Board of Governors of the Federal Reserve System
International Finance Discussion Papers
Number 586
July 1997

INCOME INEQUALITY AND MACROECONOMIC FLUCTUATIONS

Murat F. Iyigun and Ann L. Owen

INCOME INEQUALITY AND MACROECONOMIC FLUCTUATIONS

Murat F. Iyigun and Ann L. Owen*

Abstract: When per capita income is low, increases in income inequality make macroeconomic cycles less severe. We present a model in which access to credit is based on earnings potential. If low as well as middle income individuals are credit constrained, increases in income inequality lead to smaller fluctuations in aggregate consumption and output. Empirical evidence from cross-country data supports the view that greater income inequality causes lower variation of real consumption and output growth in low income countries. When per capita income is high, however, this effect is reversed.

keywords: Income Inequality, Economic Fluctuations, Business Cycles, Credit Constraints.

* The authors are respectively an economist in the Division of International Finance, Board of Governors of the Federal Reserve System and Assistant Professor of Economics at Hamilton College. We have benefitted significantly from John M. Heitkemper's competent research assistance. For useful comments and suggestions we are grateful to David Bowman, Chris Erceg, Jon Faust, Dale Henderson, Ruth Judson, Andrew Levin, Stacy Tevlin and David Weil. The views in this paper are solely the responsibility of the authors and should not be interpreted as reflecting the views of the Board of Governors of the Federal Reserve System or of any other person associated with the Federal Reserve System. Please send all correspondence to: The Board of Governors of the Federal Reserve System, Mail Stop 23, Washington, D.C. 20551.

1. Introduction

Recent changes in the income distribution in the United States as well as other industrialized countries have drawn considerable attention both in the popular press and in the academic literature. While newspaper accounts have focused on the political ramifications of growing inequality, the academic literature has taken up two issues. First, there is an active debate regarding the underlying source of the inequality, and, second, a somewhat less controversial exchange about the long-run consequences of income inequality[1]. This paper is an attempt to examine whether income inequality is associated with short-run macroeconomic performance as well.

Our main finding is that the distribution of income can affect an economy's ability to adapt to external shocks when the ability to obtain credit depends on income. Essentially, income inequality and average income, taken together, determine the fraction of individuals who are credit-constrained and cannot smooth consumption. In low income countries, where both the lower and middle classes are more likely to be credit-constrained, a more unequal distribution of income (a smaller middle class) will result in smoother aggregate consumption and GDP. In contrast, in higher income countries where only the lower class may be shut out of credit markets and unable to smooth consumption through downturns, greater inequality is likely to be associated with more variation in consumption and output.

The fact that low income individuals are more likely to be credit-constrained is an important element of our model. Zeldes (1989) provides some support for this assumption. He estimates Euler equations for two groups of individuals, showing that people with lower wealth/income ratios make consumption decisions as if they are liquidity constrained. Zeldes' result applies to individuals with low levels of wealth and not necessarily income, but Figure 1 is the result of a slightly more direct approach in providing

[1]See Levy and Murnane (1992) for a survey of proposed explanations for earnings inequality in the United States. Persson and Tabellini (1994), Perotti (1994), Galor and Zeira (1993), Murphy, Shleifer and Vishny (1989), Durlauf (1994) and Benabou (1994)–among others–consider the long-run effects of inequality.

evidence that household income matters. Using data from the 1992 Survey of Consumer Finances, the figure shows how the probability that individuals say they are unable to obtain the credit they desire depends on their household income, holding constant their net worth, education level, home ownership, and years at their current job [2].

[Figure 1 about here.]

As far as we know, Das (1993) is the most relevant work to what we present below. He develops a set of models to examine how the distribution of income might affect business cycles and concludes that greater inequality is associated with more macroeconomic fluctuations. Our approach and conclusions differ from his primarily because we rely on credit constraints–specifically, the role income plays in access to credit–to help explain macroeconomic fluctuations. In contrast, he relies on behavioral and preference differences across income groups. Moreover, our use of cross-country panel data allows us to reach a more general conclusion about how income inequality is related to macroeconomic fluctuations because we are able to analyze this effect in both high and low income countries.

Because credit market imperfections play a crucial role in our analysis, our paper is also related to others who have studied how the inability to borrow affects the cyclical behavior of the economy. Sheinkman and Weiss (1986) show that when all individuals are credit-constrained and face idiosyncratic productivity shocks, the distribution of wealth is an important determinant of aggregate income. Kiyotaki and Moore (1997) find that when entrepreneurs are unable to borrow, firm-specific shocks can be amplified to large, economy-wide effects. And, Kocherlakota (1996) shows how the inability to engage in risk-sharing arrangements can result in persistent cycles in aggregate output. While

[2]Details of this estimation appear in the appendix.

we consider some of the same themes, our approach differs from the above-mentioned work in that credit-constraints do not bind all individuals in the same way. In our simple model, low income individuals are more likely to be credit-constrained and, thus, the distribution of income determines the fraction of the population that has access to credit.

In the empirical section, we use cross-country panel data to show that greater income inequality Granger causes less consumption and output variability when per capita income is low. When per capita income is high, greater income inequality Granger causes more consumption and output variability.

The paper is organized as follows: section 2 lays out the theoretical framework, section 3 discusses our empirical results, and section 4 concludes.

2. The Framework

Individuals, who have an infinite time horizon and supply labor inelastically, solve the following maximization problem:

$$u^i \;=\; \sum_{j=t}^{\infty} \beta^j E[u(c_j^i) \mid t], \tag{1}$$

subject to

$$\Omega_j^i = \; (1+R_j)\Omega_{j-1}^i \;+\; w_j S_i - c_j^i \tag{2}$$

and,

$$\lim_{T\to\infty} \; \Omega_T^i \sum_{j=t}^{T} \frac{1}{1+R_j} \geq 0. \tag{3}$$

Equation (1) represents individual i's lifetime expected utility with $u'(c_j^i) > 0$, $u''(c_j^i) < 0$, where c_j^i denotes the individual's consumption in period j and β, $0 < \beta \leq 1$, represents the common time discount factor. Equation (2) represents individual i's

budget constraint in any given period j, where w_j represents the wage rate per efficiency units of labor, S_i denotes the individual's given, time-invariant, efficiency units of labor, Ω_j^i and Ω_{j-1}^i respectively denote the individual's assets in periods j and $j-1$, and R_j denotes the interest rate that applies between periods j and $j-1$. We assume that the wage rate per efficiency units of labor, w_j, fluctuates around its long-run equilibrium due to productivity shocks. Thus, in equation (2), $w_j = \bar{w} + \eta_j$, where η_j denotes a transitory, white-noise productivity shock. It is drawn from a distribution with a mean of zero. In addition, to ensure that $w_j > 0$, $\forall j \geq 0$, we assume that the support of η_j, $[\underline{\eta}, \bar{\eta}]$, is bounded from below such that $\bar{w} + \underline{\eta} \geq 0$. Equation (3) is necessary to rule out an ever-expanding path of borrowing.

Note that we have assumed all workers absorb the negative productivity shock proportionally. While this assumption is certainly counterfactual, we make it in order to focus attention on the link from income inequality to macroeconomic fluctuations and not on the link in the other direction. If we took a more realistic view and assumed that low income workers may be more likely to assume a disporportionate share of negative income shocks, our results would be strengthened.

If individual i is not credit constrained, we obtain the following Euler equation from the first-order conditions to the problem specified in (1)-(3):

$$u'(c_t^i) \;=\; \beta \; E[R_{t+1} \; u'(c_{t+1}^i) \mid t]. \tag{4}$$

If individual i is unable to borrow, an additional restriction, $\Omega_j^i \geq 0$, $\forall j \geq 0$, applies to the problem specified in (1)-(3). When the constraint binds, the resulting Euler equation implies

$$u'(c_t^i) \;>\; \beta \; E[R_{t+1} \; u'(c_{t+1}^i) \mid t]. \tag{5}$$

As discussed in Zeldes (1989) and as (5) implies, in periods in which the borrowing

constraint binds, the following must be true: First, since the individual is constrained from borrowing–but not from saving more–marginal utility from consumption in the current period is greater than the discounted value of expected utility from consumption in the following period. Second, in periods in which the constraint is binding so that (5) holds, the end of period real assets should be equal to zero. Namely, $\Omega_j^i = 0$. In contrast to the unconstrained individual, the constrained individual will experience fluctuations in consumption over time.

We assume that individual i's time-invariant, innate efficiency units of labor, S_i, is drawn from the probability distribution shown below:

$$S_i = \begin{cases} S_1 & \text{with probability} \quad q \\ S_A & \text{with probability} \quad (1-2q) \\ S_2 & \text{with probability} \quad q \end{cases}, \tag{6}$$

where $q \leq \frac{1}{2}$, $S_1 < S_2$ and $S_A \equiv \frac{S_1+S_2}{2}$. Note that, under this specification, q is a direct measure of income inequality. An increase in q raises the proportion of individuals at the tails of the income distribution relative to the proportion who are in the middle.

Suppose that lenders in this economy operate selectively in providing individuals credit and lend only to individuals with high earnings potential. This assumption can be motivated in a variety of ways and, as discussed in the introduction, is consistent with the empirical observation that low-income individuals have restricted access to credit. One reason for this could occur if there is a fxed cost (i.e. a monitoring or a collection cost) to bank lending. Then, without sufficient variation in the rates charged to consumers, lenders would not want to make small loans to low-income individuals. Alternatively, if there exists a subsistence level of consumption below which utility from consumption drops dramatically, low income individuals would have a relatively high probability of default with a sufficiently negative income shock. Finally, if low-income workers were

more likely to assume a disproportionate share of aggregate income shocks, they would also have a higher probability of default. Under any of these scenarios, creditors would prefer to earn a zero return on their asset holdings rather than earn an expected negative return on loans to low-income indiviuduals.

Let $\tilde{S}$ denote the threshold level of earnings potential under which credit to potential borrowers is not available. Suppose that $\tilde{S} > S_i$ for some i so that individuals with average expected income less than $\bar{w}\tilde{S}$ are constrained. As (5) implies, if the constraint is binding for some individuals in the current period, their consumption in that period will be depressed compared to other periods in which the constraint is not binding.

Given that, as specified in equation (6), there are three types of individuals in this economy, we can derive the aggregate consumption demand in period t, C_t^D, by normalizing the size of the population to one and summing up all three types of individuals' demand:

$$C_t^D \;=\; qc_t^1 \;+\; (1-2q)c_t^A \;+\; qc_t^2. \tag{7}$$

We can determine the variance of aggregate consumption demand over a period of time and how changes in the income distribution, q, affect it. Namely,

$$\begin{aligned} Var(C_t^D) \;=\; & q^2 Var(c_t^1) \;+\; (1-2q)^2 Var(c_t^A) \;+\; q^2 Var(c_t^2) \;+ \\ & 2q(1-2q)[Cov(c_t^1, c_t^A) + Cov(c_t^A, c_t^2)] \;+\; 2q^2 Cov(c_t^1, c_t^2), \end{aligned} \tag{8}$$

and,

$$\begin{aligned} \frac{\partial Var(C_t^D)}{\partial q} \;=\; & 2qVar(c_t^1) \;-\; 4(1-2q)Var(c_t^A) \;+\; 2qVar(c_t^2) \;+ \end{aligned} \tag{9}$$

$$(2-8q)[Cov(c_t^1, c_t^A) + Cov(c_t^A, c_t^2)] \; + \; 4qCov(c_t^1, c_t^2).$$

Whether a greater degree of income inequality–as summarized by an increase in q–leads to a higher or lower variance of consumption, depends on $\tilde{S}$. To examine how income inequality might affect variations in aggregate consumption demand, first consider the case in which $S_A \geq \tilde{S} > S_1$, such that only individuals with the lowest earning potential are denied credit. In this case, an increase in income inequality unambigiously leads to a greater variance of consumption demand and equation (9) is strictly positive. The reason is that both the middle and upper class, $i = A, 2$, have access to credit. Thus, in this case, increases in q raise the variance of aggregate consumption demand over time since it is only the demand of the lowest income types, $i = 1$, that exhibit any variance. That is, when $S_A \geq \tilde{S} > S_1$,

$$\frac{\partial Var(C_t^D)}{\partial q} = 2qVar(c_t^1) > 0. \tag{10}$$

Now consider the case in which $S_2 \geq \tilde{S} > S_A$. In this case, an increase in income inequality can lead to a smaller variance of consumption demand and equation (9) can be negative. Now, only the highest income labor types, $i = 2$, have access to consumption credit and they can fully smooth their consumption demand. The consumption demand of both the middle and low income types, $i = A, 2$, exhibit variance over time. Therefore, increases in q may lower the variance of aggregate consumption demand, because it would create more consumption smoothers (high income workers). In this case, equation (9) reduces to

$$\frac{\partial Var(C_t^D)}{\partial q} = \; (2-8q)Cov(c_t^1, \; c_t^A) \; + \; 2qVar(c_t^1) \; - \; 4(1-2q)Var(c_t^A). \tag{11}$$

Equation (11) can be positive or negative but is more likely to be negative if $Var(c_t^A)$ is relatively large–i.e. the middle class often finds itself in a constrained situation as is likely to be the case if the middle class is also relatively poor. We know that because the average level of c_t^1 is less than the average level of c_t^A and both types of workers' savings are proportional to their expected income, $Var(c_t^A) > Var(c_t^1)$, thus increasing the likelihood that (11) is negative.

In sum, taken together equations (8)-(11) demonstrate the impact of adverse productivity shocks on aggregate consumption demand, and how income inequality and aggregate consumption demand may be related. When only the lower class is credit-constrained, greater inequality (a smaller middle class) leads to more fluctuations in aggregate consumption. When both the lower and middle classes are constrained, however, greater inequality may lead to less fluctuations in consumption. If a country's per capita income is an indication of whether or not the middle-class is constrained, then income inequality and per capita income should be a "good" summary measure of the fraction of the population that is unable to smooth consumption. In poorer countries, both the lower and middle classes are likely to be constrained, whereas in richer countries only the lower class may be constrained. Thus, in low income countries greater inequality may translate into less fluctuations in aggregate consumption, and in higher income countries greater inequality may result in more fluctuations.

The simple framework outlined above shows the link between income distribution and aggregate demand fluctuations, but an enhanced model with nominal or real ridigities (that help generate an upward sloping short-run aggregate supply curve) would also imply a similar relationship between the income distribution and real output fluctuations. Although we do not develop such a model here, in the next section we present–in addition to the consumption/inequality relationship outlined above–some empirical evidence on this relationship.

3. Empirical Results

In this section we find empirical evidence of the above-mentioned effects. We demonstrate that countries with higher levels of income inequality have a lower variation of consumption and output growth when per capita income is low. But in richer economies, the effect of income inequality on macroeconomic fluctuations reverses: Greater income inequality is associated with greater variation in the growth of real consumption and output in economies with high per capita income.

Equation (9) spells out the implications for the empirical relationship between income inequality and output variability. Implementing a convincing empirical test of its prediction, however, raises some important issues. One issue is that output variability might be associated with greater income inequality if higher output variability creates greater inequality. Thus, even if income distribution has no effect on an economy's ability to adapt to a technology shock, one might expect there to be a positive correlation between income inequality and macroeconomic fluctuations. We address this issue using a lagged value of income inequality, focusing attention on the link from income distribution to output variation. Thus, we study the relationship between initial income inequality and subsequent output variability, essentially implementing a test for Granger causality. Surprisingly, we find stronger evidence that income inequality Granger causes higher output and consumption variability rather than higher output variability causing greater income inequality.

A second important empirical issue is that institutional/cultural features of the economy that could be correlated with income inequality may also influence the variability of output. For example, the central bank's willingness to accomodate adverse shocks may differ across countries. Another example of this type of effect is that some countries may have more extensive automatic stabilizers and a greater committment to providing a social safety net. These institutional/cultural factors could be correlated with income inequality, particularly in democracies where voting behavior can influence government

policy [3]. Fortunately, panel data is available, and we are able to address this issue by estimating a fixed-effects model.

As a result of these considerations, our empirical estimates of the effect of income inequality on macroeconomic fluctuations are obtained by estimating the following equation with panel data.

$$V_{i,t} = \mu_i + \lambda_t + \beta_1 INCINEQ_{t-1} + \beta_2 INCINEQ_{t-1} * MEANGDP_t + \beta_3 X_t + \upsilon_{i,t} \tag{12}$$

where $V_{i,t}$ is the variation of real consumption or output at time t for country i, μ_i is a country-specific effect, λ_t is a time-specific effect, $INCINEQ_{t-1}$ is a measure of income inequality in the preceding period, $MEANGDP_t$ is the average level of real per capita income, X_t are additional control variables that may help to explain output fluctuations, and $\upsilon_{i,t}$ is the variability in output not explained by the regressors. We assume that $\upsilon_{i,t}$ is uncorrelated with the regressors and is distributed normally with a mean of zero and a variance of $\sigma^2_{i,t}$.[4]

A natural choice for our empirical measure of output and consumption variability is the standard deviation of the annual growth rate of real GDP and of real consumption. In order to calculate such a measure, however, we need to collapse several years of data into one time period. Our panel spans the years 1969 to 1992, and we divide it in half, calculating a standard deviation of annual growth rates from the periods 1972 to 1980 and from 1984 to 1992. For each of the countries in our panel we have an observation

[3]Persson and Tabellini (1994) find evidence that income inequality affects long-run growth in democracies but not in non-democracies. This result suggests that income inequality may affect voting behavior which could influence the government's economic policies.

[4]In addition to adopting this assumption on the distribution of errors because of its intuitive appeal for cross-country data, we also confirmed it with a Cook-Weisberg test for heteroscedasticity.

on income inequality during the period 1969 to 1971 and during the period 1981 to 1983. Thus, we observe income inequality during a three year period and then observe the variation of GDP or consumption growth over the subsequent 9 years [5]. Similarly, $MEANGDP$ is the average of per capita income over a nine-year period.

Using this methodology we are able to include 14 countries in our panel. By relaxing our criteria slightly and including observations that have an income inequality measure taken between 1967 and 1973 and between 1979 and 1985, we are able to almost double our sample to include 27 countries. We report results for both the restricted (14-country) and full (27-country) samples.

The control variables in X_t include the average growth rate of real per capita income or consumption over the period, $GROWTH, MEANGDP$, the mean of inflation over the period $INFMEAN$, and the standard deviation of inflation over the period $INFSD$. $GROWTH$ is included because the standard deviation of growth rates may be correlated with the average growth rate, based purely on the manner in which the standard deviation is constructed. $MEANGDP$ is included to isolate its effect independent of its interaction effect with income inequality. Finally, we include the inflation mean and standard deviation because they will be correlated with output growth variability when the aggregate supply curve is upward sloping.

Estimation of equation (12) yields the empirical relationship between inequality and consumption or output variation. Specifically,

$$\frac{\partial(V_{i,t})}{\partial(INCINEQ_{t-1})} = \beta_1 + \beta_2 MEANGDP_t \tag{13}$$

Our model predicts that income inequality is associated with lower variability of output and consumption in low income countries but higher variability of output in high

[5] When we have more than one observation of inequality for a particular country over the three year period, we averaged the multiple observations to obtain a single estimate. This data selection strategy is defensible on the grounds that economy-wide measures of income inequality change very little on a year-over-year basis.

income countries. Thus, a finding of a negative β_1 and a positive β_2 would support our model.

The data we use to estimate (12) comes from a variety of sources. Real GDP and consumption levels are taken from the Penn World Tables, Mark 5.6, income inequality measures are from Deininger and Squire (1996), and data on each country's price level is from the International Financial Statistics published by the IMF. Because different measures of inequality capture slightly different aspects of the income distribution, we use two measures of income inequality–the Gini coefficient and the percent of income earned by the middle class (the middle 3 quintiles of the income distribution). Of course, a higher gini implies higher inequality, but an increase in the income share of the middle class implies lower inequality. Therefore, to convert the income share of the middle class to a measure of income inequality, we subtract it from 100 and denote it $MIDCLASS$. A list of countries appears in Appendix 2.

Since the primary implication of our model is for the variation of aggregate consumption, we first estimate equation (12) using the variation of consumption growth. The results for the full and restricted samples appear in Tables 1 and 2.

[Tables 1 and 2 about here.]

In both tables, columns 1 and 3 present the results using the gini coefficient, $GINI$, as a measure of income inequality and columns 2 and 4 use $MIDCLASS$. The results for both samples are qualitatively similar and we discuss here only the full sample results in Table 1. Using either measure of income inequality, the results are consistent with the idea that income distribution and aggregate consumption demand fluctuations are closely related. Greater inequality at the beginning of a period is associated with less variability in consumption growth over the subsequent 9 years in economies with low per

capita income. However, when per capita income is higher, this effect is reversed and greater inequality is associated with higher aggregate consumption variability. Using the coefficients estimated in columns 3 and 4, one can calculate the level of per capita income at which this turning point occurs to be about $11,000 or $12,000 (in 1985 dollars). Slightly less than 1/4 of our sample is above this turning point.

As stated earlier, in the presence of some real or nominal rigidities, it is likely that variations in aggregate consumption demand will be correlated with fluctuations in real output. Tables 3 and 4 give results from repeating the preceding exercise using the standard deviation of GDP as the dependent variable. These results are consistent with those presented in Tables 1 and 2, although reduced significance levels for the interaction of $MEANGDP$ with the inequality measure are reported for a few specifications. It is also worthwhile to note that in Tables 1 through 4, $MEANGDP$ enters negatively and significantly in explaining consumption and output variation, suggesting that high income countries have less variation in output and consumption. This finding is also consistent with the idea that individuals with higher incomes are better able to smooth consumption.

[Tables 3 and 4 about here.]

Figures 3 and 4 graphically display the results presented in Tables 1 through 4, showing the partial correlations between the standard deviations of consumption growth and of GDP growth and our two measures of inequality and their interaction with mean GDP. These plots indicate that our estimated coefficients are generally not the result of overly influential outliers. One exception to this is the plot in the upper left panel of figure 4 that shows the partial correlation between the Gini coefficient and the standard deviation of real GDP growth, suggesting that this estimation may have been affected

by four possible outliers. We reestimated this equation without these four outliers and found the new coefficient to be bigger (smaller in absolute value), but still statistically significant at the 5 percent level.

The fact that we find a negative relationship between inequality and output variability somewhat mitigates our concerns that we might be identifying inequality that results from output variability since, if this were the case, we would expect a positive relationship between inequality and output variation. Table 5 presents further support that we are not identifying such a link by showing that lagged output variation cannot be associated with subsequent levels of inequality [6]. Column 1 of Table 5 shows the results using the gini coefficient as the dependent variable and column 2 shows the results using $MIDCLASS$. Columns 3 and 4 add the square of $MEANGDP$ to the specification as the presence of a Kuznets curve would dictate. A similar exercise using the variation of consumption growth gives essentially the same result, but we do not report it here.

[Table 5 about here.]

Although there is not a statistically significant relationship between lagged output variation and future inequality on average, we should concede that our methodology is too crude to capture very short-term fluctuations in output growth and the distribution of income. Certainly, if some individuals lose their jobs in a recession, the income distribution–at least temporarily–changes, but data at an annual frequency averaged over nine years may be unable to detect these temporary changes. Our results only suggest that greater variation in output growth over several years does not appear to lead to systematic changes in the income distribution.

[6] Fortunately, we were able to estimate these regressions by expanding our data set and adding output variation over the period 1960 to 1968.

Because our model uses differences in shifts in aggregate demand as an explanation for differences in response to external shocks, it suggests that there may also be a relationship between price level variability and income inequality. Unfortunately, we were not able to uncover a similar statistically significant relationship between the standard deviation of inflation rates and income inequality. One possible reason for our inability to document this relationship is that the short-run aggregate supply curve is relatively flat. In such a case, shifts in aggregate demand will have very little impact on price level variability. This hypothesis is also consistent with the results in Tables 3 and 4 that show that neither the inflation mean nor its standard deviation are robustly correlated with the standard deviation of annual growth rates of output.

4. Conclusion

In this paper, we examine how income inequality might affect short-run macroeconomic fluctuations. We present a model in which access to credit is based on earnings potential, and demonstrate that, if low as well as middle income individuals are credit constrained, greater inequality is likely to be associated with less fluctuations in aggregate consumption and real output.

Using a cross-country panel data, we are able to find evidence supporting the view that whether income inequality leads to more or less macroeconomic fluctuations depends on average income. In low income countries, when both the lower and middle classes are more likely to be credit-constrained, a more unequal distribution of income (a smaller middle class) will result in smoother aggregate consumption and GDP. In contrast, in higher income countries where only the lower class may be shut out of credit markets and unable to smooth consumption through downturns, greater inequality is likely to be associated with more variation in consumption and output.

5. References

Benabou, Roland, 1994, "Human Capital, Inequality and Growth: A Local Perspective," *European Economic Review*, April, 38(3-4), 817-26.

Das, Satya P., 1993, *New Perspectives on Business Cycles*, (Cambridge: Edward Elgar Publishing, University Press).

Durlauf, Steven N., 1994, "Spillovers, Starification and Inequality," *European Economic Review*, April, 38(3-4), 836-45.

Deininger, Klaus and Lyn Squire, 1996, "Measuring Income Inequality: A New Data Base," World Bank mimeo.

Federal Reserve Board, 1992 Survey of Consumer Finances.

Galor, Oded and Joseph Zeira, 1993, "Income Distribution and Macroeconomics," *Review of Economic Studies*, April, 38(3-4), 817-26.

International Monetary Fund, "International Financial Statistics," 1969 - 1992.

Kiyotaki, Nobuhiro and John Moore, 1997, "Credit Cycles," *Journal of Political Economy,* 105, 2, 211-48.

Kocherlakota, Narayana R., 1996, "Consumption, Commitment and Cycles," *Jounal of Monetary Economics,* 37, 461-74.

Levy, Frank and Richard J. Murnane, 1992, "U.S. Earnings Levels and Earnings Inequality: A Review of Recent Trends and Proposed Explanations," *Journal of Economic Literature*, vol. 30, no. 3, September, 1333-1381.

Murphy, Kevin M., Andrei Shleifer and Robert W. Vishny, 1989, "Income Distribution, Market Size and Industrialization," *Quarterly Journal of Economics*, 104(3), August, 537-64.

Perotti, Roberto, 1994, "Income Distribution and Investment," *European Economic Review*, vol. 38(3-4), 827-35.

Persson, Torsten and Guido Tabellini, 1994, "Is Inequality Harmful for Growth?," *The*

American Economic Review, vol. 84, no. 3, 600-621.

Scheinkman, Jose A. and Laurence Weiss, 1986, "Borrowing Constraints and Aggregate Economic Activity," *Econometrica,* Vol. 54, No. 1, 23-45.

Summers, Robert, and Alan Heston, 1991, "The Penn World Table: An Expanded Set of International Comparisons, 1950-1988," *Quarterly Journal of Economics*, 106, 327-443.

Zeldes, Stephen P., 1989, "Consumption and Liquidity Constraints: An Empirical Investigation," *Journal of Political Economy,* Vol. 97, No. 2, 305-46.

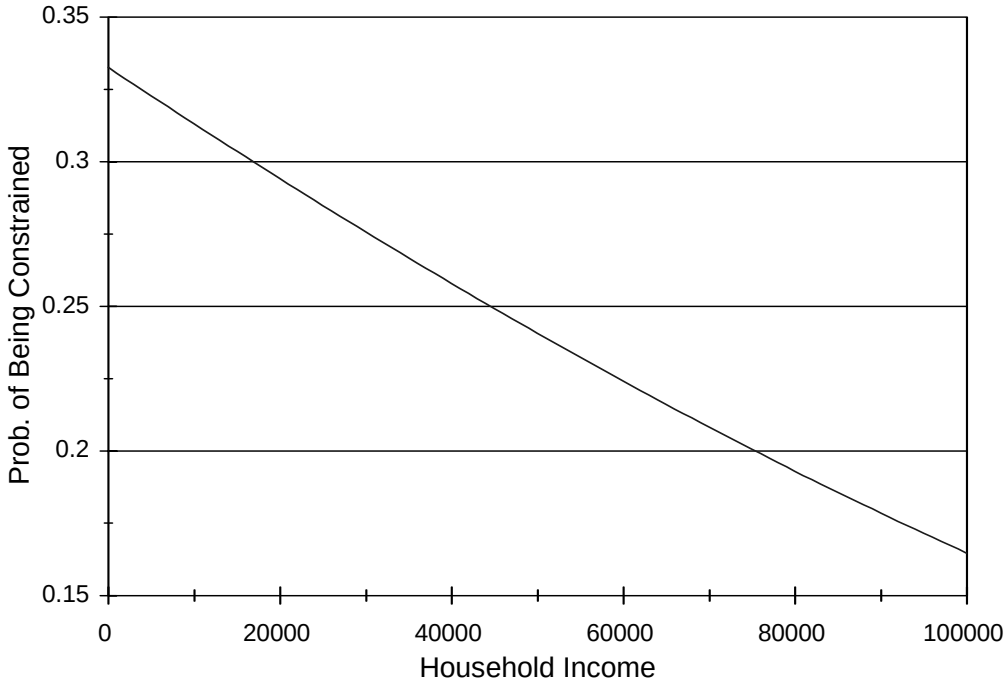


Figure 1:

Probability of being credit constrained–Evidence from 1992 Survey of Consumer Finances

Table 1: (Full Sample)

Dependent Variable: STANDARD DEVIATION OF CONSUMPTION GROWTH
(Annual Rates)

	(1)	(2)	(3)	(4)
$GINI_{t-1}$	$-.745$	$--$	$-.675$	$--$
	(4.22)		(3.18)	
$MIDCLASS_{t-1}$	$--$	-1.25	$--$	$-.999$
		(4.12)		(4.52)
$INCINEQ_{t-1} * MEANGDP_t$	.058	.109	.055	.091
	(3.29)	(3.95)	(2.75)	(4.48)
$GROWTH_t$	$-.655$	$-.851$	$-.648$	$-.905$
	(2.17)	(3.83)	(3.18)	(5.00)
$MEANGDP_t$	-1.67	-4.05	-2.03	-4.04
	(2.47)	(3.11)	(2.42)	(4.25)
$INFMEAN_t$	$--$	$--$	$-.251$	$-.334$
			(-2.31)	(2.72)
$INFSTDEV_t$	$--$	$--$	.156	.190
			(1.32)	(1.34)

Note: Country-specific and time-specific fixed effects estimate. Heteroskedasticity-corrected t-statistics are in parenthesis.

Table 2: (Restricted Sample)

Dependent Variable: STANDARD DEVIATION OF CONSUMPTION GROWTH
(Annual Rates)

	(1)	(2)	(3)	(4)
$GINI_{t-1}$	−.715	−−	−.594	−−
	(3.82)		(4.17)	
$MIDCLASS_{t-1}$	−−	−.843	−−	−.646
		(3.76)		(2.73)
$INCINEQ_{t-1} * MEANGDP_t$	.049	.073	.040	.052
	(2.70)	(4.14)	(2.94)	(2.63)
$GROWTH_t$	−.741	−.844	−.707	−.780
	(2.81)	(3.26)	(3.92)	(3.22)
$MEANGDP_t$	−1.40	−2.80	−2.22	−3.00
	(1.70)	(5.40)	(3.71)	(1.48)
$INFMEAN_t$	−−	−−	−.388	−.377
			(3.15)	(2.64)
$INFSTDEV_t$	−−	−−	.170	.160
			(1.21)	(0.97)

Note: Country-specific and time-specific fixed effects estimate. Heteroskedasticity-corrected t-statistics are in parenthesis.

Table 3: (Full Sample)

Dependent Variable: STANDARD DEVIATION OF REAL GDP GROWTH
(Annual Rates)

	(1)	(2)	(3)	(4)
$GINI_{t-1}$	$-.415$	$--$	$-.304$	$--$
	(2.13)		(2.06)	
$MIDCLASS_{t-1}$	$--$	$-.758$	$--$	$-.511$
		(2.35)		(2.26)
$INCINEQ_{t-1} * MEANGDP_t$	.031	.060	.025	.043
	(1.77)	(1.91)	(1.96)	(2.06)
$GROWTH_t$	$-.816$	$-.944$	$-.708$	$-.832$
	(4.87)	(4.10)	(4.48)	(5.91)
$MEANGDP_t$	-1.32	-2.59	-1.26	-2.17
	(2.07)	(2.04)	(2.28)	(2.48)
$INFMEAN_t$	$--$	$--$	$-.125$	$-.196$
			(1.10)	(1.32)
$INFSTDEV_t$	$--$	$--$	.173	.340
			(1.40)	(1.91)

Note: Country-specific and time-specific fixed effects estimate. Heteroskedasticity-corrected t-statistics are in parenthesis.

Table 4: (Restricted Sample)

Dependent Variable: STANDARD DEVIATION OF REAL GDP GROWTH
(Annual Rates)

	(1)	(2)	(3)	(4)
$GINI_{t-1}$	$-.529$	$--$	$-.378$	$--$
	(5.50)		(4.01)	
$MIDCLASS_{t-1}$	$--$	$-.620$	$--$	$-.449$
		(5.44)		(3.46)
$INCINEQ_{t-1} * MEANGDP_t$	.041	.053	.030	.039
	(3.85)	(3.73)	(2.73)	(2.26)
$GROWTH_t$	$-.840$	$-.822$	$-.786$	$-.782$
	(6.13)	(4.88)	(4.99)	(3.67)
$MEANGDP_t$	-1.78	-2.68	-1.57	-2.23
	(3.40)	(3.40)	(3.24)	(1.52)
$INFMEAN_t$	$--$	$--$	$-.149$	$-.142$
			(1.41)	(1.12)
$INFSTDEV_t$	$--$	$--$	.244	.242
			(2.50)	(2.21)

Note: Country-specific and time-specific fixed effects estimate. Heteroskedasticity-corrected t-statistics are in parenthesis.

Table 5: (Full Sample)

Dependent Variable: INCOME INEQUALITY

	$GINI_t$	$MIDCLASS_t$	$GINI_t$	$MIDCLASS_t$
V_{t-1}	.149	.109	.149	.065
	(0.55)	(0.35)	(0.54)	(0.24)
$MEANGDP_{t-1}$	-1.16	.757	-1.23	2.98
	(2.05)	(1.28)	(1.12)	(2.60)
$GROWTH_{t-1}$	.015	$-.036$	.017	$-.027$
	(.047)	(0.07)	(.051)	(0.05)
$MEANGDP^2_{t-1}$	$--$	$--$	.000	.001
			(0.07)	(2.76)

Note: Country-specific and time-specific fixed effects estimate. Heteroskedasticity-corrected t-statistics are in parenthesis.

Figure 3:

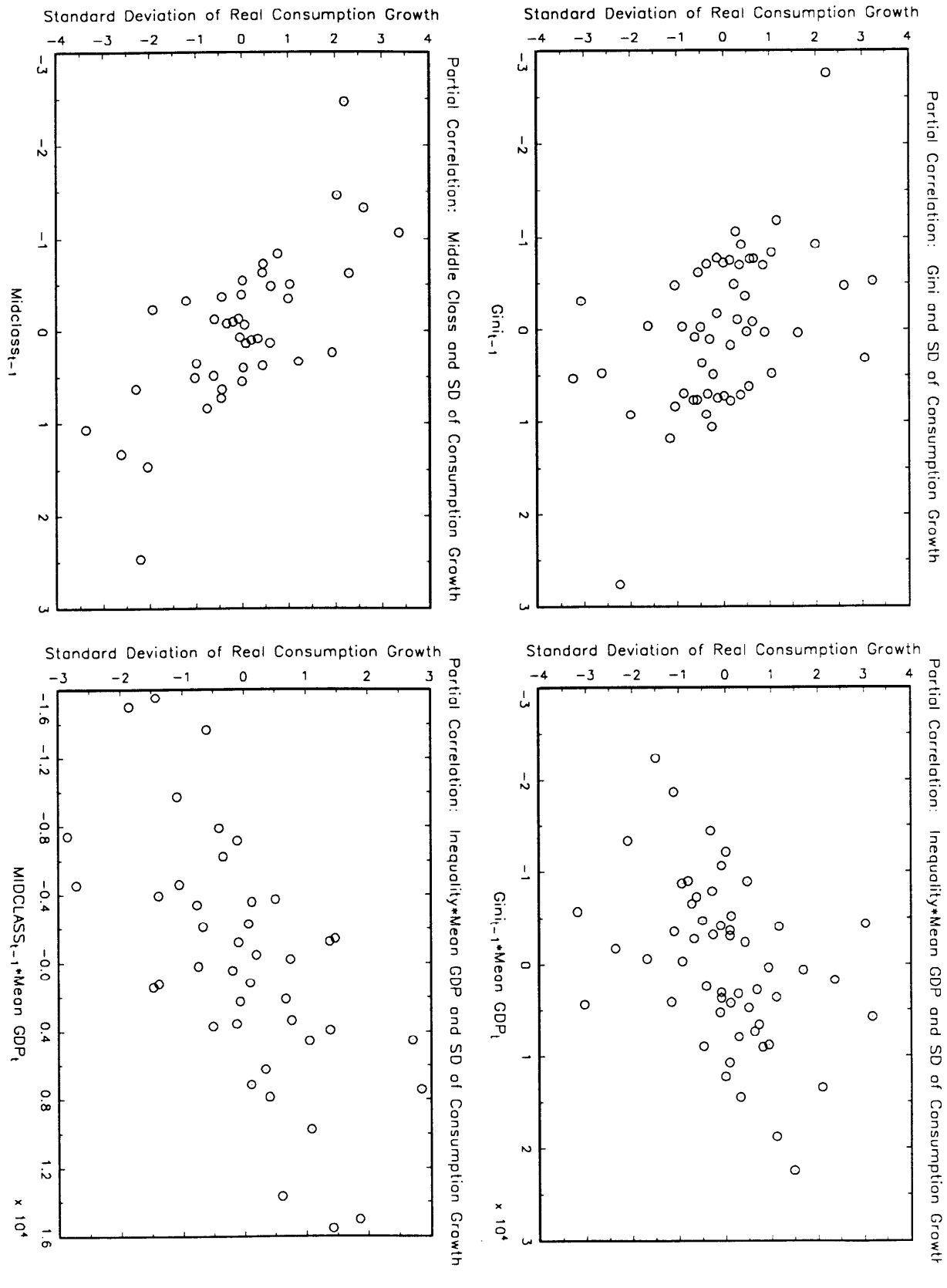
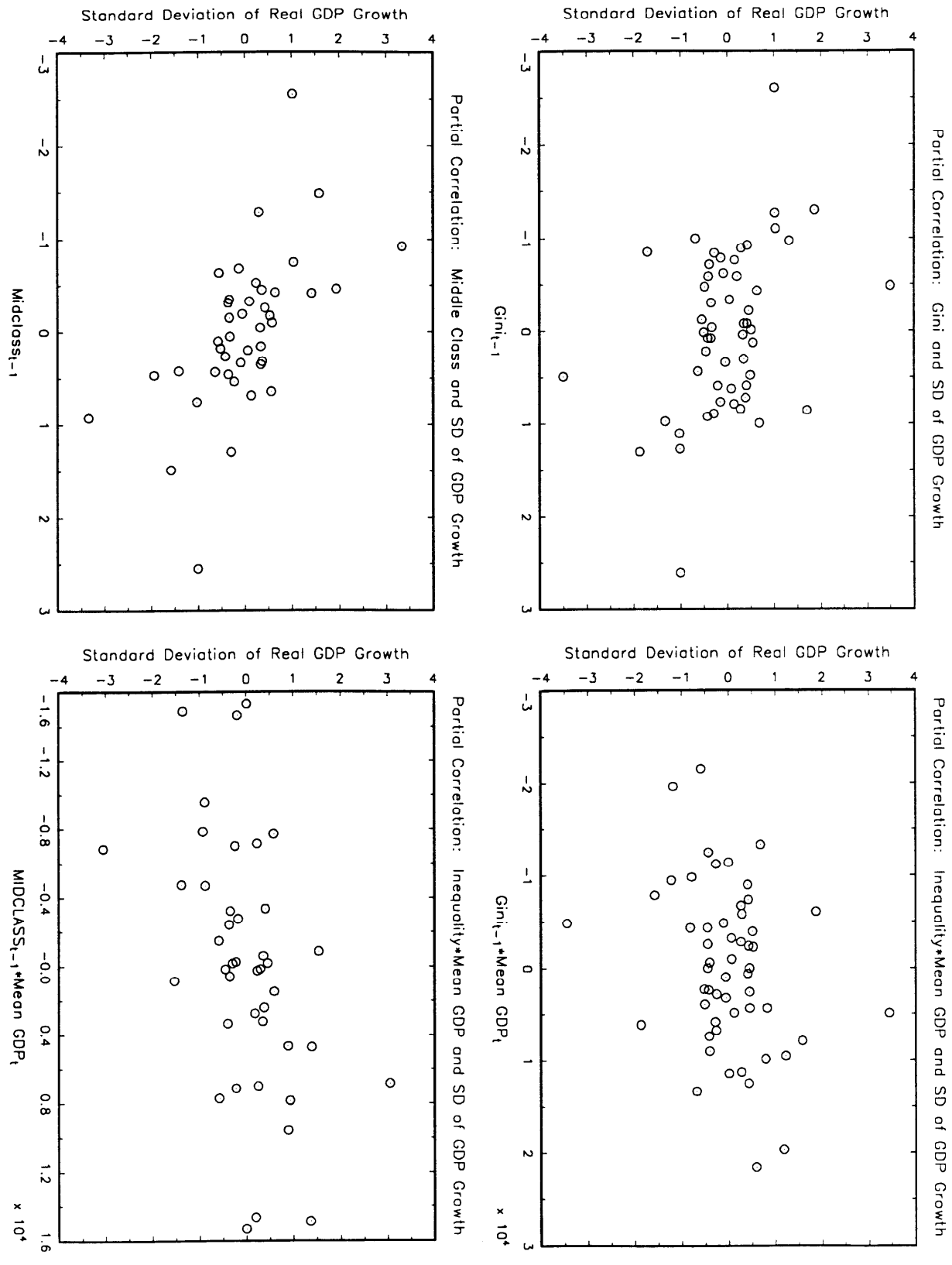

Partial Correlation: Gini and SD of Consumption Growth
Standard Deviation of Real Consumption Growth
Gini$_{t-1}$
Partial Correlation: Middle Class and SD of Consumption Growth
Standard Deviation of Real Consumption Growth
Midclass$_{t-1}$
Partial Correlation: Inequality*Mean GDP and SD of Consumption Growth
Standard Deviation of Real Consumption Growth
Gini$_{t-1}$*Mean GDP$_t$
x 10^4
Partial Correlation: Inequality*Mean GDP and SD of Consumption Growth
Standard Deviation of Real Consumption Growth
MIDCLASS$_{t-1}$*Mean GDP$_t$
x 10^4

Figure 4:


Partial Correlation: Gini and SD of GDP Growth
Standard Deviation of Real GDP Growth
Gini$_{t-1}$
Partial Correlation: Middle Class and SD of GDP Growth
Standard Deviation of Real GDP Growth
Midclass$_{t-1}$
Partial Correlation: Inequality*Mean GDP and SD of GDP Growth
Standard Deviation of Real GDP Growth
Gini$_{t-1}$*Mean GDP$_t$
× 10^4
Partial Correlation: Inequality*Mean GDP and SD of GDP Growth
Standard Deviation of Real GDP Growth
MIDCLASS$_{t-1}$*Mean GDP$_t$
× 10^4

Appendix 1: Estimation of Figure 1

Figure 1 depicts the results of a probit estimation using data from the 1992 Survey of Consumer Finances (SCF). The SCF asks respondents if they have been denied credit or have not been able to obtain as much credit as they applied for within the past 5 years. If individuals answered "yes" to this question and also to a subsequent question that they were unable to later obtain the full amount they requested by applying at other lenders, we classified them as being credit constrained. Individuals were also classified as credit constrained if they did not apply for credit because they thought they would be turned down.

While we are interested in knowing how household income affects the likelihood that an individual is credit constrained, we also recognize that other factors such as job tenure, home ownership, net worth, and education may also play a role in a lender's decisions and, thus, included them as control variables in this estimation. In order to eliminate observations associated with retired or non-working individuals, we did not include in our estimation people who were greater than 55 or who were out of the labor force. We also eliminated self-employed individuals so as not to obscure applications for business vs. individual credit. Finally, we considered only individuals with household incomes less than $100,000. The resulting sample is 1,406 individuals, 404 of whom are classified as credit constrained.

Table A-1 displays the results of our probit estimation. Total household income is significant at the 1 percent level. Interestingly, net worth, after controlling for property ownership is not significant. One possible interpretation of this result is that lenders place more importance on an applicant's income in evaluating the potential profitability of a loan because the expected payoff from foreclosing on a consumer loan is very low.

Table A-1:

Independent Variable	Coefficient	P-Value
Intercept	−0.3216 (2.94)	0.09
Household Income	0.0054 (7.46)	0.01
Household Net Worth	0.0003 (1.43)	0.23
Job Tenure	0.0157 (7.39)	0.01
Education	0.0317 (4.84)	0.03
Home Ownership	0.4120 (25.73)	0

Note: Chi-squared statistics are in parentheses.

Figure 1 is computed holding the values of all variables except household income constant at their sample averages and varying household income.

Appendix 2: The Data

COUNTRY	OBS.	OUTPUT*	CONSUMPTION*	GINI	MID. CLASS
Australia	1	1.78	1.89	32.0	39.2
	2	2.40	2.03	40.0	44.2
Canada	1	2.14	2.54	32.3	38.1
	2	3.40	3.35	31.3	37.9
Costa Rica	1	2.90	4.13	44.4	50.7
	2	2.03	1.72	45.5	51.6
Finland	1	3.57	5.55	27.0	n.a.
	2	5.24	4.35	31.5	37.3
Germany	1	2.54	1.54	33.6	41.2
	2	1.19	1.01	31.0	38.0
India	1	4.21	6.39	30.9	40.0
	2	2.17	2.99	31.5	40.6
Japan	1	2.90	2.92	36.0	45.7
	2	1.44	0.70	34.6	41.2
South Korea	1	5.92	4.61	33.0	41.2
	2	1.60	1.77	35.7	43.1
Sri Lanka	1	3.83	6.89	37.7	45.0
	2	2.27	2.55	45.3	52.0
Thailand	1	3.19	3.30	42.6	50.2
	2	3.74	3.70	43.1	51.1
Trinidad	1	3.21	4.78	51.0	53.5
	2	11.22	15.14	41.7	44.9
United Kingdom	1	3.15	3.57	25.2	37.3
	2	2.85	3.46	25.4	38.0
Unites States	1	3.18	2.57	34.0	41.0
	2	2.38	1.78	36.3	42.4
Venezuela	1	4.09	5.53	47.7	52.0
	2	6.48	5.86	42.8	48.2
Bangladesh	1	12.66	11.92	34.2	42.4
	2	2.66	2.32	37.5	45.4
Chile	1	8.07	15.64	46.0	52.3
	2	3.20	8.04	53.2	n.a.
Colombia	1	1.71	2.18	52.2	59.0
	2	1.28	2.60	54.5	58.8
France	1	2.05	1.33	44.0	n.a.
	2	1.32	0.75	34.9	41.9

COUNTRY	OBS.	OUTPUT*	CONSUMPTION*	GINI	MID. CLASS
Indonesia	1	2.17	4.57	30.7	n.a.
	2	2.23	2.65	33.7	42.2
Malaysia	1	4.31	3.90	50.0	56.2
	2	6.68	8.21	51.0	55.8
New Zealand	1	3.98	3.31	30.1	37.0
	2	2.64	2.21	33.9	36.5
Norway	1	1.14	2.02	36.0	39.8
	2	2.36	5.33	31.2	41.0
Pakistan	1	3.96	7.46	30.6	39.8
	2	1.76	3.13	32.3	41.4
Portugal	1	4.99	6.12	30.6	46.5
	2	5.13	5.79	36.8	42.6
Singapore	1	4.21	2.12	41.0	n.a.
	2	3.94	3.28	42.0	n.a.
Spain	1	3.37	3.01	30.5	n.a.
	2	2.25	1.84	26.8	35.1
Sweden	1	1.96	1.65	33.4	37.5
	2	2.34	2.20	31.6	38.6

* The standard deviation of the variable over the observation period.