	-0.153	-0.391***	

* = Significant at the 10 percent level
** = Significant at the 5 percent level
*** = Significant at the 1 percent level

TABLE 4
Regressions

	Dependent Variable: Maximum Rate				Dependent Variable: Employment Growth 1950-1980
	(1)	(2)	(3)	(4)	(5)
Intercept	10.347	13.950	13.510	-2.258	0.834
Percent Dilapidated Housing	-0.039** (0.018)	-0.074** (0.033)	-0.095* (0.049)		
Percent of Families with Income over $5000		-0.118 (0.092)	0.142 (0.097)	-0.118** (0.059)	
Democrat Governor Dummy			-0.524 (0.677)	-0.072 (0.575)	
Income Growth, 1930-1950			1.955 (2.465)	-0.013 (1.510)	
Median Years of Schooling				1.373*** (0.320)	
Maximum Rate					0.049** (0.022)
Log of 1950 Employment					-0.108** (0.046)
Number of Observations	48	48	48	48	48
Adjusted R^2	0.070	0.083	0.070	0.290	0.198

Standard Errors in parentheses.
* = Significant at the 10 percent level
** = Significant at the 5 percent level
*** = Significant at the 1 percent level