

Risk Behavior Patterns and Wealth Accumulation

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Abstract

The purpose of this study is to identify potential differences in risk behavioral patterns between women and men, as well as the difference between blacks and whites, and determine whether those existing attitudes towards risk have a predictable effect upon long-term wealth accumulation. Demographic and financial data of individuals enrolled in the Panel Study of Income Dynamics (PSID) are analyzed. The results support the position that women are more risk averse than men and that blacks are more risk averse than whites. Ultimately risk aversion behavior led women and blacks to accumulate 12.4% and 19.8% less wealth compared to men and whites respectively. The contribution of risk to the wealth gap as defined by ownership of stock investments was estimated to be 4.4% in the group comparing women and men and 10.5% in the group comparing blacks and whites.

I. Introduction

Risk represents uncertainty in a world full of opportunity. The lure of risk can be as dangerous as the call of the mythical Sirens to sailors unaware, but the scales of balance offer rewards of equal magnitude. Risk is often the difference between the triumphs of the Henry Fords of the world and the ordinary achievements of individuals just as brilliant. From the earliest explorers to the latest computer whiz kids, those individuals who have dared to take risks have made our existence better and our future brighter. Unequaled risk combined with unmatched ambition has been a recipe for the emergence of new industries and the creation of innovative technologies.

On a smaller scale the risks that we take as individuals can be just as crucial to our own long-term welfare. Our individual prosperity may be determined by behavioral patterns that evolve from genetic and social origins beyond our conscious awareness. What role does risk tolerance play in our decision-making process and what are the predicted consequences of fearful conservatism?

Several prior studies have examined the characteristic of risk tolerance among select demographic groups. One recent study reviewed the results of fifteen different independent experiments using an investment game as a method of study. The results showed that women were consistently more financially risk averse than men (Charness & Gneezy, 2012). Another recent study looked at the question of racial/ethnic differences using a hypothetical job/income risk questionnaire from the U.S. Health and Retirement Study. The results showed that blacks were significantly more risk averse than whites (Fang, Hanna, & Chatterjee, 2013).

In this study, I will compare risk behavioral patterns between women and men as well as blacks and whites. I then will estimate the effect of risk aversion behavior on long-term wealth accumulation. Finally I will approximate the contribution of risk to the resulting wealth gap between both demographic groups. This study will be presented in five sections: the introduction, the model, the descriptive statistics, the empirical results, and the conclusion.

II. Model

A model was constructed establishing log wealth, the dependent variable, as a function of multiple variables. A list of all variables included in the model each with a brief definition and an expected sign are shown in Table 1. The independent variables were separated into two categories, demographic variables and financial variables. The demographic variables included classifications for gender and race, which are the two independent factors used to differentiate the specific groups under investigation in this study.

Table 1. Variables with definitions and expected signs

Variable	Definition	Expected sign
Dependent Variable		
<i>lwealth</i>	log of wealth	
Independent Variables		
<i>Demographic Variables</i>		
age	age of head of household	+
age2	age of head of household squared	-
female	1 if female, 0 if male	-
children	number of children in family	-
married	1 if married, 0 if never married	+
black	1 if black, 0 if white	-
educ	number of years in school	+
<i>Financial Variables</i>		
linc	log of income	+
farmbus	1 if farm or business owned, 0 if not	+
checksav	1 if checking/savings acct owned, 0 if not	+
orealest	1 if other real estate owned, 0 if not	+
stocks	1 if stocks owned, 0 if not	+
vehicles	1 if a vehicle owned, 0 if not	+
oassets	1 if other assets owned, 0 if not	+
annira	1 if an annuity or IRA owned, 0 if not	+
homeeq	1 if home owned, 0 if not	+

As age increases, wealth accumulation should increase in the long run if the individual receives a reliable annual income, saves a percentage of that income regularly, and invests those savings over time. Age squared takes into account that there are predicted diminishing returns to wealth accumulation as an individual grows older. Towards the end of life, wealth can decrease very rapidly if an individual becomes incapacitated for an extended period of time before death. Females and blacks are expected to accumulate less wealth over a lifetime than males and whites respectively due to multiple factors including anticipated risk aversion behavior and possible lack of opportunity, i.e. discrimination. Individuals with children would be expected to have less wealth accumulation due to greater lifetime expenses associated with raising a family. Married individuals would be expected to

have greater wealth accumulation due to the potential for double income status and the sharing of expenses. Individuals with a higher level of education would be expected to have a greater annual income and better long-term prospects for job advancement. They might also delay marriage and family planning, which would allow for even greater wealth accumulation in the early years of a career.

The financial variables include log income, which should be positively related to wealth accumulation. All eight asset classes should also be positively related to wealth accumulation. The checking asset and the vehicles asset classes are not normally considered investments, but they do represent a positive value as far as the calculation of wealth is concerned. The other six asset classes should be considered true investment categories and can be used for wealth building over time.

In this study, stocks are considered the riskiest asset within the financial portfolio. Individuals do not need to own stocks as part of their everyday investment portfolio. Whereas owning a home and owning a farm/business can both be an investment and a functional asset, stocks are considered more a nonessential or luxury investment for most individuals. In light of the recent financial collapse in 2008-2009, there is an apparent lack of trust in the stock market to behave fairly and predictably, thus affirming the public's impression that stocks are a risky proposition at best.

III. Descriptive Statistics

The dataset for this study was obtained from the Panel Study of Income Dynamics (PSID). Initial data collection began in 1968 through annual interviews and has continued from 1997 to the present through biennial interviews. Specific wealth data collection began in 1984 and was collected in 1989,

1994, 1999, and biennially after that. The dataset used in this study was from the year 2012 (collected in 2013).

Each family unit has an individual designated as the head of the family unit. The head of the family unit is identified by gender, race, and marital status. A total of 6,337 observations were used in this study. Accumulated wealth was determined by calculating the sum of net assets including farm and/or business, checking and/or savings account, other real estate, stocks, vehicles, other assets, annuity and/or IRA, and home equity.

Summary Statistics

A summary of the means for all variables separated into an all (individuals) category as well as into select group categories, male and female as well as white and black is presented in Table 2. The average accumulated wealth for all individuals was \$215,740. The average accumulated wealth for males and females was \$266,105 and \$30,388 respectively while the average accumulated wealth for whites and blacks was \$328,568 and \$32,384 respectively.

The average age for all individuals was 42.3 years, but the average age for the female group was nearly 10 years less than the male group and the average age for the black group was nearly 6 years less than the white group. Females made up 21.4% of the total sample while blacks made up 38.1% of the entire sample. Approximately 59.5% of the individuals were married. The average number of children per individual was 0.86 with both the female group and the black group above that average. The average number of years of education for all individuals was 13.5 years with the male group slightly outpacing the female group 13.6 years versus 13.3 years and the white group outpacing the black group 13.9 years versus 12.8 years respectively.

The average income for all individuals was \$65,008. The average income for males and females was \$76,349 and \$23,272 respectively while the average income for whites and blacks was \$82,773 and \$36,140 respectively. These results go a long way in explaining the results of the average accumulated wealth over time. Each additional year of income difference adds to the wealth gap exponentially over decades of wealth accumulation.

Table 2. Mean of Variables for All Individuals and by Select Group

Variables	All	Male	Female	White	Black
wealth	215,740	266,105	30,388	328,568	32,384
lwealth	11.05885	11.3302	9.495361	11.55979	9.900166
age	42.28089	44.29982	34.85081	44.48356	38.70133
age2	2026.418	2203.576	1374.437	2236.677	1684.725
female	0.2136658			0.1119042	0.3790389
children	0.8597128	0.8472808	0.9054653	0.7884272	0.9755592
married	0.5949187	0.747943	0.0317578	0.7343869	0.3682684
black	0.3809374	0.3008228	0.6757755		
educ	13.51018	13.56592	13.30502	13.93831	12.81442
inc	65,008	76,349	23,272	82,773	36,140
linc	10.47102	10.65924	9.671344	10.71127	10.03467
farmbus	0.0956288	0.1159944	0.0206795	0.1302575	0.0393538
checksav	0.6944927	0.7595826	0.4549483	0.8462911	0.4478045
orealest	0.1241913	0.149709	0.0302806	0.1720622	0.046396
stocks	0.1376045	0.1605459	0.0531758	0.2074943	0.0240265
vehicles	0.8185261	0.8735701	0.6159527	0.901351	0.6839271
oassets	0.1118826	0.1298415	0.0457903	0.1483559	0.0526098
annira	0.2258166	0.2677102	0.0716396	0.3273005	0.0608948
homeeq	0.5218558	0.6132852	0.1853767	0.6515422	0.3111019

The results between groups in the different asset classes were also very revealing. The most commonly owned assets were vehicles (81.6%) and checking and/or savings accounts (69.4%). These assets are fairly ubiquitous and add very little to an individual's total wealth. Home equity (52.2%), which can often be the single largest component of total wealth, was the third most commonly owned asset in this sample. Annuities and/or IRAs (22.6%) were rather low considering that these

investment vehicles are associated with retirement almost exclusively. The least owned asset classes were stocks (13.8%), other real estate (12.4%), other assets (11.1%), and farm or business (9.6%). In all asset classes, males owned a higher percentage than females and whites owned a higher percentage than blacks.

In many cases the difference in percentages of asset classes owned between groups was very large. In the case of stocks male (16.1%) was three times greater than female (5.3%) and white (20.7%) was more than eight times greater than black (2.4%). When looking at home equity, male ownership (61.3%) was more than three times greater than female ownership (18.5%) and white ownership (65.2%) was two times greater than black ownership (31.1%).

In Figure 1 below, a breakdown is shown of the percentage of individuals who owned stocks and those who did not own stocks in the male and female groups as well as the white and black groups. Approximately 16% of males owned stocks versus 5.3% of females while 20.7% of whites owned stocks versus 2.4% of blacks. Overall 13.8% of individuals in the sample owned stocks. These results show a dramatic difference in stock ownership among differentiated groups. Based on the hypothesis that stocks are a substitute designation for risk, these results support the conclusions of previous studies that females and blacks are more risk averse than their counterparts.

IV. Empirical Results

Table 3 contains the regression results. The coefficient sign was negative for age and positive for age². This was the opposite of what was expected. These results indicate that individuals have decreasing wealth initially until they reach a minimum point at 17.6 years and then they start to accumulate wealth. This does make intuitive sense because of initial debt from education and family costs. As individuals begin to work and to save, they finally become wealth positive after several years. Age is significant at 10% and age² is significant at 1%.

The coefficient signs for both the female variable at $-.1243$ and the black variable at $-.1981$ variables were negative, as expected. This indicates that females will accumulate 12.4% less wealth compared to males and that blacks will accumulate 19.8% less wealth compared to whites. The variable female was significant at the 10% level and black was significant at the 1% level. The negative signs are consistent with the risk aversion hypothesis for these two groups. The coefficient sign for children was negative at $-.0337$ as well, indicating that total wealth accumulation will decrease by 3.4% for every child in a family. The variable children was significant at the 10% level. This makes intuitive sense because raising children depletes wealth resources over time.

Figure 1. Percentage Stock Ownership by Select Group



V. Empirical Results

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accumulate wealth. This does make intuitive sense because of initial debt from education and family costs. As individuals begin to work and to save, they finally become wealth positive after several years. Age is significant at 10% and age2 is significant at 1%. The coefficient signs for both the female variable at -.1243 and the black variable at -.1981 variables were negative, as expected. This indicates that females will accumulate 12.4% less wealth compared to males and that blacks will accumulate 19.8% less wealth compared to whites. The variable female was significant at the 10% level and black was significant at the 1% level. The negative signs are consistent with the risk aversion hypothesis for these two groups. The coefficient sign for children was negative at -.0337 as well, indicating that total wealth accumulation will decrease by 3.4% for every child in a family. The variable children was significant at the 10% level. This makes intuitive sense because raising children depletes wealth resources over time.

Table 3. Regression Results (dependent variable is lwealth)

Variables	Coef.	Std. Err.	P-value
age	-0.0153844* (-1.93)	0.0079767	0.054
age2	0.000436*** (5.36)	0.0000813	0.000
female	-0.1242518* (-1.84)	0.0674143	0.065
children	-0.0337411* (-1.85)	0.0182541	0.065
married	0.1405302** (2.25)	0.0623786	0.024
black	-0.198113*** (-4.20)	0.0472067	0.000
educ	0.0836304*** (9.62)	0.0086978	0.000
linc	0.154364*** (10.36)	0.148952	0.000
farmbus	0.7851798*** (13.57)	0.0578574	0.000
checksav	0.1273675** (2.44)	0.0522596	0.015
orealest	0.620788*** (11.75)	0.0528439	0.000
stocks	0.6800206*** (12.53)	0.0542883	0.000
vehicles	0.6970854*** (8.99)	0.0775147	0.000
oassets	0.4600242*** (8.49)	0.0541992	0.000
annira	0.6661104***	0.0480696	0.000

	(13.86)		
homeeq	1.445014***	0.0498369	0.000
	(28.99)		
constant	5.703797***	0.2241639	0.000
	(25.44)		
R ²	0.6706		
F _c	516.14***		
n	4,074		

Note: Numbers in parentheses are t-values. The asterisks *, **, and *** indicate statistical significance at .10, .05, and .01, respectively.

The coefficient signs for both the married and education variables were positive at .1405 and .0836 with a significance level of 5% and 1% respectively. This indicates that married individuals will accumulate 14.1% more wealth than single individuals. It also implies that wealth accumulation will increase by 8.4% for every one additional year of education. Marriage has the potential to increase wealth accumulation due to double income status, which is consistent with the findings in this study. At the same time, education should lead to more opportunities for job advancement with greater incomes.

All of the coefficient signs for the financial variables were positive, as expected. This also makes intuitive sense because all financial assets are components of wealth or are potential drivers of wealth accumulation. Home equity had the largest magnitude among all financial variables. The results indicate that individuals who own a home accumulate 144.5% more wealth than those without any home equity. Owning a farm or business had the second largest magnitude. An individual who owned a farm or a business had 78.5% greater wealth accumulation than an individual who did not own a farm or a business. Annuity/IRA and other real estate also had large magnitudes indicating a 66.6% and 62.1% greater wealth accumulation than an individual without those respective assets. The log income result indicates that a 1% increase in income will increase wealth by .15%. All of the financial asset variables were significant at the 1% level except for checking and saving which was significant at the 5% level. The R² was 67.1% and the F-test was statistically significant at the 1% level indicating that the model was good.

Oaxaca Decomposition

In this section, two unique groups being compared were examined for differences in log wealth accumulation using the Oaxaca decomposition method. Both the male and female groups as well as the white and black groups were contrasted in this manner to test for a wealth gap and/or minority discrimination. Furthermore, the wealth gap was divided into an explained part and an unexplained part. The explained part is made up of the characteristics established in the model. In addition, a detailed decomposition was performed to identify the specific contribution of each independent variable to the explained part of the wealth gap.

First, the group comparing males and females was examined. The coefficients and means for both males and females are outlined in Table 3. Using these results a decomposition was performed using the Oaxaca decomposition method. This separated the log wealth differential into two parts – the explained part and the unexplained part. The explained part contains characteristics that contribute to the log wealth differential. The unexplained part contains the unknown determinants in the log wealth differential.

In the case of males and females, the results revealed a mean difference in log wealth of 1.83, which is commonly referred to as a wealth gap. This finding matched the prediction of a wealth gap between males and females predicated on the assumption that females are more risk averse than males. The abbreviated results of the decomposition between males and females are outlined in Table 4. The explained portion was 1.705 with stocks representing .0752 of the explained portion. Overall stocks (defined as risk in this study) contributed 4.1% to the wealth gap between males and females.

Table 4. Coefficients and Means for Male and Female (dependent variable is lwealth)

Variables	Male		Female	
	β^m	X^m	β^f	X^f
age	-0.0022573	44.29982	-0.0341223	34.85081
age2	0.0003349***	2203.576	0.0004216	1374.437
children	-0.320171*	0.8472808	0.0377033	0.9054653
married	0.0939973	0.747943	0.5580466*	0.0317578
black	-0.1926795***	0.3008228	-0.2060794	0.6757755
educ	0.0792433***	13.56592	0.1347394***	13.30502
linc	0.1548803***	10.65924	0.1686039***	9.671344
farmbus	0.7787459***	0.1159944	1.108855***	0.0206795
checksav	0.1528081***	0.7595826	0.0217195	0.4549483
orealest	0.596512***	0.149709	0.9420531***	0.0302806
stocks	0.6737205***	0.1605459	0.6793283***	0.0531758
vehicles	0.7152349***	0.8735701	0.6789515***	0.6159527
oassets	0.4399103***	0.1298415	0.6744117***	0.0457903
annira	0.6434683***	0.2677102	0.924649***	0.0716396
homeeq	1.382032***	0.6132852	1.749462***	0.1853767
constant	5.44952***		5.278342***	

Table 5. Twofold Decomposition of Wealth Difference (Male and Female)

lwealth	Coef.	
<i>Differential</i>		
Prediction 1	11.37881	
Prediction 2	9.549112	
Difference (wealth gap)	1.829695	
<i>Decomposition</i>		
Explained	1.705443	
(Stocks)	.075158	(Stocks represent 4.1% of the wealth gap)
Unexplained	.1242518	

Next, the wealth gap between whites and blacks was examined. The coefficients and means for both whites and blacks are outlined in Table 6. Using these results, a decomposition was again performed using the Oaxaca decomposition method.

The results revealed a log wealth difference of 1.66 between whites and blacks. This finding matched the prediction of a wealth gap between whites and blacks predicated on the assumption that blacks are more risk averse than whites. The abbreviated results of the decomposition between whites and blacks are outlined in Table 7. The explained portion was 1.459 with stocks representing .152 of the explained portion. Overall stocks (risk) contributed 9.2% to the wealth gap between whites and blacks.

Table 6. Coefficients and Means for White and Black (dependent variable is lwealth)

Variables	White		Black	
	β^w	X^w	β^b	X^b
age	0.0020595	44.48356	-0.0160106	38.70133
age2	0.0003242***	2236.677	0.0002606	1684.725
female	-0.0170253	0.1119042	-0.2168957**	0.3790389
children	-0.013326	0.7884272	-0.0731833**	0.9755592
married	0.120898	0.7343869	0.217007**	0.3682684
educ	0.0814261***	13.93831	0.0843688***	12.81442
linc	0.1739615***	10.71127	0.0976217***	10.03467
farmbus	0.7991929***	0.1302757	0.6231941***	0.0393538
checksav	0.2041006***	0.8462911	0.0679325	0.4478045
orealest	0.5708509***	0.1720622	0.8061773***	0.046396
stocks	0.6950568***	0.2074943	0.327797	0.0240265
vehicles	0.5712735***	0.901351	0.9320167***	0.6839271
oassets	0.4010404***	0.1483559	0.7262404***	0.0526098
annira	0.6250749***	0.3273005	0.868285***	0.0608948
homeeq	1.324926***	0.6515422	1.641902***	0.3111019
constant	5.14203***		6.151268***	

Table 7. Twofold Decomposition of Wealth Difference (White and Black)

lwealth	Coef.	
<i>Differential</i>		
Prediction 1	11.60399	
Prediction 2	9.946383	
Difference (wealth gap)	1.657607	
<i>Decomposition</i>		
Explained	1.459494	
(Stocks)	.1524817	(Stocks represent 9.2% of the wealth gap)
Unexplained	.198113	

VI. Conclusion

The study looked at the relationship between risk and wealth accumulation when risk is measured as stock ownership. The results showed that as the value of an individual's stock portfolio increased, the total wealth accumulation for that individual increased as well. This supports the idea that risk is positively correlated with wealth accumulation over time.

The percentage of males and females as well as whites and blacks that owned stocks in this sample provided evidence of risk tolerance behavioral patterns between these demographic groups. Approximately 5.3% of women versus 16% of men owned stocks indicating that females are more risk averse than males. Additionally, approximately 2.4% of blacks versus 20.7% of whites had stocks in their wealth portfolio, which also shows that blacks are more risk averse than whites.

Regression results showed that there is a difference in wealth accumulation between men and women as well as whites and blacks. Women ended up with 12.4% less accumulated wealth compared to men and blacks had 19.8% less accumulated wealth compared to whites over time. Both results support the existence of a wealth gap between the demographic groups in each case.

Finally, the results from the Oaxaca decomposition method showed that risk represented a small contribution with respect to the wealth gap. Stocks contributed 4.1% to the wealth gap between males and females and 9.2% to the wealth gap between whites and blacks. Redefining risk by broadening the scope of investments included in the risk category would lead to an increase in the wealth gap as well as an increase in the percentage contribution of risk to the wealth gap.

The results of this study support the idea that risk is an inherent part of accumulating wealth at a faster pace and to a greater degree. Risk is one of the factors that can be adjusted unlike gender and race. In order to narrow the wealth gap individuals who are lagging in wealth accumulation must

review their current strategy and make the necessary changes. Increasing risk tolerance can be a small change in behavior that may begin to close that wealth gap. Behavioral strategies can impact an individual through education, motivation, and participation. By improving financial investment literacy at school and at work, by providing motivational encouragement through financial advisors and matching employer contributions in retirement accounts, and by initiating individual plans that participate in personal wealth management the wealth gap can begin to close and financial equality can become a reality in the near future.

Due to limited time a simple cross sectional analysis from 2012 was performed. Since data as far back as 1968 are available and families have been followed through generations a panel study could be performed providing deeper results. Inheritance was intentionally left out as a potential source of wealth because cross sectional data would be woefully inadequate to exploit this variable. Inheritance would certainly be appropriate for a panel study. The influence of changing income over time was not modeled very precisely. Exact past income data and appropriate future extrapolation would be more realistic. The definition of risk used in this study was very narrow. If risk encompassed additional financial assets such as ownership of a business or farm, then the effect of risk would deliver an even larger effect on wealth accumulation and the wealth gap.

References

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