Calibration:

G=1.03, ρ=2, p=0.005, σ^2_ε=0.2, σ^2_η=0, β=0.96, r=0.04

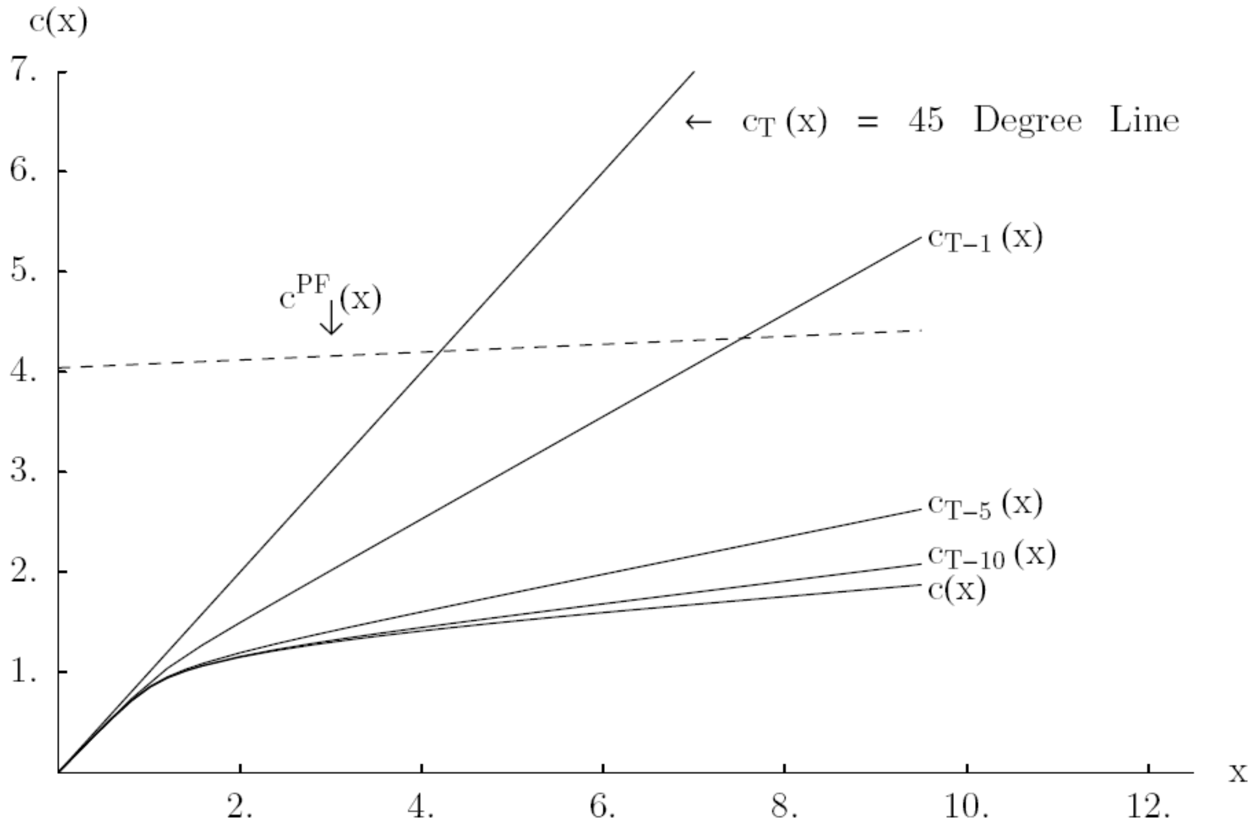

Figure 1: Convergence of Consumption Functions $c_{T-n}(x)$ as n Rises

Carroll (2001)

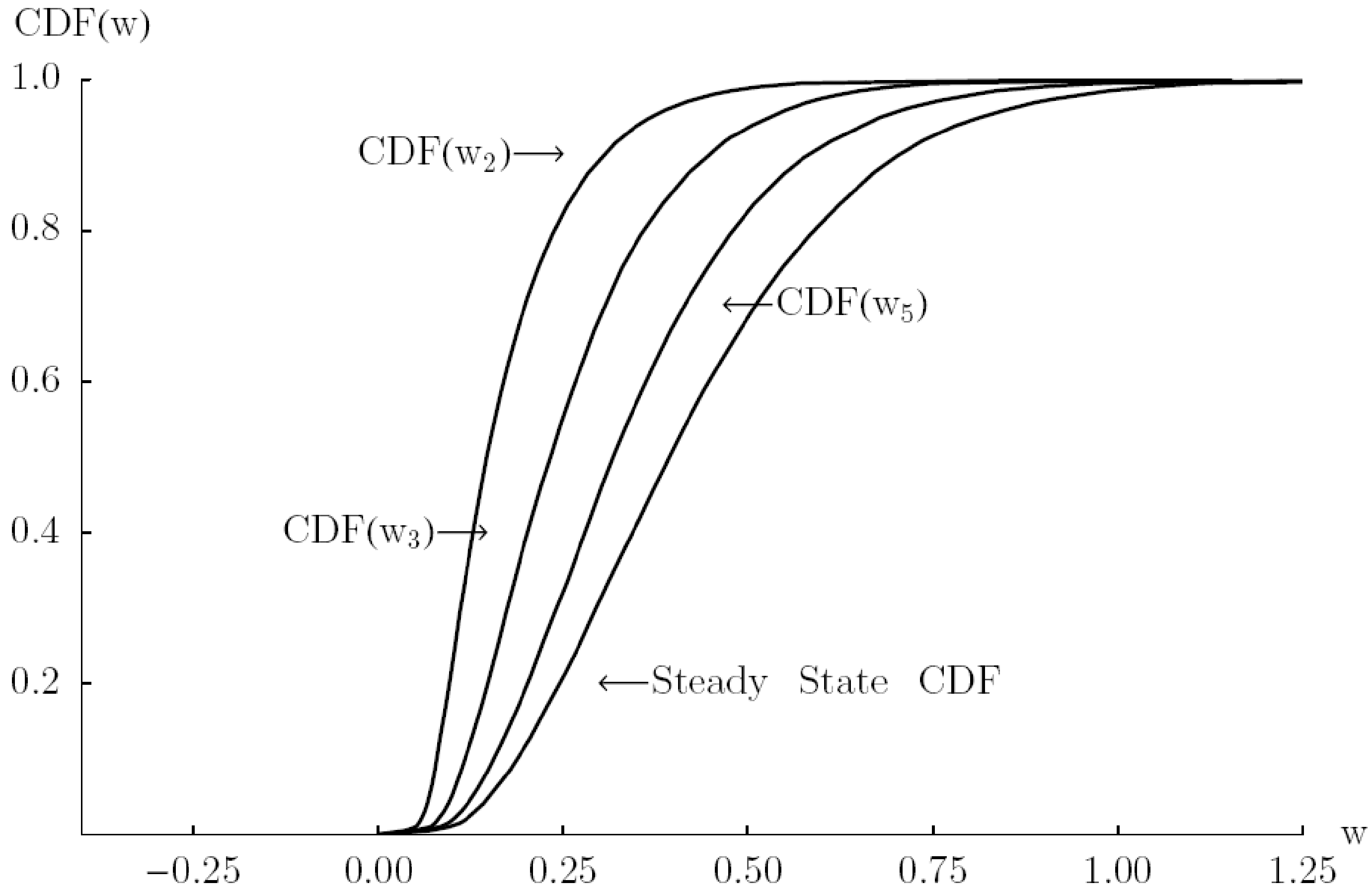

Figure 2: Cumulative Distribution Functions Starting With $w_{1,i} = 0 \ \forall \ i$

Carroll (JEP 2001)

Table 1: Steady-State Statistics For Alternative Consumption Models

Income Growth Factor	Mean w	Median w	Aggregate Consumption Growth	Mean MPC	Frac With w < 0	Frac With w = 0
Panel A. Baseline Model, No Constraints						
G=1.03	0.43	0.40	1.030	0.330	0.000	0.000
G=1.02	0.52	0.48	1.020	0.276	0.000	0.000
G=1.00	2.26	2.06	1.000	0.064	0.000	0.000
Panel B. Strict Liquidity Constraints						
G=1.03	0.28	0.24	1.030	0.361	0.000	0.070
G=1.02	0.36	0.32	1.020	0.301	0.000	0.051
G=1.00	2.28	2.06	1.000	0.065	0.000	0.000
Panel C. Borrowing Up To 0.3 Allowed						
G=1.03	−0.03	−0.06	1.030	0.361	0.611	0.000
G=1.02	0.06	0.01	1.020	0.299	0.478	0.000
G=1.00	1.94	1.71	1.000	0.064	0.023	0.000
Panel D. Borrowing Up to 0.3 at $R = 1.15$ Allowed						
G=1.03	0.11	0.07	1.030	0.327	0.320	0.058
G=1.02	0.21	0.16	1.020	0.274	0.210	0.046
G=1.00	2.11	1.89	1.000	0.064	0.007	0.002
Panel E. Statistics from the 1995 SCF						
–	1.02	0.29	–	–	0.205	0.025

Notes: Results in Panels A through D reflect calculations by the author using simulation programs available at the author's website, http://www.econ.jhu.edu/people/carroll/ccaroll.html. In Panel A, no constraint is imposed, but income can fall to zero, which prevents consumers from borrowing. In Panels B through D, the worst possible event is for income to fall to half of permanent income. For comparison, Panel E presents the mean and median values of the ratio of nonhousing wealth to permanent income from the 1995 *Survey of Consumer Finances* for non-self-employed households whose head was aged 25-50; the measure of permanent income is actual measured household income for households who reported that their income over the past year was 'about normal', and whose reported income was at least $5000; other households are dropped. The program that generates these statistics (and figure 6) is also available at the author's website.

Carroll (JEP 2001)

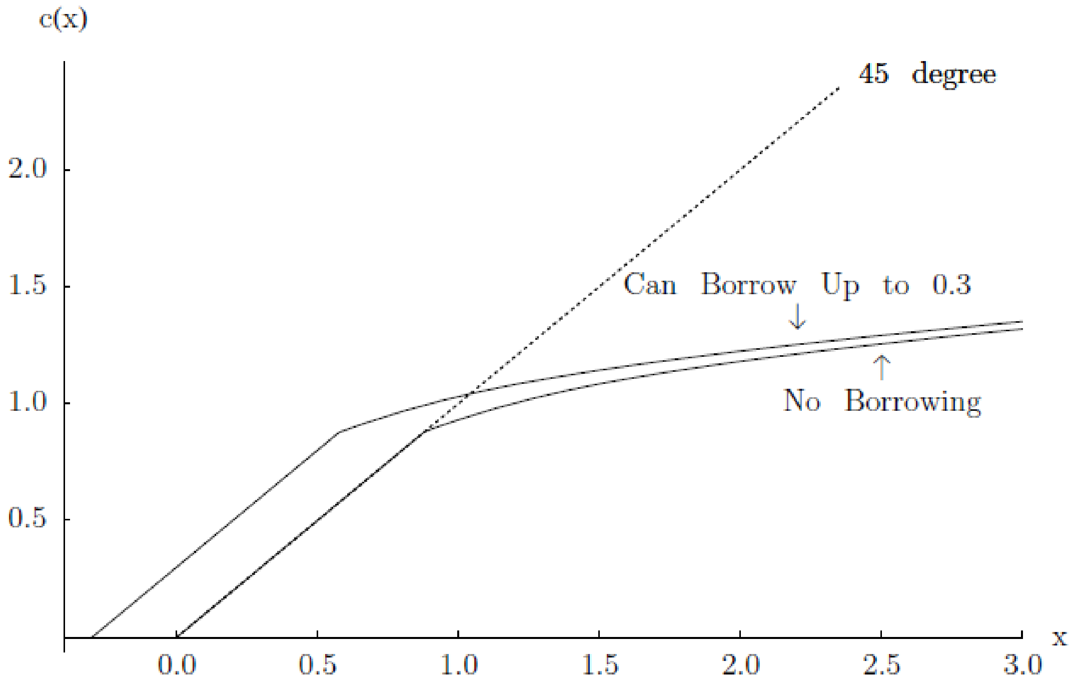

Figure 4: Converged Consumption Rule Under Liquidity Constraints

Carroll (JEP 2001)

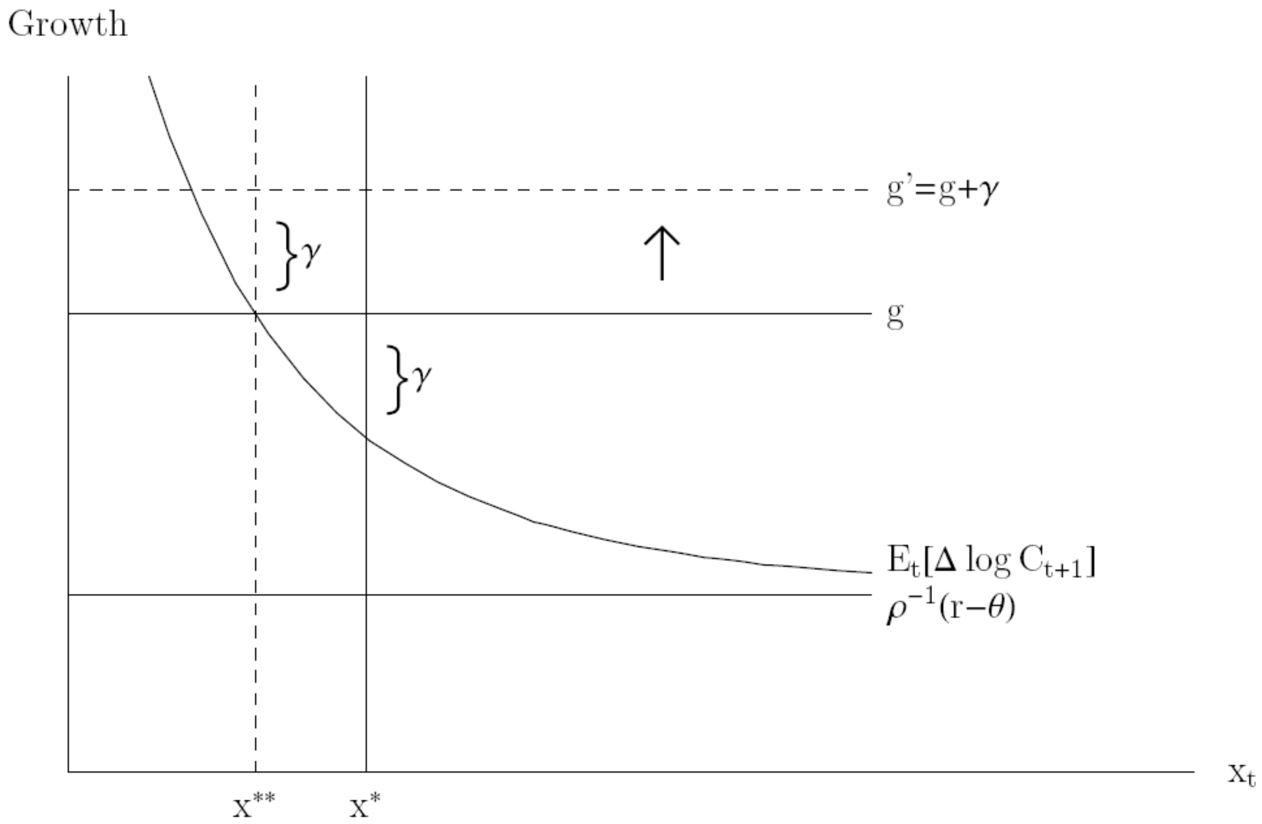

Figure 3: Expected Consumption Growth and Cash-On-Hand

Carroll (JEP 2001)

TABLE II

THE RESPONSE OF DEBT TO INCREASES IN THE CREDIT LIMIT

Row		b_{Tot}	*S.e.*	# obs
(1)	average MPC (dD/dL)	0.126	0.021	231644
(2)	automatic dL	0.096	0.016	145429
	manual dL	1.673	0.773	
(3)	fixed account effects	0.138	0.029	145429
(4)	credit scores	0.085	0.021	127431
(5)	scores, debt, account age	0.122	0.022	131636
(6)	IV	0.111	0.018	145396
(7)	IV: scores, account age	0.083	0.030	131603
(8)	IV: $\#(dL \neq 0)$	0.104	0.020	145396
(9)	d(interest rates)	0.122	0.024	137279
(10)	interest rates	0.122	0.024	137279
(11)	balances on other cards	0.026	0.030	130486

A distributed lag model (equation (1)) was used to estimate the dynamic response of credit card debt ΔD to changes in credit limits ΔL including twelve lags. b_{Tot} $(=b_{12})$ gives the long-run, cumulative change in debt as a fraction of the change in the line (the MPC out of liquidity), dD/dL. All regressions include a full set of month dummies. The standard errors allow for heteroskedasticity across accounts as well as serial correlation within accounts. Sample sizes vary with missing variables. Row (2) distinguishes manual line changes (requested by the consumer) from automatic changes (initiated by the issuer), and includes separate intercepts for each case. Rows (3)–(8) include the controls for the manual line changes; the reported b_{Tot} is for the automatic changes. Row (3) includes a fixed effect by account. Row (4) includes as controls a cubic polynomial in the normalized credit scores, both internal and external, interacted by issuer dummies; and then twelve lags of all these terms (i.e., 2 scores $\times$ 3 polynomial terms $\times$ 13 lags $\times$ issuer dummies). Row (5) includes cubic polynomials in the two scores, debt and account age; all from month $t-1$ and all interacted by issuer dummies. Rows (6)–(8) instrument for ΔL with indicator variables for the number of months since the latest change in line. Row (7) includes as controls cubic polynomials in the two scores and account age, from month $t-1$. Row (8) includes dummy variables for the total number of line changes each account received during the sample period. Row (9) includes as controls the change in account interest rate with twelve lags. Row (10) includes instead the level of the interest rate with twelve lags. In row (11) the dependent variable is balances on *other* credit cards held by the account-holder.

Gross/Souleles (2002)

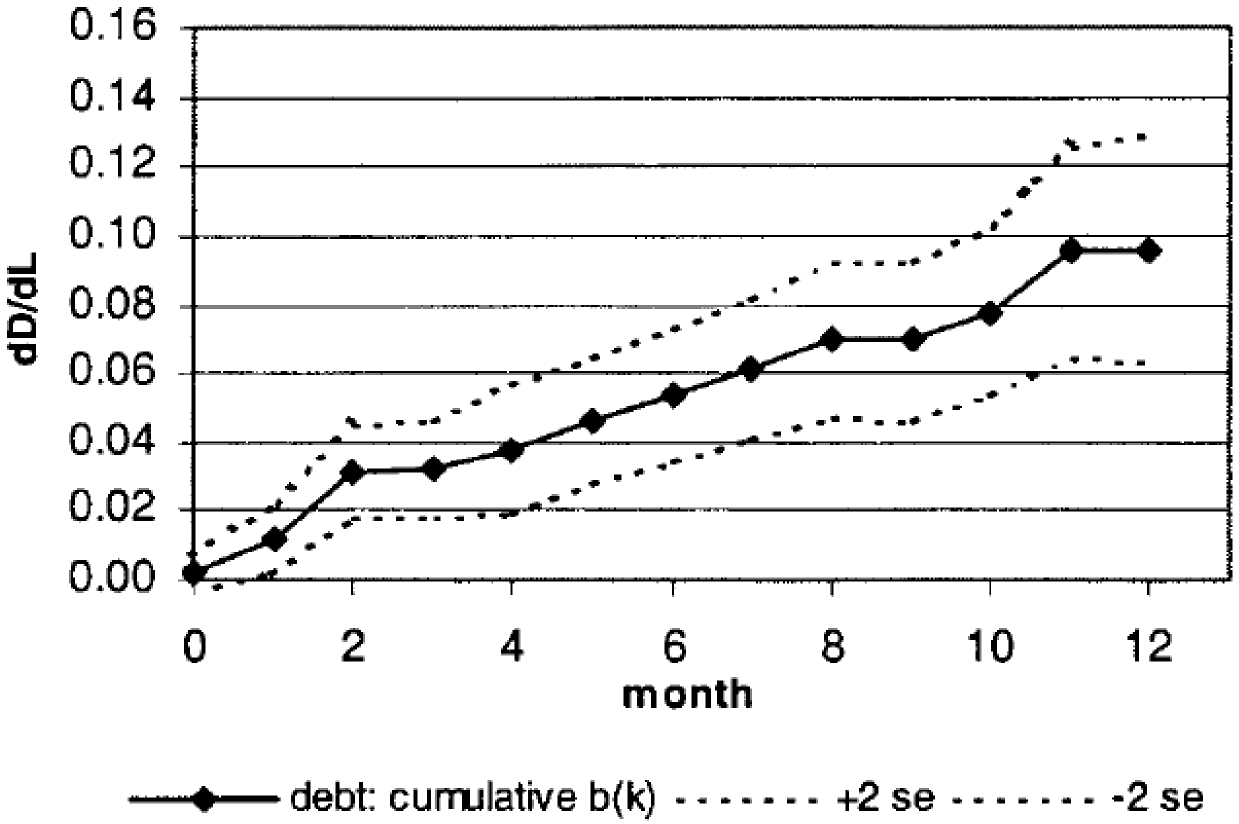

FIGURE I
The Cumulative Response of Debt to "Automatic" Increases in the Credit Line, per Dollar of Extra Line (Table II, Row (2))

Gross/Souleles (2002)

TABLE III

THE RESPONSE OF DEBT TO CHANGES IN INTEREST RATES

Row		b_{Tot}	S.e.	# obs
(1)	interest sensitivity (dD/dr)	−112.6	8.4	185151
(2)	normalize by line: $d(D/L)/dr$	−0.016	0.001	185151
(3)	fixed account effects	−132.4	7.9	185151
(4)	credit scores	−109.4	11.9	107542
(5)	scores, debt, account age	−117.1	9.5	173406
(6)	IV	−79.1	27.2	147158
(7)	IV: scores, account age	−156.4	32.1	138709
(8)	IV: $\#(dr \neq 0)$	−80.8	26.8	147158
(9)	d(credit limit)	−111.8	−8.3	185099
(10)	increase r	−90.1	9.2	185151
	decrease r	−317.7	63.7	
(11)	balances on other cards	37.8	20.2	142334

A distributed lag model (equation (2)) was used to estimate the dynamic response of credit card debt ΔD to changes in credit card interest rates Δr including nine lags. b_{Tot} $(=b_9)$ gives the long-run, cumulative change in debt per percentage point increase in rates, dD/dr. All regressions include a full set of month dummies. The standard errors allow for heteroskedasticity across accounts as well as serial correlation within accounts. Sample sizes vary with missing variables. In row (2) only, the dependent variable is the change in the ratio of debt to the credit limit. Row (3) includes a fixed effect by account. Row (4) includes as controls a cubic polynomial in the normalized credit scores, both internal and external, interacted by issuer dummies; and then nine lags of all these terms (i.e., 2 scores × 3 polynomial terms × 10 lags × issuer dummies). Row (5) includes cubic polynomials in the two scores, debt and account age; all from month $t-1$ and all interacted by issuer dummies. Rows (6)–(8) instrument for Δr with indicator variables for the number of months since the latest change in rates. Row (7) includes as controls cubic polynomials in the two scores and account age, from month $t-1$. Row (8) includes dummy variables for the total number of rate changes each account received during the sample period. Row (9) includes as controls the change in account credit limit with nine lags. Row (10) distinguishes the response to increases versus decreases in interest rates, including separate intercepts for each case. In row (11) the dependent variable is balances on *other* credit cards held by the account-holder.

Gross/Souleles (2002)

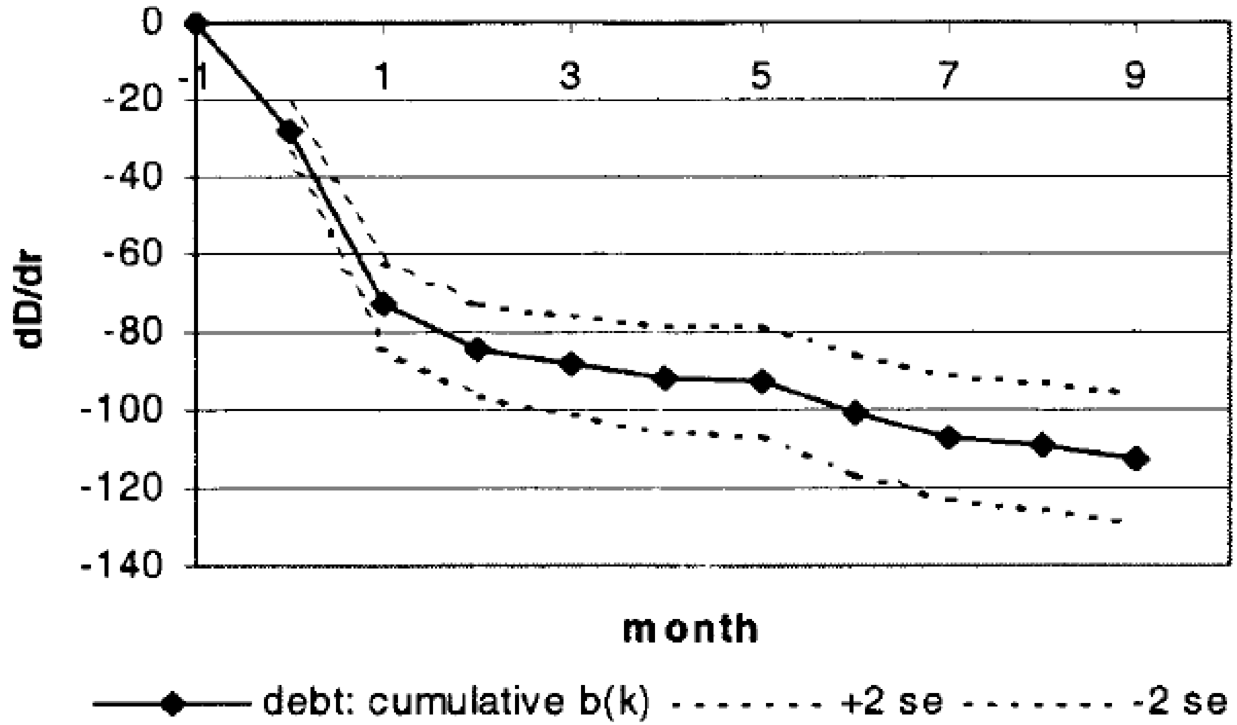

FIGURE II
The Cumulative Response of Debt to Increases in the Interest Rate, per Percentage Point (Table III, Row (1))

Gross/Souleles (2002)

TABLE IV
Utilization Rates and Liquidity Constraints

Row	b_{Tot}	$S.e.$	# obs
A. Credit limit changes			
(1) dD/dL			143511
utilization < .50	0.068	0.018	
utilization .50–.90	0.158	0.060	
utilization > .90	0.452	0.125	
(2) d(utilization)/dL			143511
utilization < .50	−0.012	0.004	
utilization .50–.90	0.013	0.015	
utilization > .90	0.012	0.026	
B. Interest rate changes			
(3) dD/dr			182317
increase r			
utilization < .50	−65.0	11.4	
utilization .50–.90	−129.5	20.5	
utilization > .90	−85.5	21.4	
decrease r			
utilization < .50	−296.9	99.7	
utilization .50–.90	−429.3	120.2	
utilization > .90	−151.9	63.7	

This table contrasts the response of debt to credit supply (b_{Tot}) across accounts starting with different initial utilization rates (balances divided by the credit limit). In Panel A, for changes in credit limits (equation (1)), utilization is taken from month $t - 13$; in Panel B, for changes in interest rates (equation (2)), it is taken from month $t - 10$. Row (3) also distinguishes increases versus decreases in interest rates, for each utilization group. In rows (1) and (3) the dependent variable is the change in debt ΔD. In row (2) it is the change in utilization rate. Panel A includes controls for manual credit limit changes; the reported b_{Tot} is for the automatic changes. All regressions include separate intercepts for each utilization group, and a full set of month dummies. The standard errors allow for heteroskedasticity across accounts as well as serial correlation within accounts.

Gross/Souleles (2002)