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The Impact of Age on Retail Sales

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Analyses of single cross-sections of household data obtain age coefficients (impacts) that are actually a combination of age and year-of-birth effects. By analyzing two cross-sections, one is able to estimate separate age and birth year effects. We do this, concentrating on the impacts on retail spending. We find that households over age 40 spend relatively more on retail than do those under age 40 and that those born during the Great Depression are relatively low retail spenders.

Introduction

In 1989, Mankiw and Weil (1989) published their infamous forecast that real house prices would decline by 47 percent by 2007 in response to the aging of the Baby Boomers (right number, wrong sign!). They used data from one year—1980—to relate housing demand to age. They found that the demand for housing rose until around age 50 and declined sharply thereafter. Largely for this reason, they forecast that housing demand would decline as the Baby Boomers aged and thus that real house prices would fall precipitously.

The housing-age relationship is, of course, rather violently inconsistent with the life-cycle hypothesis of Ando and Modigliani (1963), which predicts consumption smoothing across age categories. For example, when people are young, they borrow to finance asset purchases that deliver current consumption services (housing and transportation), thereby permitting greater consumption of retail and other goods. Also while they typically consume most health care when they are elderly, they pay into medical insurance pools throughout their working years, smoothing the cost of health care over their life. By smoothing medical costs, they can smooth their consumption of retail and other goods.

A problem with relating demand to age variables in a single cross section is that age variables are perfectly correlated with birth year variables.[1] For example, people who were in their thirties in 1980 were born in the 1940s, those in their forties in 1980 were born in the 1930s, and so on. That is, what seem to be age effects could, instead, be birth year or generational effects. In fact, Green and Hendershott (1996) emphasized that all generations were not alike and argued that Mankiw and Weil's measured relationship between housing demand and age reflected generational differences. More specifically, young adults in 1980 had much more education than their parents and grandparents and had expectations of greater labor force participation. Thus they were likely to expect to have greater real income and wealth at every subsequent age than their parents and grandparents did. As a result, they would have

[1] Coulson and McMillen (2006) discuss this problem in the context of estimating hedonic house price equations.

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higher, not lower, housing demand and real house prices would rise, not fall, as they replaced their parents/grandparents.[2]

So why might age matter, even after holding variables like labor force participation and education constant? Some time back "capital markets" for consumption were not remotely complete, making consumption smoothing difficult. However, the explosion in consumer credit products has alleviated this. On the other hand, people clearly do not smooth their consumption of leisure: they consume less of it when young and middle-aged, and more at an older age. This certainly has something to do with the age-specific characteristics of marginal productivity. It is not unreasonable to expect that the composition of consumption changes with the amount of leisure consumed (some goods are compliments to leisure, others are not).

But perhaps more important than how old people are, is when they were born. For example, life expectancy at birth among females in 1900 was 47 years old; now it is 80 (Oeppen and Vaupel 2002). If one is planning consumption across the life-cycle, the expected length of their life surely matters.[3] The longer expected life, the lower annual consumption (holding retirement age and the bequest motive constant). Further, people in households today have less incentive to buy health insurance early in their lives (as opposed to retail goods) than in earlier times. Finally, most of those born during the Great Depression lived in households that had catastrophic economic experiences and likely formed economic expectations markedly different than those born in earlier or later years.

To this point, work on the relationship between aging and spending has been largely descriptive and has not attempted to disentangle age from birth year effects. However, there is evidence that Baby Boomers have different attitudes toward spending than their elders and thus that birth year might matter. For example, the Allianz Life Insurance Company of North America and Harris Interactive conducted a survey on attitudes toward intergenerational wealth transfers in which 2,627 people from both the Boomer and Depression generations were asked about financial attitudes (*The Allianz American Legacies Study*, 2005). One striking finding was that members of the Depression generation were seven times more likely (22% versus 3%) than the Boomers to believe that they owed their children an inheritance. In addition, Taylor, Funk and Clark (2007) find in the Pew Research Center Survey of 2000 adults in 2006 that the only age group where a plurality felt that they had saved enough was the over 65 group (the group born before 1941). This age group was also the group least likely to answer that their finances were ever "out of control." While Taylor et al. do not perform a multivariate analysis, it is striking that being in this age group seemed to matter more than income and education in determining attitudes toward spending and savings.

In the present paper we explore the effect of the life-cycle and generational differences on retail sales (excluding autos). Generation differences can include

[2] While Green and Hendershott (1996, p 478) speculate that real prices based on 1980 household characteristics were likely to rise only modestly, labor force participation continued to rise sharply after 1980 (see Table 3 below), suggesting a large real price increase.

[3] It is, of course, it is hard to imagine that those born at the beginning of the century expected the life-extending capacity of modern medicine. For a discussion of how medicine has influenced life expectancy, see Cutler et al. (2006).

differences in work effort, education attainment, household structure, and the propensity to save. We begin with an overview of the determinants of retail sales, considering sales as the product of real income and the share of this income spent on retail sales. In this overview we provide historical data on spending shares, their likely determinants, and the likely determinants of real income per capita.

We then explain average real retail sales per capita using county-wide data from the 1992 and 2002 Censuses of Retail Trade and from the corresponding 1990 and 2000 US Censuses of Population and Housing for just over 3,000 counties. A major advantage of using two cross-sections is that we can differentiate separate age and birth year effects, as noted by McKenzie (2007). We estimate both partial and total life-cycle and generational effects.

Economic Determinants of Retail Spending

Total real retail sales per capita is expressed as the product of the ratio of real sales to real income, real income per adult, and the share of adults in the population:

$$\text{Retail Sales Per Capita} = (\text{Retail Sales/Income}) \times (\text{Income/Adults}) \times (\text{Adults/Population}) \quad (1)$$

Thus there are two variables of interest in addition to the adult/population ratio: the propensity to spend on retail goods and the level of real income per adult.

Table 1 lists the propensities of households to spend income on eight different classes of goods over the last forty years based on National Income and Product Account data. Households devote 13% to 18% of their income to each of retail outlays including autos, food and beverages, housing, medical, other services, "residual" expenses, and smaller fractions to fuel and savings. Some of these shares have been trending upward (medical and other services) and some downward (food and saving).

Explanation of some changes is straightforward, being related to changes in relative prices. For example, the rise in the fuel share in the 1970s and decline in the 1980s are certainly largely due to the rise and fall of real energy prices; the decline in the food share in the 1980s was due to a decline in real food prices; and the upward trend in the share spent on medical is due to some combination of rise in the price and quality of medical services (although note that medical expenditures flattened during the 1990s when HMOs largely replaced fee-for-service medical delivery). Other expenditure shares had to move in compensating fashion. Unfortunately, we have little knowledge on regional variation in these real prices so they cannot be included in our regional analysis.

Two other major expenditure categories in this data are housing and retail. Because of economies in the production of housing services (e.g., kitchens and bathrooms can serve multiple people), the more adults group up, the less they will spend on housing and the more on other goods such as retail. This suggests that the retail share will be positively related to the married couple share of households. On the other hand, the more children adults have, the more that will be spent on food, housing, medical care, and other services for offspring and thus the less that would be available for spending on retail. Similarly, the more children the greater is the need to save for

Table 1.
Distribution of Disposable Income by Expenditure Category (NIPA).

	1970	1980	1990	2000	d70s	d80s	d90s
Retail	0.138	0.124	0.087	0.135	-0.013	-0.037	0.048
Food	0.200	0.190	0.144	0.135	-0.010	-0.046	-0.009
Fuel	0.039	0.060	0.025	0.023	0.021	-0.035	-0.002
Housing	0.189	0.211	0.191	0.188	0.021	-0.020	-0.003
Medical	0.059	0.079	0.142	0.138	0.020	0.063	-0.004
Other Services	0.110	0.106	0.155	0.175	-0.003	0.048	0.020
Saving	0.104	0.081	0.108	0.043	-0.023	0.027	-0.065
Residual	0.162	0.149	0.149	0.163	-0.013	-0.001	0.015

Source: National Income and Products Accounts (note that autos is in retail).

their education and thus the lower should be retail sales. Thus, the greater is household size, holding the married couple share constant, the lower the expected retail spending share.

Households headed by blacks generally have not, *ceteris paribus*, accumulated as much wealth as households headed by whites (see Oliver and Shapiro, 1996). Thus blacks will tend to spend a smaller share of income than whites. Also, homeowners must have accumulated sufficient savings to make a down payment (see Haurin, Hendershott and Wachter, 1997) and would thus, *ceteris paribus*, tend to have more wealth than renters. Therefore retail spending would be expected to be higher in regions with higher home ownership rates, other things being equal.

The married couple share of households has been falling steadily, although particularly in the 1970s, going from 70% in 1970 to 54% in 2000. Unmarried family households (singles with children) have risen slowly, but the big increase is in single households, which grew from 19% to 31% between 1970 and 1990. Owner households have risen by about 3 percentage points overall, and household size fell sharply from 3.11 in 1970 to 2.63 in 1990. The shares of married couples and homeowners rise with age (until about age 65), and the black share declines with age (these and all subsequent data in this section come from the Decennial Census of the United States).

The real income of adults is determined by their productivity and work effort. Productivity is strongly related to education. Table 2 lists the proportions in 1990 and 2000 of those 25 and older without a high school degree, with that degree but without a college degree, and with a college degree. As can be seen, changes in these proportions in the 1990s were huge: the share without a high school degree dropped by nearly 40 %, while the share with a college degree rose by over 25%.

Aggregate work effort is the product of the number of people in the labor force and the average number of hours they worked. Table 3 gives the shares of females and males in different age groups that were in the labor force in 1980, 1990, and 2000, as well as a forecast for 2010 from the Census. The differences in changes by gender are striking. Participation rates for males of all ages have dropped (by nearly 10% for both

Table 2.
Educational Attainment Shares in 1990 and 2000.

Year	Not HS Graduate	HS Graduate	College Graduate
1990	24.8	54.9	20.3
2000	15.8	58.5	25.6

Source: Decennial Census of the United States, 1990 and 2000.

Table 3.
Labor Force Participation Rates by Age and Gender.

Female				
	1980	**1990**	**2000**	**2010**
16-24	60.9	61.5	62.3	64.0
25-44	65.5	75.0	76.8	80.7
45-64	50.6	58.2	64.3	67.6
65+	8.1	8.6	9.4	11.1
Male				
	1980	**1990**	**2000**	**2010**
16-24	73.2	70.1	67.8	66.8
25-44	95.4	94.2	93.0	92.7
45-64	81.7	79.3	78.0	77.4
65+	19.0	16.3	17.5	19.5

Source: Decennial Census of the United States, 1980, 1990, 2000.

those under age 25 and those over age 64), while rates for females have increased, by 15% to 30% for those over age 24. The drop for older men was especially sharp in the 1980s; participation actually increased in the 1990s. The 2010 forecast suggests that these trends will continue.

Table 4 presents a breakdown of the distribution of the population by age for 1980, 1990, and 2000, as well as forecasts for 2010 and 2020. The fraction of the population under age 20 fell by a full three percentage points from over 31.8% in 1980 to 28.7% in 1990 (and is projected to fall another two percentage points by 2020), and the twenties age share fell by 4.4 percentage points (25%) between 1980 and 2000. Offsetting these declines were sharp increases in the 30-39 and 40-49 age classes (1980s) and 40-49 and 50-59 (1990s) age classes. Going forward, the 50-59 and 60-69 age shares are projected to increase dramatically between 2000 and 2010 and the 60-69 and 70-79 age shares between 2010 and 2020.

The year of birth could also be important, owing to different tastes of different generations (their choices regarding work versus leisure and spending versus investing

Table 4.
Age Distribution of Population, 1980-2020.

Age	1980	1990	2000	2010	2020	d80s	d90s	d00s	d10s
0-19	0.318	0.287	0.286	0.270	0.264	-0.031	-0.001	-0.016	-0.006
20-29	0.180	0.162	0.136	0.137	0.131	-0.018	-0.026	0.001	-0.006
30-39	0.140	0.168	0.154	0.127	0.130	0.028	-0.014	-0.027	0.003
40-49	0.101	0.127	0.151	0.142	0.119	0.026	0.024	-0.009	-0.023
50-59	0.103	0.088	0.109	0.137	0.127	-0.015	0.021	0.028	-0.010
60-69	0.084	0.083	0.072	0.095	0.118	-0.001	-0.011	0.023	0.023
70-79	0.050	0.057	0.058	0.054	0.071	0.007	0.001	-0.004	0.017
80+	0.025	0.028	0.033	0.038	0.039	0.003	0.005	0.005	0.001

Source: Decennial Census of the United States, 1970, 1980, 1990, 2000.

Table 5.
Percent of Population Born in Different Decades.

Year	1990	2000	2010	2020	d90s	d00s	d10s
1930s	0.088	0.072	0.054	0.039	-0.016	-0.018	-0.015
1940s	0.127	0.109	0.095	0.071	-0.018	-0.014	-0.024
1950s	0.168	0.151	0.137	0.118	-0.017	-0.014	-0.019
1960s	0.162	0.154	0.142	0.127	-0.008	-0.012	-0.015

Source: Decennial Census of the United States, 1980, 1990, 2000.

in human and financial capital). For example, Depression babies might have a higher tendency to save, other things being equal. Table 5 shows how the shares of population born in the 1930s, 1940s, 1950s, and 1960s has and is expected to decline over time.

Because we explain within county sales data, we need to be concerned not only with how much people in a county are spending but where they are doing their spending. Spending within a region consists of part of the total spending of people living in the region (the characteristics of people in the region, which we have data on, determine this total) and part of the spending of people living outside the region. In general, the more attractive a region is to shoppers, the greater will be both the share that residents spend within the region and the share of total nonresident spending that occurs within the region.

To capture attractiveness, we use the share of the county population that resides in "urban areas" (defined by the Census Bureau as those with at least 1000 people per square mile in the Census block or 500 people per square mile in the Census and contiguous blocks). Heavily urban counties are bound to have more shopping opportunities than rural counties because of the fixed costs involved in developing shopping centers. Moreover, it is only in populous places that it is possible to purchase

a wide variety of goods. As is the case with labor markets, populous cities allow opportunities for specialization in retail sales that smaller places do not. For example, a small county will likely not have Asian grocery stores (unless it has a disproportionately large Asian population), while a large county will. Small counties may have a Wal-Mart, and perhaps a Sears; large counties will have Wal-Marts, Sears, Kohl's, Macy's, and Nordstroms. In 1990, a sixth of our counties had no "urban" population, the mean is 34.5%, and 10% of our counties have 83% or more urban. By 2000, the share of counties that had no urban population had risen to 26.2%, and 10% of counties were more than 85% urban. Both the share in urban areas and a dummy for whether the share is zero are included in our estimation.

Basic Estimation

Our data come from two sources: the Summary Tape Files of the 1990 and 2000 Censuses of Population and Housing, and the 1992 and 2002 Censuses of Retail Trade. Altogether, virtually all counties have at least one retail establishment, although confidentiality limits us to having counties with at least two establishments. The STF files give us demographic and economic information on households, and the Census of Retail Trade gives us county level data on retail spending, both in aggregate and within individual retail categories. We define retail spending to include food and beverage sales and clothing, but not automobile outlays. For most of our estimation we explain retail spending per capita (population is included as an explanatory variable because that spending may not be exactly homogeneous in population).

The difference in time between the two data sets can be problematic—ideally, we would want to know the contemporaneous effect of demographic characteristics on retail spending behavior. Fortunately, at least the difference in time works in the correct direction—it is more plausible to think that an earlier demographic mix could cause later behavior than the converse. Indeed, we actually receive a benefit from the difference in periods because endogeneity ceases to be a problem: if the variables on the left-hand side of an equation are measured later than the variables on the right-hand side, it is not possible that the left has "caused" the right. In fact, we could look at the 1990 demographic data as an instrument for contemporaneous demographic data. Therefore, we view the difference in time periods as being innocuous or perhaps even useful.

We report regressions explaining retail sales per capita. Because the county data vary widely in population, we use weighted least square estimation (each observation is weighted by its share of total population). The basic age variables are the shares of each age category of the population in each county (i.e., the share ages 20-29, the share ages 30-39, the share 40-49, through the share that is over age 79). The dropped category is the share of the population under age 20. Results are reported for each of the 1990 and 2000 cross-sections.

The coefficients, standard errors, and *t*-ratios for the basic equation are in Table 6. For the 1990 data, the adjusted R^2 is 0.23 and all coefficients except those for the two oldest age classes have *t*-statistics greater than 8 (in absolute value). For 2000,

Table 6.
Regressions with Age Shares Explaining Per Capita Retail Spending.

	1990			2000		
	Parameter	S.E.	*t*-stat	Parameter	S.E.	*t*-stat
Intercept	-12.0	1.0	-11.9	-16.6	1.2	-10.9
Age Share of Pop. Between 20 and 29	41.3	3.3	12.6	30.3	3.9	9.9
Age Share of Pop. Between 30 and 39	46.7	4.9	9.5	40.8	5.0	9.6
Age Share of Pop. Between 40 and 49	62.1	5.9	10.6	93.8	7.7	10.9
Age Share of Pop. Between 50 and 59	-71.8	8.1	-8.8	25.9	10.0	2.7
Age Share of Pop. Between 60 and 69	82.6	7.9	10.4	-98.1	7.4	9.2
Age Share of Pop. Between 70 and 79	-15.2	10.0	-1.5	148.0	6.6	11.0
Age Share of Pop. Above 80	21.6	10.9	2.0	-34.7	1.0	-3.1
R^2	0.23			0.21		
n	3082			3049		

Unit of observation is the county. Per capita spending is in thousands of dollars.

all but the 50-59 and 80+ age class coefficients have *t*-statistics greater than 8 and the adjusted R^2 is 0.21.

Two broad similarities for these panels stand out. First, retail sales are higher for those under age 50 than for those over 50. The average of the coefficients for those in their twenties through forties is about 50 for both panels, and the average drops to less than 10 for the older cohorts. Economically this is quite meaningful. As Table 5 indicated, during the 2000-2010 decade a five percentage point shift in the share of population under age 50 to over age 50 is expected. The decline in retail sales per capita is thus 0.05 times the difference between 50 and 10. That is, retail sales per capita would fall by 2 relative to the mean 2000 value of 10.8 thousand dollars or by nearly 20 percent.

The second broad similarity is the volatility in the coefficients for cohorts over age 50. For 1990, the coefficient of the fifties cohort is 76 below the over-age-50 average of 4, while that for the sixties cohort is 79 above. For 2000, the sixties cohort coefficient is 108 below the average of 10, while that for the seventies cohort is 138 above. The fact that these swings differ by a decade suggests a large birth year effect. More specifically, those in their fifties in 1990 were born in the 1930s, as were those in their sixties in 2000. That is, Depression babies are relatively low retail spenders. In contrast, those in their sixties in 1990, like those in their seventies in 2000, were born during the roaring 1920s and are relatively high retail spenders.

Pure or Partial Age and Birth Year Effects

We expand the basic equation by adding the following county-level variables: the share of population over age 24 with at least a college degree; the average labor force

Table 7.
Per Capita Retail Sales Regressions.

	1990			2000		
	Coeff.	*t*-ratio	RHS Mean and SE	Coeff.	*t*-ratio	RHS Mean and SE
Intercept	14.0	(4.3)		3.14	(0.9)	
Age Share of Pop. Between 20 and 29	-12.0	(2.9)	0.11 (0.02)	-2.85	(4.0)	0.12 (0.03)
Age Share of Pop. Between 30 and 39	-1.0	(0.2)	0.16 (0.02)	3.16	(0.7)	0.14 (0.02)
Age Share of Pop. Between 40 and 49	-2.6	(0.4)	0.12 (0.02)	3.24	(0.4)	0.15 (0.02)
Age Share of Pop. Between 50 and 59	-37.2	(5.1)	0.09 (0.01)	-20.1	(2.3)	0.12 (0.02)
Age Share of Pop. Between 60 and 69	51.0	(7.1)	0.09 (0.02)	1.75	(0.2)	0.09 (0.02)
Age Share of Pop. Between 70 and 79	-19.1	(2.1)	0.07 (0.02)	35.0	(2.7)	0.07 (0.02)
Age Share of Pop. Above 80	-43.5	(4.1)	0.04 (0.01)	-41.0	(3.8)	0.06 (0.02)
Labor Force Participation Rate*	9.62	(6.8)	0.61 (0.07)	9.76	(5.7)	0.60 (0.08)
Share of Population with College Degree*	6.66	(6.6)	0.35 (0.11)	10.2	(11.1)	0.017 (0.08)
Natural Log of Population	-0.09	(1.8)	10.1 (1.40)	-0.14	(2.4)	10.2 (1.4)
Owner-Occupied Housing Share*	0.02	(0.1)	0.72 (0.08)	12.9	(4.2)	0.74 (0.08)
Urban Share	3.65	(11.7)	0.37 (0.30)	5.17	(12.3)	0.39 (0.32)
Urban Dummy (county in MSA)	1.49	(5.2)	0.74 (0.43)	1.38	(3.7)	0.74 (0.44)
Average Household Size*	-2.56	(5.7)	2.71 (0.23)	-2.80	(6.1)	2.63 (0.24)
Share Black	2.34	(5.1)	0.07 (0.11)	-3.51	(5.3)	0.08 (0.03)
Share of Married Headed Households*	-3.57	(2.0)	0.61 (0.06)	-7.07	(2.0)	0.47 (0.07)
Share of Singles with Children*	-21.5	(7.9)	0.12 (0.04)	-10.9	(1.7)	0.09 (0.27)
R^2		0.44			0.45	
n		3,082			3,049	

participation rate; two urban share variables (the share of population that is "urban" and the zero urban population dummy); the shares of households that are married, are unmarried families, are black and are homeowners; the average household size; and the log of the county population. As is seen in Table 7, most of variables work similarly and as expected in the two panels: the income determinants, labor force participation and college share (*t*-ratios of 6 to 11), the two urban variables (*t*-ratios of 3.5 to 12), and household size (*t* of 6). The small negative coefficient on log of population suggests that retail sales increase a bit less than proportionately with population. The shares of households that are owner-occupants and that are black work as expected in the 2000 panel only (positive and negative coefficients, respectively). The shares that are married couples and unmarried families have negative coefficients, the former being unexpected.

To get a sense of magnitude of the impact of the non-age variables, in 2000, a one standard deviation (12%) increase in the labor force participation rate would cause

per capita retail spending to increase by about 8%. A one standard deviation (about a third) increase in the share with a college degree would raise per capita retail spending by a similar percentage. A one standard deviation increase in county population — a multiple of roughly four — produces a $156 decline in spending, after controlling for urban share and an urban dummy. A one standard deviation increase in urban share (near doubling) leads to a 16% increase in retail spending per capita, and the presence of an urban population at all leads to a 14% increase. A one standard deviation increase in household size (0.24 persons) produces a $680 decline in spending; a one standard deviation increase in married couple households (15% increase in married share) leads to a $495 decrease, and a one standard deviation increase of share of single households with children produces a $295 decrease.

Adding the non-age variables roughly doubles the adjusted R^2s to about 0.45. However, the impacts of the age/birth-year variables decline substantially. The marked difference in the average of the coefficients for those under and over age 50 virtually disappears. Further, the marked volatility of the coefficients for age classes over age 50 declines sharply, especially in the 2000 panel.

The estimated age coefficients in the 1990 and 2000 regressions reflect the impact of both age and birth year on spending. To illustrate, the 2000 sixties age coefficient incorporates the impact of being in one's sixties and of being born during the 1930s, and the 1990 sixties coefficient reflects being in one's sixties and of being born during the 1920s. Thus the difference between these coefficients is the differential impact on retail spending of being born in the 1930s versus the 1920s, *ceteris paribus*. Therefore, we can separate out the impacts of age and birth year using these two cross-sections (McKenzie, 2007).

The left pair of columns in Table 8 is based on the age-only regressions, while the right pair is based on the expanded regressions. The first column in the pair lists the change in birth year cohort effects by decade; the 163 indicates the large positive effect of the roaring 20s relative to prior years, the -181 is the huge negative impact of the Depression, especially relative to the roaring 20s, and the 97 coefficient means that the Depression effect was not fully carried over to those born in the 1940s. The second column in the pair cumulates (provides a running sum of the values in) the first column from the earliest birth date to those born in the 1970s, indicating the effect of being born in the different decades all relative to being born before 1910. As can be seen, there is little variation among those borne after 1940, but the differential effects being born in the 1920s and 1930s stand out.

The implied birth year effects based on the expanded equations are listed in the third and fourth columns of Table 8. These are our best estimates of the pure impact of birth year, holding all other factors constant. Here the effect of the roaring 20s is largely dampened relative to the effect in the age-only equation (54 versus 163), as is the Depression effect (-50 versus -181). And these are the only two coefficients significantly different from zero (or from the 7 mean response).

Just as we can calculate birth year effects, we can compute age effects. To illustrate, the thirties age coefficient for 2000 is the thirties age effect plus the effect of being born in the 1960s, while the twenties coefficient for 1990 is the twenties age effect plus the effect of being born in the 1960s. Thus the difference between the two is

Table 8.
Pure Birth Year Impacts on County Retail Sales Per Capita.

	Age-Only Equation (Table 6)		Expanded Equation (Table 7)	
Birth year	decade impact	cumulated impact	decade impact	cumulated impact
1970s versus 1960s	-10	40	10	43
1960s versus 1950s	-6	50	4	33
1950s versus 1940s	32	56	6	29
1940s versus 1930s	97	24	17	23
1930s versus 1920s	-181	-73	-50	6
1920s versus 1910s	163	108	54	56
1910s versus earlier	-55	-55	2	2

Table 9.
Pure Age Effects on County Retail Spending Per Capita.

	Age only Equation (Table 6)		Expanded Equation (Table 7)	
Age	Decade impact	Cumulated impact	Decade impact	Cumulated impact
Thirties versus twenties	0	15	15	15
Forties versus thirties	47	47	4	19
Fifties versus forties	-36	11	-17	2
Sixties versus fifties	-26	-15	39	41
Seventies versus sixties	63	48	-16	25
Over 79 versus seventies	-20	28	-22	3

the effect on retail spending associated with aging from one's twenties to one's thirties, holding birth year constant. The results for the age only and the expanded equations are in Table 9. Here we cumulate starting with those in their twenties (go downward) and ending at the 80+ group. Conceptually, the numbers in this column indicate how much greater is retail spending of older people relative to what they would have spent in their twenties, *ceteris paribus*.

We begin with the age only equation. The accumulation column indicates that retail spending is particularly high for those in their forties and seventies. However, when the expanded equation is used, only the coefficient for 1960s versus the 1950s is statistically different from zero (the mean response). And the cumulative column has those in their 60s as the highest spenders.

Total Age and Birth Year Effects

It appears that many of the earlier estimated age/birth-year effects with the age-only model (Table 6) were largely due to a relationship of retail spending to the underlying education, labor force participation, and household size variables, rather

than to age/birth year per se. To see this, we regress the latter variables on the age variables for each census year. Table 10 contains these results. The age shares alone explain over half the variation in labor force participation, college share, and household size for both panels, about half in home ownership and over 40 percent in married share. The results are largely as expected. To illustrate, labor force participation is highest in the middle years and declines after age 50. Also, those born during the Depression (ages 50-59 in 1990 and ages 60-69 in 2000) were less likely to obtain a college degree.

Table 11 contains results explaining retail sales per capita where the residuals from the equations in Table 10 replace the actual economic and household share variables. The coefficients on these residual (error) terms are necessarily identical to those on the variables in Table 7, but many of the age coefficients change significantly, generally moving back toward those in Table 6. For example, the difference in the average of the above and below age 50 coefficients reappears, although it is only two-thirds as large as that in Table 6. Likewise, the decade to decade variability for those over age 50 is partially reintroduced, especially for the 1990 panel. That is, part of the impact of age and birth year has been stripped from the impact of the economic and household share variables and has been "passed through" to the underlying age and birth year variables.

Separate age and birth year effects can be obtained by taking differences in coefficients as above. These are listed in Tables 12 and 13. As opposed to the results in the right hand columns of Tables 8 and 9, these results are "total" effects of age and birth year, allowing for impacts of the variation of labor force participation, etc., with age. The birth year effects move back toward those in the age-only regression. The cumulative coefficients suggest that those born after 1940 spend significantly more on retail than those born before (those born in the 1920s being a partial exception). This is, of course, largely due to more education and greater labor force participation.

The age effects for those above age 50 differ markedly. The cumulative column indicates that all above age 40 spend more than those in their twenties and thirties. Possibly the young spend relatively more on housing, automobiles or education (or paying off college loans). There is some volatility in estimates for the other decades, but it is unlikely that these are statistically different from each other given that they are obtained by subtracting coefficients whose standard errors are in the 5 to 10 range. That is, holding economic and household share variables constant, there is no significant age effect beyond age 40.

Table 10.
Age Regression Coefficients, 1990 and 2000.

1990	Labor Force Participation Rate	College Share	Owner-Occupant Share	Average Household Size	Married Household Share	Single-headed w/ Children Share
Intercept	0.28	-0.40	0.87	5.27	1.19	0.15
Age Share Between 20 and 29	0.67	1.93	-0.66	-2.97	-2.53	0.51
Age Share Between 30 and 39	1.09	2.14	-0.28	-5.20	-1.37	0.02
Age Share Between 40 and 49	1.27	3.58	-0.63	-2.62	0.97	-1.00
Age Share Between 50 and 59	0.04	-4.14	1.83	-2.32	-0.21	0.61
Age Share Between 60 and 69	-0.43	1.62	-2.18	-3.25	-0.97	0.32
Age Share Between 70 and 79	-0.96	-0.36	1.11	-4.09	-0.29	-0.22
Age Share of Pop. Above 80	1.11	1.41	0.38	-8.65	-2.58	-0.79
R^2	0.68	0.57.	0.05	0.56	0.43	0.16
2000						
Intercept	0.34	-1.01	1.20	6.41	0.99	0.25
Age Share Between 20 and 29	0.29	1.85	-2.09	-5.83	-1.97	-0.30
Age Share Between 30 and 39	0.30	2.26	-2.58	-1.51	-2.07	-0.27
Age Share Between 40 and 49	1.65	2.91	1.00	-7.74	0.58	-0.27
Age Share Between 50 and 59	0.81	1.98	0.66	-6.65	0.55	-0.22
Age Share Between 60 and 69	-1.54	-2.57	-0.39	-4.70	0.08	0.14
Age Share Between 70 and 79	-1.09	2.25	-0.42	-1.08	-1.15	0.49
Age Share of Pop. Above 80	0.98	0.99	-1.82	-8.19	-1.58	-0.87
R^2	0.53	0.53	0.49	0.59	0.46	0.16

Note: Coefficients in bold are significant at the 5% level.

Table 11.
Per Capita Retail Sales (in 000s) Regressions.

	1990		2000	
	Coefficient Estimate and *t*-ratio	RHS Mean and Standard Error	Coefficient Estimate and *t*-ratio	RHS Mean and Standard Error
Intercept	-8.61 (8.6)		-16.2 (-10.6)	
Age Share Between 20 and 29	15.3 (4.3)	0.11 (0.02)	25.6 (9.7)	0.12 (0.03)
Age Share Between 30 and 39	33.5 (7.2)	0.16 (0.02)	17.7 (3.9)	0.14 (0.02)
Age Share Between 40 and 49	60.0 (11.1)	0.12 (0.02)	82.5 (11.4)	0.15 (0.02)
Age Share Between 50 and 59	-55.1 (7.8)	0.09 (0.01)	33.8 (4.2)	0.12 (0.02)
Age Share Between 60 and 69	60.6 (8.7)	0.09 (0.02)	-20.5 (2.0)	0.09 (0.02)
Age Share Between 70 and 79	-16.9 (2.0)	0.07 (0.02)	48.4 (3.6)	0.07 (0.02)
Age Share of Pop. Above 80	32.5 (3.4)	0.04 (0.01)	-0.77 (0.1)	0.06 (0.02)
Labor Force Participation Rate*	9.62 (6.8)	0.61 (0.07)	9.76 (5.7)	0.60 (0.08)
Share of Population with College Deg.*	6.66 (6.6)	0.13 (0.07)	10.2 (11.1)	0.017 (0.08)
Natural Log of Population	-0.09 (1.8)	10.1 (1.4)	-0.14 (2.4)	10.2 (1.4)
Owner-Occupied Housing Share*	0.02 (0.1)	0.72 (0.08)	12.9 (4.2)	0.74 (0.08)
Urban Share	3.65 (11.7)	0.37 (0.30)	5.17 (12.3)	0.39 (0.32)
Urban Dummy (county in MSA)	1.49 (5.2)	0.74 (0.43)	1.38 (3.7)	0.74 (0.44)
Average Household Size*	-2.56 (5.7)	2.71 (0.23)	-2.80 (6.1)	2.63 (0.24)
Share Black	2.34 (5.1)	0.07 (0.11)	-3.51 (5.3)	0.08 (0.03)
Share of Married Headed Households*	-3.57 (2.0)	0.61 (0.06)	-7.07 (2.0)	0.47 (0.07)
Share of Singles with Children*	-21.5 (7.9)	0.12 (0.04)	-10.9 (1.7)	0.09 (0.27)
R^2	0.44		0.45	
n	3,082		3,049	

** Variable is residual after conditioning on age.*

Table 12.
Total Birth Year Impacts on County Retail Sales Per Capita.

	Age-Only Equation (Table 6)		Expanded Equation (Table 7)	
Birth year	Decade Impact	Cumulated Impact	Decade Impact	Cumulated Impact
1970s versus 1960s	-10	40	10	57
1960s versus 1950s	-6	50	-16	47
1950s versus 1940s	32	56	23	63
1940s versus 1930s	97	24	89	40
1930s versus 1920s	-181	-73	-81	-49
1920s versus 1910s	163	108	65	32
1910s versus earlier	-55	-55	-33	-33

Table 13.
Total Age Effects on County Retail Spending Per Capita.

	Age only Equation (Table 6)		Expanded Equation (Table 7)	
Age	Decade Impact	Cumulated Impact	Decade Impact	Cumulated Impact
Thirties versus twenties	0		2	
Forties versus thirties	47	47	49	51
Fifties versus forties	-36	11	-26	25
Sixties versus fifties	-26	-15	25	50
Seventies versus sixties	63	48	-12	38
Over 79 versus seventies	-20	28	17	55

Conclusion

We investigate how non-auto-related retail sales per capita vary across roughly 3000 US counties. The major determinant is variation in average real income, which we proxy for with the average share of adults with a college degree and the average labor force participation rate. Other determinants include average household size and the urbaness of the county (more stores, more in county sales).

Our focus is on pure demographic effects. Does average spending vary with the proportions of the population in different decadal age classes? Given the known future relative decline in middle age households and rise in older households owing to the aging of the baby boom, this would be valuable information for forecasting retail sales.

There are two problems in estimating age effects. First, in a single cross-section, age correlates perfectly with year of birth, and we do not want to confuse birth year and age effects. We finesse this problem by analyzing two cross sections. Second, we want to estimate a total age effect, including the impact working through variables like the labor force participation rate (initially participation increases with age and then declines). We solve this with a two stage estimation.

We find significant "total" birth year and age effects. For those under age 40, retail spending is significantly lower than for those over age 40. The young tend to spend relatively more heavily on housing and education (including paying off loans). Thus the aging of the Baby Boomers likely stimulated retail spending during the past two decades, but will have little effect going forward.

For birth year, those born during the Depression are relatively light retail spenders. Thus their demise over time will increase retail spending per capita. But given that Depression babies are only six percent of the population, this effect will be small.

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