

# The Origins of Savings Behavior\*

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First draft: July 30, 2010  
This draft: January 23, 2011

## Abstract

Analyzing identical and fraternal twins matched with data on their savings propensities, we find that genetic variation explains about 33 percent of the variation in savings behavior across individuals. Parenting effects on savings behavior are strong for those in their twenties but decay to zero by middle age, i.e., parents do not have a lifelong non-genetic impact on their children's savings. The family environment when growing up and an individual's socioeconomic status later in life moderate genetic effects, so that more supportive environments result in a stronger genetic expression of savings behavior. We also find that savings behavior is genetically correlated with income growth, smoking, and body mass index, suggesting that the genetic component of savings behavior reflects innate time preferences and lack of self-control. In a world moving towards individual retirement savings autonomy, understanding the deeper origins of individuals' savings behavior is becoming increasingly important.

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\*We are thankful for comments from seminar participants at the 2011 AFA Meeting, Arizona State University, China Europe International Business School, Claremont Graduate University, Duke University, 2010 FMA Annual Meeting, NBER Behavioral Economics Working Group, Singapore International Conference on Finance, University of Miami Finance Conference, University of Southern California, University of Western Ontario, and valuable discussions with Peter Bossaerts, Alon Brav, John Campbell, Christopher Carroll, Darrell Duffie, Daniel Hamermesh, Jarrad Harford, Larry Harris, Cam Harvey, Greg Hess, David Hirshleifer, Chris Hrdlicka, Andrew Karolyi, Camelia Kuhnen, Owen Lamont, Andy Lo, Alessandro Previtero, Ed Rice, Jay Ritter, Tano Santos, Hersh Shefrin, Robert Shiller, Richard Thaler, James Weston, Rod White, Frank Yu, and Paul Zak. We thank Jack Goldberg at the University of Washington Twin Registry for advice, Florian Muenkel for research assistance, and Kara Ralston for editorial assistance. We acknowledge research funding from the Financial Economics Institute and the Lowe Institute of Political Economy at Claremont McKenna College, and the Global Business Center and the CFO Forum at the University of Washington. This project was pursued in part when Cronqvist was visiting the Institute for Financial Research (SIFR), which he thanks for its hospitality. Statistics Sweden and the Swedish Twin Registry (STR) provided the data for this study. STR is supported by grants from the Swedish Research Council, the Ministry of Higher Education, AstraZeneca, and the National Institute of Health (grants AG08724, DK066134, and CA085739). Any errors or omissions are our own.

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# The Origins of Savings Behavior

## Abstract

Analyzing identical and fraternal twins matched with data on their savings propensities, we find that genetic variation explains about 33 percent of the variation in savings behavior across individuals. Parenting effects on savings behavior are strong for those in their twenties but decay to zero by middle age, i.e., parents do not have a lifelong non-genetic impact on their children's savings. The family environment when growing up and an individual's socioeconomic status later in life moderate genetic effects, so that more supportive environments result in a stronger genetic expression of savings behavior. We also find that savings behavior is genetically correlated with income growth, smoking, and body mass index, suggesting that the genetic component of savings behavior reflects innate time preferences and lack of self-control. In a world moving towards individual retirement savings autonomy, understanding the deeper origins of individuals' savings behavior is becoming increasingly important.

# I Introduction

There is enormous variation across individuals in terms of wealth accumulated at retirement age, even among those with very similar estimated lifetime incomes. Economists have found that this dispersion can not be easily explained by socioeconomic characteristics or asset allocation choices (e.g. Venti and Wise (1998, 2000)). Instead, savings behavior, i.e., the choice by an individual to save or consume earlier in life, seems to be a much more important determinant of cross-sectional variation in wealth.<sup>1</sup> These findings raise a fundamental question: Where does an individual's savings behavior originate from? In particular, are we born with a particular savings propensity, is it governed by parents instilling preferences into their children, or is it the result of individual-specific life experiences? In this paper, we address these questions.

Existing research has employed a variety of empirical approaches to analyzing savings behavior, and we are not the first to explore the determinants of individual savings behavior.<sup>2</sup> However, the novel approach in this paper is to empirically decompose the variation in savings behavior across individuals into separate genetic and environmental effects, and to also examine gene-environment interplay (e.g., whether specific environments moderate predisposition to a behavior), none of which has been performed previously. The approach to analyzing savings behavior employed in this paper thus blends economics and biology, an intersection of research disciplines recognized as potentially important by several economists (e.g., Marshall (1920), Becker (1976), Hirshleifer (1977), and Knudsen, Heckman, Cameron, and Shonkoff (2006)), but one that has so far received relatively little attention.<sup>3</sup>

In standard life-cycle or precautionary savings models, variation in savings behavior across individuals is explained by heterogeneity in time and risk preferences (i.e., those with low personal discount rates and high risk aversion are predicted to save more). Theoretical work suggests that the existence and shape of individual preferences could be the outcome of natural selection (e.g., Rogers (1994), Robson (2001), and Brennan and Lo (2009)), meaning that preferences, and therefore savings

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<sup>1</sup>Already Friedman (1953) concluded that “a large part of the existing inequality of wealth can be regarded as produced by men to satisfy their tastes” (p. 290).

<sup>2</sup>We refer to Browning and Lusardi (1996) for an extensive review of micro-level research on savings behavior.

<sup>3</sup>Marshall (1920) went as far as concluding that “economics is a branch of biology broadly interpreted” (p. 772).

behavior, should be at least partially genetic. On the empirical side, there is recently emerging evidence that preferences are partly genetic (e.g., Kuhnen and Chiao (2009), Barnea, Cronqvist, and Siegel (2010), and Cesarini, Johannesson, Lichtenstein, Sandewall, and Wallace (2010) for risk preferences, and Eisenberg et al. (2007) and Carpenter et al. (2009) for time preferences). Others have questioned assumptions embedded in the life-cycle model, e.g., the cognitive ability to solve the consumption-savings problem and the self-control and willpower to execute the optimal savings plan (e.g., Thaler (1994) and Benartzi and Thaler (2007)). Several empirical studies have indeed found that non-standard models and “behavioral factors” explain variation in savings (or the lack of savings) across individuals (e.g., Bernheim et al. (2001a), Lusardi (2001), and Madrian and Shea (2001)). As a result, genetic variation in savings behavior may not necessarily reflect only genetic preferences, as in standard models, but may also reflect cognitive ability, self-control, or other non-standard factors being partly genetic.

Turning to social, rather than genetic, transmission of preferences and behavior, others have emphasized parents’ instilling behaviors into their children (e.g., Cavalli-Sforza and Feldman (1981), Mischel et al. (1989), and Bisin and Verdier (2008)). There is indeed anecdotal evidence suggesting that at least some parents exert costly effort to teach their children particular savings behavior, by providing a piggy bank, opening a savings account, and otherwise emphasizing the benefits of a frugal lifestyle. Parent-child socialization has been found to be empirically relevant for behaviors other than savings, such as religion (e.g., Bisin and Verdier (2000); Bisin et al. (2004)). While there exists work on the effects of government-sponsored financial education programs on savings behavior (e.g., Bernheim et al. (2001b) and Bernheim and Garrett (2003)), there is a surprising lack of empirical analysis of parenting and savings behavior.

Research by Charles and Hurst (2003) and Knowles and Postlewaite (2004) suggests significant parent-child similarities in savings behavior. While similarity in income explains about half of the age-adjusted elasticity of child wealth with respect to parental wealth in Charles and Hurst (2003), they hypothesize that similar savings propensities among parents and their children is another possible explanation. Both these studies are important in that they suggest that parents pass on their savings propensities to their children, but they do not examine the extent to which

this similarity is genetic versus the result of social transmission of behavior from parents to their children.<sup>4</sup>

There are at least two reasons why it is essential for economists to carefully examine the deeper origins of savings behavior. First, most industrialized countries are rapidly moving away from pensions and defined benefit retirement plans (e.g., Poterba et al. (2007)), meaning that individuals' decisions how much to save (and how to invest) will increasingly determine their well-being during retirement. As we move towards more autonomy in the domain of savings, understanding how these decisions are made becomes increasingly important. Second, our work has potentially important implications for the design as well as the evaluation of public policy interventions directed at savings behavior. As Bernheim (2009) recently concluded “[t]he discovery of a patience gene could shed light on the extent to which correlations between the wealth of parents and their children reflect predispositions rather than environmental factors that are presumably more amenable to policy intervention” (p. 14).

Analyzing data from Sweden on identical and fraternal twins and their savings behavior, we are able to empirically decompose the variation in individuals' propensity to save into genetic and environmental components.<sup>5</sup> We use a standard definition of an individual's savings rate, i.e., the change in net worth (excluding value changes of the individual's home) divided by disposable income. Following Venti and Wise (1998), we regress out the effects of socioeconomic characteristics and asset allocation choices, to estimate the adjusted savings rate (i.e., the residual from a regression with standard controls). The decomposition of this savings rate measure into genetic and environmental factors rests on an intuitive insight: Identical twins share 100 percent of their genes, while the average proportion of shared genes is only 50 percent for fraternal twins, so if identical twins have more similar savings behavior than fraternal twins, then there is evidence that the propensity to

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<sup>4</sup>A large literature in economics has studied parent-child similarities in other domains than savings behavior. Borjas (1992) and Solon (1992) find a positive and significant intergenerational correlation in income. Chiteji and Stafford (1999) examine asset allocations, and find that children, as young adults, are more likely to own stocks when their parents owned such assets. Bowles and Gintis (2002) report that socioeconomic status is persistent across generations. Mulligan (1999), Black et al. (2005), and Güell et al. (2007) provide evidence of significant intergenerational transmission with respect to education.

<sup>5</sup>Several studies in economics have examined data on twins, e.g., Behrman and Taubman (1976), Taubman (1976), Ashenfelter and Krueger (1994), and Ashenfelter and Rouse (1998). Others have used adoption data to address similar questions; see, e.g., Sacerdote (2002) and Björklund, Lindahl, and Plug (2006).

save, at least partly, originates from an individual's genetic composition. Formally, a random effects model with three effects (one genetic, one parental or common, and one individual-specific) and a covariance structure imposed by genetic theory is estimated by maximum likelihood, as is standard in quantitative genetics research (e.g., Neale and Maes (2004)).

Our analysis produces several results. First, savings rates are indeed much more correlated among identical than fraternal twins in our data (correlations of 0.33 versus 0.16). Specifically, we find that genes explain about 33 percent of the variation in savings behavior across individuals in our sample. This results is robust to a number of alternative savings rate measures and to the assumptions underlying the estimated model (e.g., equal environments and random mating). Each individual is born with an innate genetic predisposition to a specific savings behavior, an effect that is found not to disappear later in life. Second, the parenting effect on savings behavior (by socialization, not genes) is found to be zero on average, but a detailed analysis reveals that the strength of the effect varies in systematic ways, and as predicted by work on parent-child social transmission of behavior. In particular, we find that parenting explains 40 to 50 percent of the variation in savings rates for the youngest individuals in our sample (20 to 25 year olds), but this effect decays significantly and attains zero for those in their forties, i.e., parenting does not have a lifelong impact on their children's savings propensities. We also find that parenting explains more of the variation in savings behavior when there were no siblings in the family growing up, suggesting that parenting effects on savings are smaller when time for parenting and teaching is likely to be more scarce. Third, we report evidence of significant gene-environment interaction.<sup>6</sup> Specifically, we find that the family environment when growing up (the wealth of the parents) and an individual's current socioeconomic status moderates genetic predispositions to a particular savings behavior, evidence which is consistent with the prediction of the bioecological theory that genetic effects are stronger in more supportive environments. Finally, we examine why savings behavior is genetic. We find that savings behavior is correlated with income growth, smoking, and body mass index, and a formal decomposition reveals that these correlations are mainly genetic, and

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<sup>6</sup>Cunha and Heckman (2010) go as far as concluding that "the nature versus nurture distinction is obsolete" (p. 3), and they argue that the notion that genes are moderated by environments should receive more attention in economic research.

not environmental. Overall, the evidence suggests that the genetic component of savings behavior reflects time preferences as well as lack of self-control.

The paper is organized as follows. Section II reviews related research. Section III describes our data sources, defines the savings measures and other variables, and reports summary statistics. Section IV reports our results on genetic and social transmission of savings behavior as well as robustness checks. Section V contains further evidence and extensions. Section VI discusses what the evidence does and does not mean. Section VII concludes.

## II Related Research

Based on theory as well as existing empirical evidence there are reasons to hypothesize that an individual's savings behavior may be explained by both genetic factors and parent-child socialization. In this section, we review this related work.

### A Genes and Savings Behavior

#### A.1 Preferences

Since the seminal work by Modigliani and Brumberg (1954), the standard life-cycle savings model has been the framework through which economists have traditionally studied individuals' savings and consumption choices. This model has been extended to incorporate precautionary savings and bequest motives.<sup>7</sup> Heterogeneity in savings behavior across individuals can be explained by variation of preference parameters across individuals. Lusardi (1998) provides empirical evidence that savings behavior is in part explained by individual heterogeneity in time, risk, and bequest preferences. This raises the question of the origins of preferences. Rogers (1994), Robson (1996), Netzer (2009), Robson and Samuelson (2009), and Brennan and Lo (2009) theorize that the existence and shape of preferences are the outcome of natural selection, implying that preferences, and therefore savings

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<sup>7</sup>For precautionary savings models, see, e.g., Leland (1968), Kimball (1990), Skinner (1988), Deaton (1991), Carroll (1992) and Hubbard, Skinner, and Zeldes (1995). For models with bequest motives, see, e.g., Becker and Tomes (1976) and Bernheim, Shleifer, and Summers (1985).

behavior, are partially genetic.<sup>8</sup>

A large number of experimental and non-experimental studies have found significant individual heterogeneity in time preferences (e.g., Lawrance (1991), Barsky et al. (1997), Warner and Pleeter (2001), and Harrison, Lau, and Williams (2002)). But little is known about the origins of this heterogeneity. In a gene-mapping study, Eisenberg et al. (2007) identify specific genes related to variation in personal discount rates across individuals.<sup>9</sup> While this suggests that time preferences have a genetic component, a gene-mapping approach cannot quantify the overall importance of genetic variation in explaining the observed heterogeneity.

In our empirical approach, we control for risk preferences, revealed through an individual's asset allocation choices. But it is worth pointing out that recent evidence suggests that an individual's risk preferences have a significant genetic component (e.g., Cesarini et al. (2009) and Cesarini et al. (2010)). Barnea et al. (2010) examine individuals' financial portfolios and find that about one third of the cross-sectional variation in the share in equities across individuals is explained by a genetic effect. Moreover, gene-mapping studies have found that those with certain genes find risky behaviors more rewarding (e.g., Kuhnen and Chiao (2009), Dreber et al. (2009), and Zhong et al. (2009)).

## A.2 Behavioral Factors

As Benartzi and Thaler (2007) emphasize, there are a large number of studies on savings behavior that question some of the assumptions embedded in standard economic models of savings behavior.<sup>10</sup> First, while standard models assume that individuals have the cognitive ability to solve the multiperiod consumption-savings optimization problem, Lusardi (2001) and Ameriks, Caplin, and Leahy (2003) show that there is significant variation across individuals in the propensity to plan, which results in differential savings behavior.<sup>11</sup> Skills and the propensity to plan are likely related to measures of cognitive ability, such as IQ, which is partly genetic. Bouchard and McGue (1981) find

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<sup>8</sup>For a more extensive overview of research at the intersection of neurobiology, genetics, and economics, we refer to Camerer, Loewenstein, and Prelec (2005) and Benjamin et al. (2008).

<sup>9</sup>Eisenberg et al. (2007) elicit individuals' time preferences by posing a series of choices between smaller intermediate and larger delayed monetary rewards (e.g., Fuchs (1982)) and with different durations of a delay, for example "Would you prefer to have \$500 today or \$1,000 in five years?"

<sup>10</sup>For a critical review of the life-cycle model of savings behavior, see Thaler (1994).

<sup>11</sup>Dufo et al. (2006) suggest that information as well as incentives affect savings behavior.

in a review of 111 studies that genes explain 40–80 percent of the variation in IQ, and McClearn et al. (1997) find a genetic component of cognitive ability also in those 80 years or older.

Second, standard models also assume that individuals have self-control and willpower to implement an optimal savings plan, while other theories question such assumptions (e.g., Thaler and Shefrin (1981) and O’Donoghue and Rabin (1999)). There is a large literature which reports evidence of variation across individuals with respect to self-control. In the seminal “marshmallow experiment,” psychology researcher Walter Mischel found significant heterogeneity across pre-school children in the propensity to forego an immediate reward (i.e., consuming a marshmallow) for a larger, but delayed, reward (i.e., consuming two marshmallows when the experimenter returned to the room). Most importantly, research on these children in adolescence showed that the self-control behavior estimated using the marshmallow experiment explained a series of important outcomes later in life, including SAT scores, educational attainment, and social competence (e.g., Mischel, Shoda, and Rodriguez (1989)). Lack of self-control may also result in insufficient savings among some individuals. Some behaviors related to lack of self-control, such as attention-deficit hyperactivity disorder (ADHD), smoking, obesity, and impulse control disorders, have a significant genetic component (e.g., Barkley (1997)).

Several empirical studies have found that non-standard models and “behavioral factors” are important explanations for variation in savings (or the lack of savings) across individuals (e.g., Bernheim et al. (2001a) and Madrian and Shea (2001)). As a result, genetic variation in savings behavior may not necessarily be a result of genetic preferences, as in standard models, but may also be the result of cognitive ability, self-control, or other non-standard factors being partly genetic.

## **B Parent-Child Socialization and Savings Behavior**

Social transmission, as opposed to genetic transmission, is another potential explanation for parent-child similarity in savings behavior (Bisin and Verdier, 2008).<sup>12</sup> Becker and Mulligan (1997) argue that “[p]arents often spend resources on teaching their children to better plan for the future, resources

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<sup>12</sup>The socialization we study in this paper is “direct vertical socialization,” i.e., transmission of from parents to their children (e.g., Cavalli-Sforza and Feldman (1981), Boyd and Richerson (1985), and Richerson and Boyd (2005)). We do not study “oblique socialization,” i.e., socialization outside the family, which takes place in society at large though learning from others in the population.

that affect the children’s discount rates” (p. 736). Mischel et al. (1989) suggest that the early family environment could be important in nurturing self-control. Bisin and Verdier (2001) provide a model of parent-child socialization. A common assumption in such models is that children are born without defined preferences, and they are first exposed to their parents’ socialization. Through parenting parents transmits their own preferences to their children. If parent-child socialization is not successful, the child is affected by a random role model in the population (e.g., peers, teachers, etc.). Altruism makes parents exert costly effort to socialize their children, but this altruism is paternalistic in the sense that parents prefer to socialize their children to their very own preferences. Models with these assumptions have been used to explain parent-child social transmission of, e.g., religion and labor supply preferences (e.g., Bisin and Verdier (2000), Bisin et al. (2004), and Fernandez et al. (2004)), and we hypothesize that models of social transmission from parents to their children may extend to savings behavior.<sup>13</sup>

### III Data

#### A Data Sources

The data set we use in this paper was constructed by matching a large number of identical and fraternal twins from the Swedish Twin Registry (STR), the world’s largest twin registry (Lichtenstein et al., 2006), with annual data from these twins’ tax filings.

Twins are registered at birth in Sweden, but the STR also collects additional data through in-depth interviews for use by researchers.<sup>14</sup> For example, we have data on the zygosity of each twin pair: “monozygotic,” or identical, twins are genetically identical, while “dizygotic,” or fraternal, twins are genetically different.<sup>15</sup> We also have data on, e.g., intra-pair twin communication, which

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<sup>13</sup>In a controversial article, Harris (1995) challenges the notion that parents affect the behavior of their children. She concludes based on evidence from genetics research that parents have little long-lasting effects on their children’s personality.

<sup>14</sup>The STR data used in this study were obtained through the “SALT” (Screening Across Lifespan Twin) study for twins born between 1886 and 1958 and through the “STAGE” (Swedish Twin Studies of Adults: Genes and Environment) study for those born between 1959 and 1985. Participation rates were 60–70 percent.

<sup>15</sup>Zygosity is based on questions about intrapair similarities in childhood. One of the survey questions is: Were you and your twin partner during childhood “as alike as two peas in a pod” or were you “no more alike than siblings in general” with regard to appearance? This method has been validated with DNA as having 98 percent or higher accuracy. For twin pairs for which DNA sampling has been conducted, zygosity status based on DNA analysis is used.

we use in our analysis.

Data from the twins' tax filings are available because, until 2006, Swedish taxpayers were subject to a wealth tax, and banks, brokerage firms, and other financial institutions were required to report to the tax authorities annual data about assets individuals own. Data are collected for each taxpayer individually, are managed by Statistics Sweden, and may be used by researchers. The combination of our data on income, assets, and debt provides an unusually detailed and complete characterization of the financial decisions of Swedish households.<sup>16</sup>

## B Sample Selection

After merging cross-sectional data on twins from the STR with annual tax data between 2002 and 2006, we compile our sample in several steps. First, the methodology we use requires us to drop twin pairs with incomplete data. To focus our study on pre-retirement savings behavior, we select only individuals between 20 and 65 years of age (at the end of our sample period in 2006).<sup>17</sup> To reduce the impact of significant changes in net worth unrelated to savings behavior, we exclude twins whose marital status changed during the sample period. We also require that an individual's average annual net worth is positive, that the individual owns some financial or real assets other than her primary residence and that the average annual disposable income is more than SEK 10,000 (approximately \$1,400 at an average exchange rate of SEK 7.20 per dollar). Finally, we drop individuals in the 1% tails of the savings rate distribution to reduce the potential impact of outliers. Our final data set consists of 14,930 twins.

Panel A of Table 1 reports the number of twins by zygosity and sex. 30 percent are identical, while the rest are fraternal. Opposite-sex twins are most common (38%), while identical male twins are the least common (13%). The frequency of different types of twins in the table is consistent with what would be expected from populations of twins (e.g., Bortolus et al. (1999)).

Panel B of Table 1 reports summary statistics for socioeconomic characteristics as well as asset allocation choices for the individuals in our sample. Detailed definitions for all the variables are

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<sup>16</sup>For a more detailed discussion of these data, see Calvet, Campbell, and Sodini (2007, 2009).

<sup>17</sup>The official retirement age in Sweden is 65, but we observe age only at the end of the year and thus include twins that turned 65 at some point during 2006.

available in Appendix Table A1. While identical and fraternal twins appear similar with respect to characteristics such as age, marital status, health, income, net worth, and asset allocation, we observe substantial cross-sectional variation. Differences in characteristics and asset allocation may affect individual savings behavior. We return to this question after introducing our savings measure.

## C Measuring Savings Behavior

Our data set does not contain a pre-defined measure of savings behavior, and as Dynan, Skinner, and Zeldes (2004) point out, there are several empirical approaches to measuring individuals' savings rates. Conceptually, we want to characterize an individual's savings behavior by the relative amount of permanent income that is not consumed, but saved for future consumption or bequest. In practice, we measure savings as the change in an individual's net worth between the end of 2002 and the end of 2006, excluding capital gains or losses related to the individual's home.<sup>18</sup> We scale the amount of savings by an individual's disposable income over the same period. The savings rate,  $s_{ij}$ , for twin  $j$  (1 or 2) in pair  $i$  is therefore defined as:

$$s_{ij} = \frac{Net\ Worth_{ij,2006} - Net\ Worth_{ij,2002} - (\sum_{t=2003}^{2006} \Delta Home\ Value_{ij,t})}{\sum_{t=2003}^{2006} Disposable\ Income_{ij,t}} \quad (1)$$

$Net\ Worth_{ij,t}$  is the sum of the value of financial assets, including bank accounts,<sup>19</sup> real estate and other assets, less debt, at the end of year  $t$ .  $Disposable\ Income_{ij,t}$  is the sum of labor income, investment income,<sup>20</sup> income from businesses, early retirement income, and net transfer payments (e.g., child support and unemployment benefits), less taxes, during year  $t$ .  $\Delta Home\ Value_{ij,t}$  is a measure of capital gains or losses related to the individual's primary home, and captures the annual difference in reported home values, excluding changes that are associated with changes in home ownership status.

Panel C of Table 1 reports summary statistics for the savings rate of the individuals in our sample. Between the end of 2002 and the end of 2006, the net worth changed on average by about

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<sup>18</sup>That is, we regard the individual's primary home as consumption. The change in value of other real estate assets is regarded as investment income and is part of the savings measure.

<sup>19</sup>Bank account balances of less than SEK 10,000 (or for which the interest was less than SEK 100 during the year). However, Statistics Sweden's estimations suggest that 98 percent of all bank accounts balances is included in the data.

<sup>20</sup>Investment income includes realized capital gains or losses.

\$76,000 for identical and \$78,000 for fraternal twins, of which about \$41,000 is the result of home value changes. Excluding such changes and scaling by the disposable income results in the savings rate,  $s_{ij}$ , as defined in equation (1). For identical twins the average  $s_{ij}$  is 23 percent, while it is 25 percent for fraternal twins. The medians are about 12 percent for both groups.<sup>21</sup> Importantly, the variation across identical twins (53%) and across fraternal twins (54%) is also very similar.

Following Venti and Wise (1998), we next use a linear regression model to control for individual socioeconomic characteristics that may enhance or limit an individual’s savings (i.e., “circumstances,” “resource shocks” or “chance” events). These include age, marital status, and the number of children.<sup>22</sup> Age is included because savings behavior may have a life-cycle component. Although the number of children and marital status are not necessarily chance events, we include them because, if only due to economies of scale, marriage may increase the resources available for savings. The number of children may be a measure of a bequest motive for savings,<sup>23</sup> and is also included because expenses related to raising children reduce the resources for savings. We include proxies for inheritances, health status, and episodes of unemployment. Poor health may reduce the amounts out of which savings could be taken, and so may unemployment. We control for the number of siblings as more siblings may act as insurance, reducing savings. We control for disposable household income as it might affect the observed savings rate without being directly related to the underlying savings propensity.<sup>24</sup> When possible, we also control for the spouse’s value on any of these variables. Finally, we include 20 region fixed effects. Similar to Venti and Wise (1998), we do not include education, ethnic origin, and other characteristics that may correlate with preferences for savings.

In order to focus on savings behavior related to time preferences or self-control, we attempt to control risk preferences by also including controls for asset allocation choices. Even individuals with the same savings propensity who choose to save a similar fraction of their income may differ with

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<sup>21</sup>Dynan, Skinner, and Zeldes (2004) study savings in the U.S. using data from the Survey of Consumer Finance (SCF) and the Panel Study of Income Dynamics (PSID) from 1984–1989. They document median savings rates between 3 and 10 percent. Because their estimates do not exclude changes in home values (about 6 percent p.a. in the U.S. during their time), our findings suggest that the Swedish individuals in our sample save a larger proportion of their disposable income than Americans did in the 1980s.

<sup>22</sup>We have data only for the number of children living in the twin’s household.

<sup>23</sup>For empirical evidence on the bequest motive for savings, see, e.g., Bernheim (1991).

<sup>24</sup>For example, public pensions in Sweden are based on income. We will return to the discussion of public and private pensions below.

respect to their savings rate as defined in equation (1) because some have invested their savings in the stock market, while others have saved through, e.g., bank accounts. We therefore use data on allocation to several asset classes to control for such variation, e.g., the proportion in stocks, bonds, and bank accounts, and an indicator for business ownership. We hence control for heterogeneity in risk preferences across individuals, as revealed by their asset allocation choices.<sup>25</sup>

Appendix Table A2 reports results from regressing  $s_{ij}$ , as defined in equation (1), on the aforementioned socioeconomic characteristics as well as asset allocation choices. Because these variables may have varying effects over the life-cycle, we estimate separate regressions for those younger than 35, those older than 50, and those in the intermediary age category. Several of the coefficients are statistically significant and with the expected signs. In aggregate, these variables explain 9 to 14 percent of the cross-sectional variation of our savings rate, depending on age group. Having removed the variation in socioeconomic characteristics as well as asset allocation across individuals, we use the regression residuals as our adjusted savings rate,  $\hat{s}_{ij}$ , in all of the following analysis of individual savings behavior. Panel C of Table 1 provides summary statistics for the adjusted savings rate. By construction, the cross-sectional variation has decreased. The distribution of the adjusted savings rate has also become more centered, with the median (-0.05) for both identical and fraternal twins now much closer to the mean (0.00).

## IV Empirical Results

### A Correlations for Identical versus Fraternal Twin Pairs

If identical twins are significantly more similar with respect to savings behavior than fraternal twins, then there is evidence that the propensity to save, at least partly, originates from an individual's genes. We therefore start by computing Pearson's correlation coefficients for savings propensities separately for identical and fraternal twins. Figure 1 shows that the savings rate correlation for identical twins is 0.33, compared to 0.16 for fraternal twins. This difference is statistically significant at the 1%-level. We also report separate correlations for male and female twins, and find that the

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<sup>25</sup>Standard models, such as Samuelson (1969) and Merton (1969), show that in a frictionless market, differences in risk preferences explain cross-sectional variation in the share in equities.

difference in correlations between identical and fraternal twins (0.27 versus 0.10) is significantly larger for males than females.

These correlation results are a first and intuitive indication that variation in savings behavior has a genetic component. It is important to note, however, that because the correlation in savings behavior among identical twins is significantly lower than one, this evidence shows that genetic variation does not completely explain differences in savings behavior, but that the environment plays an important role as well.<sup>26</sup> In the rest of the paper, we perform a more formal empirical decomposition of the cross-sectional variation in savings behavior into genetic versus environmental components.

## B Empirical Decomposition of Savings Behavior

### B.1 Methodology

To decompose the propensity to save, measured by the adjusted savings rate,  $\hat{s}_{ij}$ , we estimate the following random effects model:<sup>27</sup>

$$\hat{s}_{ij} = \alpha + a_{ij} + c_i + e_{ij}, \quad (2)$$

where  $j$  (1 or 2) indexes one of the twins in a pair  $i$ .  $\alpha$  is an intercept term and  $a_{ij}$  and  $c_i$  are unobservable random effects, representing an additive genetic effect and the effect of the environment common to both twins (e.g., parenting), respectively.  $e_{ij}$  is an individual-specific error term that represents idiosyncratic environmental effects (e.g., life experiences) as well as measurement error.

$a_{ij}$ ,  $c_i$ , and  $e_{ij}$  are assumed to be independently normally distributed with zero means and variances  $\sigma_a^2$ ,  $\sigma_c^2$ , and  $\sigma_e^2$ , respectively, so that the total residual variance is the sum of three variance components:  $\sigma_a^2 + \sigma_c^2 + \sigma_e^2$ . Identification of  $\sigma_a^2$  separately from  $\sigma_c^2$  is possible because of the covariance structure imposed by genetic theory. Consider two unrelated twin pairs  $i = 1, 2$  with twins  $j = 1, 2$  in each pair, where the first pair is identical twins and the second pair is

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<sup>26</sup>Fraga et al. (2005) document epigenetic differences in identical twins. While research on the importance and the causes of such differences in gene expression is ongoing, we do not consider epigenetic effects in this study.

<sup>27</sup>This model is often referred to as an “ACE model” in quantitative genetics research, and has been used extensively.  $A$  stands for additive genetic effects,  $C$  for common environment, and  $E$  for idiosyncratic environment.

fraternal twins. The corresponding genetic components are:  $a = (a_{11}, a_{21}, a_{12}, a_{22})'$ . Analogously, the vectors of common and idiosyncratic environmental effects are:  $c = (c_{11}, c_{21}, c_{12}, c_{22})'$  and  $e = (e_{11}, e_{21}, e_{12}, e_{22})'$ . Assuming a linear relationship between genetic and behavioral similarity, genetic theory suggests the following covariance matrices:

$$\text{Cov}(a) = \sigma_a^2 \begin{bmatrix} 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1/2 \\ 0 & 0 & 1/2 & 1 \end{bmatrix}, \text{Cov}(c) = \sigma_c^2 \begin{bmatrix} 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 \end{bmatrix}, \text{Cov}(e) = \sigma_e^2 \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}.$$

We use maximum likelihood estimation (MLE) to estimate the above model (see, e.g., McArdle and Prescott (2005) and Feng, Zhou, Zhang, and Zhang (2009)).

## B.2 Estimates from Random Effects Model

Table 2 reports estimates of variance components  $A$ ,  $C$ , and  $E$ .  $A$  is the proportion of the total residual variance of an individual's savings rate attributable to an additive genetic factor:

$$A = \frac{\sigma_a^2}{\sigma_a^2 + \sigma_c^2 + \sigma_e^2}$$

The proportions attributable to common and idiosyncratic environmental effects,  $C$  and  $E$ , are computed analogously.

As a benchmark for model fit, the first row of Table 2 Panel A reports an “E model” in which both  $A$  and  $C$  are constrained to zero, and the second row reports a “CE model,” in which only  $A$  is constrained to zero. The final row reports a full “ACE model.” We also report the Akaike Information Criterion (AIC) to compare fit across models and we have performed likelihood ratio (LR) tests to compare the “E model” against the “CE model,” and the “CE model” against the “ACE model.”

Our analysis produces several results. First, based on AIC, the full ACE model is preferred; based on the LR tests, the full ACE model is preferred over a CE model, which is preferred over an

E model. That is, modeling a genetic factor significantly improves the fit of a model which explains cross-sectional variation in individual savings behavior. Second, we quantify the proportion of the variation in savings behavior attributable to a genetic effect  $A$  and find that it is about 33 percent (statistically significant at the 1%-level). That is, variation in savings behavior originates to a very large extent from genetic variation across individuals.<sup>28</sup> This evidence supports some economists' references to a "patience gene" (Bernheim, 2009) such that those equipped with such genes would then be predicted to save more. In contrast,  $C$  is estimated to be zero, suggesting that savings behavior on average is not explained by differences in the common parental environment in which children grow up. Finally, we find that idiosyncratic environmental effects  $E$  contribute substantially to the variation in savings behavior.  $E$  is 67 percent, and is statistically significant at all levels. This is the largest component in the model, but captures an entire set of possible individual-specific life experiences and other non-genetic circumstances, in addition to measurement error. It suggests, however, that individual-specific life experiences significantly influence an individual's savings behavior.

Table 2 Panel B reports results on sex-based differences in savings behavior. We find that for men, the  $A$  component is 35 percent, i.e., larger than for women, for which it is only 23 percent. That is, the relative genetic variation of men's propensity to save is about 50 percent larger than that of women. The  $C$  component is zero for men, but 7.8 percent for women, albeit not statistically significant. We conclude that while the savings behavior of men is more attributable to their genes, the behavior of women is affected relatively more by individual-specific life experiences. The behavior of an individual's spouse may be one such life experience that is captured by  $E$  in our model.

### B.3 Alternative Measures of Savings Behavior

We have checked that our results are similar if using other measures of savings behavior. First, we calculate *Savings Rate 2* which, in contrast with our previous measure, includes capital gains or losses related to an individual's primary home. This measure is similar to the definition used by

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<sup>28</sup>We have re-estimated the model for same sex twins only, and find that results are unchanged.

Dynan, Skinner, and Zeldes (2004). We again remove variation in socioeconomic characteristics and asset allocation choices by regression,<sup>29</sup> and we decompose the adjusted savings rate, and report results in Panel A of Table 3. We find that the  $A$ ,  $C$ , and  $E$  components are very similar to the previously reported estimates.

Second, we define savings as a stock variable. In particular, we calculate the *Wealth-to-Income Ratio* by dividing an individual’s net worth at the end of 2006 by the cumulative disposable income between 1998 and 2006 (i.e., all available income data). This measure is similar to the definition used by Bernheim et al. (2001b).<sup>30</sup> Again, we control for socioeconomic characteristics and allocation choices, and we report the results of our decomposition in Panel A. Genetic variation, captured by the  $A$  component, now accounts for almost 40 percent of the cross-sectional variation of the adjusted *Wealth-to-Income Ratio*. The  $C$  component is about 3 percent, but insignificant, while the individual specific environment, captured by the  $E$  component, accounts for the remaining 57 percent.

One concern with our savings rate measures is that they do not consider defined benefit plans. Individuals that expect a relatively large pension may choose to save less. This is problematic to completely address because we do not have data on pensions upon retirement. However, public pensions in Sweden are based on income, which we control for. Private pensions by employers vary largely by occupation. To the extent that occupational choices are more similar for identical than fraternal twins, our results on savings behavior may be confounded. We therefore use data on occupation, based on the International Standard Classification of Occupations (ISCO-88), and available for a subset of our data. In Panel B of Table 3, we report results for this subset of twins, first without controlling for occupation and then when controlling for 94 occupation fixed effects. Without controlling for occupation, we find that the genetic component,  $A$ , is 28 percent. When controlling for occupational choices, the genetic component drops by about three percentage points. We conclude that our results do not seem to simply represent genetic variation in occupational

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<sup>29</sup>Differently from the regression specification shown in Appendix Table A2, we also include the individual’s investment in real estate other than the primary home, scaled by total assets (including home assets). The  $R^2$ ’s of the three regressions is between 15 and 24 percent (untabulated).

<sup>30</sup>The top and bottom one percentile of the distribution have been dropped.

choices and related defined benefit plans.<sup>31</sup>

## B.4 Robustness to Model Assumptions

There are several important assumptions behind the model in equation (2). In this section, we address the robustness of our results to these assumptions.

*Equal Environments.* The model assumes that identical and fraternal twins experience equally similar environments. But parents may treat identical twins more similarly than fraternal twins, in which case the model attributes unequal environments to the genetic component. One approach to this problem is to study twins separated at birth or early in life, who were thus “reared apart” (see, e.g., the seminal work by Bouchard et al. (1990)), and for which the parental environment is by definition zero. However, it is uncommon for adoption authorities to separate twins, and with the additional filters we use when constructing our savings measure we are left with a sample that is too small for reliable statistical analysis. We therefore combine twins that were reared apart with twins that report very little contact between them. In particular, we identify 33 twin pairs that spent at most 10 years in the same household and combine them with 251 twin pairs that meet at most twice a year and communicate with one another at most four times per year.<sup>32</sup> In Panel A of Table 4, we report results from a variance decomposition using these 568 twins. We still find a significant genetic component of savings behavior (21%), even among those twin pairs that have been separated early in life or have no or little contact with one another. This result should reduce concerns that

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<sup>31</sup>As a complement to defined benefit plans, Sweden also has a privatized Social Security system since years 2000 (e.g., Cronqvist and Thaler (2004)), where required contributions are a small portion (about 2.5 percent) of labor income, which we control for in our regressions. The amounts in these accounts are excluded from our net worth measure, but represent a very small portion of wealth, and would therefore not be expected to significantly affect overall savings behavior. Also, because of their age, most individuals in our sample are not affected by the privatized Social Security system.

<sup>32</sup>Twin interaction is measured through interviews by the STR (“How often do you meet?” and “How often do you have contact?”).

genetic and common environmental effects are confounded in the analysis of this paper.<sup>33</sup>

*Genetic Mechanisms.* The model assumes an additive genetic mechanism. However, a dominant gene inherited from one parent may override a recessive gene inherited from the other parent. A dominant genetic effect can be added to the model in equation (2); see Plomin, Defries, McClearn, and McGuffin (2008) for details. Table 4 Panel B shows that our estimate of a dominant genetic component  $D$  is 5 percent, but not statistically significant at conventional levels, and the total genetic component ( $A + D$ ) from this model is 34 percent. That is, our conclusions of a significant genetic effect on the propensity to save does not change if assuming a dominant genetic mechanism.

*Random Mating.* The model assumes that individuals mate randomly, i.e., individuals are as likely to choose mating partners who are different from themselves as they are to choose partners who are similar. Researchers have examined assortative mating based on education (e.g., Pencavel (1998)) and the extent to which individuals marry to diversify their labor income risk versus marry for other reasons (Hess, 2004). More recently, Kimball et al. (2009) have provided evidence of positive correlation of survey-based risk preferences between spouses. Such covariation in risk preferences is consistent with positive assortative mating, but could also be the outcome of common experiences. We are not aware of any studies on mating based on time preferences or savings propensities. While we are not able to explicitly model assortative mating, we note that positive assortative mating between our twins' parents would make fraternal twins more similar relative to identical twins and would therefore bias the estimate of the genetic component downwards and the estimate of the parenting or common environmental component upwards (see, for example, Neale and Maes (2004)).

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<sup>33</sup>Phillips (1993) points out that identical and fraternal twins may also differ with respect to their prenatal environments. Specifically, about two thirds of identical twins share the same chorion (and share blood supply and are exposed to the same hormones), while one third of identical and all fraternal twins have their own chorion. If the prenatal environment is important for postnatal behavior, then chorionic variation could inflate estimates of genetic effects. Most twin data sets, including ours, do not provide information on whether identical twins are mono- or dichorionic. Sokol et al. (1995) study 44 twins and find that identical twins with shared chorion are more similar than dichorionic twins with respect to some personality traits, including impulsivity, but generally not with respect to cognitive ability, but in a more recent study of social behavior, Hur (2007) finds no impact of chorionic variation. While we cannot empirically assess the importance of chorionic variation for savings behavior, we follow Prescott et al. (1999) and estimate that the possible upward bias of our estimate of the genetic effect is about 4 percentage points. For this calculation, we assume that the relative variance of the chorionic effect equals 0.20 (see, for example, Sokol et al. (1995)) and that two thirds of identical twins are monozygotic. We also use the fact that about 30% of the twins in our data are identical. Thus, chorionic variation seems to have at most a modest effect on our point estimates.

## V Further Evidence and Extensions

### A Effects of Parenting on Savings Behavior

One intriguing result so far in the paper is that parenting seems to affect savings behavior very little, if at all. This is surprising in the sense that social transmission of behavior from parents to their children seems to be important for several other economic behaviors (e.g., Bisin and Verdier (2000), Bisin, Topa, and Verdier (2004), Fernandez, Fogli, and Olivetti (2004), and Knudsen et al. (2006)). While the parenting effect with respect to savings behavior is zero on average, it is likely that the strength of the effect varies predictably so that it is stronger for certain groups of individuals. Based on theories of parent-child social transmission, we next analyze whether the strength of the parenting effect varies with an individual's age and scarce parenting.

#### A.1 Age

We model the variance components in equation (2) as a function of age and age-squared.<sup>34</sup> We find that the effect of parenting on savings behavior varies significantly with age. Figure 2 shows the decay in the estimated parenting effect. In particular, we find that parenting explains about 40 to 50 percent of the variation in savings rates for the youngest individuals in our sample (20-25 year olds), but this effect decays significantly and attains zero by middle age. That is, while parents seem to strongly affect their children's savings behavior early on in life, the effect disappears over time as their children gain their own individual-specific life experiences.<sup>35</sup>

Our interpretation of this evidence is that social transmission from parents to their children affects children's savings behavior early on in life, but unlike genetic effects, parenting does not have a lifelong impact on an individual's savings behavior. These results are broadly consistent with research in behavioral genetics which has found a significant effect of the common family environment in early ages on, e.g., personality, but also shown that such effects approach zero in adulthood (e.g., Bouchard (1998)).

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<sup>34</sup>We use a standard interaction model (see, for example, Harden et al. (2007) for details) where age and age-squared act as variance moderators. Details are available upon request.

<sup>35</sup>We find that genes still explain 28 percent of the cross-sectional variation in saving propensities among those older than 50 (untabulated), so in contrast to parenting effects, the genetic effect does not disappear.

## A.2 Costs of Parenting

Parenting involves exerting costly effort, i.e., it takes time and other scarce resources to teach a behavior to a child, and parenting is difficult to delegate. We therefore predict that the common family environment results in a smaller effect on a child’s savings behavior when parenting is relatively more scarce, all else equal. In particular, the presence of more children in the family may reduce the time parents are able to commit to each individual child. That is, we predict that the presence of siblings reduces the average effect of parenting.<sup>36</sup>

In Panel A of Table 5, we estimate and report separate models for twins who grew up in families with and without other siblings. We find that parenting explains about 12 percent of the cross-sectional variation in the propensity to save among individuals with no siblings. The effect is statistically significant at the 5%-level. In contrast, we find no effect of parenting when there are siblings in the family.<sup>37</sup> That is, the propensity to save in adult life of those who grew up with no siblings will be more affected by their parents’ savings behavior. We conclude that the effects of parenting on savings behavior seem to be smaller when parenting is likely more scarce.

## B Gene-Environment Interactions

While an individual’s genes may provide an innate predisposition to a specific savings behavior, we predict that environmental conditions may determine the extent to which the behavior is expressed. In this section, we therefore examine gene-environment interactions.<sup>38</sup>

The bioecological theory of gene-environment interactions suggests that the expression of a specific genetic predisposition is stronger in more supportive environments (Bronfenbrenner and Ceci, 1994).<sup>39</sup> We therefore predict that a more supportive socioeconomic environment, both in the family when growing up or later in life, moderates a genetic effect on savings behavior.

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<sup>36</sup>We note that there may be a sample selection problem if only those with particularly effective parenting skills endogenously choose to have a larger number of children.

<sup>37</sup>We do not find that this effect decays with the number of children, either because the main difference is between twins and one extra child or because the decay is difficult to estimate precisely as there are only a small number of families with four or more children in our data set.

<sup>38</sup>For a more extensive overview of research on the interplay of genes and environments, we refer to Rutter (2006).

<sup>39</sup>This model can, for example, explain the evidence in Taylor et al. (2010), who show that the genetic effect on reading fluency among first- and second-graders increases as the quality of the children’s teacher increases (measured by reading gain among non-twin classmates).

## B.1 Family Environment

We examine the extent to which the twin’s family environment when growing up moderates genetic propensities. One characteristic of the family environment is the net worth and the financial resources in the family.<sup>40</sup> Panel B of Table 5 reports that an individual’s savings behavior in adult life is more affected by genes when growing up in a wealthier family. In particular, genes explain 25 percent of the cross-sectional variation in savings propensity among those who grew up in wealthier families, compared to 18 percent among those who grew up in a relatively poorer family.

## B.2 Current Environment

We also examine whether an individual’s current socioeconomic status, measured by the twin’s own net worth, moderates genetic effects on savings behavior. Panel C of Table 5 reports that genes explain about 37 percent of the cross-sectional variation in the propensity to save among the wealthier, compared to only 21 percent among the relatively poorer. One interpretation of this evidence is that while the wealthier are able to choose a consumption-savings behavior that reflects their genetic predisposition and preferences, the savings behavior of the relatively poor is more governed by the individual-specific life experiences that, by chance, they were exposed. We conclude that a more supportive environment results in a stronger genetic expression of savings behavior.<sup>41</sup> Importantly, an individual’s current socioeconomic status seems to be a stronger moderator of genetic effects than the parental and family environment.

## C Why is Savings Behavior Genetic?

To analyze what explains the genetic component of savings behavior, we next examine whether our measure of savings behavior is correlated with other behaviors and outcomes that may measure

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<sup>40</sup>We are not able to measure parents’ net worth when the twins grew up so we use parents’ net worth at the end of 2002 as an admittedly imperfect proxy.

<sup>41</sup>While the results presented here suggest a significant gene-environment interaction, they could be confounded by possible gene-environment correlations (see, for example, Purcell (2002)). We have therefore estimated a gene-environment interaction model in the presence of gene-environment correlation (see Rathouz et al. (2008)). We find a significant genetic correlation between the savings rate and an indicator that is one if a twin’s net worth is higher than the median and zero otherwise. Nevertheless, we also find support for a statistically significant and directionally similar moderating effect of wealth on the genetic and environmental factors. The implied variance components for twins with net-worth below and above the median are very similar to those reported in Panel C of Table 5. Details are available upon request.

time preferences, impatience, or lack of self-control, such as income growth, education, smoking, and relative body weight. In Panel A of Table 6, we report the overall correlation between the propensity to save and these other measures. We compute the average log income growth rate for each individual between the end of 2002 and the end of 2006. We find a significantly positive correlation between an individual's savings rate and income growth, consistent with the common prediction that patient individuals experience higher income growth. Importantly, for a subset of individuals, data on education (number of years), smoking (number of cigarettes smoked per day), and body mass index (BMI) (weight relative to squared height) are available from the STR's interviews.<sup>42</sup> We find no statistically significant correlation between education and savings behavior, but significantly negative correlations between an individual's savings rate and smoking and body mass index. That is, those who save less are found to smoke more and are more likely to be obese based on their BMI. Overall, this evidence suggests a certain consistency in behavior (Barsky et al., 1997) because of an individual's time preferences and level of self-control.

We also decompose the covariance matrices for these outcomes into three components corresponding to genetic effect as well as effects of the common and individual-specific environments.<sup>43</sup> Based on the decomposed covariance matrices, we compute the genetic and environmental correlations between savings behavior and the other behaviors and outcomes. This enables us to examine whether the overall correlations are genetic or environmental. Table 6 Panel B shows that the correlations between savings behavior and each of the other behaviors and outcomes are almost entirely due to overlapping genetic factors. For example, lack of savings and obesity is correlated because of genes, not environmental conditions. Only our measure of smoking has a weakly significant environmental correlation with savings behavior.<sup>44</sup>

One explanation for why savings behavior is genetic appears to be that an individual's time preferences are partly genetic. Our evidence of a significant positive genetic correlation between an individual's savings and income growth supports such an explanation. Some individuals are born to

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<sup>42</sup>These data were collected between 1998 and 2002 and are only available for twins born before 1958.

<sup>43</sup>For this analysis, we use a bivariate Cholesky decomposition; see Neale and Maes (2004) for details.

<sup>44</sup>More generally, these results stress the importance of accounting for latent characteristics when examining the causal impact of one behavior or environment onto an outcome of interest (see Conti et al. (2010) for a discussion of the effect of education on health outcomes).

be more patient, and this affects these individuals' savings behavior, as well as other outcomes, e.g., the choice of income process. Moreover, the negative and significant genetic correlation between savings rate and both smoking and body weight suggests that behavioral factors such as lack of self-control may also affects savings behavior. For example, to the extent that a high BMI and obesity may be interpreted as an expression of lack of self-control, we conclude that lack of savings correlates with lack of self-control, and this correlation is mainly found to be genetic.

## VI What the Evidence Does and Does Not Mean

In this section, we discuss several important implications of our findings.

### *Implications for Accumulation of Wealth*

The evidence in this paper, together with the existing evidence on genetic determinants of income and asset allocation (Behrman and Taubman (1989), Taubman (1976), Barnea, Cronqvist, and Siegel (2010), and Cesarini et al. (2010)), suggest that cross-sectional variation in wealth at retirement age partly reflects genetic differences across individuals. In Table 7, we therefore estimate a random effect model as in equation (2) for net worth around retirement age (60 to 69 year), i.e., we study the outcome of many years of income, savings behavior, and asset allocations.<sup>45</sup> We find that about 39 percent of the cross-sectional variation in wealth accumulated up to retirement is explained by genes. The effect of the common family environment and upbringing, which by model construction also reflects wealth inherited from parents, explain seven percent of the cross-sectional variation. The remaining 54 percent is due to individual-specific life experiences. The evidence that accumulated wealth is partly genetic has potential implications for our understanding of the causes behind persistent wealth inequalities in society.

### *Variation Across Countries and Cultures*

While we find that genes explain about 33 percent of the variation in savings behavior across

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<sup>45</sup>We include all individuals that in 2006 were between 60 and 69 years old and had non-missing wealth data between 2003 and 2006. To avoid that our results are affected by outliers, we drop individuals in the bottom and top one percent of the distribution.

individuals in our sample, it is important to note that this is not a universal biological constant, but an estimate *relative* to the amount of environmental variation in the analyzed sample. If there is limited variation in environmental factors, then the genetic component will indeed be relatively large. Our data are from Sweden, a country which is sometimes perceived to have relatively high cultural homogeneity (meaning low variation in environmental factors in the context of our model). Since we only observe individuals from one country at one point in time, our empirical analysis cannot capture the relative importance of country characteristics such as culture. Finally, the analysis of one country rather than a broader set, likely reduces the amount of total variation in environmental factors. To get some sense for the importance of environmental variation, we have re-estimated our model for those living in the most rural areas (average population density of 6 residents per km<sup>2</sup>) and those in the most urban areas (average population density of 1,030 residents per km<sup>2</sup>). We find (untabulated) that the individual-specific environment ( $E$ ) explains a larger proportion of the variation in more populated regions (65%) than in the most rural areas (52%). Our interpretation of this evidence is that life in more populated areas results in exposure to more idiosyncratic life experiences, through, e.g., social interaction and consumption choices, which affects savings behavior. In contrast, in very rural areas, savings behavior is less affected by idiosyncratic life experiences, but more by genetic predisposition.

### *Oblique Socialization and Peer Effects*

Our evidence should not be interpreted as meaning that peer and social networking effects are unimportant for savings behavior.<sup>46</sup> First, while one specific social transmission mechanism – the one between parents and their children – is found to be small on average, our analysis also reveals some of the specific subsets of individuals for which parent-child transmission of behavior are significant. Second, in this paper we have not analyzed peers and their effects on individuals' savings behavior. However, exploiting the data on twin-twin communication, we find (untabulated) that social interactions are important: Twins who interact more than once per week with each other have more similar savings behavior as captured by a significant common environmental component  $C$

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<sup>46</sup>Several studies in economics and finance suggest that peer effects are important in the financial domain (e.g., Madrian and Shea (2000), Hong et al. (2004), and Brown et al. (2008)).

that in this subset explains about 12% of the variation in savings behavior. This result is consistent with social interaction affecting individuals' behavior (e.g., Bikhchandani et al. (1992, 1998), Shiller (1995), and Hirshleifer and Teoh (2009)), and emphasizes the potential importance of “oblique socialization” (Cavalli-Sforza and Feldman, 1981) also in the domain of savings behavior. Recently, even the kindergarten environment has been shown to explain savings behavior of adults (Chetty et al., 2010). To the extent that twins have non-overlapping social networks, peer effect on savings will in our paper be captured by the individual idiosyncratic factor ( $E$  in our model). Future research should examine which specific characteristics of social networks are important for savings behavior and also whether this is an environmental factor which moderates genetic effects (e.g., whether peers similar to oneself moderate genetic propensity).

### *Effectiveness of Public Policy*

Economists and policy makers have recently devoted significant effort to examining financial literacy and methods to change individual savings behavior (e.g., Bernheim, Garrett, and Maki (2001b), Bernheim and Garrett (2003), Thaler and Benartzi (2004), Lusardi and Mitchell (2009)). One important question is therefore whether our evidence of a genetic component of savings behavior means that policy in the domain of savings behavior is meaningless? As argued by Bernheim (2009), evidence of a genetic component of savings behavior has implications for the design and the evaluation of policy initiatives with respect to savings behavior: Environmental factors are presumably more amenable to policy than innate predispositions. The decaying effect of parenting suggests that policies that rely mainly on parents for implementation may not have a life-long impact. We also find evidence of significant gene-environment interaction, which means that understanding the genetic component of savings behavior and its interactions with the environment may produce *more* effective policies. But it is important to point out that our analysis is focused on the cross-sectional variance of savings behavior, not the level: Certain policies can affect the average amount of savings without affecting the variation across individuals. For example, policy that changes a country's “savings culture” are not captured in our variance decomposition model.

## VII Conclusion

The goal of this study has been to understand the deeper origins of individuals' savings behavior. Our work suggests that there is not a simple answer to the question of what explains variation in individual's savings behavior. Savings behavior is governed by both innate genetic predispositions, social transmission of behavior from parents to their children, and gene-environment interactions where the environmental conditions moderate genetic effects.

We find that genes explain about 33 percent of the variation in savings behavior across individuals. Each individual is born with an innate genetic predisposition to a specific savings behavior, an effect that is found not to disappear later in life. Parenting explains 40 to 50 percent of the variation in savings rates for the youngest individuals in our sample (20 to 25 year olds), but this effect decays significantly and attains zero for those in their forties, i.e., parenting does not have a lifelong impact on their children's savings propensities. We also find that the family environment when growing up (the wealth of the parents) and an individual's current socioeconomic status moderates genetic predispositions to a particular savings behavior, evidence which is consistent with theories that genetic effects are predicted to be stronger in more supportive environments. Finally, we examine why savings behavior is genetic, and find that savings is genetically correlated with income growth, smoking, and body mass index, suggesting that the genetic component of savings behavior reflects time preferences as well as lack of self-control.

Our work raises a number of currently unanswered questions for future research. For example, we find that more than half of the cross-sectional variation in savings rates is explained by individual-specific life experiences. What are the important events in life that systematically govern an individual's savings behavior? Identical twins start off early in life exhibiting very similar savings behaviors, but over their lives their savings behavior sometimes start to diverge, so the question then becomes what are the differential life experiences that result in different savings behavior? Another question relates to gene-environment interactions, in particular to better understanding what experiences or interventions moderate genetic propensities to a specific savings behavior.

## References

- Ameriks, J., Caplin, A., Leahy, J., 2003. Wealth accumulation and the propensity to plan. *Quarterly Journal of Economics* 118 (3), 1007–1047.
- Ashenfelter, O., Krueger, A. B., 1994. Estimates of the economic returns to schooling from a new sample of twins. *American Economic Review* 84 (5), 1157–1173.
- Ashenfelter, O., Rouse, C., 1998. Income, schooling, and ability: Evidence from a new sample of identical twins. *Quarterly Journal of Economics* 113 (1), 253–284.
- Barkley, R. A., 1997. *ADHD and the nature of self-control*. Guilford Press, New York, NY.
- Barnea, A., Cronqvist, H., Siegel, S., 2010. Nature or nurture: What determines investor behavior? *Journal of Financial Economics* 98, 583–604.
- Barsky, R. B., Juster, F. T., Kimball, M. S., Shapiro, M. D., 1997. Preference parameters and behavioral heterogeneity: An experimental approach in the health and retirement study. *Quarterly Journal of Economics* 112, 537–579.
- Becker, G., Mulligan, C., 1997. The endogenous determination of time preference. *Quarterly Journal of Economics* 112 (3), 729–758.
- Becker, G., Tomes, N., 1976. Child endowments and the quantity and quality of children. *Journal of Political Economy* 84 (4), 143–162.
- Becker, G. S., 1976. Altruism, egoism, and genetic fitness: Economics and sociobiology. *Journal of Economic Literature* 14, 817–826.
- Behrman, J., Taubman, P., 1989. Is schooling mostly in the genes? Nature-nurture decomposition using data on relatives. *Journal of Political Economy* 97, 1425–1446.
- Behrman, J. R., Taubman, P., 1976. Intergenerational transmission of income and wealth. *American Economic Review* 66, 436–440.
- Benartzi, S., Thaler, R. H., 2007. Heuristics and biases in retirement savings behavior. *Journal of Economic Perspectives* 21, 81–104(24).
- Benjamin, D., Chabris, C., Glaeser, E., Gudnason, V., Harris, T., Laibson, D., Launer, L., Purcell, S., 2008. *Genoeconomics*. The National Academies Press, Ch. 15, pp. 304–335.
- Bernheim, B., 1991. How strong are bequest motives? Evidence based on estimates of the demand for life insurance and annuities. *Journal of Political Economy* 99 (5), 899–927.
- Bernheim, B., 2009. On the potential of neuroeconomics: A critical (but hopeful) appraisal. *American Economic Journal: Microeconomics* 1 (2), 1–41.
- Bernheim, B., Skinner, J., Weinberg, S., 2001a. What accounts for the variation in retirement wealth among U.S. households? *American Economic Review* 91 (4), 832–857.
- Bernheim, B. D., Garrett, D. M., 2003. The effects of financial education in the workplace: Evidence from a survey of households. *Journal of Public Economics* 87, 1487–1519.

- Bernheim, B. D., Garrett, D. M., Maki, D. M., 2001b. Education and saving: The long-term effects of high school financial curriculum mandates. *Journal of Public Economics* 80, 435–465.
- Bernheim, B. D., Shleifer, A., Summers, L. H., 1985. The strategic bequest motive. *Journal of Political Economy* 93 (6), 1045–1076.
- Bikhchandani, S., Hirshleifer, D., Welch, I., 1992. A theory of fads, fashion, custom, and cultural change as informational cascades. *Journal of Political Economy* 100 (5), 992–1026.
- Bikhchandani, S., Hirshleifer, D., Welch, I., 1998. Learning from the behavior of others: Conformity, fads, and informational cascades. *Journal of Economic Perspectives* 12 (3), 151–170.
- Bisin, A., Topa, G., Verdier, T., 2004. Religious intermarriage and socialization in the United States. *Journal of Political Economy* 112 (3), 615–664.
- Bisin, A., Verdier, T., 2000. Beyond the melting pot: Cultural transmission, marriage, and the evolution of ethnic and religious traits. *Quarterly Journal of Economics* 115 (3), 955–988.
- Bisin, A., Verdier, T., 2001. The economics of cultural transmission and the dynamics of preferences. *Journal of Economic Theory* 97 (2), 298 – 319.
- Bisin, A., Verdier, T., 2008. Cultural transmission. In: Durlauf, S. N., Blume, L. E. (Eds.), *The New Palgrave Dictionary of Economics*. Palgrave Macmillan, Basingstoke.
- Björklund, A., Lindahl, M., Plug, E., 2006. The origins of intergenerational associations: Lessons from Swedish adoption data. *Quarterly Journal of Economics* 121, 999–1028.
- Black, S. E., Devereux, P. J., Salvanes, K. G., 2005. Why the apple doesn't fall far: Understanding intergenerational transmission of human capital. *American Economic Review* 95 (1), 437–449.
- Borjas, G. J., 1992. Ethnic capital and intergenerational mobility. *Quarterly Journal of Economics* 107 (1), 123–150.
- Bortolus, R., Parazzini, F., Chatenoud, L., Benzi, G., Bianchi, M., Marini, A., 1999. The epidemiology of multiple births. *Human Reproduction Update* 5 (2), 179.
- Bouchard, T. J., 1998. Genetic and environmental influences on adult intelligence and special mental abilities. *Human Biology* 70, 257–279.
- Bouchard, T. J., Lykken, D. T., McGue, M., Segal, N. L., Tellegen, A., 1990. Sources of human psychological differences: The Minnesota study of twins reared apart. *Science* 250, 223–228.
- Bouchard, T. J., McGue, M., 1981. Familial studies of intelligence: A review. *Science* 212, 1055–1059.
- Bowles, S., Gintis, H., 2002. The inheritance of inequality. *Journal of Economic Perspectives* 16 (3), 3–30.
- Boyd, R., Richerson, P., 1985. *Culture and the Evolutionary Process*. University of Chicago Press, Chicago, IL.
- Brennan, T. J., Lo, A. W., 2009. The origin of behavior. Working Paper, MIT Sloan School of Management.

- Bronfenbrenner, U., Ceci, S. J., 1994. Nature-nurture in developmental perspective: A bioecological theory. *Psychological Review* 101, 568–586.
- Brown, J. R., Ivković, Z., Smith, P. A., Weisbenner, S., 2008. Neighbors matter: Causal community effects and stock market participation. *Journal of Finance* 63, 1509–1532.
- Browning, M., Lusardi, A., 1996. Household saving: Micro theories and micro facts. *Journal of Economic Literature* 34, 1797–1855.
- Calvet, L. E., Campbell, J. Y., Sodini, P., 2007. Down or out: Assessing the welfare costs of household investment mistakes. *Journal of Political Economy* 115, 707–747.
- Calvet, L. E., Campbell, J. Y., Sodini, P., 2009. Fight of flight? Portfolio rebalancing by individual investors. *Quarterly Journal of Economics* 124, 301–348.
- Camerer, C., Loewenstein, G., Prelec, D., 2005. Neuroeconomics: How neuroscience can inform economics. *Journal of Economic Literature* 43, 9–64.
- Carpenter, J. P., Garcia, J. R., Lum, J. K., 2009. Can dopamine receptor genes explain economic preferences and outcomes? Working Paper, Middlebury College.
- Carroll, C. D., 1992. The buffer-stock theory of saving: Some macroeconomic evidence. *Brookings Papers on Economic Activity* 23 (1992-2), 61–156.
- Cavalli-Sforza, L., Feldman, M., 1981. *Cultural Transmission and Evolution: A Quantitative Approach*. Princeton University Press, Princeton, NJ.
- Cesarini, D., Dawes, C. T., Johannesson, M., Lichtenstein, P., Wallace, B., 2009. Genetic variation in preferences for giving and risk taking. *Quarterly Journal of Economics* 124, 809–842.
- Cesarini, D., Johannesson, M., Lichtenstein, P., Sandewall, O., Wallace, B., 2010. Genetic variation in financial decision making. *Journal of Finance* 65, 1725–1754.
- Charles, K. K., Hurst, E., 2003. The correlation of wealth across generations. *Journal of Political Economy* 111, 1155–1182.
- Chetty, R., Friedman, J. N., Hilger, N., Saez, E., Whitmore Schanzenbach, D., Yagan, D., 2010. How does your kindergarten classroom affect your earnings? evidence from project star. NBER Working Paper.
- Chiteji, N. S., Stafford, F. P., 1999. Portfolio choices of parents and their children as young adults: Asset accumulation by African-Americans. *American Economic Review* 89, 377–380.
- Conti, G., Heckman, J. J., Urzua, S., 2010. The education-health gradient. *American Economic Review* 100 (2), 234–38.
- Cronqvist, H., Thaler, R. H., 2004. Design choices in privatized social-security systems: Learning from the Swedish experience. *American Economic Review* 94 (2), 424–28.
- Cunha, F., Heckman, J. J., 2010. Investing in our young people. Working Paper, University of Chicago, Department of Economics.

- Deaton, A., 1991. Saving and liquidity constraints. *Econometrica* 59 (5), 1221–1248.
- Dreber, A., Apicella, C. L., Eisenberg, D. T. A., Garcia, J. R., Zamore, R. S., 2009. The 7R polymorphism in the dopamine receptor D4 gene (DRD4) is associated with financial risk-taking in men. *Evolution and Human Behavior* 30, 85–92.
- Duflo, E., Gale, W., Liebman, J., Orszag, P., Saez, E., 2006. Saving incentives for low-and middle-income families: Evidence from a field experiment with h&r block. *Quarterly Journal of Economics* 121 (4), 1311–1346.
- Dynan, K. E., Skinner, J., Zeldes, S. P., 2004. Do the rich save more? *Journal of Political Economy* 112 (2), 397–444.
- Eisenberg, D., MacKillop, J., Modi, M., Beauchemin, J., Dang, D., Lisman, S., Lum, J., Wilson, D., 2007. Examining impulsivity as an endophenotype using a behavioral approach: a DRD2 taqi a and DRD4 48-bp VNTR association study. *Behavioral and Brain Functions* 3 (1), 2.
- Feng, R., Zhou, G., Zhang, M., Zhang, H., 2009. Analysis of twin data using SAS. *Biometrics* 65, 584–589.
- Fernandez, R., Fogli, A., Olivetti, C., 2004. Mothers and sons: Preference formation and female labor force dynamics. *Quarterly Journal of Economics* 119 (4), 1249–1299.
- Fraga, M. F., Ballestar, E., Paz, M. F., Ropero, S., Setien, F., Ballestar, M. L., Heine-Suer, D., Cigudosa, J. C., Urioste, M., Benitez, J., Boix-Chornet, M., Sanchez-Aguilera, A., Ling, C., Carlsson, E., Poulsen, P., Vaag, A., Stephan, Z., Spector, T. D., Wu, Y.-Z., Plass, C., Esteller, M., 2005. Epigenetic differences arise during the lifetime of monozygotic twins. *Proceedings of the National Academy of Sciences of the United States of America* 102 (30), 10604–10609.
- Friedman, M., 1953. Choice, chance, and the personal distribution of income. *Journal of Political Economy* 61 (4), 277–290.
- Fuchs, V. R., 1982. Self-employment and labor force participation of older males. *Journal of Human Resources* 17 (3), 339–357.
- Güell, M., Rodríguez Mora, J. V., Telmer, C., 2007. Intergenerational mobility and the informative content of surnames. Working Paper, Carnegie Mellon University, Tepper School of Business.
- Harden, K., Turkheimer, E., Loehlin, J., 2007. Genotype by environment interaction in adolescents cognitive aptitude. *Behavior Genetics* 37, 273–283, 10.1007/s10519-006-9113-4.
- Harris, J. R., 1995. Where is the child’s environment? A group socialization theory of development. *Psychological Review* 102 (3), 458 – 489.
- Harrison, G. W., Lau, M. I., Williams, M. B., 2002. Estimating individual discount rates in Denmark: A field experiment. *American Economic Review* 92 (5), 1606–1617.
- Hess, G., 2004. Marriage and consumption insurance: What’s love got to do with it? *Journal of Political Economy* 112 (2), 290–318.

- Hirshleifer, D., Teoh, S. H., 2009. Thought and behavior contagion in capital markets. In: Hens, T., Schenk-Hoppe, K. (Eds.), *Handbook of Financial Markets: Dynamics And Evolution*, Handbooks in Finance. North-Holland, Amsterdam, The Netherlands, Ch. 1, pp. 1–46.
- Hirshleifer, J., 1977. Economics from a biological viewpoint. *Journal of Law and Economics* 20, 1–52.
- Hong, H., Kubik, J. D., Stein, J. C., 2004. Social interaction and stock-market participation. *Journal of Finance* 59 (1), 137–163.
- Hubbard, R., Skinner, J., Zeldes, S., 1995. Precautionary saving and social insurance. *Journal of Political Economy*, 360–399.
- Hur, Y.-M., 2007. Effects of the Chorion Type on Prosocial Behavior in Young South Korean Twins. *Twin Research and Human Genetics* 10 (5), 773–777.
- Kimball, M., 1990. Precautionary saving in the small and in the large. *Econometrica* 58 (1), 53–73.
- Kimball, M. S., Sahm, C. R., Shapiro, M. D., 2009. Risk preferences in the psid: Individual imputations and family covariation. *American Economic Review* 99 (2), 363–68.
- Knowles, J., Postlewaite, A., 2004. Do children learn to save from their parents? Working Paper, University of Pennsylvania, Department of Economics.
- Knudsen, E. I., Heckman, J. J., Cameron, J. L., Shonkoff, J. P., 2006. Economic, neurobiological, and behavioral perspectives on building Americas future workforce. *Proceedings of the National Academy of Sciences* 103 (27), 10155–10162.
- Kuhnen, C. M., Chiao, J., 2009. Genetic determinants of financial risk taking. *PLoS ONE* 4.
- Lawrance, E. C., 1991. Poverty and the rate of time preference: Evidence from panel data. *Journal of Political Economy* 99 (1), 54–77.
- Leland, H., 1968. Saving and uncertainty: The precautionary demand for saving. *Quarterly Journal of Economics* 82 (3), 465–473.
- Lichtenstein, P., Sullivan, P. F., Cnattingius, S., Gatz, M., Johansson, S., Carlström, E., Björk, C., Svartengren, M., Wolk, A., Klareskog, L., de Faire, U., Schalling, M., Palmgren, J., Pedersen, N. L., 2006. The Swedish twin registry in the third millennium: An update. *Twin Research and Human Genetics* 9, 875–882.
- Lusardi, A., 1998. On the importance of the precautionary saving motive. *American Economic Review* 88 (2), 449–453.
- Lusardi, A., 2001. Explaining why so many people do not save. Working Paper, Dartmouth College, Department of Economics.
- Lusardi, A., Mitchell, O. S., 2009. How ordinary consumers make complex economic decisions: Financial literacy and retirement readiness. Working Paper, Dartmouth College, Department of Economics.

- Madrian, B. C., Shea, D., 2000. Peer effects and savings behavior in employer-sponsored savings plans. Working Paper, University of Chicago, Graduate School of Business.
- Madrian, B. C., Shea, D. F., 2001. The power of suggestion: Inertia in 401(k) participation and savings behavior. *Quarterly Journal of Economics* 116, 1149–1525.
- Marshall, A., 1920. *Principles of Economics*. Macmillan, London, U.K.
- McArdle, J. J., Prescott, C. A., 2005. Mixed effects variance components models for biometric family analysis. *Behavior Genetics* 35, 631–652.
- McClearn, G. E., Johansson, B., Berg, S., Pedersen, N. L., Ahern, F., Petrill, S. A., Plomin, R., 1997. Substantial genetic influence of cognitive abilities in twins 80 or more years old. *Science* 276, 1560–1563.
- Merton, R. C., 1969. Lifetime portfolio selection under uncertainty: The continuous-time case. *Review of Economics and Statistics* 51, 247–257.
- Mischel, W., Shoda, Y., Rodriguez, M., 1989. Delay of gratification in children. *Science* 244 (4907), 933–938.
- Modigliani, F., Brumberg, R., 1954. Utility analysis and the consumption function: an interpretation of cross-section data. In: Kurihara, K. K. (Ed.), *Post-Keynesian Economics*. Rutgers University Press, New Brunswick, NJ.
- Mulligan, C., 1999. Galton versus the human capital approach to inheritance. *Journal of Political Economy* 107 (S6), S184–S224.
- Neale, M. C., Maes, H. H. M., 2004. *Methodology for Genetic Studies of Twins and Families*. NATO ASI Series D: Behavioural and Social Science. Kluwer Academic Publishers B.V., Dordrecht, The Netherlands.
- Netzer, N., 2009. Evolution of time preferences and attitudes toward risk. *American Economic Review* 99, 937–955.
- O'Donoghue, T., Rabin, M., 1999. Doing it now or later. *American Economic Review* 89, 103–124.
- Pencavel, J., 1998. Assortative mating by schooling and the work behavior of wives and husbands. *American Economic Review* 88, 326–329.
- Phillips, D. I. W., 1993. Twin studies in medical research: can they tell us whether diseases are genetically determined? *The Lancet* 341 (8851), 1008 – 1009.
- Plomin, R., Defries, J. C., McClearn, G. E., McGuffin, P., 2008. *Behavioral Genetics*. Worth Publishers, New York, NY.
- Poterba, J., Venti, S., Wise, D., 2007. The decline of defined benefit retirement plans and asset flows. NBER Working Paper.
- Prescott, C. A., Johnson, R. C., McArdle, J. J., 1999. Chorion type as a possible influence on the results and interpretation of twin study data. *Twin Research* 2, 244–249.

- Purcell, S., 2002. Variance components models for gene-environment interaction in twin analysis. *Twin Research* 5, 554–571.
- Rathouz, P., Van Hulle, C., Rodgers, J., Waldman, I., Lahey, B., 2008. Specification, testing, and interpretation of gene-by-measured-environment interaction models in the presence of gene-environment correlation. *Behavior Genetics* 38, 301–315.
- Richerson, P., Boyd, R., 2005. *Not By Genes Alone*. University of Chicago Press, Chicago, IL.
- Robson, A. J., 1996. The evolution of attitudes to risk: Lottery tickets and relative wealth. *Games and Economic Behavior* 14, 190–207.
- Robson, A. J., 2001. Why would nature give individuals utility functions? *Journal of Political Economy* 109, 900–914.
- Robson, A. J., Samuelson, L., 2009. The evolution of time preference with aggregate uncertainty. *American Economic Review* 99 (5), 1925–53.
- Rogers, A. R., 1994. Evolution of time preference by natural selection. *American Economic Review* 84 (3), 460–81.
- Rutter, M., 2006. *Genes and behavior: Nature/nurture interplay explained*. Blackwell Publishers, Oxford, UK.
- Sacerdote, B., 2002. The nature and nurture of economic outcomes. *American Economic Review* 92, 344–348.
- Samuelson, P. A., 1969. Lifetime portfolio selection by dynamic stochastic programming. *Review of Economics and Statistics* 51, 239–246.
- Shiller, R. J., 1995. Conversation, information, and herd behavior. *American Economic Review* 85 (2), 181–185.
- Skinner, J., 1988. Risky income, life cycle consumption, and precautionary savings. *Journal of Monetary Economics* 22 (2), 237–255.
- Sokol, D., Moore, C., Rose, R., Williams, C., Reed, T., Christian, J., 1995. Intrapair differences in personality and cognitive ability among young monozygotic twins distinguished by chorioion type. *Behavior Genetics* 25, 457–466, 10.1007/BF02253374.
- Solon, G., 1992. Intergenerational income mobility in the United States. *American Economic Review* 82 (3), 393–408.
- Taubman, P., 1976. The determinants of earnings: Genetics, family, and other environments: A study of white male twins. *American Economic Review* 66 (5), 858–870.
- Taylor, J., Roehrig, A. D., Hensler, B. S., Connor, C. M., Schatschneider, C., 2010. Teacher quality moderates the genetic effects on early reading. *Science* 328 (5977), 512–514.
- Thaler, R. H., 1994. Psychology and savings policies. *American Economic Review* 84 (2), 186–192.

- Thaler, R. H., Benartzi, S., 2004. Save more tomorrow: Using behavioral economics to increase employee savings. *Journal of Political Economy* 112, 164–187.
- Thaler, R. H., Shefrin, H. M., 1981. An economic theory of self-control. *Journal of Political Economy* 89 (2), 392–406.
- Venti, S. F., Wise, D. A., 1998. The cause of wealth dispersion at retirement: Choice or chance? *American Economic Review* 88 (2), 185–191.
- Venti, S. F., Wise, D. A., 2000. Choice, chance, and wealth dispersion at retirement. Working Paper, National Bureau of Economic Research.
- Warner, J. T., Pleeter, S., 2001. The personal discount rate: Evidence from military downsizing programs. *American Economic Review* 91 (1), 33–53.
- Zhong, S., Israel, S., Xue, H., Ebstein, R. P., Chew, S. H., 2009. Monoamine Oxidase A gene (MAOA) associated with attitude towards longshot risks. *PLoS ONE* 4.

**Table 1**  
Summary Statistics

**Panel A: Number of Twins by Zygosity and Sex**

	All Twins	Identical Twins			Fraternal Twins			
		Male	Female	Total	Same Sex: Male	Same Sex: Female	Opposite Sex	Total
Number of twins ( <i>N</i> )	14,930	1,988	2,494	4,482	2,142	2,622	5,684	10,448
Fraction (%)	100%	13%	17%	30%	14%	18%	38%	70%

**Panel B: Socioeconomic Characteristics and Asset Allocation**

Variable	All Twins	Identical Twins			Fraternal Twins		
	<i>N</i>	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.
Age	14,930	48.84	52.00	12.52	53.20	56.00	9.98
Married	14,930	0.51	1.00	0.50	0.58	1.00	0.49
Divorced	14,930	0.10	0.00	0.30	0.11	0.00	0.32
Widowed	14,930	0.02	0.00	0.12	0.02	0.00	0.15
Number of Siblings	14,930	1.38	1.00	1.33	1.51	1.00	1.45
Children in Household Indicator	14,930	0.42	0.00	0.49	0.38	0.00	0.48
Number of Children in Household (4-year avg.)	14,930	0.86	0.00	1.17	0.71	0.00	1.07
Poor Health (4-year avg.)	14,930	0.19	0.00	0.32	0.21	0.00	0.35
Unemployed (4-year avg.)	14,930	0.12	0.00	0.27	0.10	0.00	0.26
College Degree	14,742	0.87	1.00	0.33	0.82	1.00	0.38
Parent(s) still Alive (2002)	14,930	0.61	1.00	0.49	0.52	1.00	0.50
Inheritance (USD, 2003-2006)	14,930	1,616	0	12,447	1,438	0	9,443
Disposable Income (USD, 4-year avg.)	14,930	34,628	30,551	19,412	35,978	31,210	22,551
St. Dev. of Log Growth Rate of Disposable Household Income	14,930	0.22	0.19	0.14	0.20	0.17	0.14
Net Worth (USD, 4-year avg.)	14,930	132,048	83,098	161,961	139,214	90,404	168,248
Business Owner	14,930	0.05	0.00	0.22	0.07	0.00	0.25
Equity / Assets (excl. Housing) (4-year avg.)	14,930	0.37	0.33	0.31	0.35	0.30	0.31
Bonds / Assets (excl. Housing) (4-year avg.)	14,930	0.02	0.00	0.07	0.02	0.00	0.07
Cash / Assets (excl. Housing) (4-year avg.)	14,930	0.34	0.26	0.30	0.33	0.25	0.29
Other Financial Assets / Assets (excl. Housing) (4-year avg.)	14,930	0.08	0.00	0.18	0.08	0.00	0.18
Real Assets (excl. Housing) / Assets (excl. Housing) (4-year avg.)	14,930	0.18	0.00	0.32	0.22	0.00	0.34

**Panel C: Savings Behavior**

Variable	All Twins	Identical Twins			Fraternal Twins		
	<i>N</i>	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.
Change in Net Worth (USD)	14,930	76,107	49,697	106,929	78,489	52,258	112,846
Change in Home Value (USD)	14,930	41,206	24,170	63,381	40,748	25,236	64,248
Savings Rate	14,930	0.23	0.12	0.53	0.25	0.13	0.54
Adjusted Savings Rate	14,930	0.00	-0.05	0.50	0.00	-0.05	0.51

Table 1 Panel A provides information on the number of identical and non-identical twins used in this study. Panel B provides summary statistics for several socio-demographic characteristics and asset allocation choices, separately for identical and non-identical twins. Panel C reports summary statistics for the main measure of savings behavior, *Savings Rate*, which is defined as the four year change in net worth adjusted for the change in home value (zero for non-home owners) divided by the four year disposable income, as well as the *Adjusted Savings Rate*, which is the residual from regressions reported in Appendix Table A2. All variables are defined in Appendix Table A1.

**Table 2**  
Decomposition of Savings Behavior

**Panel A: All Twins**  
(*N*=14,930)

Model	AIC	Variance Components		
		<i>A</i>	<i>C</i>	<i>E</i>
E	21,850			1.0000
CE	21,526		0.2066 0.0111	0.7934 0.0111
ACE	21,468	0.3273 0.0155	0.0000	0.6727 0.0155

**Panel B: By Sex**

Model	<i>N</i>	Variance Components		
		<i>A</i>	<i>C</i>	<i>E</i>
Male Twins	4,130	0.3540 0.0258	0.0000	0.6460 0.0258
Female Twins	5,116	0.2308 0.0717	0.0777 0.0566	0.6915 0.0259

Table 2 reports results from maximum likelihood estimation of linear random effects models. The (adjusted) *Savings Rate* is modeled as a linear function of up to three random effects representing additive genetic effects (*A*), shared environmental effects (*C*), as well as an individual-specific error (*E*). In Panel A, we report results for a model that only allows for an individual-specific random effect (*E* model), a model that also allows for a shared environmental effect (*CE* model), and a model that also allows for an additive genetic effect (*ACE* model). The model is estimated using all 14,930 twins in our data set. When the non-negativity constraint for a variance parameter is binding, we report a zero. In each case, we report Akaike's information criterion (AIC), the variance fraction of the combined error term explained by each random effect (*A* – for the additive genetic effects, *C* – for shared environmental effects, *E* – for the individual-specific random effect) as well as the corresponding standard errors. We perform likelihood ratio tests (LR) and at the 1% level reject the *E* model in favor of the *CE* model and the *CE* model in favor of the *ACE* model. Panel B reports results for *ACE* models estimated separately for male and female twins. *N* provides the number of observations used in each estimation.

**Table 3**  
Measuring Savings Behavior

**Panel A: Alternative Measures**

Model	<i>N</i>	Variance Components		
		<i>A</i>	<i>C</i>	<i>E</i>
Savings Rate 2	14,350	0.3223 0.0461	0.0081 0.0328	0.6696 0.0189
Wealth-to-Income Ratio	14,362	0.3964 0.0418	0.0320 0.0307	0.5717 0.0167

**Panel B: Controlling for Private Employer Pensions**

Model	<i>N</i>	Variance Components		
		<i>A</i>	<i>C</i>	<i>E</i>
Not Controlling for Occupation	7,886	0.2774 0.0236	0.0000	0.7226 0.0236
Controlling for Occupation	7,886	0.2490 0.0235	0.0000	0.7510 0.0235

Table 3 reports results from maximum likelihood estimation of linear random effects models. Savings behavior is modeled as a linear function of three random effects representing additive genetic effects (*A*), shared environmental effects (*C*), as well as an individual-specific error (*E*). Panel A reports results for alternative proxies for savings behavior. See Appendix Table A1 for a definition of *Savings Rate 2* and the *Wealth-to-Income Ratio*. In Panel B, we report results for the subset of 7,886 twins for which we have data on their occupation. We first report estimates when not controlling for occupation. We then report estimates after also including 93 occupational fixed effects in the regressions otherwise specified in Appendix Table A2. In each case, we report the variance fraction of the combined error term explained by each random effect (*A* – for the additive genetic effects, *C* – for shared environmental effects, *E* – for the individual-specific random effect) as well as the corresponding standard errors. *N* provides the number of observations used in each estimation.

**Table 4**  
Robustness

**Panel A: Reared Apart or Little Contact**

Model	<i>N</i>	Variance Components		
		<i>A</i>	<i>C</i>	<i>E</i>
Reared Apart or Little Contact	568	0.2136 0.1126	0.0000	0.7864 0.1126

**Panel B: ADE Model**

Model	<i>N</i>	Variance Components		
		<i>A</i>	<i>D</i>	<i>E</i>
Savings Rate	14,930	0.2831 0.0560	0.0528 0.0641	0.6641 0.0184

Table 4 reports results from maximum likelihood estimation of linear random effects models. The (adjusted) *Savings Rate* is modeled as a linear function of three random effects representing additive (*A*) or dominant (*D*) genetic effects, shared environmental effects (*C*), as well as an individual-specific error (*E*). In Panel A, we report results for twins that spent at most ten years in the same household or have very limited interaction with one another (i.e. twins who meet at most twice per year and who communicate with one another at most four times per year). Panel B reports results when allowing for a dominant genetic effect. Dominant genetic effects (*D*) are associated with an average (genetic) correlation between fraternal twins of 0.25, as opposed to 0.5 for additive genetic effects (*A*). In each case, we report the variance fraction of the combined error term explained by each random effect (*A* – for the additive genetic effects, *D* – for dominant genetic effects, *C* – for shared environmental effects, *E* – for the individual-specific random effect) as well as the corresponding standard errors. *N* provides the number of observations used in each estimation.

**Table 5**  
Further Evidence and Extensions

**Panel A: Scarce Parenting**

Model	<i>N</i>	Variance Components		
		<i>A</i>	<i>C</i>	<i>E</i>
No Siblings	3,682	0.2073 0.0889	0.1247 0.0629	0.6680 0.03688
Siblings	11,242	0.3117 0.0182	0.0000	0.6883 0.0182

**Panel B: Parents' Net Worth**

Model	<i>N</i>	Variance Components		
		<i>A</i>	<i>C</i>	<i>E</i>
Below Median Net Worth	4,036	0.1776 0.0341	0.0000	0.8224 0.0341
Above Median Net Worth	4,054	0.2545 0.0761	0.1413 0.0581	0.6042 0.0292

**Panel C: Twin's Own Net Worth**

Model	<i>N</i>	Variance Components		
		<i>A</i>	<i>C</i>	<i>E</i>
Below Median Net Worth	4,926	0.2079 0.0740	0.0930 0.0570	0.6991 0.0277
Above Median Net Worth	4,926	0.3688 0.0261	0.0000	0.6312 0.0261

Table 5 reports results from maximum likelihood estimation of linear random effects models. The (adjusted) *Savings Rate* is modeled as a linear function of three random effects representing additive genetic effects (*A*), shared environmental effects (*C*), as well as an individual-specific error (*E*). In Panel A, we report results separately for those twins that have no other siblings and those that have at least one non-twin sibling. Panel B reports results separately for twins whose parents at the end of 2002 have net worth below and above the sample median. Panel C reports results separately for those twins whose net-worth at the end of 2002 is below or above the sample median. In each case, we report the variance fraction of the combined error term explained by each random effect (*A* – for the additive genetic effects, *C* – for shared environmental effects, *E* – for the individual-specific random effect) as well as the corresponding standard errors. When the non-negativity constraint for a variance parameter is binding, we report a zero. *N* provides the number of observations used in each estimation.

**Table 6**  
Genetic and Environmental Correlations

**Panel A: Correlation with the (adjusted) Savings Rate**

	Log Income Growth	Years of Education	Number of Cigarettes	BMI
Total Correlation	0.0420 0.0080	-0.0140 0.0120	-0.0650 0.0130	-0.0550 0.0120
<i>N</i>	14,726	7,880	6,216	7,746

**Panel B: Genetic and Environmental Correlations**

	Log Income Growth	Years of Education	Number of Cigarettes	BMI
Correlation of Genetic Effects	0.1210 0.0350	0.0090 0.0900	-0.0890 0.0480	-0.1170 0.0390
Correlation of Common or Parental Environments	0.0000	0.0000	0.0000	0.0000
Correlation of Individual-specific Environments	0.0030 0.0160	-0.0480 0.0310	-0.0540 0.0290	-0.0080 0.0280

Table 6 Panel A reports maximum likelihood estimates (MLE) of the correlation between the (adjusted) *Savings Rate* and the average log income growth rate between 2002 and 2006, the number of years of education, the number of cigarettes smoked per day, and the body-mass-index (BMI). Panel B reports the correlation between the corresponding genetic and environmental (common and individual-specific) effects. We report MLE standard errors for each point estimate. *N* provides the number of observations used in each estimation.

**Table 7**

Decomposition of Wealth Distribution

Model	<i>N</i>	Variance Components		
		<i>A</i>	<i>C</i>	<i>E</i>
Net Worth (2006)	11,992	0.3934	0.0683	0.5383
		0.0459	0.0328	0.0190

Table 7 reports results from maximum likelihood estimation of linear random effects models. *Net Worth* (at the end of 2006) of twins between age 60 and 69 is modeled as a linear function of three random effects representing additive genetic effects (*A*), shared environmental effects (*C*), as well as an individual-specific error (*E*). We report the variance fraction of the combined error term explained by each random effect (*A* – for the additive genetic effects, *C* – for shared environmental effects, *E* – for the individual-specific random effect) as well as the corresponding standard errors. *N* provides the number of observations.

## Appendix Table A1

Definition of all Variables

Variable	Description
<b>Types of Twins</b>	
Identical Twins	Twins that are genetically identical, also called monozygotic twins. Zygosity is determined by the Swedish Twin Registry based on questions about intrapair similarities in childhood.
Non-identical Twins	Twins that share on average 50% of their genes, also called dizygotic or fraternal twins. Non-identical twins can be of the same sex or of opposite sex. Zygosity is determined by the Swedish Twin Registry based on questions about intrapair similarities in childhood.
<b>Measures of Savings Behavior</b>	
Savings Rate	Savings Rate is calculated as the change in net-worth between the end of 2002 and the end of 2006, less capital gains or losses related to an individual's primary residence, divided by the total disposable income for 2003 to 2006. The top and bottom 1% of the distribution have been dropped. We use the residual from a linear regression model (see Appendix Table A2) of the savings rate onto individual circumstances and asset allocation choices as the adjusted savings rate. The adjusted savings rate is the main empirical proxy for an individual's savings behavior.
Savings Rate 2	Savings Rate 2 is calculated as the change in net-worth between the end of 2002 and the end of 2006 divided by the total disposable income for 2003 to 2006. The top and bottom 1% of the distribution have been dropped. We use the residual from a linear regression model of the savings rate onto individual circumstances and asset allocation choices as the adjusted savings rate 2. The regression specification differs from the one in Appendix Table A2, as we also include the relative allocation to other real assets. All allocations are scaled by total assets that include home assets. The adjusted savings rate 2 is an alternative empirical proxy for an individual's savings behavior.
Wealth-to-Income Ratio	Wealth-to-Income Ratio is calculated by dividing an individual's net worth at the end of 2006 by the cumulative disposable income for 1998 to 2006. We use the residual from a linear regression model of the Wealth-to-Income Ratio onto individual circumstances and asset allocation choices as the adjusted Wealth-to-Income Ratio. The regression specification differs from the one in Appendix Table A2, as we also include the relative allocation to other real assets. All allocations are scaled by total assets that include home assets. The adjusted Wealth-to-Income Ratio is an alternative empirical proxy for an individual's savings behavior.
<b>Socioeconomic Characteristics</b>	
Male	An indicator variable that equals one if an individual is male and zero otherwise. Gender is obtained from Statistics Sweden.
Age	An individual's age on Dec. 31, 2006 as reported by the Statistics Sweden.
Age (Spouse)	The age of the spouse on Dec. 31, 2006 as reported by the Statistics Sweden. For unmarried individuals, the variable is zero.
Married	An indicator variable that equals one if an individual is married in all years between 2003 and 2006 and zero otherwise. It is obtained from the Statistics Sweden.
Divorced	An indicator variable that equals one if an individual is divorced in all years between 2003 and 2006 and zero otherwise. It is obtained from the Statistics Sweden.
Widowed	An indicator variable that equals one if an individual is widowed in all years between 2003 and 2006 and zero otherwise. It is obtained from the Statistics Sweden.
Number of Siblings	The number of non-twin siblings an individual has. The number is obtained from Statistics Sweden.
Children in Household Indicator	An indicator that is one if an individual has any children living in the household and zero otherwise. The information is obtained from Statistics Sweden
Number of Children in Household	The number of children living in the household. The number is obtained annually from Statistics Sweden and averaged for 2003 to 2006.
Poor Health	An indicator variable that is one if an individual receives payments due to illness, injury, or disability and zero otherwise. The data are obtained annually from Statistics Sweden and averaged for 2003 to 2006.
Poor Health (Spouse)	An indicator variable that is one if an individual's spouse receives payments due to illness, injury, or disability and zero otherwise. The data are obtained annually from Statistics Sweden and averaged for 2003 to 2006. For unmarried individuals, the variable is zero.
Unemployed	An indicator variable that is one if an individual receives payments due to unemployment and zero otherwise. The data are obtained annually from Statistics Sweden and averaged for 2003 to 2006.
Unemployed (Spouse)	An indicator variable that is one if an individual's spouse receives payments due to unemployment and zero otherwise. The data are obtained annually from Statistics Sweden and averaged for 2003 to 2006. For unmarried individuals, the variable is zero.

Variable	Description
Parent(s) still Alive (2002)	An indicator that is one if at least one parent is still alive in 2002, otherwise zero. The data are obtained from Statistics Sweden.
Inheritance	Inheritance is calculated by identifying cases where the last parent dies between the end of 2002 and 2006 and dividing the parent's net worth at the end of 2002 (if positive) by the number of children (i.e. two twins plus number of siblings). The variable is zero in all other cases. When reported in United States Dollars (USD), Swedish Krona (SEK) amounts have been converted at SEK/USD 7.1588, the average end of year exchange rate for 2003 to 2006. All data are from Statistics Sweden.
Disposable Income	The average disposable income of the individual for the period 2003 to 2006, as defined by Statistics Sweden, that is the sum of income from labor, business, and investment, plus received transfers, less taxes and alimony payments. When reported in United States Dollars (USD), Swedish Krona (SEK) amounts have been converted at SEK/USD 7.1588, the average end of year exchange rate for 2003 to 2006. The data are obtained from Statistics Sweden.
Disposable Household Income	The average disposable income of the individual and, if married, her spouse for the period 2003 to 2006, as defined by Statistics Sweden, that is the sum of income from labor, business, and investment, plus received transfers, less taxes and alimony payments. The data are obtained from Statistics Sweden.
St. Dev. of Log Growth Rate of Disposable Household Income	The time-series standard deviation of the log growth rate of disposable household income between 1999 and 2006. The variable is missing if four or more of the log growth rates are missing. The top and bottom one percentile of the log growth rate distribution is set to missing.
Net Worth	The average difference between the market value of an individual's assets and her liabilities, calculated by Statistics Sweden at the end of each year between 2003 and 2006. When reported in United States Dollars (USD), Swedish Krona (SEK) amounts have been converted at SEK/USD 7.1588, the average end of year exchange rate for 2003 to 2006. The data are obtained from Statistics Sweden.
Change in Net Worth	The change in an individual's net worth between the end of 2002 and the end of 2006. When reported in United States Dollars (USD), Swedish Krona (SEK) amounts have been converted at SEK/USD 7.1588, the average end of year exchange rate for 2003 to 2006. The data are obtained from Statistics Sweden.
Change in Home Value	Capital gains and losses associated with the owner occupied house between the end of 2002 and the end of 2006. When reported in United States Dollars (USD), Swedish Krona (SEK) amounts have been converted at SEK/USD 7.1588, the average end of year exchange rate for 2003 to 2006. The data are obtained from Statistics Sweden.
<b>Asset Allocation</b>	
Business Owner	An indicator that is one if in at least one year between 2003 and 2006 an individual or her spouse has income from active business activity that exceeds 50% of the labor income. The indicator is zero otherwise. Income data are obtained from Statistics Sweden.
Equity / Assets (excl. Housing)	The amount of direct and indirect equity investments scaled by all assets (excluding home assets). The data are obtained annually from Statistics Sweden and averaged for 2003 to 2006.
Bonds / Assets (excl. Housing)	The amount of fixed income investments scaled by all assets (excluding home assets). The data are obtained annually from Statistics Sweden and averaged for 2003 to 2006.
Cash / Assets (excl. Housing)	The amount held in bank accounts and money market funds scaled by all assets (excluding home assets). The data are obtained annually from Statistics Sweden and averaged for 2003 to 2006.
Other Financial Assets / Assets (excl. Housing)	The amount invested in other financial assets, such as derivatives and insurance products, scaled by all assets (excluding home assets). The data are obtained annually from Statistics Sweden and averaged for 2003 to 2006.
Real Assets (excl. Housing) / Assets (excl. Housing)	The amount invested in real assets, such as vacation and rental properties, but excluding home assets scaled by all assets (excluding home assets). The data are obtained annually from Statistics Sweden and averaged for 2003 to 2006.

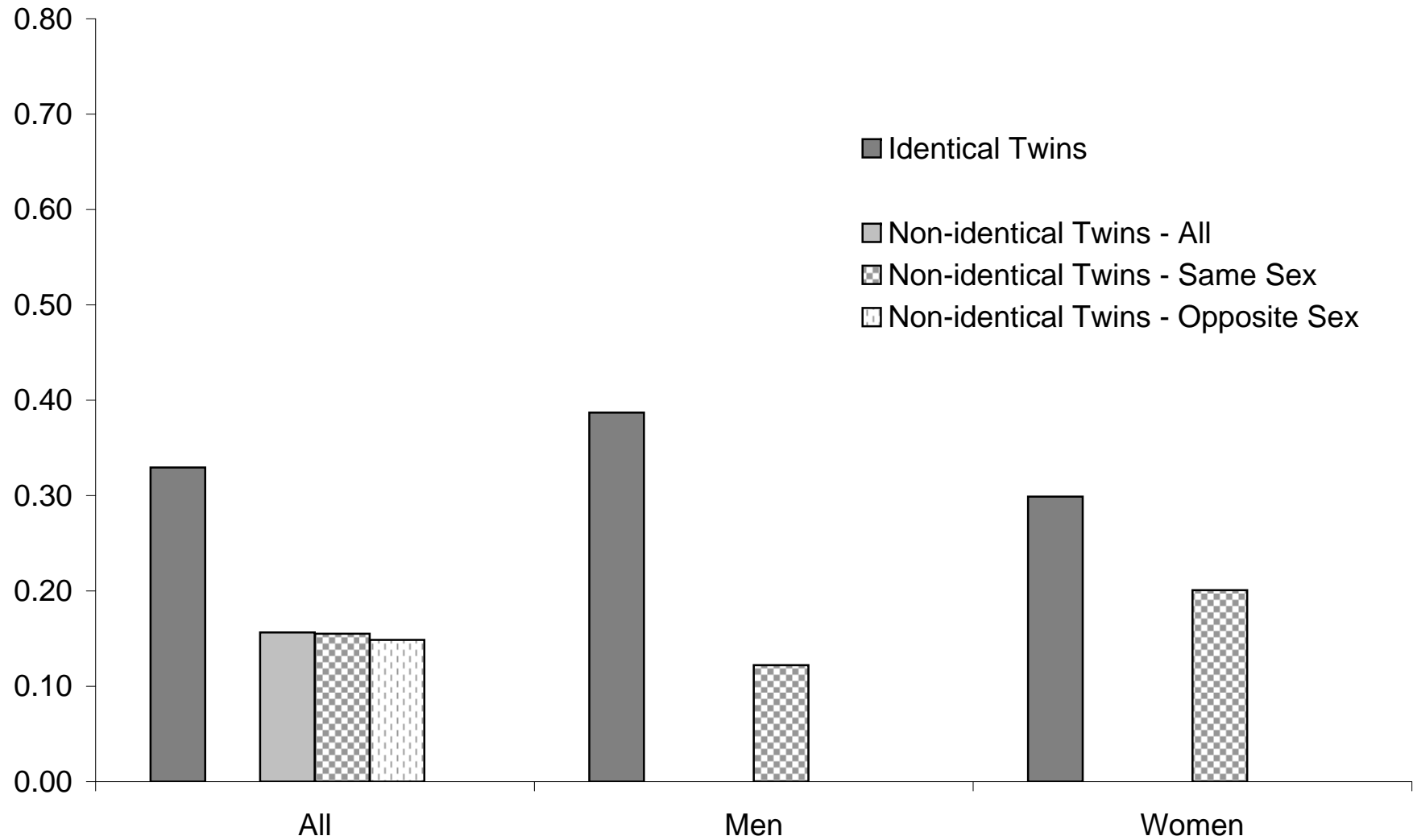
**Appendix Table A2**

Controlling for Socioeconomic Characteristics and Asset Allocation

	Young (18 - 35)	Middle Age (36 - 50)	Older (51 - 65)
Intercept	-0.6719 1.0379	-0.6252 0.9645	-2.8047 1.0936
Male	0.0453 0.0327	-0.0037 0.0171	-0.0224 0.0105
Age	0.1535 0.0715	0.0093 0.0425	0.1340 0.0366
Age squared	-0.0026 0.0012	-0.0001 0.0005	-0.0011 0.0003
Age (Spouse)	0.0000 0.0038	-0.0003 0.0009	0.0002 0.0004
Married	0.1379 0.1166	-0.1034 0.0319	-0.1042 0.0189
Divorced	-0.1412 0.3600	-0.1042 0.0348	-0.1571 0.0179
Widowed		-0.0275 0.1654	-0.1847 0.0323
Children Indicator	-0.1450 0.0905	-0.0328 0.0334	-0.0304 0.0235
Number of Children (4-year average)	0.0180 0.0338	-0.0177 0.0112	-0.0079 0.0138
Poor Health (4-year average)	-0.0467 0.0867	-0.0900 0.0323	-0.1066 0.0140
Poor Health (Spouse) (4-year average)	-0.2343 0.2854	-0.1027 0.0487	-0.0269 0.0207
Unemployed (4-year average)	0.0045 0.0553	-0.0274 0.0343	-0.0441 0.0193
Unemployed (Spouse) (4-year average)	-0.0033 0.2128	-0.0747 0.0538	-0.0395 0.0288
Number of Siblings	-0.0526 0.0195	-0.0180 0.0071	-0.0132 0.0037
Parent(s) still Alive (2002)	0.0766 0.0506	-0.0087 0.0245	0.0198 0.0120
Inheritance (ln)	-0.0177 0.0252	0.0144 0.0042	0.0078 0.0017
Disposable Household Income (ln, 4-year average)	-0.0931 0.0445	0.0758 0.0271	-0.0304 0.0135
St. Dev. of Log Growth Rate of Disposable Household Income	0.2514 0.1240	0.1910 0.0689	0.1594 0.0427
Business Owner	0.1997 0.1013	0.2289 0.0358	0.2295 0.0220
Equity / Assets (excluding home assets)	-0.5648 0.0837	-0.3943 0.0280	-0.4069 0.0182
Bonds / Assets	-0.7458 0.2510	-0.3615 0.1247	-0.3657 0.0702
Cash / Assets	-0.5802 0.0854	-0.4961 0.0306	-0.5328 0.0189
Other Financial Assets / Assets	-0.7108 0.1145	-0.4936 0.0449	-0.4478 0.0299
Regional Fixed Effects (21 regions)	Yes	Yes	Yes
<i>N</i>	1,542	3,678	9,710
<i>R</i> <sup>2</sup>	0.09	0.14	0.14

Appendix Table A2 reports OLS estimates and standard errors for three linear regressions (one per age group) of the *Savings Rate* onto an individual's socioeconomic characteristics and asset allocation choices. In addition to the variables listed in the table, we include 20 regional fixed effects in all regressions. *N* provides the number of observations and *R*<sup>2</sup> the coefficient of determination.

**Figure 1**  
Correlations of Savings Behavior by Genetic Similarity and Gender



**Figure 2**  
Parenting Effects and Child Age

