HOOVER IP²

WORKING PAPER SERIES
NO. 18002

THE DEMOGRAPHICS OF INTELLECTUAL PROPERTY

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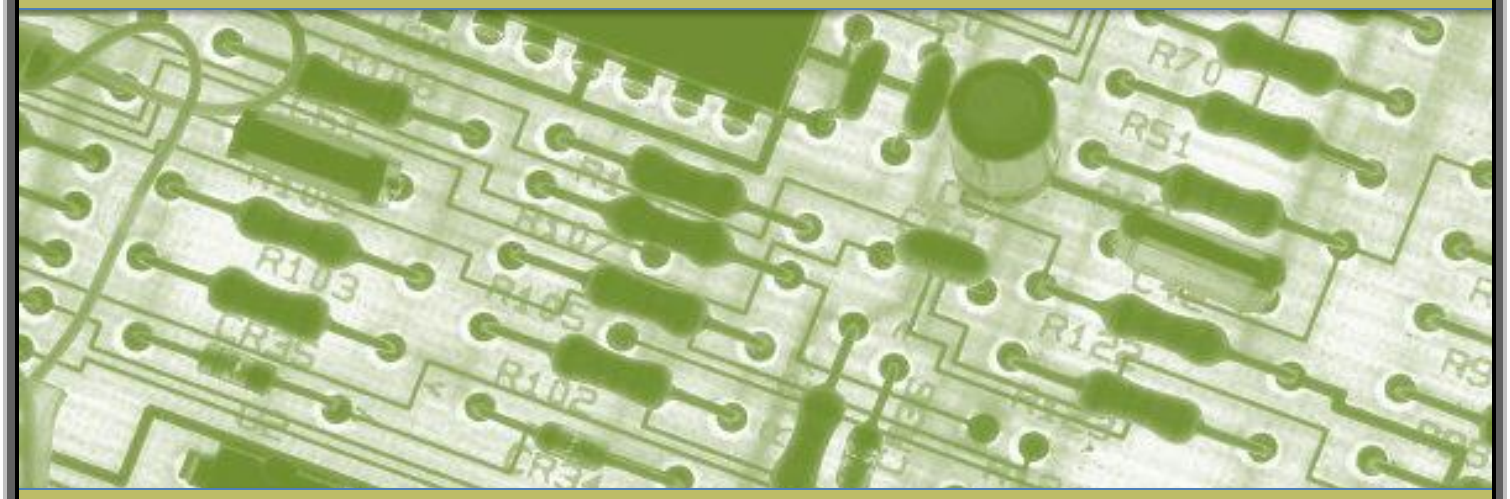
Revised: January 19, 2018



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The Demographics of Intellectual Property

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ABSTRACT

During the past three generations, the US age distribution has been shifting inexorably. In 1950 one of twelve Americans were aged sixty-five or over; today one of seven Americans are in that age bracket; most forecasts indicate the ratio will be one in four by 2050

Not only is the age distribution shifting (that is, relatively higher percentages of retirees and lower percentages of kids) but, as life expectancies increase, the absolute number of older Americans is increasing even more dramatically. In 1950 11 million Americans were over the age of sixty-five; by 2060, that number will approach 100 million.

Spending patterns change as people age and retire; with less income, they spend less and their total consumption declines. Although per capita spending falls for older Americans, their numbers (driven by the aging Baby Boomers and increasing life expectancies) are growing, and the net effect on spending is smaller than it was a generation ago.

In addition the product mix of their consumption undergoes changes. Older Americans spend more on all varieties of medical care (pharmaceuticals, medical devices, physician services, home care), but other spending changes occur as well. Now working longer and with more active lifestyles than previous generations, their relative consumption of transportation, entertainment, communication, and computer services has increased.

In those sectors of the economy there is much technological change and innovation. Moreover, industries that complement and support those sectors—those involved in miniaturization, product portability, and battery size and useful life—depend even more on technological change and innovation. Those sectors of the economy are heavily invested in and depend crucially on intellectual capital: patents and copyrights, research and development, and creative business methods.

Using four metrics, the importance to older Americans of the fourteen major expenditure categories in the US Consumer Expenditure Survey ordered. Those ranked as most important to older Americans are among the most patent-intensive segments of the economy.

Data show that the most innovative industries are those with secure property rights. As those economic sectors become more important, intellectual property rights protection becomes imperative. Securing intellectual property rights will lead to securing the well-being of an aging population.

INTRODUCTION

During the past three generations, the US age distribution has been shifting steadily. In 1950 one of twelve Americans was aged sixty-five or over; in 2010 one of eight Americans was in that age bracket; most forecasts are that the ratio will be one in four by 2050. This shift has implications across the economy, impacts American culture, and affects the way people think about aging and the aged population.

There are a number of causes for the change in the age distribution; the relatively higher percentages of older[1] Americans and the lower percentages of kids. Longer life expectancies, lower fertility, Baby Boomers reaching retirement age, delayed marriages, higher female participation rate—the list of causes and explanations is long and well documented.

The changed age distribution also reflects and *produces* secondary and tertiary effects. Families are smaller while, paradoxically, offspring are living with their parents after college. Older Americans are working longer, are more active, and are increasingly connected; education levels are increasing.

These lifestyle and quality-of-life changes percolate through the economy, and the results are seen in the consumption mix of today's older Americans relative to those from earlier generations. The US Consumer Expenditure Survey summarizes the consumption expenditures of Americans, aggregating them into fourteen categories. Of those fourteen categories, during the past twenty-eight years, the consumption patterns of older Americans moved away significantly from their initial share of total expenditures (in 1988) in eleven categories—clear indications of changing consumption patterns.

Since consumer spending constitutes 70 percent of GDP, small percentage changes can have substantive impacts on the economy. What is the impact of these changing consumption patterns on the whole economy? Specifically for this paper, what is the impact of the changing consumption patterns of older Americans?

Intellectual property (IP)-intensive industries constitute more than one-third of US GDP.[2] Do older Americans consume more from consumables produced by IP-intensive industries? Relying on studies produced by the US Department of Commerce and data collected by the Bureau of Labor Statistics (BLS), this question will be investigated.

CONSUMER EXPENDITURE SURVEY

In additional to US Census data, the primary data source for this paper is the Consumer Expenditure Survey (CES), administered by the US Census Bureau on behalf of the BLS. It compiles survey and interview data to determine how Americans spend. CES's primary use is to establish, verify, and adjust the weights of the contents of the market basket of goods used to compute US price indexes.

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[1] For this report, "older" refers to the population aged sixty-five and older; "young" or "other" refers to those younger than sixty-five.

[2] US Department of Commerce, Economics and Statistics Administration and US Patent and Trademark Office, *Intellectual Property and the U.S. Economy: 2016 Update*, 2016, p. 22.

Consumption data has been collected by the US government since the 1800s. CES—this very systematic and comprehensive data collecting activity—began in 1980. Summary data are available from 1984 forward; detailed data by age group are available from 1988 forward.

CES provides data on the pattern of consumption by US households and partitions it into fourteen major categories.

Alcohol	Healthcare[3]	Education
Apparel	Entertainment	Tobacco Products
Food	Personal Care	Cash Contributions
Housing	Reading	Personal Insurance
Transportation		Miscellaneous

These major categories consist of a number of minor categories. In some cases, the data are very granular; for example, in 2016, there are nearly 250 minor "housing" categories and more than 170 minor "food" categories. "Tobacco products and smoking supplies," on the other hand, has only four minor categories, and "personal insurance and pensions" has only nine.

A drawback to the CES is that it does not include institutionalized populations (those in long-term care facilities); it does, however, include those living independently in retirement communities. As end-of-life care and skilled nursing facilities are expensive, CES probably understates the expenditures of older Americans on housing and health care.

DEMOGRAPHICS

A number of major trends affected the US population age profile in the twentieth century and into the twenty-first. The Great Depression exacerbated a downward trend in the native birthrate; World War II further dampened birth rates. The United States then witnessed a massive increase in birthrates in the years immediately following the end of the war; some twenty-five to thirty years later, those Baby Boomers became parents and produced a generation of Millennials. Since the 1960s, immigration has been on the rise.

As important as the birthrate is the change in life expectancy, which went up dramatically in the twentieth century. Male and female life expectancies for the 1940 birth cohort in the United States (the year in which the first monthly Social Security checks were mailed) were sixty-one and sixty-five,[4] respectively. The life expectancy of boys and girls born in 2015 are seventy-six and eighty-one.[5]

In the United States, the swings in birth rates have been overwhelmed by this steady increase in life expectancies, brought about, in large part, by better health care and healthier lifestyles. Today's older Americans are living longer than their forebears. Today's sixty-five-year-olds have a life expectancy

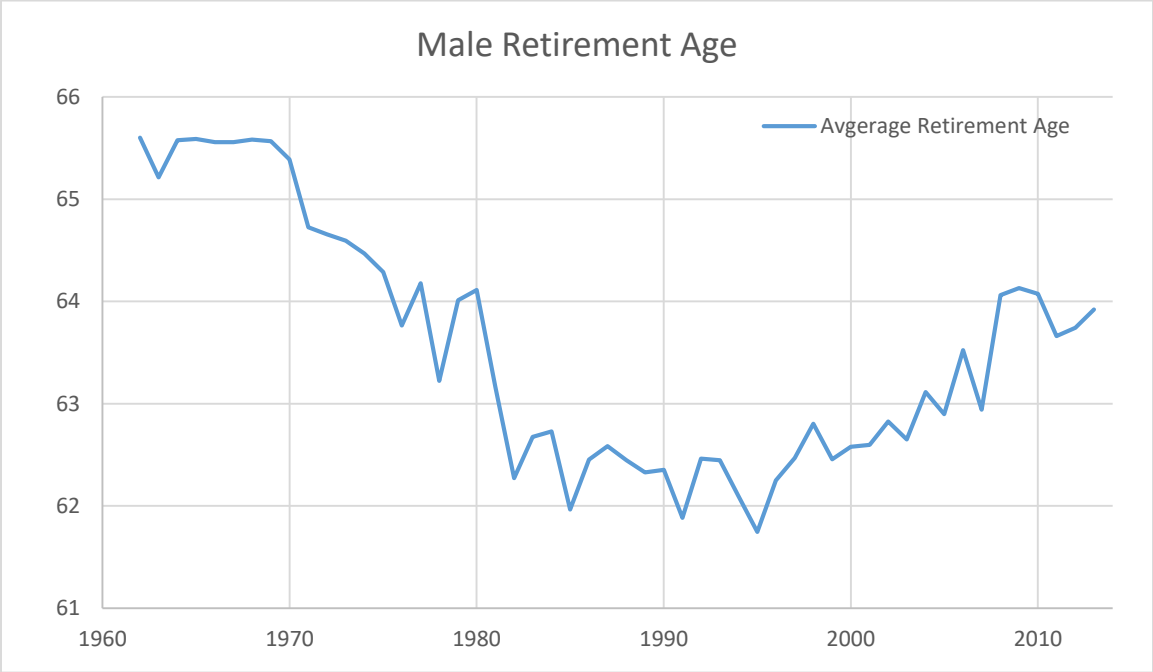
[3] When referring specifically to the health care category in the CES, the term "healthcare" will be used. This is consistent with the style adopted by BLS for the survey.
[4] US Bureau of the Census, *Historical Statistics of the United States, Colonial Time to 1957,* US Government Printing Office (1960), p. 25.
[5] https://www.cdc.gov/nchs/data/hus/hus16.pdf#015; accessed December 7, 2017.

of 19.4 years; just a generation ago, a sixty-five-year old's life expectancy was 17.2 years; in 1950, a sixty-five-year-old could expect to live 13.9 more years.

Despite native birthrates falling to historic lows, the US population is growing, and, the number of older Americans is increasing dramatically. In 1950, eleven million Americans were sixty-five or older; currently, there are forty-nine million older Americans—they constitute nearly 15 percent of the US population. By 2060 the number of older Americans will approach one hundred million.

Americans are retiring later. In the 1960s, the average retirement age for men was sixty-five; it fell steadily and in 1995, the average retirement age for men fell to an all-time low of 61.7. Older Americans are now delaying retirement (in the wake of the Great Recession, sometimes for financial reasons); by 2013, male retirement age had increased by more than two full years to 63.9.[6]

Figure 1



The lifestyle of older Americans is also changing. In retirement older Americans are more active and more connected; some start second careers. With more free time, more discretionary income, and better health, they travel more.

CONSUMPTION AND SPENDING PATTERNS

Over time, changes in consumption patterns are inevitable: consumers' tastes change and new products are introduced. New products improve quality and sometimes replace old products; for example, cell phones replace landlines, smart phones replace flip phones. As relative prices change people substitute one good for another, for example, air travel rather

[6] Calculations made by the Center for Retirement Research at Boston College.

than rail. Tastes change, for example, people spend more time at home watching videos and less time going to movie theaters. In the United States, there has also been an overall wealth effect; as incomes rise, individuals shift away from time-intensive goods to costlier goods and services, for example, they may choose to eat out more as opposed to preparing meals at home.

The household consumption of goods is continually evolving, resulting in changing shares of the total composition in the fourteen categories identified in the CES.[7] For some categories, the ranges of annual shares of annual expenditures are quite narrow. The table below reports the average annual share of household expenditures for all households and additional data that provide a sense of the range of the shares for twenty-eight years of CES. The summary statistics are reported for the fourteen major categories identified in CES from 1988 through 2016.[8]

Table 1

SHARE OF TOTAL HOUSEHOLD EXPENDITURES ANNUAL AVERAGE FOR ALL HOUSEHOLDS, 1988–2016				
Major Category	**Mean**	**Minimum**	**Maximum**	**Coefficient of Variation**
Housing	32.6%	30.7%	34.4%	.031
Healthcare	6.0%	5.0%	8.0%	.146
Food	13.4%	12.4%	15.1%	.057
Transportation	17.9%	15.6%	19.7%	.062
Entertainment	5.1%	4.9%	5.6%	.036
Apparel and services	4.4%	3.1%	5.9%	.207
Personal care products and services	1.3%	1.1%	1.5%	.079
Alcoholic beverages	0.9%	0.8%	1.1%	.072
Tobacco products and smoking services	0.8%	0.6%	1.0%	.147
Education	1.8%	1.3%	2.3%	.187
Reading	0.4%	0.2%	0.6%	.387
Personal insurance and pension funds	10.1%	8.7%	11.9%	.096
Cash contributions	3.3%	2.7%	3.9%	.090
Miscellaneous	2.0%	1.3%	3.0%	.228

Because these are percentages values, the variations and year-to-year changes are muted. Despite the narrow ranges for most categories, there are discernable time trends. Focusing on the six largest categories (which account for 85 percent of total household expenditures) and reading (which has the largest variance in year-to-year reporting), the table below shows that the share of spending on housing, healthcare, and personal insurance has been increasing during the last three decades, whereas the shares of spending on food, transportation, and reading have been declining. Spending on entertainment has been essentially flat.

[7] This is the reason the BLS changes the contents of the market basket of goods it uses to compute prices indexes.
[8] Additional data are available for 1984 through 1987, but data partitioned by age brackets are not reported for those years.

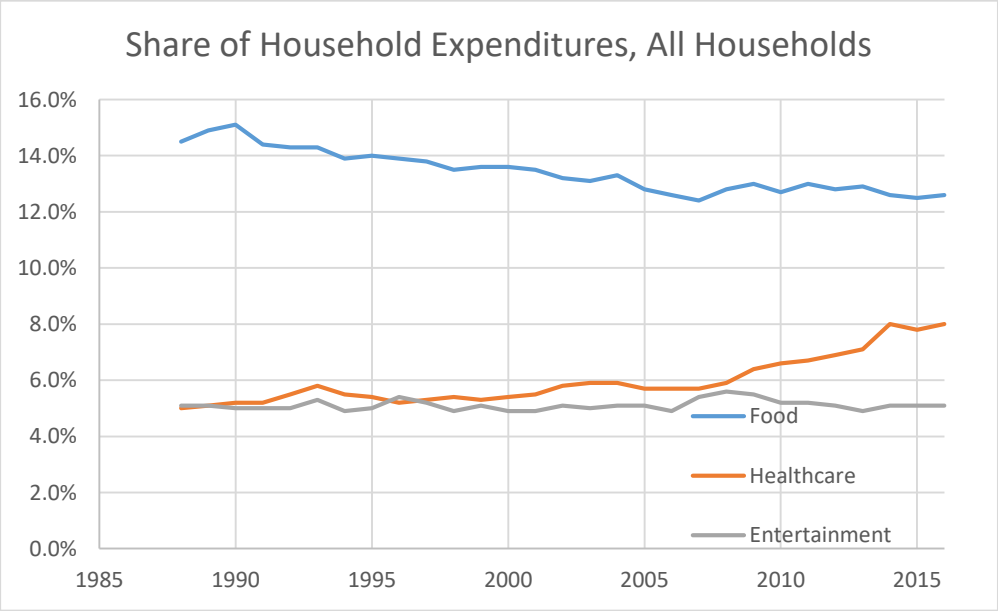
Table 2

TIME TREND OF TOTAL HOUSEHOLD EXPENDITURES ALL HOUSEHOLDS, 1988–2016				
Major Category	**Time Trend**	**Year-to-Year Correlation**	**28-Year Percentage Change**	**Annual Growth Rate**
Housing	Increasing	.81	+5.6%	0.2%
Healthcare	Increasing	.87	+60.5%	1.7%
Food	Decreasing	-.93	-13.2%	-0.5%
Transportation	Decreasing	-.64	-19.7%	-0.8%
Entertainment	Flat	.14	-1.0%	0.0%
Reading	Decreasing	-.98	-64.5%	-3.6%
Personal insurance & pension funds	Increasing	.89	+37.2%	1.1%

The impact of differing inflation rates across the categories is not incorporated into this analysis. For example, during this time period there has been significant inflation in health care and insurance. This, no doubt, has some influence on the increases in their relative shares of household expenditures.

The graph below shows examples of the time series shares for the healthcare, food, and entertainment categories. The food category shows a steady decline over the twenty-eight-year period; healthcare increases significantly. This shows that although the data ranges are narrow, there are significant fluctuations. Expenditures on entertainment fluctuate around its twenty-eight-year mean of 5.1 percent but never range far from that average.

Figure 2



CONSUMPTION AND SPENDING BY OLDER AMERICANS

Examining the CES data partitioning by age (choosing sixty-five as a reasonable and, for data collection purposes, convenient break point) supports the axiom that older Americans spend less than the overall population. In 1988 households headed by older Americans spent only two-thirds as much as the full sample of Americans. Although this percentage increased during the next twenty-eight years, in 2016, older Americans still spent only 80 percent of the national average.

As the table below shows, the difference in expenditures by older Americans relative to those under sixty-five is stark, but the gap is closing. During this time period, there was effectively no change in household size for either age group; these increases, therefore, reflect increased per capita expenditures as well.

Table 3

AVERAGE ANNUAL HOUSEHOLD EXPENDITURES (Nominal $)					
Year	Household Expenditures			Expenditures of 65+ Households as a Percentage of Other Groups	
	All	Head < 65	Head 65 +	All HH	HH Head < 65
1988	$25,892	$28,131	$17,297	66.8%	61.5%
2000	38,045	40,942	26,533	69.7%	65.5%
2010	48,109	50,986	36,802	76.5%	72.2%
2016	57,311	60,954	45,756	79.8%	75.1%

Beginning in 2000, CES reported standard errors for household expenditures by category. In each year from 2000 through 2016, total household expenditures by older Americans fall outside the 95 percent confidence level for all American households—evidence that older Americans spend less than Americans in general spend.

These differences saturate the spending patterns for the CES major categories as well. There are only two instances in which older Americans spend at the same level, statistically, as the full sample of Americans: the reading category in 2000 and 2001. Reading amounts only to about one-half of 1 percent of household expenditures and is the category that has the greatest relative decline in expenditures.

The comparisons of older to young Americans, however, may mask the importance of older Americans in the consumer economy. Economists focus on marginal changes and relative shares, but one must not lose track of magnitudes—a reason to look seriously at seniors' total expenses. Increasing in numbers and changing in character, older Americans constitute a consumer group not to be ignored. As Senator Everett Dirksen is reported to have said, "A million here, a million there, pretty soon, you're talking real money." A few summary statistics provide evidence.

- One-seventh of the US population is sixty-five and older.[9]
    - By 2050 that fraction is expected to be one-fourth.

[9] 14.1 percent, per US Census; http://quickfacts.census.gov/qfd/states/00000.html.

- Average per capita consumer spending by those aged sixty-five to seventy-four was $46,000 in 2012.
    - There are fifteen million in that age group.[10]
- Total consumer expenditures by older Americans were approximately $1.4 trillion in 2016, which is 19 percent of total consumer expenditures.
- Health care accounts for about one-eighth of older Americans expenditures.[11]

As people reach retirement age, their incomes and spending are generally lower. In response, for years, retailers and marketers have been directing their products, their advertising, and their research at the twenty- to forty-year-old age bracket. BLS data show that those in the thirty-five to forty-four and the forty-five to fifty-four-year-old age brackets are the highest spending.[12] Households headed by thirty-five to fifty-four-year-olds spent $69,000 per household in 2016, contrasted to $51,000 in spending by households outside that age range.

Despite these disparities, as their numbers increase older Americans' relative and absolute purchasing power is increasing. In addition, historically, successive birth cohorts consume more.[13]

As noted above, today's older Americans are living longer, healthier lives and, generally, have a markedly different—more active—lifestyle than their predecessor generations. But there is no doubt that their spending patterns differ from those of the younger generation. There are numerous axioms regarding and explanations for these differing spending patterns.

- Older Americans spend more on health care.
- Declining health leads to more health-related expenditures, which crowds out some spending in non-health-related fields.
- Older Americans purchase fewer durables. They have a low spending/consumption ratio, that is, they are less likely to replace durable goods but continue to realize the benefits of long-lived goods.
- Older Americans, generally retired, have fewer work-related expenses, particularly for clothing and transportation. Previous spending on these items moves to luxury and discretionary items, such as travel and entertainment.
- Older Americans contribute at much lower levels to retirement accounts, pension funds, and Social Security.
- As they near the end of their lives, older Americans make more cash contributions.

The table below reports the average annual share of household expenditures for all households, for households headed by an individual less than sixty-five, and for households headed by an individual aged sixty-five or older. The data are reported for the fourteen major categories identified in the CES.

[10] http://www.bls.gov/opub/reports/cex/consumer_expenditures2012.pdf.
[11] http://www.bls.gov/opub/ted/2015/consumer-spending-by-age-group-in-2013.htm.
[12] https://www.bls.gov/opub/btn/volume-4/consumer-expenditures-vary-by-age.htm.
[13] Sudipto Banerjee, "Expenditure Patterns of Older Americans, 2001–2009," *Employee Benefit Research Institute Issue Brief*, No. 368, February 2012.

Table 4

SHARE OF TOTAL HOUSEHOLD EXPENDITURES ANNUAL AVERAGE 1988–2016			
Category	**All Households**	**Household Head Less than 65**	**Household Head 65 or Older**
Housing	32.6%	32.5%	33.6%
Healthcare	6.0%	4.8%	12.3%
Food	13.4%	13.4%	13.7%
Transportation	17.9%	18.3%	15.8%
Apparel and services	4.4%	4.6%	3.4%
Personal care products and services	1.3%	1.2%	1.5%
Entertainment	5.1%	5.2%	4.6%
Alcoholic beverages	0.9%	1.0%	0.8%
Tobacco products & smoking services	0.8%	0.8%	0.6%
Education	1.8%	2.1%	0.6%
Reading	0.4%	0.3%	0.5%
Personal insurance and pension funds	10.1%	11.1%	4.5%
Cash contributions	3.3%	2.8%	5.9%
Miscellaneous	2.0%	1.9%	2.3%
Average Total Expenditures (in 2009 $)	**$46,369**	**$49,677**	**$33,728**

There are substantial differences in the relative shares of expenditures by older Americans in three of the five largest expenditure categories. Proportionately, older American households spend nearly three times as much as the rest of the households do on health care.[14] For households headed by those under sixty-five (typically with more dependents), health care expenditures are less than 5 percent of total expenditures.[15] Older Americans spend about 15 percent less on transportation, reflecting less work-related travel and fewer vehicles purchases (a durable good).

Older Americans spend less than one-half as much on personal insurance and pension fund contributions. Retirees are taking distributions from pension and retirement funds, from Social Security, and from long-term care policies; the majority of older Americans do not contribute to those insurance funds.

Of the other large categories, housing and food (expenditures in which are less discretionary), there is little difference in expenditures between the two age groups.

There is a wealth effect that effects cash contributions; after years of accumulating assets, older Americans have less reason to save. Older Americans typically spend down their wealth, often in the form of philanthropy and gifts to family members.

[14] This may be an underestimate of the disparity since CES does not survey those in nursing homes and other group care facilities. Those costs can easily exceed the average $6,000 per year that older Americans report as health care expenses in the 2016 survey.

[15] The relative amount younger Americans spend on health care has increased substantially over the past five years; before 2011, younger Americans spent only 55 percent as much on health care as older Americans, which was about 5 percent of their total expenditures.

Education, a much smaller expenditure category, also shows a large disparity in spending. This difference is, of course, driven by large expenditures by the youngest households on their own education and, as they have families, on their children's education. Older Americans, for the most part have completed their formal schooling and invest less in economically beneficial human capital.

Annual shares, however, tell only part of the story. Analyses of trending spending patterns are equally important.

An earlier table presented expenditure time trends for selected important expenditure categories. Replicating that table for older Americans shows that, despite the previously documented large differences in the *amount* of expenditures by older Americans, the trends in shares of expenditures, by age group, are similar, although not perfectly congruent.

Table 5

TIME TREND OF SHARES OF TOTAL HOUSEHOLD EXPENDITURES OLDER AMERICAN HOUSEHOLDS, 1988–2016					
	All	**Older American Households**			
Major Category	**Time Trend**	**Time Trend**	**Year-to-Year Correlation**	**28-Year Percentage Change**	**Annual Growth Rate**
Housing	Increasing	Increasing	.81	+8.2%	0.3%
Healthcare	Increasing	Increasing	.71	+8.0%	0.3%
Food	Decreasing	Decreasing	-.92	-15.0%	-0.6%
Transportation	Decreasing	Slight Decrease	-.33	-15.3%	-0.6%
Entertainment	Flat	Increasing	.86	+35.6%	1.1%
Reading	Decreasing	Decreasing	-.96	-49.3%	-2.5%
Education	Decreasing	Increasing	.59	+120.5%	3.0%
Personal insurance etc.	Increasing	Increasing	.86	+49.1%	1.5%

Disparities are evident in three categories. First, older Americans are increasing their expenditures on entertainment, whereas, for all Americans, relative spending on entertainment was flat. Second, older Americans are not significantly reducing their expenditures on transportation—one of the major areas of expenditure decline for all American households.

Education is one of the smallest expenditure categories for older Americans, accounting for, on average, only 0.6 percent of total expenditures. It is, however, the category where relative growth in expenditures by older Americans is the greatest. Reflecting their changing lifestyles, desire for self-improvement, appetite for culture and the arts, and the opportunity for distance learning, education's share of total expenditures more than doubled during the last twenty-eight years.

WHAT HAS THIS TO DO WITH INTELLECTUAL PROPERTY?

The US consumer economy is becoming increasingly sophisticated, its products more diverse, and with more features. As the United States becomes older, there will be increased demand for this widening range of consumer goods and services. The growing older population (in both relative and absolute terms) will spend more and expect more in return. As noted above, this generation of older Americans is different in a number of ways. They work longer and, in retirement, they are more active and they are more digitally connected.

This leads to questions: (1) Are older Americans heavily dependent on the product of creative, IP-intensive industries and (2) Do economic and public policy decisions that are directed at IP-intensive industries have unintended consequences for older Americans? Coupling the US Consumer Expenditure Survey and studies by the US Department of Commerce and the US Patent and Trademark Office (USPTO) provides suggestive evidence.

Four metrics are considered in the analysis.

1. CES consumption categories with the largest shares by older Americans
2. CES consumption categories in which older Americans shares differ from young Americans
3. CES consumption categories in which older Americans are increasing their relative consumption
4. Areas in which innovations and inventions may potentially provide great benefit to older Americans

As the Baby Boomers reach retirement age (the first Baby Boomers reached the age of sixty-five in 2011) and fill the age brackets of older Americans, the sheer number of older Americans will offer challenges to health care and living conditions of a magnitude far surpassing the influence on consumption of their parents and grandparents.

For the past thirty years the share of total consumption by older Americans has been increasing to the point where their spending power is massive. The consumer expenditures of the forty-five million Americans over the age of sixty-five amounted to more than $1 trillion in 2016. According to the CES between 1988 and 2016, annual average consumer expenditures by older American households increased by 165 percent. For all households, the growth was 121 percent; for those households headed by individuals less than sixty-five, the growth was 117 percent.

Adjusting for inflation, households headed by older Americans increased their consumption by 48 percent, more than double the 21 percent increase for the other households.

During this time period, there was effectively no change in the household size for either age group; these increases, therefore, reflect increased per capita expenditures as well. This pattern of increasing expenditures by older Americans is expected to continue in the coming decades.[16]

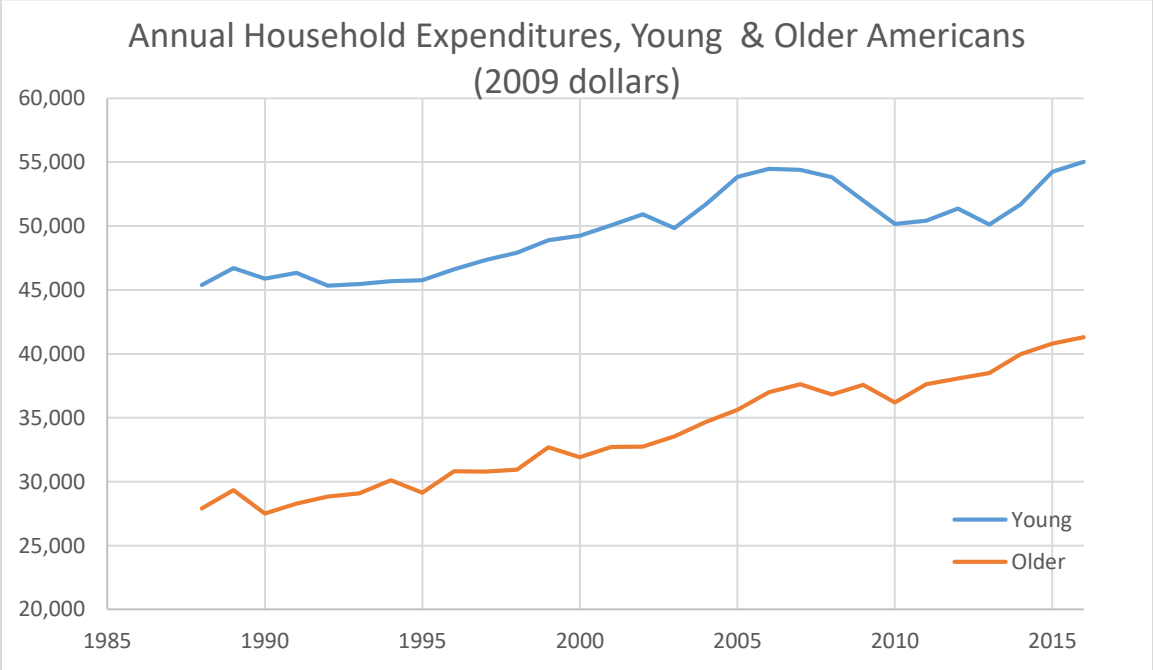
[16] Jody Holtzman, "What's Your 50+ Strategy? A New Investment Theme," *Venture Capital Review,* Issue 29, 2013.

Table 6

AVERAGE ANNUAL HOUSEHOLD EXPENDITURES (Nominal $)					
Year	All Households	Household Head Less than 65		Household Head 65 or Older	
		% of All HHs	Expenditures	% of All HHs	Expenditures
1988	$25,892	79.3%	$28,131	20.7%	$17,297
2000	38,045	79.7%	40,942	20.3%	26,533
2010	48,109	79.7%	50,986	20.3%	36,802
2016	57,311	75.9%	60,954	24.1%	45,756

The graph below shows average household expenditures by older American households and other households in real dollars. In 1988 the gap was $17,481. Through most of the sample period, the gap has been closing; by 2016, the gap shrunk by 14 percentage points to $13,718 (in real terms).

Figure 3



TRENDS IN SPENDING BY OLDER AMERICANS

How are older Americans spending their money?

Older Americans spend less than the young do and, as shown above, in many respects older American households consumption expenditures differ from those in the rest of the economy. They spend more on health care and less on work-related items. They contribute more philanthropically but make much lower payments to insurance and pension funds. Data for the minor CES categories

show, for example, that older Americans spend less on new car purchases, major appliances, and, not surprisingly, more on drugs.[17]

The time trends in the mix of consumption goods for older and young American households are, however, quite similar. The table below provides simple time series correlations for older and young American households. High positive correlations indicate expenditures by older and young Americans move at about the same rate and in the same direction (up or down).

Table 7

SIMILARITY OF SPENDING PATTERNS BETWEEN OLDER AND YOUNG AMERICANS			
Major Category	**Spending Pattern**		**Correlation**
	Young	**Older**	
Housing	Increasing	Increasing	.79*
Healthcare	Increasing	Increasing	.68*
Food	Decreasing	Decreasing	.93*
Transportation	Decreasing	Decreasing	.71*
Apparel and services	Decreasing	Decreasing	.94*
Personal care products and services	Decreasing	Decreasing	.83*
Entertainment	Decreasing	Increasing	-.02
Alcoholic beverages	Decreasing	Increasing	-.11
Tobacco products and smoking services	Decreasing	Decreasing	.89*
Education	Increasing	Increasing	.47*
Reading	Decreasing	Decreasing	.99*
Personal insurance and pension funds	Increasing	Increasing	.90*
Cash contributions	Increasing	Increasing	.36
Miscellaneous	Decreasing	Decreasing	.70*
*Significant at 5 percent level.			

The spending patterns differ on expenditures for entertainment, in which older Americans spending is increasing and young Americans are spending slightly less over time. Young Americans are increasing their cash contributions at a faster rate than older Americans are; however, older Americans still contribute more than double what young Americans contribute. The third divergence is alcohol and related expenditures, which is a very minor category; older Americans are spending more, younger Americans, less.

INNOVATION AND INVENTIONS

To improve their quality of life and to simplify their lives, older Americans are demanding new products that enhance their lifestyle and mitigate the effects of aging. As more seniors live independently, in addition to medical advances, nonmedical and high-tech devices will allow them to live fuller lives.

[17] These more granular comparisons are fields to be plowed later.

What was once a convenience will soon be a necessity. The categories of goods identified as ripe for innovation are large yet concentrated in a few consumption categories, and the industries that produce these goods are important to older Americans.

- Drugs to battle the effects of dementia, Alzheimer's, diabetes, and other conditions associated with aging
- Medical devices that monitor individual health status, communicate information directly to doctors, and provide individualized medical care
- Driverless cars for those old, infirm, or sight impaired
- Drones to deliver groceries, drugs, and other consumables
- Smart household appliances
- User-friendly home computers and handheld devices
- Distance learning
- E-readers
- Interconnected smart phones

Seeing the large and growing consumer base of older Americans and noting the qualitative shift in their health, activity, and independence, the business community will not stand by idly. Industries will shift their focus from the sickest and elderly to active older Americans: improved and personalized health care, better transportation, smarter appliances, interconnected household utilities, and more entertainment and enrichment opportunities.

PATENT-INTENSIVE INDUSTRIES

In 2012 and 2016 the US Department of Commerce and the US Patent and Trademark Office (USPTO) issued reports that "identified the industries that rely most heavily on patents, trademarks, and copyrights as IP-intensive."[18] The 2016 report further adds that "IP is a major part of a robust and growing economy."[19]

All three types of IP included in the analysis offer legal and regulatory protection to the holders of the patents, trademarks, and copyrights. The nature of the IP protection varies.

Patents provide the grantee with the right, for a fixed period of time, to exclude others from exploiting the use of the patented item without permission or a licensing agreement. Patents stimulate invention and innovation by ensuring legal protection for a limited time in which the grantee can commercialize inventions, work to recoup their costs, and build on the innovation process. Patent-intensive industries are the primary focus of the following analysis.

Copyrights protect creators of original, creative work from unauthorized copying or reproduction. Copyrights protect those who create, produce, and distribute their unique creative works and are usually granted in the literature, music, television, movie, and arts fields. The industries identified in

[18] Trade secrets, the fourth major piece of intellectual property, are not included in the USPTO studies.
[19] US Department of Commerce, Economics and Statistics Administration and US Patent and Trademark Office, *Intellectual Property and the U.S. Economy: 2016 Update*, 2016, p. i.

the USPTO study as copyright-intensive are narrowly grouped within the print and literature, design, and artist industries. Although inherently creative, copyright intensity is less important in this study.

Trademarks identify and distinguish products and serve as indicators of the products' quality, characteristics, and origin. Trademarks, brand names, and logos are important in consumer and heavily marketed industries. Trademarks—typically issued after the product has come to market and well after the innovation process has been completed—are a valuable service to the public. Trademarks are not an important element of this study.

Using a variety of metrics, the 2016 USPTO report identified eighty-one four-digit North American Industry Classification System (NAICS) industries as IP-intensive, twenty-five of them as patent-intensive. The study estimated that the eighty-one IP-intensive industries constitute more than one-third of US GDP.[20] These industries, needless to say, permeate the economy. They include patent-intensive industries (e.g., chemicals and pharmaceuticals, telecommunications, and computers), copyright-intensive industries (e.g., publishing, motion picture, and computer design), and trademark-intensive industries (e.g., food products, retail shopping, radio, and television).

The two tables that follow list the twenty-five four-digit industries identified in the 2016 USPTO as patent-intensive.

The first table lists the seven patent-intensive industries that are primarily manufacturing or that produce heavy equipment used in the manufacture of a variety of intermediate products and machines. These contribute to the production of a host of consumer goods or manufacture the component parts for consumer goods in various product groups. Most are not involved in the end product production of consumer goods.

Table 8

PATENT-INTENSIVE INDUSTRIES MANUFACTURING OR INTERMEDIAT GOODS		
NAICS Code	**Industry**	**Product Examples**
3251	Basic chemicals	Chemicals used in basic processes
3259	Other electrical equipment and components	Manufacturing chemical ink and explosives
3333	Commercial and service industry machinery	Commercial laundry equipment, commercial cooking equipment
3334	Ventilation, heating, air conditioning, and commercial refrigeration equipment manufacturing	Commercial and industrial refrigeration, ventilating, heating, air conditioning, and freezer equipment
3335	Metalworking machinery manufacturing	Metal cutting machines, tools, dies, wire machines
3339	Other general purpose machinery	Pumps, air compressors, cranes, elevators
3353	Electrical equipment manufacturing	Specialty transformers, voltage regulators, switching equipment

[20] US Department of Commerce, Economics and Statistics Administration and US Patent and Trademark Office, *Intellectual Property and the U.S. Economy: 2016 Update*, 2016.

The table below lists the eighteen patent-intensive industries that are primarily involved in producing end-use consumer goods. It matches the patent-intensive industries to the fourteen categories from the CES. This, however, is far from a perfect mapping—the NAICS codes used in the USPTO study and the consumer categories in the CES (which does not use NAICS codes) do not match well. A more detailed matching algorithm is forthcoming.

Table 9

PATENT-INTENSIVE INDUSTRIES CONSUMER GOODS			
NAICS Code	**Industry**	**Product Examples**	**Consumer Expenditure Survey Category**
3253	Pesticides, fertilizers, and other agricultural equipment	Fertilizers, agricultural and household pest control	Food Housing: Household operations
3254	Pharmaceutical and Medicine Manufacturing	Antibiotics, antihistamines, cold remedies,	Healthcare: Drugs
3255	Paint, Coating, and Adhesive Manufacturing	Paints and stains	Housing: Maintenance, repairs, insurance, other expenses
3256	Soaps, Cleaning Compounds, and Toilet Preparations	Soaps, shampoos, shaving cream, laundry detergent	Personal Care Products and Services Housing: Housekeeping supplies
3331	Agriculture, Construction, and Mining Machinery Manufacturing	Farm machinery; milking, fertilizing planting	Food
3332	Industrial Machinery Manufacturing	Semiconductor Machinery Manufacturing	Housing: Small appliances, miscellaneous housewares
3336	Engine, turbine, and power transmission equipment	Automobile parts (except engines), diesel engines	Transportation
3341	Computer and Peripheral Equipment Manufacturing	Laptops, DVDs, Personal computers	Housing: Miscellaneous household equipment Reading
3342	Communications Equipment	Television and radio broadcasting equipment, GPS equipment	Housing: Telephone equipment Entertainment: Audio and visual equipment and services
3343	Audio and Video Equipment Manufacturing	Television sets, home stereo	Entertainment: Audio and visual equipment and services
3345	Semiconductor and other electronic component manufacturing	Semiconductors, circuit boards, memory chips	Housing: Miscellaneous household equipment

3345	Electronic Instruments	Hearing aids, MRI equipment, temperature controllers	Healthcare: Medical supplies
3346	Manufacturing and reproducing magnetic and optical media	Blank tapes, duplicating audio, video, and software	Entertainment: Audio and visual equipment and services Housing: Miscellaneous household equipment
3351	Electric Lighting Equipment	Electric light bulbs and tubes, residential lighting fixtures	Housing: Small appliances
3352	Household Appliance Manufacturing	Refrigerators, stoves, fans	Housing: Major appliances
3359	Other electrical equipment and components	Batteries, fiber optic cable, energy wire	Entertainment: Audio and visual equipment and services Housing: Small appliances, miscellaneous household equipment
3391	Medical Equipment and Supplies Manufacturing	Surgical and dental equipment	Healthcare: Medical services
3399	Other miscellaneous manufacturing	Jewelry and silver, sporting goods, toys	Apparel and services Entertainment: Toys, hobbies, playground equipment

The USPTO studies do not include service industries, which are a large component of the personal insurance and cash contributions industries. Hence, they are eliminated from the following analysis. The miscellaneous category is also dropped from the subsequent analysis.

Healthcare's largest components (medical services and insurance) are also service related; the two other components of the healthcare category are drugs and medical supplies. Medical services, one of the large components, is highly dependent on medical technology and equipment; therefore, despite being largely a service industry, healthcare (which is the second-largest expenditure category for older Americans) is included.

Examining the above table shows that the highly patent-intensive industries are concentrated in just a few of the CES categories. In this study, the CES categories are divided into three patent intensity categories.

High Patent Intensity	Medium Patent Intensity	Low Patent Intensity
Entertainment	Apparel and services	Alcoholic beverages
Healthcare	Food	Tobacco products
Housing	Personal care	Education
	Reading	
	Transportation	

The food category is a bit of a conundrum. The supplies and equipment used to grow and process food are in patent-intensive industries and genetically modified organisms and hybrid crops, which increase productivity, are patentable. However, the USPTO report lists the three-digit food industry as the *absolute least* patent-intensive. The USPTO methodology incorporates the number of employees in the industry into its calculations. Food delivery is highly labor-intensive, which would lead to depressing the relative value of IP as measured by USPTO and, therefore, contribute to the food category's low patent intensity ranking in the USPTO study.

Reading and entertainment are the most copyright-intensive industries. Copyrights are not part of this analysis, but when incorporated, reading, no doubt, will establish itself as a highly IP-intensive industry.

The table below provides a summary of the various characteristics for the fourteen categories of expenditures by older American households and whether they are patent-intensive.

The first three characteristics are objective. "Share" splits the major CES categories at a 5 percent share level for older Americans. The seven largest categories account for greater than 85 percent of expenditures by older Americans. "Similarity to Full Sample" incorporates a number of factors to determine if older Americans are consuming relatively more of a certain set of goods than the rest of the sample. Those factors include (i) comparison of the share of consumption by the two groups and (ii) whether the time trend in expenditures is moving in the same direction. The third objective factor examines the simple time trend in expenditures by older Americans.

The subjective measure is whether the category of goods is characterized as one in which there is substantial potential for innovation.

Table 10

MAJOR CATEGORY	**OLDER AMERICANS EXPENDITURES CHARACTERICS**				**PATENT INTENSITY**
	Share	**Similarity to Full Sample**	**Year-to-year Growth**	**Innovative Sector**	
Housing	**Large**	Similar	**Growing**	**Yes**	**High**
Healthcare	**Large**	**Consume More**	**Growing**	**Yes**	**High**
Food	**Large**	Similar	Declining	No	Medium
Transportation	**Large**	Consume Less	Slight Decline	**Yes**	Medium
Entertainment	**Large**	Consume Less	**Growing**	**Yes**	**High**
Apparel & services	Small	Consume Less	Declining	No	Medium
Personal care products	Small	Similar	Slight Decline	No	Medium
Alcoholic beverages	Small	Similar	Flat	No	Low
Tobacco products	Small	Similar	Declining	No	Low
Education	Small	Consume Less	**Growing**	No	Low
Reading	Small	Similar	Declining	**Yes**	Medium
Insurance & pensions	**Large**	Consume Less	**Growing**	No	NA
Cash contributions	**Large**	**Consume More**	Flat	No	NA
Miscellaneous	Small	Similar	Declining	No	NA

Using these criteria, six of the major CES categories are identified as important to older Americans by at least two of the four metrics. The six are housing, healthcare, transportation, entertainment, education, and cash contributions. Cash contributions, although meeting two of the four criteria, is mainly a service industry and, because of data constraints, its role in the subsequent analysis is limited.

Based on the USPTO reports, three of the fourteen major categories (housing, healthcare, and entertainment) are patent-intensive. These are also the only three categories that meet three of the four selection criteria for being important to older Americans. The other CES category that is important to older Americans, transportation, is in the medium category of patent intensity.

As noted in the USPTO report, "IP-intensive industries continue to be a major, integral and growing part of the US economy."[21] This is eminently the case for older Americans. Their consumption patterns show a proclivity toward patent-intensive industries; moreover, advancements in the fields of medicine and transportation will greatly aid the oldest in the US population.

Older Americans rely on the products produced by IP-intensive industries. As the population ages routinizing and mechanizing simple, daily life tasks become more important, and innovations that saturate these parts of the economy will become more valuable. Everyday accessories, digital devices, and countless drugs, treatments, and medical devices are in various stages of development; they will greatly help the aging population.

There must be financial incentives for those who create ways to help the aging population with medical breakthroughs, everyday household appliances, and help in transportation. Well-protected IP rights provides the right incentives in these industries (1) to invent and create, (2) to invest in innovation, and (3) to share knowledge through licensing and other arrangements.

Every year bills appear on Capitol Hill that would weaken patent protections. Previous legislation and US Supreme Court decisions have undermined elements of the patent system. This research indicates that such legislation is shortsighted and that restrictions on IP may adversely affect older Americans.

CONCLUSION

Americans are getting older, and these older Americans demand products and exhibit consumption patterns that are different from those of young Americans. Today's older Americans live different lifestyles than their predecessor generations. They live longer, work longer, are more active, spend more, and spend differently. As many older Americans are now living independently, non-medical and high-tech medical devices allow them to live fuller lives. Innovation and inventions are going to help older Americans live their lives to the fullest.

Older Americans are spending more on housing, health care, and entertainment—all economic sectors with histories of invention and, along with transportation, economic sectors that are ripe for

[21] US Department of Commerce, Economics and Statistics Administration and US Patent and Trademark Office, *Intellectual Property and the U.S. Economy: 2016 Update*, 2016, p. i.

continued innovation. The USPTO defines IP-intensive industries. Mapping these patent-intensive industries to the BLS Consumer Expenditure Survey shows that the housing, health care, and entertainment industries are all patent-intensive and that their products are used extensively by older Americans.

These advancements, however, will occur only if the intellectual property rights system allows innovators to appropriate the gains from their creations. Weakening the US patent system, through both legislation and court decisions, is going to weaken incentives and get in the way of the production of those good things.

ACKNOWLEDGEMENTS

The author wishes to thank the following for their assistance, advice, support, and encouragement in undertaking this study: Miles Fowler, Alexander Galetovic, Stephen Haber, Wesley Hartmann, Herb Klein, Isabel Lopez, Luke Shanqing, Rumei Su, Ann Wood, and Leilei Xu as well as the participants of Hoover IP^2 conferences.

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Version 1.05
January 19, 2018