HOUSEHOLD DEBT AND AGGREGATE CONSUMPTION EXPENDITURES

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Abstract

This paper shows that the debt burden of households, as measured by the debt service to income ratio, is helpful in forecasting the future growth of consumption expenditures. Using data for the United States over the period 1960-97, I find a significant negative relationship between the debt-service ratio of households and future aggregate spending growth. This effect is statistically important for spending on durable goods and services, but not for spending on nondurable goods. Because almost 70 percent of spending on nondurable goods represents purchases of food and clothing (which are relatively non-discretionary), I conclude that my results are consistent with the view that borrowing-constrained households will limit their discretionary purchases when faced with tightened lending standards following an increase in their debt burden.

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1. Introduction

A concern often expressed by policymakers and analysts in recent years is that rising levels of consumer debt may restrain future spending by households and slow the U.S. economy.[1] They point to increases in delinquency rates on consumer loans, record numbers of bankruptcy filings, and an increasing share of income devoted to paying interest on debt as signs that some households have become overextended. But because changes in these indicators are often concentrated among a small proportion of households, other observers doubt whether these indicators reflect the debt burden faced by the "average consumer" and disagree about the extent to which these indicators are useful in forecasting the future course of aggregate consumer spending.[2]

In this paper, I assess the extent to which the debt burden of households is helpful in explaining aggregate consumer spending. To measure the debt burden, I use the ratio of household debt service to disposable personal income.[3] This ratio captures the demands on current income of paying interest and principal on household debt, and is likely to better approximate the economy-wide burden of household debt than other indicators such as delinquency rates, bankruptcy rates, or debt-to-income ratios.[4]

Taking the perspective of an economic forecaster, I explore in Section 2 whether the debt-service ratio helps predict future changes in consumer spending. I find that lagged values of the debt-service ratio alone explain 8 percent of the change in real personal consumption expenditures (14 percent for spending on services), with a rise in the debt-service ratio leading to a decline in the future growth rate of spending. This result, however, tells us very little because the debt-service ratio might be a proxy for other determinants of consumer spending. Thus, I test whether the debt-service ratio contributes incremental predictive power over and above a set of indicators frequently used in prediction equations for consumer spending. I find that the debt-service ratio adds about six percentage points to the ability of these other indicators to predict the

growth of consumer spending (roughly a 50-percent increase in the adjusted-R^2 compared with the set of "control" variables).[5]

My finding that the debt-service ratio predicts the future growth of consumer spending is at odds with standard versions of the life-cycle and permanent-income theories of consumption. These theories state that current spending by households should reflect all available information so that future changes in spending are unpredictable.[6] The predictive power of the debt-service ratio, however, is not surprising, given that several other indicators have been shown by previous authors to predict the future growth of consumption expenditures.

One explanation that allows for the ability of current indicators to predict future consumption growth is the "rule-of-thumb" paradigm of Campbell and Mankiw (1990). Their framework assumes that some households are forward-looking and choose consumption optimally, while others follow a rule-of-thumb and set consumption equal to income. In this framework, the debt-service ratio could help predict the future growth of consumption expenditures because it helps predict (negatively) the future growth of income, part of which accrues to "rule-of-thumb" consumers–households who consume all of their income each year and never accumulate assets or debts. Thus, in Section 3, I ask whether the Campbell-Mankiw framework can account for the predictive ability of the debt-service ratio. I find the answer for the most part is no. Although the debt-service ratio is helpful in predicting the future growth in income, it also has a direct influence on the future growth of consumer spending <u>after</u> accounting for its effect on income. The one exception is for nondurable goods, where the debt-service ratio has no direct influence on future spending growth.

I next argue that the debt-service ratio in fact should directly influence the growth of spending if "rule-of-thumb" consumers have <u>some</u> limited access to credit. Under this interpretation, the level of spending supported by a given level of income would vary inversely with the debt burden faced by households because a higher debt burden induces

financial institutions to tighten lending standards for these consumers, restricting their ability to finance additional purchases with credit. My finding that the debt-service ratio has direct effects on spending growth for durable goods and services but not for nondurable goods (almost 70 percent of which are food and clothing) is consistent with the belief that constrained consumers would limit their spending most sharply on discretionary items. The paper concludes in Section 4 with a brief summary of its results and suggestions for further research.

2. Simple Prediction Equations for Consumer Spending

As shown in Figure 1, the debt-service ratio appears to be negatively correlated with consumer spending growth, at least since the early 1970s. This relationship could, of course, simply reflect the response of spending and debt service to other underlying economic factors. The purpose of this section is to evaluate whether the debt-service ratio is of independent help in predicting future spending growth.

To assess the predictive ability of debt service for consumer spending, I first regressed the growth rate of various categories of real consumer spending against lagged values of the ratio of debt service to disposable personal income:

$$(1) \qquad \Delta \log C_t = a_0 + \Sigma a_i DS_{t-i} + e_t.$$

Table 1 reports the adjusted-R^2 for this equation using quarterly data on total real personal consumption expenditures and its components.[7] I provide results for both the debt-service ratio on consumer loans and the debt-service ratio on total loans, using lags 1 to 4 and then 2 to 5 of these ratios.[8] As seen in the top panel of Table 1, lagged values of the debt-service ratio for consumer loans explain virtually none of the growth in any of these consumption measures. The adjusted R^2 for these estimates are roughly zero and the coefficients on lagged values of the debt-service ratio for consumer loans are jointly

statistically significant only at levels generally well above 5 percent (shown by numbers in parentheses). In contrast, as seen in the bottom panel, lagged values of the debt-service ratio for total loans explain about 8 percent of the variation in the growth of total personal consumption expenditures and as much as 14 percent of the services component of spending. The probability that this explanatory power arises by mere chance is estimated to be nearly zero (except in the case of nondurable spending where lags 1 to 4 are jointly significant only at the 8-percent level). Because a household presumably cares about the overall debt burden and not just the part arising from consumer loans, the statistical significance of total debt service but not consumer debt service in predicting the growth of consumer spending seems reasonable. Furthermore, the sum of the coefficients on the lagged total debt-service ratio is negative for all spending categories, indicating that a rise in the debt-service ratio over four quarters slows the growth of consumption expenditures.

These results demonstrate that the total debt-service ratio is a statistically significant predictor of consumer spending growth. Although the proportion of the spending growth explained–8 percent for total spending and 14 percent for the services component–may seem small, other indicators by themselves yield a similarly small amount of explanatory power. For example, lagged values of the University of Michigan's index of consumer sentiment alone explain about 14 percent of the growth in consumption expenditures and lagged values of disposable personal income alone explain roughly 6 percent. The statistical significance of the total debt-service ratio by itself in these prediction equations could, however, simply reflect information also available from other indicators. To be useful from a forecaster's perspective, the debt-service ratio needs to add explanatory power to other sets of indicators.

Table 2 reports results for prediction equations which include a set of control variables. Estimates are provided for the adjusted-R^2 when the controls alone are used and when lagged values of the debt-service ratio are added to the set of controls.[9] The

control variables are lagged values of the dependent variable, lagged values of real labor income, and lagged values of ratio of household financial net worth to disposable personal income.[10] Although the choice of control variables is somewhat arbitrary, I employ this set as a minimal specification that reflects the sort of variables often used in forecasting models for consumer spending.[11] Results for specifications using lags 1 to 4 and lags 2 to 5 are provided.

As seen in Table 2, the increment to adjusted-R^2 varies across consumption categories: the debt-service ratio adds no explanatory power to the set of controls in the case of nondurables (lags 1 to 4), while adding 10 percentage points in the case of services (lags 2 to 5). For total consumption expenditure, the debt-service ratio adds about 6 percentage points (lags 2 to 5), equivalent to about one-half times the explanatory power of the controls alone. In all cases except nondurables, the coefficients on the lagged values of the debt-service ratio are jointly statistically significant at the 0.000 level (shown in parentheses).[12] And, as expected, the sum of these coefficients is negative so that a rise in the debt-service ratio lowers consumption growth. Interestingly, the absolute magnitude of this sum is about 4-5 times larger for spending on durables than for nondurable goods or services. Since purchases of durables are more likely to be financed through consumer loans than purchases of nondurable goods or services, the debt burden of households should be relatively more important in determining spending on durables, as reflected in the larger cumulative effect from the lagged debt-service ratio. These coefficient estimates imply that a one-percentage point rise in the debt-service ratio sustained for four quarters (holding constant the control variables) will reduce the quarterly growth rate of spending on durable goods by around one percentage point, reduce the quarterly growth rate of total spending by about one-quarter of a percentage point, and reduce the growth rate of spending on services by about one-fifth of a percentage point.

I interpret the results of Table 2 as suggesting the usefulness of debt service as an independent predictor of the growth rate of consumer spending. To check the robustness of my results, I estimated prediction equations using real disposable personal income instead of labor income as one of the control variables. The findings were nearly identical to those reported in Table 2, with the debt-service ratio adding to the predictive power of the set of controls in all cases expect for nondurables (lags 1 to 4). I thus conclude that the debt-service ratio adds at least some predictive power to the control variables in explaining the growth of total consumer spending, as well as the growth of spending on durable goods and services, but is of less help in explaining growth of spending on nondurable goods. I address more fully its weak performance in predicting nondurable spending growth in Section 3, where I also explore whether the "rule-of-thumb" framework is consistent with the ability of the debt-service ratio to predict the growth of consumer spending.

3. Interpreting the Ability of Debt Service to Predict Consumer Spending

The finding that lagged values of the debt-service ratio help predict the growth rate of consumption expenditures directly violates implications of the lifecycle/permanent income model of consumer behavior. In principle, such a violation could arise for several reasons. Campbell and Mankiw have proposed one reason in their "rule-of-thumb" model. They assume that consumers can be divided into two groups: those who follow the lifecycle/permanent income hypothesis in choosing their spending and those who follow a rule-of-thumb by spending their entire income each period. In the basic version of their model, the consumption good is completely nondurable and the decision period of the consumer is the same as the sampling period of the data. Under these circumstances, consumption expenditures of lifecyclers follows a random walk so that the change in consumption expenditures is random:

(2) $\Delta C^L_t = \eta_t$

where η_t reflects news about future income prospects and is completely unpredictable prior to period t. For rule-of-thumb consumers, the change in consumption expenditures equals the change in their income:

(3) $\Delta C^R_t = \Delta Y^R_t$.

By further assuming that a constant share, λ, of total income is received by rule-of-thumb consumers, the change in total consumption expenditures is given as:

(4) $\Delta C_t = \lambda \Delta Y_t + \eta_t$.

Equation (4) provides a possible explanation for why lagged values of economic indicators help to explain the future change in consumption expenditures. In particular, lagged values of such indicators might help predict the future change in income accruing to rule-of-thumb consumers, which in turn determines the change in their consumption expenditures.

To test this model, equation (4) is estimated using instrumental variables because the error term (which contains news about income) is certain to be correlated with the change in income.[13] The error term, however, is likely to have a first-order moving-average component if consumption decisions are made continuously but the data on consumption expenditures are measured as time averages over the quarter.[14] Accordingly, for the estimates presented below, I lag the instruments at least twice so as to avoid correlation with the error term.

Lagged values of the debt-service ratio do not directly enter equation (4). They could, however, indirectly influence the future change in consumption expenditures by

helping predict the future change in income. For lifecyclers, a rise in debt service could reflect increased borrowing in response to an upward revision in future prospects for the economy as a whole. If this were the case, however, lagged values of the debt-service ratio would be associated with a jump upward in future consumption expenditures. The simple prediction equations presented in Section 2, however, show a negative correlation between the lagged debt-service ratio and future spending growth. Furthermore, lagged values of the debt-service ratio have a statistically significant but negative effect on future income growth.[15]

One possible reason for the negative relationship between debt service and income growth is that a rise in the debt-service ratio might represent a signal to creditors that some borrowers have become overextended, leading these creditors to subsequently tighten lending standards and thereby slow the overall pace of economic activity. But in order for such a tightening in lending standards to actually slow the economy in the first place, it must have the effect of altering the consumption plans of some consumers. This could happen if rule-of-thumb consumers are able to borrow in limited amounts but are still constrained and unable to achieve their desired level of consumption. For these consumers, tighter lending standards would lead to slower spending, because either less additional credit is forthcoming and/or stricter payment terms force them to allocate more income toward debt service. In this case, lagged values of the debt-service ratio should enter equation (4) directly, in addition to their role as a predictor of the future growth of income. Thus, a test of this modified model involves estimating:

$$(5) \qquad \Delta C_t = \lambda \Delta Y_t + \Sigma a_i DS_{t-i} + \eta_t$$

and checking for the significance of the coefficients on the debt-service ratio.

Table 3 provides estimates of equations (4) and (5). I use two sets of instruments, denoted by A and B. Set A includes a constant, lags 2 to 5 of the dependent variable, and

lags 2 to 5 of the growth of income. Set B includes the variables in set A plus lags 2 to 5 of the ratio of household net worth to disposable personal income. When lagged values of the debt-service ratio are included in the regression, I add them to the instrument lists.

I first highlight results for estimates of equation (4) in which the debt-service ratio is not included. These results, shown in the first two columns of Table 3, demonstrate that the standard version of the Campbell-Mankiw model fits the data quite well. Values of λ are estimated with a high degree of precision for total spending and its components (except durables when instrument set A is used). For the category of total consumption expenditures, the point estimate is 0.7, with a standard error of around 0.1. The point estimates of λ are a bit smaller for nondurables (varying between 0.4 and 0.5 depending on the instrument set) and services (between 0.5 and 0.6). By contrast, the point estimate of λ for durables is larger, exceeding 0.9 for instrument set A and nearly reaching 1.2 for instrument set B. Both the variation in the point estimate of λ across expenditure categories and values of λ greater than one are at odds with the interpretation that λ represents the constant share of income accruing to rule-of-thumb consumers. The estimated value of λ, however, will be larger when the category of consumption exhibits greater durability.[16] For highly durable goods this coefficient can exceed unity. Only in the hypothetical case of completely nondurable consumption does this coefficient represent the share of income accruing to rule-of-thumb consumers.

Regardless of how one should interpret the estimates of λ, I find the model seems well-specified in the sense that I can not reject the overidentifying restrictions. For all categories of consumption expenditures, a test of the overidentifying restrictions finds that the equation residuals are not correlated with either set of instruments (although this conclusion is somewhat weaker for durable goods when instrument set B is used yielding a p-value of 0.09). I take the inability to reject the overidentifying restrictions as evidence that the Campbell-Mankiw model fits the data adequately.

I now discuss results from estimates of equation 5, in which the debt-service ratio directly influences the growth rate of spending. The results appear in the last three columns of Table 3. Here, I also report results for a test of the joint significance of lagged values of the debt-service ratio. My findings indicate that the debt-service ratio has a direct effect on spending growth for the total, durable and service categories (but not for nondurable goods). This direct effect is present even though I include lagged values of the debt-service ratio in the instrument sets so as to account for its role in forecasting the future change in income. When instrument set A is used, I reject the hypothesis that coefficients on the lagged values of the debt-service ratio are jointly zero at levels of significance below 5 percent in the equations for total, durable, and service categories. These results a somewhat weaker when instrument set B is used, where the rejections are at or below the 7.5-percent level, except for durables (15-percent level). I find no statistical support, however, for the hypothesis that the lagged debt-service ratio has a direct effect on spending growth for nondurable goods (p-values of 0.35 with instrument set A and 0.29 with instrument set B). Tests of the overidentifying restrictions show no evidence against specifications that include lagged values of the debt service ratio (although for durable goods with instrument set B the p-value is only 0.06).

The finding that lagged values of the debt-service ratio have a direct effect on spending growth for the durable and service categories but not nondurable goods, is consistent with the modified rule-of-thumb model described above. In particular, households who are constrained but able to borrow in limited amounts would see their total spending directly affected when a rising debt service burden leads financial institutions to tighten credit. Households who face tighter lending conditions likely would slow their spending growth first in those categories that are considered "discretionary." Thus, the finding that the debt-service ratio directly affects spending on durables and services but not on nondurable goods fits this modified model because spending on the first two categories is likely to be more discretionary than spending on

the latter (spending on food and clothing compose almost 70 percent of spending on nondurable goods). In addition, the lack of a direct effect on spending growth for nondurables is consistent with the results of Table 2, which found that the debt service ratio had weaker predictive power for nondurable goods than for other categories.

4. Summary

This paper has shown that the debt burden of households, as measured by the debt service to income ratio, is helpful in forecasting the future growth of consumer spending. Not only is the debt-service ratio a statistically significant predictor of the growth in spending, it also explains about as much of the variation in spending growth as many other commonly used indicators. And even when combined with other economic indicators, the debt-service ratio provides some incremental power for explaining spending growth. Accordingly, I conclude that the debt-service ratio is an important indicator to consider in forecasting consumer spending.

From a theoretical standpoint, the ability of lagged indicators to explain future spending growth violates the lifecycle and permanent-income hypotheses of consumer behavior. In this regard, my finding that lagged values of the debt-service ratio predict future spending growth is similar to results reported by other authors who find lagged values of various indicators also help to forecast spending growth. The Campbell-Mankiw rule-of-thumb model is a framework in which lagged indicators can help predict future spending growth, but only to the extent that they help predict future income growth. I find, however, that lagged values of the debt-service ratio help explain spending growth directly, even after accounting for their ability to predict future income growth. This result, while inconsistent with the Campbell-Mankiw model, seems consistent with the role of debt service in affecting spending by constrained (rule-of-thumb) consumers who have some limited (but not zero) access to credit. Furthermore, the lack of a direct role for the debt-service ratio in explaining spending growth for

nondurable goods seems consistent with the likely behavior of constrained consumers slowing their spending on discretionary items rather than necessities (such as food and clothing, which make up the bulk of nondurable goods).

Future work should focus on understanding more fully why a rising debt-service ratio leads to a slowdown in spending growth. In particular, does this relationship reflect greater prudence on the part of constrained consumers who cut back on their own or does it reflect a tightening of credit standards by financial institutions who limit new credit to constrained consumers? Another avenue of research is to explore models of precautionary saving in which the uncertainty of future income affects the current growth of spending.[17] To the extent that the debt-service ratio proxies for uncertainty, it could help explain the growth of consumption. For example, if households borrow less (save more) when the future is more uncertain, then a lower debt-service ratio would reflect greater uncertainty. Greater uncertainty could lead to lower contemporaneous spending as households build up a "rainy-day" fund. In the future, however, spending growth would rise because households would have met their asset accumulation goals. Accordingly, greater uncertainty, as reflected in a lower debt-service ratio, would lead to faster future spending growth.

Footnotes

[1] See, for example, Dunn (1997), Hansell (1997), and The Economic Report of the President, February 1997, pages 54-61.

[2] The argument that consumer debt is a lagging rather than a leading indicator is made forcefully in Murray (1997).

[3] Ratios of debt service to disposable personal income are estimated on a quarterly basis by the staff at the Federal Reserve Board. They provide estimates for both consumer loans (mainly credit card, auto, and other consumer installment loans) and mortgage loans. The Fed staff also estimates the value of lease payments, mainly on autos, which have become increasingly prevalent as an alternative to financing auto purchases. I do not include the value of lease payments in the debt service data used in this paper because leases may not always be a close substitute for loans, and because adding lease payments to the conventional debt-service series did not appreciably change the quarterly pattern of variation.

[4] Although rising numbers of delinquencies and bankruptcies directly affect only a small share of households, financial institutions might respond to rising numbers of delinquencies and bankruptcies by limiting credit to a broad segment of households not experiencing financial problems. News about record rates of delinquencies and bankruptcies might also lead the "average" household to be more cautious in its spending. As a measure of the economy-wide debt burden facing households, however, these indicators of financial distress likely are inferior to the debt-service ratio, which captures the relative carrying cost of debt.

[5] In related work, Ludvigson (1997) shows that the growth of consumer credit is positively correlated with the future growth of consumption expenditures. The present paper illustrates how the ratio of debt service to income is negatively correlated with the future growth of consumption expenditures. I argue that a rise in the debt-service ratio leads to a subsequent tightening of credit for borrowing-constrained consumers, thereby reducing the future growth of spending. This result is consistent with Ludvigson's finding because a rise in the debt-service ratio results in a tightening of credit growth which, in turn, leads to slower spending growth.

[6] See Hall (1978).

[7] The approach followed in this paper is similar to the one used in Carroll , Fuhrer, and Wilcox (1994). Their paper explores the relationship between consumer sentiment and the growth of consumer spending.

[8] Total debt service includes scheduled interest and principal payments on mortgage loans as well as on consumer loans. I employ two specifications of lags partly as a check for robustness, but also because, as discussed below, the data on consumption expenditure likely contain a first-order moving-average component. If this is the case, then using lags 2 and higher for the debt-service ratio will avoid the possible spurious correlation between lag 1 and consumption growth. The national income account data used in this paper reflect the annual revision released by the Department of Commerce in July 1998. The sample period reflects the availability of data on debt service payments.

[9] Throughout the remainder of this paper, the term "debt-service ratio" refers to the debt-service ratio for total loans (consumer loans plus mortgage loans).

[10] I measure real labor income by wages and salaries plus transfer payments minus personal contributions for social insurance, all deflated by the price index for personal consumption expenditures. I use this measure of income because the "rule-of-thumb" paradigm of Campbell and Mankiw (1990), which I test in Section 3, requires a measure of income that rule-of-thumb consumers have available to spend. Since these consumers, unlike lifecycle consumers, do not accumulate assets, they will have no share in the interest or dividend income included in total disposable personal income. Following Carroll et al. (1994), I do not subtract tax payments from labor income since fluctuations in these payments likely are motivated by tax avoidance strategies that rule-of-thumb consumers are unlikely to take advantage of. To the extent that these consumers pay only ordinary income tax, their share of tax payments is likely to be relatively constant through time. The financial net worth of households, as reported in the flow of funds accounts, includes the net worth of nonprofit institutions. I adjusted the reported values of household net worth by subtracting items clearly identifiable from the separately reported flow of funds data on nonprofits, and then used the resulting series as household net worth.

[11] For instance, lagged consumption, income, and net worth variables often are employed in equations for consumption expenditure used in large-scale macroeconometric models.

[12] Prediction equations using lags 1 to 5 (not reported) give results very similar to those reported in Table 2.

[13] Following Campbell and Mankiw (1990), I estimate the model as changes in the logarithm of consumption expenditures and income rather than changes in the level.

Using log changes implies that λ has only an approximate interpretation as the share of income accruing to rule-of-thumb consumers.

[14] See Christiano, Eichenbaum, and Marshall (1991). Durability of consumption goods is another reason why the error term might have a first-order moving-average component, although as discussed in Carroll et al. (1994), the implications of durability for the rule-of-thumb model are not supported at all by the data.

[15] Tests using both lags 1 to 4 and lags 2 to 5 of the debt service ratio to predict the growth of labor income showed joint significance at less than the 5-percent level, with the sum of the coefficients less than zero. Results for disposable personal income were similar to those using labor income.

[16] Carroll et al. (1994) show how the coefficient on income growth in the Campbell-Mankiw model will vary positively with the durability of consumption goods.

[17] See, for example, Dynan (1993), Carroll (1992, 1997), and Lusardi (1998).

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Table 1–Simple Prediction Equations for Consumer Spending Growth

Consumer Loans

Row	Type of Real PCE	Lags 1 to 4 of Debt-Service Ratio		Lags 2 to 5 of Debt-Service Ratio	
		Sum of Coefficients	Adjusted R-Squared	Sum of Coefficients	Adjusted R-Squared
1	Total	-0.01 (0.396)	-0.01	-0.02 (0.596)	0.00
2	Durable Goods	-0.44 (0.183)	0.01	-0.43 (0.092)	0.00
3	Nondurable Goods	0.02 (0.953)	-0.02	0.01 (0.801)	-0.02
4	Services	0.08 (0.476)	0.02	0.07 (0.404)	0.02

Total Loans

Row	Type of Real PCE	Lags 1 to 4 of Debt-Service Ratio		Lags 2 to 5 of Debt-Service Ratio	
		Sum of Coefficients	Adjusted R-Squared	Sum of Coefficients	Adjusted R-Squared
1	Total	-0.26 (0.000)	0.07	-0.27 (0.000)	0.08
2	Durable Goods	-0.84 (0.000)	0.04	-0.82 (0.003)	0.04
3	Nondurable Goods	-0.18 (0.080)	0.02	-0.19 (0.019)	0.03
4	Services	-0.20 (0.000)	0.13	-0.20 (0.000)	0.14

Notes: Dependent variable in each regression is the log change in the indicated category of real personal consumption expenditures. The debt-service ratio is either debt service on consumer loans or debt service on total loans (including mortgages) divided by disposable personal income. A constant term (not reported) was included in each regression. The numbers in parentheses are probability values for the joint significance of the lags of the debt-service ratio. Hypothesis tests used a consistent covariance matrix allowing serial correlation at lags up to either 4 or 5, depending on the specification. The sample period is 1960:1 to 1997:4

Table 2–Incremental Predictive Power of the Debt-Service Ratio

Row	Type of Real PCE	Lags 1 to 4 of Explanatory Variables			Lags 2 to 5 of Explanatory Variables		
		Adjusted R^2 Without Debt-Service Ratio	Adjusted R^2 With Debt-Service Ratio	Sum of Coefficients on Debt-Service Ratio	Adjusted R^2 Without Debt-Service Ratio	Adjusted R^2 With Debt-Service Ratio	Sum of Coefficients on Debt-Service Ratio
1	Total	0.20	0.24	-0.23 (0.000)	0.14	0.20	-0.25 (0.000)
2	Durable Goods	0.10	0.15	-1.06 (0.000)	0.07	0.10	-0.92 (0.000)
3	Nondurable Goods	0.18	0.18	-0.14 (0.130)	0.04	0.07	-0.19 (0.051)
4	Services	0.18	0.25	-0.18 (0.000)	0.16	0.26	-0.19 (0.000)

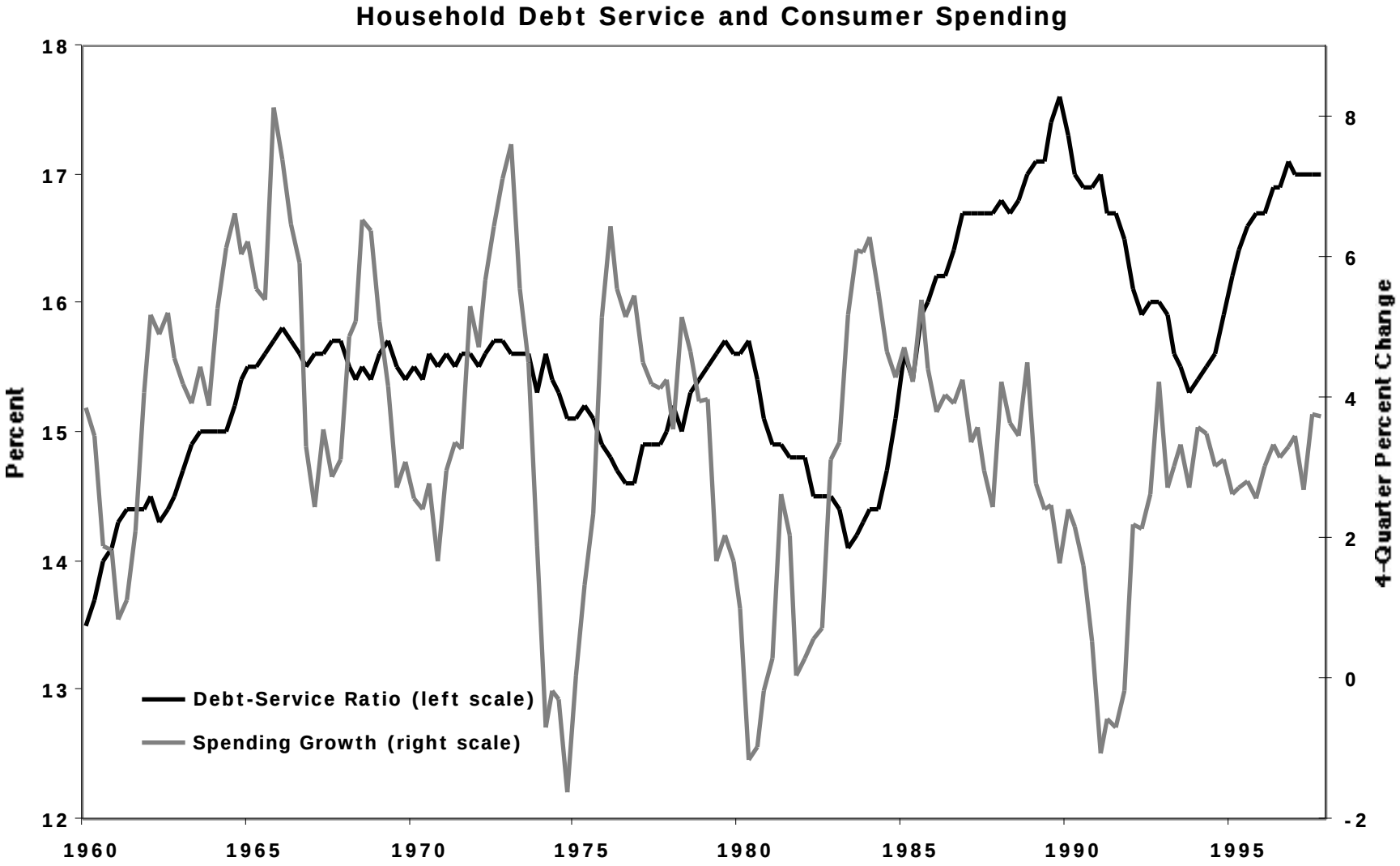
Notes: Dependent variable in each regression is the log change in the indicated category of real personal consumption expenditures. The first column for each set of results reports adjusted R^2 for regressions using a set of control variables but omitting the debt-service ratio. The second column reports results from regressions including the debt-service ratio. The third column shows the sum of the coefficients on the lags of the debt-service ratio. Control variables include lags (either 1 to 4 or 2 to 5) of the dependent variable, lags of the log change in labor income (defined in the text), lags of the ratio of household net worth to disposable personal income, and a constant term. The debt-service ratio is total debt service divided by disposable personal income. The numbers in parentheses are probability values for the joint significance of the lags of the debt-service ratio. Hypothesis tests used a consistent covariance matrix allowing serial correlation at lags up to either 4 or 5, depending on the specification. The sample period is 1960:1 to 1997:4.

Table 3–Estimates for the Rule-of-Thumb Model, With and Without Lags of the Debt-Service Ratio

			Without Debt-Service Ratio		With Debt-Service Ratio		
Row	Type of Real PCE	Instrument Set	λ (coefficient on log change in real labor income)	Probability Value for Test of Overidentifying Restrictions	λ (coefficient on log change in real labor income)	Probability Value for Test of Overidentifying Restrictions	Probability Value for Joint Significance of Lags of Debt-Service Ratio
1	Total	A	0.74 (0.159)	0.222	0.61 (0.168)	0.281	0.048
		B	0.67 (.0120)	0.117	0.67 (0.118)	0.155	0.067
2	Durable Goods	A	0.92 (0.659)	0.538	1.05 (0.653)	0.390	0.013
		B	1.18 (0.540)	0.092	1.47 (0.513)	0.063	0.146
3	Nondurable Goods	A	0.48 (0.151)	0.270	0.43 (0.155)	0.252	0.349
		B	0.43 (0.123)	0.423	0.44 (0.119)	0.349	0.292
4	Services	A	0.60 (0.098)	0.455	0.50 (0.113)	0.254	0.041
		B	0.52 (0.076)	0.594	0.47 (0.078)	0.566	0.004

Notes: Dependent variable in each regression is the log change in the indicated category of real personal consumption expenditures. The explanatory variables for all estimates include a constant term and the contemporaneous log change in real labor income. Estimates where the debt-service ratio is included use lags 2 to 5 of the ratio of total debt service to disposable personal income. Instrument set A includes a constant term, lags 2 to 5 of the dependent variable, and lags 2 to 5 of the log change in real labor income. Instrument set B includes the variables in instrument set A plus lags 2 to 5 of the ratio of household net worth to disposable personal income. When the debt-service ratio is included in the regression, lags 2 to 5 of the debt-service ratio are added to the instrument sets. The test statistic (not reported) used in testing the overidentifying restrictions has a chi-squared distribution with degrees of freedom equal to the number of instruments minus two. The numbers in parentheses under estimates of λ are consistent standard errors. The sample period is 1960:1 to 1997:4

Figure 1



Source: Bureau of Economic Analysis and Board of Governors of the Federal Reserve System. Data are quarterly from 1960.1 to 1997.4.