Household Balance Sheets, Consumption, and the Economic Slump
A Clarification

Atif Mian
Princeton University and NBER

Amir Sufi
University of Chicago Booth School of Business and NBER

September 2018

1   Summary

The research study by Mian et al. (2013) (MRS, hereafter) estimates the effect of the decline in housing net worth on household spending. This memo clarifies an issue brought to our attention by Bill Dupor and Rong Li. In our view, the issue is not material for the estimate of the effect of housing wealth changes on overall household spending. However, the issue is important for the exact estimate of the marginal propensity to spend on *new autos* out of housing wealth.

In summary, the estimate provided in MRS of the marginal propsensity to spend on autos out of housing wealth should be interpreted as a marginal propensity to spend on *auto-related expenses more generally* instead of a marginal propensity to spend on *new autos*. As shown here, the specific estimate for the marginal propensity to consume on *new autos* is approximately 25% smaller than the marginal propensity to spend on *auto-related expenses more generally* reported in MRS. This implies a marginal propensity to spend on *new auto sales* in the 0.013 to 0.018 range. The overall estimate of the marginal propensity to spend out of housing wealth of 0.05 to 0.07 reported in MRS is robust to alternative specifications, as is the heterogeneity of the MPS with respect to income, wealth, and leverage.

2   Issue

The first step in the MRS analysis is to allocate aggregate household spending to counties in 2006. Here is the strategy. Total household spending is split into four categories (indexed below by i): auto expenditures, groceries, other durables, and other non-durables. These categories are defined by the NAICS codes of the stores where goods are bought: auto (441); groceries (445); other durables (442, 443, 444); and other non-durables (446, 447, 448, 451, 452, 722). At the county level (indexed below by c), the MRS analysis employs MasterCard spending data and data covering new auto purchases from R.L. Polk. The county-level MasterCard data are also classified by NAICS codes that perfectly match the Census for all

codes, with the exception of autos. Given that people do not generally buy autos using a credit card or debit card, we do not rely on the MasterCard data to measure auto purchases.

The MRS analysis uses 2006 as its benchmark year. For 2006, for groceries, other durables, and other non-durables, spending in category i for county c is estimated using the following proportionality assumption:

$$Spend_{i,c,2006} = \frac{MC_{i,c,2006}}{\sum MC_{i,c,2006}} * CensusSpending_{i,2006}$$

where $MC_{i,c}$ is the MasterCard measure of spending on NAICS category i in county c in 2006, and $CensusSpending_{i,2006}$ is aggregate spending on NAICS category i in 2006.

In MRS, the same proportionality assumption is used to allocate expenditures on autos, where the proportion is based on the fraction of all new auto sales as of 2006 recorded in the R.L. Polk data:[1]

$$Spend_{auto,c,2006} = \frac{NewAutoSales_{c,2006}}{\sum NewAutoSales_{c,2006}} * CensusSpending_{i=441,2006}$$

Notice in the above equation spending on all auto-related expenditures for the Census Spending category 441 is allocated to county c based on the proportion of new auto purchases for county c in 2006.

In this regard, there is an incorrect statement in MRS. The text of MRS says, "So a county with 10% of total R.L. Polk autos purchased in 2006 would be allocated 10% of all expenditures from the census retail sales on new autos in 2006." The last part of this statement is incorrect. It should instead say: "So a county with 10% of total R.L. Polk autos purchased in 2006 would be allocated 10% of all expenditures from the census retail sales on all auto-related expenditures in 2006."

The Census retail sales category 441 includes spending at automobile and other motor vehicle dealers (4411, 4412) and automotive parts, acc., and tire stores (4413). There is a

---

[1] $NewAutoSales$ reflects the number of new vehicles purchased, not the dollars spent on new vehicles.

sub-category of the broader category that is spending at new car dealers (44111). In 2006, this sub-category accounted for 76% of total spending in category 441.[2] The MRS county-level spending on "auto" ($Spend_{auto,c,2006}$ above) should be interpreted as total spending on all auto-related expenditures in a county in 2006, and not only new automobile purchases.

The second step in MRS is to estimate the change in household spending in county c on category i in the county from 2006 to 2009. For groceries, other durables, and other non-durables, the analysis in MRS uses the percentage change in MasterCard expenditures on category i in county c from 2006 to 2009 to obtain the 2009 level of spending in county c on category i. For auto spending, the analysis in MRS uses the percentage change in new auto sales according to R.L. Polk in county c from 2006 to 2009.

Formally, for groceries, other durable, and other non-durables, spending on category i in county c in 2009 is:

$$Spend_{i,c,2009} = \frac{(MC_{i,c,2009} - MC_{i,c,2006})}{MC_{i,c,2006}} * Spend_{i,c,2006}$$

where $Spend_{i,c,2006}$ comes from above.

Total auto expenditures in county c for 2009 is:

$$Spend_{auto,c,2009} = \frac{(NewAutoSales_{c,2009} - NewAutoSales_{c,2006})}{NewAutoSales_{c,2006}} * Spend_{auto,c,2006}$$

Notice here that the percentage change in new auto sales in county c from 2006 to 2009 is used to estimate expenditures on all auto-related expenditures in 2009, not only expenditures on new auto sales in 2009.

As a final point, R.L. Polk data are available at the zip-code-year level, and so we also calculate measures of spending on auto-related goods similarly at the zip code level. The calculations at the zip-level are done exactly as the calculations for the county-level described

---

[2]Spending at used car dealers, for example, accounts for 8% of the Census retail sales category 441 in 2006.

above with c being replaced with z.

3 Clarification of MRS estimates

There are two important assumptions above that should be clarified. First, the MRS analysis allocates spending on all auto-related expenditures to a county as of 2006 using the fraction of aggregate new auto purchases for the county in 2006. Second, the MRS analysis uses the percentage change in new auto purchases in a county to estimate the total spending on all auto-related expenditures in the county as of 2009.

Given these assumptions, it is important to clarify what the coefficient estimates represent. In particular, the marginal propensity to spend on autos out of housing wealth in MRS should be interpreted as a marginal propensity to spend (MPS) on all auto-related expenditures instead of an MPS on new autos. The relevant estimates of this MPS on all auto-related expenditures are 0.023 in Figure IV and 0.018 in Table V of MRS.

Under the assumption that the county-level percentage change from 2006 to 2009 in new auto sales and auto-related expenditures other than new auto sales are the same, the MPS on new autos and other auto-related expenditures is proportional to aggregate spending on new autos and other auto-related expenditures in 2006, respectively. Using the MPS estimate in Figure IV, this yields an MPS on new autos of 0.017 and an MPS on other auto-related expenditures of 0.006. Using the estimate in column 5 of Table V, the implied MPS on new autos is 0.014 and the implied MPS on other auto-related expenditures is 0.004.

4 Alternative estimates

Are the results of MRS sensitive to the assumptions noted above? In our view, the primary concern involves the assumption that the decline in auto-related expenditures other than new auto sales, which we call *residual auto spending*, in a given county is not accurately measured using the percentage decline in new auto sales in the county. For example, a

reasonable argument is that counties with the largest drop in housing net worth would see a smaller drop in residual auto spending relative to spending on new autos. We note from the outset that this is unlikely to materially affect the overall results, given that residual auto spending makes up only 24% of spending in the auto category and only 5% of aggregate retail spending in 2006.

An alternative is to use the percentage change in spending on durable goods to estimate county-level spending on residual auto spending as of 2009. Formally:

$$Spend_{residualauto,c,2006} = \frac{NewAutoSales_{c,2006}}{\sum NewAutoSales_{c,2006}} * CensusSpending_{residualauto,2006}$$

and:

$$Spend_{residualauto,c,2009} = \frac{(MC_{durables,c,2009} - MC_{durables,c,2006})}{MC_{durables,c,2006}} * Spend_{residualauto,c,2006}$$

$CensusSpending_{residualauto,2006}$ is defined as total spending at all auto-related stores (category 441) in the Census Retail Sales minus spending at new car dealerships (category 44111). Spending on new auto sales in a county in 2006 uses only spending at new car dealerships in 2006, and spending on new auto sales in 2009 is calculated using the percentage change in new auto sales from the R.L. Polk data as above.

Tables 1 through 10 and Figure 1 present the summary statistics and the main results of the MRS study under this alternative calculation. The overall estimates are similar across all specifications. Figure 1 shows an MPS on new autos of 0.018 from the county-level analysis. Table 8, column 5 shows an MPS on new autos of 0.013 from the zip-code level analysis.

References

Mian, Atif, Kamalesh Rao, and Amir Sufi, "Household Balance Sheets, Consumption, and the Economic Slump," *The Quarterly Journal of Economics*, 2013, *128* (4), 1687–1726.

Table 1: **Summary statistics, original**

	N	Mean	Std. Dev.	10th	90th	Wtd. Mean	Wtd. Std. Dev.	Wtd. Median
Housing net worth shock, 2006-9	944	-0.063	0.083	-0.169	0.003	-0.092	0.097	-0.063
Financial net worth shock, 2006-9	944	-0.096	0.011	-0.108	-0.084	-0.094	0.010	-0.095
Change in home value, $000, 2006-9	944	-28.401	38.363	-79.072	1.161	-47.463	49.143	-25.857
Spending growth, 2006-9	944	-0.059	0.135	-0.229	0.110	-0.092	0.113	-0.100
Change in spending, $000, 2006-9	944	-1.682	4.606	-6.729	3.295	-3.382	4.396	-3.490
Change in auto spending, $000, 2006-9	944	-2.603	1.630	-4.465	-1.037	-3.283	2.004	-2.766
Change in other durables spending, $000, 2006-9	944	-0.630	1.337	-1.988	0.536	-1.090	1.085	-1.025
Change in grocery spending, $000, 2006-9	944	0.542	0.895	-0.199	1.502	0.534	0.686	0.425
Change in other non-durable spending, $000, 2006-9	944	1.009	2.802	-1.637	4.032	0.456	2.364	0.183
Employment share in construction, 2006	944	0.119	0.054	0.065	0.182	0.125	0.048	0.120
Employment share in tradables, 2006	944	0.130	0.102	0.032	0.247	0.110	0.071	0.104
Employment share in other, 2006	944	0.522	0.232	0.274	0.830	0.667	0.268	0.660
Employment share in nontradables, 2006	944	0.210	0.067	0.137	0.283	0.216	0.051	0.217
Income per household, $000, 2006	944	52.200	15.917	38.187	70.199	59.854	18.935	55.261
Net worth per household, $000, 2006	944	429.898	246.735	230.523	684.491	520.779	288.809	459.735
Housing leverage ratio, 2006	944	0.616	0.229	0.360	0.902	0.608	0.179	0.585
Housing supply elasticity, Saiz	540	2.192	1.044	0.943	3.589	1.715	0.968	1.529
Number of households, thousands	944	98.197	187.506	12.841	237.783	455.860	666.239	232.526
Change in home equity limit, $000, 2006-9	944	-0.473	4.786	-3.323	2.857	-0.725	3.637	-0.403
Change in credit card limit, $000, 2006-9	944	-1.043	2.419	-3.567	1.778	-1.574	1.781	-1.653
Change in fraction of subprime borrowers, 2006-9	944	-0.010	0.024	-0.038	0.019	-0.004	0.024	-0.008
Change in refinancings, $000, 2006-9	944	1.236	6.646	-5.247	7.263	-1.268	8.518	1.010

Table 2: **Summary statistics, alternative**

	N	Mean	Std. Dev.	10th	90th	Wtd. Mean	Wtd. Std. Dev.	Wtd. Median
Housing net worth shock, 2006-9	944	-0.063	0.083	-0.169	0.003	-0.092	0.097	-0.063
Financial net worth shock, 2006-9	944	-0.096	0.011	-0.108	-0.084	-0.094	0.010	-0.095
Change in home value, $000, 2006-9	944	-28.401	38.363	-79.072	1.161	-47.463	49.143	-25.857
Spending growth, 2006-9	944	-0.043	0.137	-0.213	0.133	-0.081	0.112	-0.096
Change in spending, $000, 2006-9	944	-1.305	4.782	-6.388	3.847	-3.021	4.428	-3.171
Change in new auto spending, $000, 2006-9	944	-1.983	1.242	-3.402	-0.790	-2.501	1.526	-2.107
Change in resid auto spending, $000, 2006-9	944	-0.243	0.516	-0.768	0.207	-0.421	0.419	-0.396
Change in other durables spending, $000, 2006-9	944	-0.630	1.337	-1.988	0.536	-1.090	1.085	-1.025
Change in grocery spending, $000, 2006-9	944	0.542	0.895	-0.199	1.502	0.534	0.686	0.425
Change in other non-durable spending, $000, 2006-9	944	1.009	2.802	-1.637	4.032	0.456	2.364	0.183
Employment share in construction, 2006	944	0.119	0.054	0.065	0.182	0.125	0.048	0.120
Employment share in tradables, 2006	944	0.130	0.102	0.032	0.247	0.110	0.071	0.104
Employment share in other, 2006	944	0.522	0.232	0.274	0.830	0.667	0.268	0.660
Employment share in nontradables, 2006	944	0.210	0.067	0.137	0.283	0.216	0.051	0.217
Income per household, $000, 2006	944	52.200	15.917	38.187	70.199	59.854	18.935	55.261
Net worth per household, $000, 2006	944	429.898	246.735	230.523	684.491	520.779	288.809	459.735
Housing leverage ratio, 2006	944	0.616	0.229	0.360	0.902	0.608	0.179	0.585
Housing supply elasticity, Saiz	540	2.192	1.044	0.943	3.589	1.715	0.968	1.529
Number of households, thousands	944	98.197	187.506	12.841	237.783	455.860	666.239	232.526
Change in home equity limit, $000, 2006-9	944	-0.473	4.786	-3.323	2.857	-0.725	3.637	-0.403
Change in credit card limit, $000, 2006-9	944	-1.043	2.419	-3.567	1.778	-1.574	1.781	-1.653
Change in fraction of subprime borrowers, 2006-9	944	-0.010	0.024	-0.038	0.019	-0.004	0.024	-0.008
Change in refinancings, $000, 2006-9	944	1.236	6.646	-5.247	7.263	-1.268	8.518	1.010

Table 3: **Net Worth Shock and Consumption Growth, 2006-9, original**

	(1)	(2)	(3)	(4) IV	(5) State FE	(6) Excluding AZ, CA, FL, NV
Housing net worth shock, 2006-9	0.634**	0.613**	0.590**	0.774**	0.457**	0.869**
	(0.125)	(0.122)	(0.130)	(0.239)	(0.101)	(0.148)
Financial net worth shock, 2006-9		-0.595				
		(1.032)				
Employment share in construction, 2006			-0.448**	-0.287	-0.171	-0.288
			(0.150)	(0.216)	(0.127)	(0.160)
Employment share in tradables, 2006			0.051	0.011	0.042	-0.027
			(0.067)	(0.092)	(0.066)	(0.065)
Employment share in other, 2006			-0.025	-0.045	-0.057	-0.058
			(0.038)	(0.050)	(0.037)	(0.039)
Employment share in nontradables, 2006			0.193	0.095	0.228	0.106
			(0.156)	(0.167)	(0.137)	(0.158)
ln(Income per household, 2006)			-0.002	0.024	-0.006	0.028
			(0.033)	(0.047)	(0.046)	(0.045)
ln(Net worth per household, 2006)			-0.028	-0.035	-0.023	-0.034
			(0.018)	(0.023)	(0.020)	(0.025)
Constant	-0.034*	-0.092	0.167*	0.147	0.121	0.132
	(0.015)	(0.099)	(0.077)	(0.092)	(0.090)	(0.087)
Observations	944	944	944	540	944	833
R^2	0.298	0.301	0.355	0.319	0.547	0.230

Table 4: **Net Worth Shock and Consumption Growth, 2006-9, alternative**

	(1)	(2)	(3)	(4) IV	(5) State FE	(6) Excluding AZ, CA, FL, NV
Housing net worth shock, 2006-9	0.608**	0.574**	0.569**	0.776**	0.427**	0.870**
	(0.121)	(0.113)	(0.128)	(0.246)	(0.104)	(0.147)
Financial net worth shock, 2006-9		-0.980				
		(0.991)				
Employment share in construction, 2006			-0.383*	-0.200	-0.155	-0.219
			(0.153)	(0.220)	(0.133)	(0.164)
Employment share in tradables, 2006			0.054	0.002	0.047	-0.019
			(0.064)	(0.090)	(0.064)	(0.064)
Employment share in other, 2006			-0.026	-0.049	-0.054	-0.060
			(0.039)	(0.051)	(0.038)	(0.040)
Employment share in nontradables, 2006			0.194	0.099	0.191	0.097
			(0.141)	(0.154)	(0.135)	(0.144)
ln(Income per household, 2006)			-0.018	0.009	-0.009	0.016
			(0.033)	(0.046)	(0.046)	(0.045)
ln(Net worth per household, 2006)			-0.028	-0.035	-0.026	-0.036
			(0.017)	(0.022)	(0.020)	(0.024)
Constant	-0.025	-0.120	0.235**	0.210*	0.167	0.198*
	(0.015)	(0.094)	(0.075)	(0.090)	(0.091)	(0.088)
Observations	944	944	944	540	944	833
R^2	0.279	0.286	0.342	0.294	0.524	0.234

* $p < 0.05$, ** $p < 0.01$. Robust standard errors in parentheses.

Table 5: **Average marginal propensity to consume out of housing wealth, original**

	(1)	(2)	(3)	(4) IV	(5) State FE	(6) Excluding AZ, CA, FL, NV
Change in home value, $000, 2006-9	0.054**	0.119**	0.051**	0.072**	0.051**	0.094**
	(0.009)	(0.015)	(0.011)	(0.020)	(0.013)	(0.017)
(Change in home value, $, 2006-9)^2		0.432**				
		(0.076)				
Employment share in construction, 2006			-9.730	-2.904	-7.437	-2.296
			(5.473)	(7.790)	(5.372)	(5.811)
Employment share in tradables, 2006			2.031	0.437	1.514	-0.793
			(2.232)	(3.778)	(2.187)	(2.493)
Employment share in other, 2006			-1.566	-3.033	-2.183	-2.625
			(1.457)	(1.848)	(1.416)	(1.464)
Employment share in nontradables, 2006			-1.791	-3.249	-3.336	-4.099
			(5.431)	(5.976)	(5.042)	(5.342)
Income per household, $000, 2006			-0.056*	-0.019	-0.043	-0.022
			(0.022)	(0.032)	(0.030)	(0.029)
Net worth per household, $000, 2006			0.003*	0.002	0.002	0.002
			(0.001)	(0.001)	(0.002)	(0.001)
Constant	-0.829	0.263	3.308**	3.207**	3.392**	3.411**
	(0.535)	(0.553)	(0.677)	(0.927)	(0.860)	(0.836)
Observations	944	944	944	540	944	833
R^2	0.362	0.423	0.421	0.347	0.573	0.336

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.

Table 6: **Average marginal propensity to consume out of housing wealth, alternative**

	(1)	(2)	(3)	(4) IV	(5) State FE	(6) Excluding AZ, CA, FL, NV
Change in home value, $000, 2006-9	0.052**	0.120**	0.049**	0.072**	0.048**	0.093**
	(0.009)	(0.016)	(0.011)	(0.022)	(0.014)	(0.017)
(Change in home value, $, 2006-9)^2		0.447**				
		(0.084)				
Employment share in construction, 2006			-7.695	0.148	-6.242	0.082
			(5.939)	(8.498)	(5.817)	(6.267)
Employment share in tradables, 2006			1.654	-0.246	1.300	-0.867
			(2.247)	(4.058)	(2.113)	(2.692)
Employment share in other, 2006			-1.462	-3.101	-1.961	-2.635
			(1.539)	(1.991)	(1.508)	(1.574)
Employment share in nontradables, 2006			-0.727	-2.274	-3.571	-3.748
			(5.619)	(6.338)	(5.396)	(5.553)
Income per household, $000, 2006			-0.067**	-0.030	-0.048	-0.030
			(0.024)	(0.034)	(0.031)	(0.031)
Net worth per household, $000, 2006			0.003*	0.002	0.002	0.002
			(0.001)	(0.001)	(0.002)	(0.001)
Constant	-0.537	0.592	3.758**	3.693**	3.854**	3.881**
	(0.564)	(0.592)	(0.679)	(0.917)	(0.915)	(0.812)
Observations	944	944	944	540	944	833
R^2	0.337	0.402	0.401	0.313	0.555	0.331

* p < 0.1, ** p < 0.05. Robust standard errors in parentheses.

Table 7: **Heterogeneity in the MPC by wealth and income, original**

	County-level Analysis		County-level Analysis		ZIP code-level analysis		
	Dependent variable: *ΔTotal Spending,* *($000), 2006-9*		*Dependent variable:* *ΔAuto Spending,* *($000), 2006-9*		*Dependent variable:* *ΔAuto Spending,* *($000), 2006-9*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ΔHome value, $000, 2006-9	0.076**	0.065**	0.034**	0.046**	0.018**	0.022**	0.025**
	(0.012)	(0.015)	(0.005)	(0.005)	(0.001)	(0.002)	(0.002)
Net worth, $ millions, 2006	-4.285*		-1.803**			-0.353	
	(2.129)		(0.664)			(0.242)	
(ΔHome value)*(Net worth, 2006)	-0.038		-0.024*			-0.007**	
	(0.024)		(0.009)			(0.001)	
Income per household, $ millions, 2006		-63.970*		-31.756**			-4.012
		(28.124)		(7.805)			(3.130)
(ΔHome value)*(Income per household, 2006)		-0.180		-0.431**			-0.094**
		(0.332)		(0.100)			(0.022)
Constant	1.247	2.826*	-1.299**	-0.360	-2.071**	-1.880**	-1.805**
	(0.678)	(1.211)	(0.199)	(0.331)	(0.170)	(0.120)	(0.116)
Observations	944	944	944	944	6263	6220	6263
R^2	0.462	0.478	0.427	0.440	0.153	0.161	0.163

* $p < 0.05$, ** $p < 0.01$. Robust standard errors in parentheses.

Table 8: **Heterogeneity in the MPC by wealth and income, alternative**

	County-level Analysis		County-level Analysis		ZIP code-level analysis		
	Dependent variable: Δ*Total Spending, ($000), 2006-9*		*Dependent variable:* Δ*Auto Spending, ($000), 2006-9*		*Dependent variable:* Δ*Auto Spending, ($000), 2006-9*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ΔHome value, $000, 2006-9	0.073**	0.050**	0.036**	0.048**	0.013**	0.017**	0.019**
	(0.013)	(0.017)	(0.009)	(0.007)	(0.001)	(0.001)	(0.002)
Net worth, $ millions, 2006	-4.533		-1.530**			-0.269	
	(2.707)		(0.539)			(0.185)	
(ΔHome value)*(Net worth, 2006)	-0.024		-0.027*			-0.005**	
	(0.029)		(0.011)			(0.001)	
Income per household, $ millions, 2006		-62.311		-27.946**			-3.057
		(34.685)		(6.339)			(2.384)
(ΔHome value)*(Income per household, 2006)		0.142		-0.453**			-0.072**
		(0.405)		(0.089)			(0.017)
Constant	1.768*	3.157*	-0.859**	-0.017	-1.578**	-1.432**	-1.375**
	(0.804)	(1.444)	(0.194)	(0.278)	(0.130)	(0.092)	(0.089)
Observations	944	944	944	944	6263	6220	6263
R^2	0.390	0.408	0.359	0.367	0.153	0.161	0.163

* $p < 0.05$, ** $p < 0.01$. Robust standard errors in parentheses.

Table 9: **Heterogeneity in the MPC: The role of housing debt, original**

	Dependent variable: Housing leverage ratio, 2006		Dependent variable: ΔAuto Spending, ($000), 2006-9		
	(1)	(2)	(3)	(4)	(5)
Net worth, $ millions, 2006	0.004 (0.013)			-0.153 (0.158)	
Income per household, $ millions, 2006		0.327 (0.233)			0.022 (1.624)
ΔHome value, ($000), 2006-9			0.006** (0.002)	0.010** (0.002)	0.011** (0.002)
Housing leverage ratio, 2006			-2.108** (0.228)	-2.142** (0.232)	-2.187** (0.229)
(ΔHome value)(Housing leverage ratio, 2006)			0.021** (0.003)	0.020** (0.004)	0.020** (0.003)
(ΔHome value)(Net worth, 2006)				-0.005** (0.001)	
(ΔHome value)(Income per household, 2006)					-0.058** (0.015)
Constant	0.595** (0.011)	0.576** (0.016)	-0.784** (0.150)	-0.666** (0.150)	-0.703** (0.157)
Observations	6385	6448	6222	6182	6222
R^2	0.000	0.003	0.272	0.272	0.279

* $p < 0.05$, ** $p < 0.01$. Robust standard errors in parentheses.

Table 10: **Heterogeneity in the MPC: The role of housing debt, alternative**

	Dependent variable: Housing leverage ratio, 2006		Dependent variable: ΔAuto Spending, ($000), 2006-9		
	(1)	(2)	(3)	(4)	(5)
Net worth, $ millions, 2006	0.004 (0.013)			-0.116 (0.121)	
Income per household, $ millions, 2006		0.327 (0.233)			0.017 (1.237)
ΔHome value, ($000), 2006-9			0.004** (0.001)	0.007** (0.001)	0.009** (0.001)
Housing leverage ratio, 2006			-1.606** (0.174)	-1.632** (0.176)	-1.666** (0.175)
(ΔHome value)(Housing leverage ratio, 2006)			0.016** (0.002)	0.015** (0.003)	0.015** (0.002)
(ΔHome value)(Net worth, 2006)				-0.003** (0.001)	
(ΔHome value)(Income per household, 2006)					-0.044** (0.012)
Constant	0.595** (0.011)	0.576** (0.016)	-0.598** (0.114)	-0.508** (0.114)	-0.536** (0.119)
Observations	6385	6448	6222	6182	6222
R^2	0.000	0.003	0.272	0.272	0.279

* $p < 0.05$, ** $p < 0.01$. Robust standard errors in parentheses.

Figure 1: **Average Marginal Propensity to Consume, original & alternative**