Results

The check and stamp households resemble each other in most respects (see app. table 1). Table 1 presents the difference in mean weekly food expenditure between the two groups.[20]

Whether we normalize expenditure by adult male equivalent[21] for calorie intake or by the size of the food consumption unit, we see a significant difference in total food expenditure between the two groups of households. Only about 5 percent of the households had higher food stamp allotments than food expenditures. Thus, we would not expect the measurable difference in food expenditure to be caused by the elimination of the constraint for the check-receiving households.

Another way of verifying the presence of the cash-out puzzle in these data is to consider the marginal propensity to consume out of stamps and compare it with that out of income. We can estimate these parameters through estimation of the Engel curve for food expenditure. Other authors (for example, Levedahl, 1995) have used this approach, but we feel it deserves further explanation. The point of our econometric estimation is to map the expansion path of food expenditure that arises from the utility-maximizing behavior of agents. At different income and benefit levels, we estimate the optimal choice of food expenditure. The problem that arises is that individuals who receive food benefits in the form of food stamps are facing a kinked budget constraint. Stamp-receiving individuals who are observed to be on the kink (food expenditure equal to food stamp benefits) or on the flat portion of the budget constraint (food expenditure less than food stamp benefits) are not at an optimal point for their income level. These constrained individuals presumably would change their behavior if the food stamp benefit were changed to cash/check.

The Engel curve we wish to estimate is one that traces out a behavioral relationship. The behavioral relationship for constrained and unconstrained individuals is thus clearly different. In the former, optimization is constrained, whereas for the latter it is unconstrained. Furthermore, the cash-out puzzle refers only to the behavior of unconstrained individuals. There is no cash-out puzzle for constrained individuals—expenditure is expected to change under cash-out for these individuals. Therefore, the Engel curves we wish to estimate are those of unconstrained stamp households.

Appendix table 2 provides a comparison of the constrained and unconstrained households. The constrained households tend to be much poorer, perhaps indicating that the constraint arises not so much from differences in taste as from a tighter budget constraint.[22] According to the conventional theory, we would expect the marginal propensity to consume food out of food stamps for unconstrained households to be equal to that out of cash income. (This is due to the fact that unconstrained households can substitute food coupons for cash expenditure on food and switch the cash expenditure to other goods. This is precisely the kind of optimization decision that constrained households cannot make.) A difference in these two marginal propensities would provide further evidence of the presence of the cash-out puzzle in these data.

[20]For all parameter estimates in the report, * and ** indicate significance at the 90- and 95-percent confidence levels. Numbers in parentheses below coefficient estimates are standard errors, except where otherwise indicated.

[21]We use household size measured in equivalent nutrition units for food energy, an adult equivalent adjusted for guest meals and number of meals eaten at home. The meals are similar to those reported by Fraker, Martini, and Ohls (1995) when it appears that they use this particular normalization.

Table 1—Food expenditure for stamp and check households

Item	Weekly food expenditure per member of the food consumption unit	Weekly food expenditure per adult male equivalent
Stamp households	$21.38	$35.49
Check households	$20.23	$33.14
Difference	-$1.15*	-$2.34**
(Test statistic)	(-1.84)	(-2.18)

Notes: * indicates that the variable is statistically significant at the 90-percent confidence level; ** indicates that the variable is statistically significant at the 95-percent confidence level.

Source: Data are from the San Diego Cash-Out Experiment, conducted by the U.S. Department of Agriculture, Food and Consumer Service (currently Food and Nutrition Service).

[22]If differences in tastes were determining constrained/unconstrained households, we would expect to see at least some wealthier households in the constrained group of households. As it is, we only see poor households. Of course, since stamp benefits and income are inversely related, we would expect the constraint to be more important for poorer households.

Many different functional forms have been used to estimate Engel curves for food expenditure. Here, we consider the following three models:

(a) $fexp_i = \alpha + \beta y_i + \gamma fsb_i + X_i'\delta$,

(b) $\ln(fexp_i) = \alpha + \beta \ln(y_i + \gamma fsb_i) + X_i'\delta$, and

(c) $\ln(fexp_i) = \alpha + \beta \ln(y_i + fsb_i) + \gamma \frac{fsb_i}{(y_i + fsb_i)} + X_i'\delta$,

where *fexp* is food expenditure, *y* is cash income, *fsb* is stamp benefits, and *X* is a vector of household characteristics.[23]

To check for the correct functional form, we first impose the condition that food stamps and coupon benefits have the same effect on food expenditure. (This is equivalent to setting $\gamma = \beta$ in model (a), $\gamma = 1$ in model (b), and $\gamma = 0$ in model (c).) We then estimate the bi-variate regression of food expenditure per person on total income per person. We also show the results of including household size as an explanatory variable. These results, presented in table 2, clearly show the importance of returns to scale in household food purchasing and preparation. For the double-log model, we get a marginal propensity to consume food out of total income of 0.067, measured at median values of income and food expenditure. This result is similar to the linear model and is in line with previous surveys.

Figure 3 shows nonparametric regression results for the linear and double-log specifications. The graphs show fitted values of the regression function for values of per-person income between the first and 99th percentiles of income. The regression function is calculated using Nadaraya-Watson kernel regression, and the bandwidth is chosen by leave-one-out cross-validation, which minimizes the sum of squared prediction errors.[24]

Both specifications show some signs of nonlinearity. For larger values of income, we observe the decreasing marginal propensity to consume, including one range that appears to be slightly negative. We did fit a quadratic expenditure system to the data but are unable to reject that the coefficient on income squared is zero. The double-log specification shows moderate signs of nonlinearity, again particularly at larger values of income. For both specifications, the relationship

[23]The linear model (a) is the only one of the three that is consistent with utility maximization; however, models (b) and (c) give a better fit for most data. The linear model does not allow for a decreasing share of food expenditure in total expenditure at higher income levels, an empirical regularity observed in nearly all consumer expenditure surveys. Model (b) is used by Moffitt (1989), while Senauer and Young (1986) and Levedahl (1995) employ model (c); both allow the share of food stamps in total income to affect food expenditure. Levedahl (1995) discusses these and other models and shows that model (c) provides the greatest degree of flexibility, imposing few restrictions on the relationships between the marginal propensities to consume out of stamps and income and their rates of change.

[24]Tail values were used in regression calculations but were discarded from the graph. See Härdle (1990) for details of nonparametric regression analysis. Our method tends to undersmooth somewhat, but we feel that it is easier for the reader to correct this with the eye than to unsmooth an overly smoothed curve.

Table 2—San Diego cash-out experiment: Unconstrained households

	Unconstrained, stamp households (n = 487)			
Model	(a)		(b)	(c)
	(1)	(2)	(3)	(4)
Cash and benefit income per household member	0.091**	0.056**	0.369**	0.228**
	(0.014)	(0.014)	(0.042)	(0.045)
Household size		-1.631**		-.342**
		(.272)		(.049)
Constant	14.704**	23.298**	1.403**	2.409**
	(1.022)	(1.740)	(.175)	(.220)
Adjusted R^2	.0804	.1421	.1335	.2118

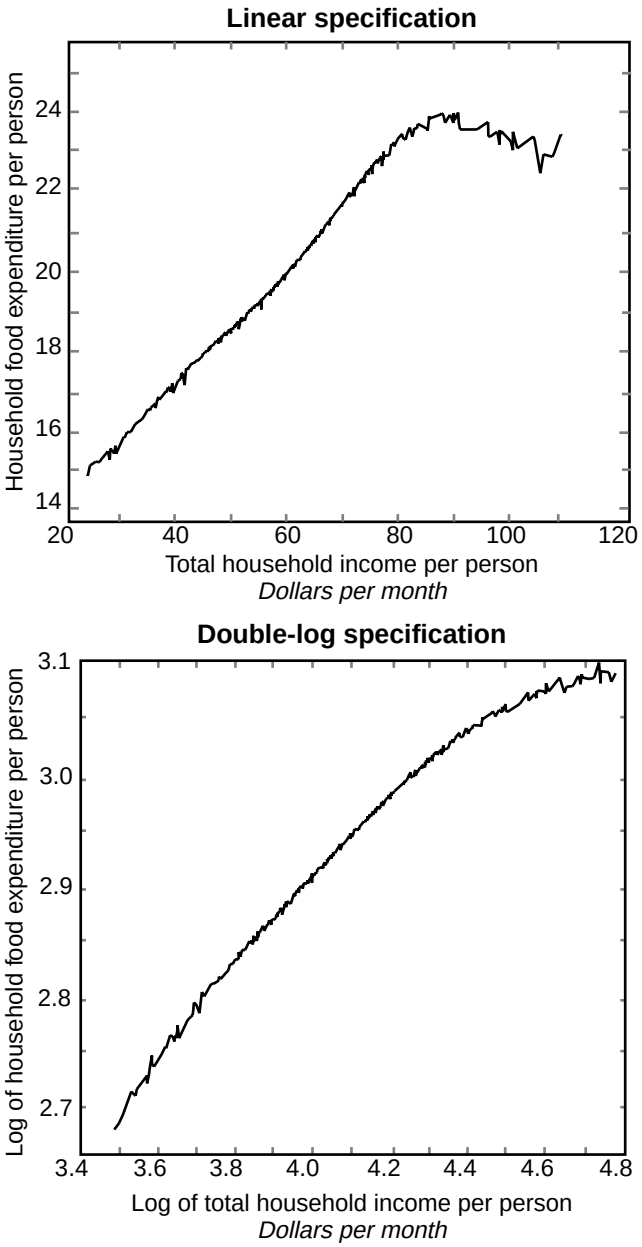
Notes: These are the coefficient estimates from models (a), (b), and (c). The standard errors are in parentheses. * indicates that the variable is statistically significant at the 90-percent confidence level; ** indicates that the variable is statistically significant at the 95-percent confidence level.

Source: Data are from the San Diego Cash-Out Experiment, conducted by the U.S. Department of Agriculture, Food and Consumer Service (currently Food and Nutrition Service).

seems linear for the bulk of the data. In analyzing our estimates, we shall keep figure 3 in mind. Neither nonparametric regression accounts for the full set of explanatory variables considered later in this report.

We now estimate all three models, using a full range of explanatory variables to control for receipt of other food subsidies, household composition, and household characteristics. In the appendix, we discuss some sensitivity analyses that we conducted. Regardless of the choice of model, the cash-out puzzle remains clearly visible in the data. A significant difference exists between the marginal propensities to consume out of cash income and food coupons, even for those households unconstrained in their food-purchasing behavior. Table 3 presents the results from the regression, using a complete matrix of explanatory variables for the linear model. We also show the results imposing the constraint that the effect of cash income and stamp benefits be equal. This is clearly rejected by an F-test of equality of the coefficients on cash income and stamp benefits.

Figure 3.
San Diego cash-out: Unconstrained stamp households' nonparametric regression



We scale the food expenditure and income quantities by household size rather than by using an equivalence scale. We then include variables to control for the percentage of household members in different age groups, who, presumably, have different nutritional needs.[25]

Table 4 presents results from regressions, using the double-log models (b) and (c). Again, the marginal propensities to consume out of stamps and income are found to be significantly different. The results from the two models are quite similar.

Levedahl (1995) estimates model (c) with a slightly different specification and a slightly different sample of the same data set. Qualitatively, his results are similar to those shown here, though our results show slightly larger marginal propensities to consume from both coupons and cash income.

In summary, in line with other studies, marginal propensities to consume out of cash income and food stamps are significantly different for unconstrained households in our data set. Thus, the cash-out puzzle seems to be robustly present in the data. Furthermore, the results are robust to choice of functional form and the nonparametric regressions seem to lend support to either the linear or double-log relationship for the bulk of the data.

[25]The primary reason we choose to follow this approach is that it is not at all clear what type of equivalent scale should be used for total household food expenditure. In much of the food stamp literature, the adult male equivalent for calories is used to weight total food expenditure. We feel that this is inappropriate, since providing for energy needs is only one small part of overall food expenditure and allowing age proportions to directly affect total food expenditure is a more reasonable modeling assumption.

Table 3—San Diego Cash-Out Experiment: Coefficient estimates for linear model

Model	Unconstrained stamp households (n = 487) (a) with $\gamma = \beta$	(a)
Cash and benefit income per household member	0.053** (0.014)	
Cash income per household member		0.051** (0.014)
Food stamp benefit per household member		.419** (.132)
Household size	-1.457** (.346)	-1.165** (.359)
Money value of gifts of food per household member	.718** (.232)	.705** (.231)
In-kind food commodity donations per household member	-.799** (.380)	-.741** (.378)
Breakfast subsidy per household member	.216 (.409)	.175 (.406)
Lunch subsidy per household member	.405** (.163)	.442** (.162)
Female-headed household	.525 (1.181)	.701 (1.174)
Weekly meals eaten as guest per household member	-1.196** (.191)	-1.191** (.190)
Weekly meals eaten by guests per household member	1.035** (.137)	1.039** (.136)
Proportion of households with child(ren) age 0 to 1	-1.947 (4.109)	-2.220 (4.081)
Proportion of households with child(ren) age 2 to 17	.244 (3.175)	-.319 (3.159)
Proportion of households with member(s) over age 60	-6.128 (5.373)	-3.835 (5.398)
Constant	22.880** (2.121)	19.174** (2.489)
Adjusted R^2	.2848	.2949

Notes: The dependent variable is per-person food expenditure. The standard errors are in parentheses. The first column imposes the restriction that cash income and food stamps have the same effect on food expenditure. * indicates that the variable is statistically significant at the 90-percent confidence level; ** indicates that the variable is statistically significant at the 95-percent confidence level.

Source: Data are from the San Diego Cash-Out Experiment, conducted by the U.S. Department of Agriculture, Food and Consumer Service (currently Food and Nutrition Service).

Table 4—San Diego Cash-Out Experiment: Coefficient estimates for double-log models

Model	Unconstrained stamp households (n = 487) (b)	(c)
Cash and benefit income per household member		0.388** (0.059)
β in model (b)	0.383** (0.059)	
γ in model (b)	7.850** (2.383)	
Proportion of food stamp benefits in total cash and benefit income		1.068** (.260)
Log of household size	-.326** (.076)	-.323** (.076)
Money value of gifts of food per household member	.030** (.010)	.030** (.010)
In-kind food commodity donations per household member	-.024 (.017)	-.024 (.017)
Breakfast subsidy per household member	.003 (.018)	.003 (.018)
Lunch subsidy per household member	.021** (.007)	.021** (.007)
Female-headed household	-.032 (.057)	-.032 (.057)
Weekly meals eaten as guest per household member	-.054** (.009)	-.054** (.009)
Weekly meals eaten by guests per household member	.037** (.006)	.036** (.006)
Proportion of households with child(ren) age 0 to 1	.165 (.195)	.231 (.193)
Proportion of households with child(ren) age 2 to 17	.328** (.161)	.375** (.158)
Proportion of households with member(s) over age 60	.023 (.242)	-.071 (.242)
Constant	1.389** (.333)	1.431** (.316)
Adjusted R^2	.3574	.3470
MPC out of income	.062** (.018)	.076** (.013)
MPC out of stamps	.487** (.142)	.395** (.078)
MPC out of stamps - MPC out of income	.425** (.137)	.319** (.074)

Notes: The standard errors are in parentheses. The standard errors for the nonlinear model (b) are calculated with bootstrap. * indicates that the variable is statistically significant at the 90-percent confidence level; ** indicates the variable is statistically significant at the 95-percent confidence level. MPC denotes the marginal propensity to consume.

Source: Data are from the San Diego Cash-Out Experiment, conducted by the U.S. Department of Agriculture, Food and Consumer Service (currently Food and Nutrition Service).

Stigma Reconsidered

Moffitt (1983) found that stigma was associated with enrolling in Aid to Families with Dependent Children (AFDC) but, not surprisingly (since AFDC benefits were paid in cash), stigma did not vary with benefit levels. In other words, throughout the FSP literature, the common argument is that benefits that look like cash should be treated like cash. Thus, we take steps to verify that the check-receiving households indeed treat their food benefits like cash income. If they do not, this would provide evidence against the stigma hypothesis. Table 5 presents a summary of results for this comparison.

In the sample with check- and stamp-receiving households, we include a dummy variable for stamp-receiving households and interact this dummy variable with the income, stamp benefit, and household size variables. We fail to reject the hypothesis that the marginal propensities to consume between the stamp and check groups are different. The intercept dummy is significant and positive (consistent with table 1). Full regression results are presented in appendix tables 7 and 8.

Check households treat their check benefits like stamps in a significantly different way than they treat cash income. This finding contradicts the stigma hypothesis, or at a minimum, indicates that the stigma hypothesis by itself is insufficient to explain the puzzle. Now we turn to an explanation that we find more compelling, that the puzzle is driven by intra-household dynamics.

Table 5—Is stigma the explanation? Unconstrained stamp households and all check households

Model	Pooled sample (n = 953)	Unconstrained stamp households (n = 487)	All check households (n = 466)
Linear model:			
MPC(Y)	0.046**	0.051**	0.037**
	(0.010)	(0.014)	(0.014)
MPC(FSB)	.318**	.416**	.221*
	(.089)	(.132)	(.122)
MPC(FSB) - MPC(Y)	.272**	.365**	.184
	(.089)	(.132)	(.122)
Double-log model:			
MPC(Y)	.307**	.393**	.235**
	(.057)	(.078)	(.084)
MPC(FSB)	.069**	.075**	.063**
	(.010)	(.013)	(.014)
MPC(FSB) - MPC(Y)	.238**	.318**	.172**
	(.053)	(.074)	(.078)

Notes: MPC(Y) is the marginal propensity to consume out of income, and MPC(FSB) is the marginal propensity to consume out of food stamp (check) benefits. The standard errors are in parentheses. * indicates that the variable is statistically significant at the 90-percent confidence level; ** indicates that the variable is statistically significant at the 95-percent confidence level.

Source: Data are from the San Diego Cash-Out Experiment, conducted by the U.S. Department of Agriculture, Food and Consumer Service (currently Food and Nutrition Service).

Intra-Household Resource Allocations

The major prediction of the model developed previously is that multi-adult and single-adult unconstrained households may have different consumption patterns. Multi-adult households may exhibit larger marginal propensity to consume food out of coupons than out of cash. However, single-adult households should not exhibit the cash-out puzzle. The marginal stigma-based explanation formalized in the Theoretical Framework section, however, predicts that if nonfood items taken together constitute a normal good, then single-adult households should exhibit the cash-out puzzle. This difference then provides a way of empirically evaluating the two competing hypotheses. We, therefore, estimate both pooled and separate Engel curves for multi- and single-adult households, using models (a) and (c) and the specification developed earlier in this section of the report. The results are presented in table 6. We include a dummy variable for single-adult households and interact it with the income and food benefit variables. Using an F-test, we reject the poolability of these two samples. In other words, the relationship between cash income, benefit income, and food expenditure is significantly different for the single- and multiple-adult households.

Full regression results are provided in appendix tables 4 and 5. These results come from estimating separate regressions for the two subsets of data. Using interactive dummy variables, imposing identical response coefficients for the household characteristic variables,

Table 6—San Diego Cash-Out Experiment: Single and multi-adult headed households compared

Model	All stamp households	Multi-adult households	Single-adult households
Linear model:			
MPC(Y)	0.051**	0.071**	0.017
	(0.014)	(0.018)	(0.021)
MPC(FSB)	.419**	.687**	.030
	(.132)	(.224)	(.180)
MPC(FSB) - MPC(Y)	.367**	.616**	.013
	(.131)	(.224)	(.180)
Double-log model:			
MPC(Y)	.076**	.108**	.009
	(.013)	(.018)	(.020)
MPC(FSB)	.395**	.526**	.073
	(.078)	(.107)	(.114)
MPC(FSB) - MPC(Y)	.319**	.418**	.064
	(.074)	(.103)	(.107)

Notes: MPC(Y) is the marginal propensity to consume out of income, and MPC(FSB) is the marginal propensity to consume out of food stamp (check) benefits. The standard errors are in parentheses. * indicates that the variable is statistically significant at the 90-percent confidence level; ** indicates that the variable is statistically significant at the 95-percent confidence level.

Source: Data are from the San Diego Cash-Out Experiment, conducted by the U.S. Department of Agriculture, Food and Consumer Service (currently Food and Nutrition Service).

and using sparser specifications lead to quantitatively similar results. (These results are also included in the appendix.) Appendix tables 5 and 6 provide results for only those families with children. Since these make up the bulk of our sample, the results are essentially unchanged. The substantive conclusions are the same.

The low marginal propensities to consume for single-adult headed households are surprising. Within our model, we control for many differences between single- and multi-adult households. Appendix table 9 provides a comparison of the single- and multi-adult households. As seen in this table, in comparison with multi-adult households, single-adult households have lower average incomes and lower monthly food expenditures; are more likely to eat as a guest in someone else's household and less likely to have guests; have higher education levels; lower household size; and fewer people over the age of 51. While we control for many of these differences in our model, differences over unobserved variables may lead to the low marginal propensities to consume. As an example, in addition to lower average incomes, single-adult households are more likely to have longer spells of poverty (Rodgers and Rodgers, 1992). These longer poverty spells may lead to different budgeting rules that underlie the low marginal propensities to consume. As another example, Gleason, Schochet, and Moffitt (1998) showed that single-adult households have substantially longer food stamp participation spells than other households. Longer food stamp participation spells may lead to households setting their food expenditures more closely to the food stamp allotment and using any deviation from this amount for nonfood expenditures, resulting in low marginal propensities to consume.

Regardless of the specification used, the regression results unambiguously confirm the main prediction of the model presented above and run counter to the prediction generated from the stigma-based explanation. Though all nonfood items taken together constitute a normal good, there is no evidence of a cash-out puzzle for single-adult headed households. The difference in expenditure patterns in the aggregate is completely explained by the consumption behavior of multi-adult households. Clearly, further empirical exploration of this difference between multi- and single-adult headed households is needed. The results here provide strong encouragement to explore this explanation of the cash-out puzzle.