Value versus Growth Investing: Why Do Different Investors Have Different Styles?*

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Abstract

We find that several factors explain an investor's style, i.e., the value versus growth orientation of the investor's stock portfolio. First, an investor's style has a biological basis – a preference for value versus growth stocks is partially ingrained in an investor already from birth. Second, investors who a priori are expected to take more financial risk (e.g., men and wealthier individuals) have a preference for growth, not value, which may be surprising if the value premium reflects risk. Finally, an investor's style is explained by life course theory in that experiences, both earlier and later in life, are related to investment style. Investors with adverse macroeconomic experiences (e.g., growing up during the Great Depression or entering the job market during an economic downturn) and those who grew up in a lower status socio-economic rearing environment have a stronger value orientation several decades later in their lives. Our research contributes a new perspective to the long-standing value/growth debate in finance.

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I think Warren [Buffett] captured the idea himself in his 1964 article "The Superinvestors of Graham and Doddsville" and in it he talks about – value investing is like an inoculation – you either get it right away, or you never get it. And I think it's just true. I actually think there's just a gene for this stuff, whether it's a value investing gene or a contrarian gene.

— Seth Klarman, in an interview with Charlie Rose, 2011.

I Introduction

The concepts of "value" and "growth" investing have a long history in financial economics. Today, there exist some 2,050 value funds and 3,200 growth funds catering to investors with preferences for these investment styles.[1] Fidelity, the world's largest provider of employer-sponsored retirement plans such as 401(k) plans, prominently features a description of value and growth funds on their Learning Center website.[2] For more than two decades, Morningstar has provided a Value-Growth Score to help investors choose a fund with their preferred style. There are best-selling books about both value and growth strategies, and countless business magazine articles boast recommendations about the "Best Value Funds" and/or the "Best Growth Funds." Wall Street professionals are educated about value and growth investing already in business school, with many MBA programs today offering (very popular) courses on, e.g., Value Investing. Most importantly from the perspective of academic research, one of the most debated issues in the past several decades is the differential returns of investments in value versus growth stock portfolios – the value premium debate (e.g., De Bondt and Thaler (1985), Fama and French (1992, 1993, 1996), Lakonishok, Shleifer, and Vishny (1994), and Daniel and Titman (1997)).[3]

Despite all this attention to value and growth investing, very little research has attempted to explain the determinants of an individual's investment style. That is, why are some investors value oriented, while others are growth oriented? In this paper, we argue that differences in investment styles across individuals, in principle, may stem from either of two non-mutually exclusive sources. First, these differences may be biological, in the sense that a gene, or most likely a combination

[1] Morningstar.com.

[2] https://www.fidelity.com/learning-center/mutual-funds/growth-vs-value-investing.

[3] This debate has not been limited to only the U.S. stock market, but extended to several other markets as well (e.g., Chan et al. (1991), Fama and French (1998), and Daniel et al. (2001)).

of several genes, result in a preference for a specific investment style. In recent years, individual characteristics of first-order importance for portfolio choice, e.g., the propensity to take financial risk, have indeed been shown to be partly explained by an individual's genetic composition (e.g., Cesarini et al. (2009), Barnea, Cronqvist, and Siegel (2010) and Cesarini et al. (2010)). As a result, we hypothesize that an individual's investment style has a biological basis, i.e., a preference for value versus growth stocks is partially ingrained in an investor from birth.

Second, based on life course theory, an approach to research in social psychology,[4] which has recently made its way into economics and finance research (e.g., Oyer (2006, 2008), Kaustia and Knüpfer (2008), Malmendier and Nagel (2011, 2013), and Schoar and Zuo (2013)), we hypothesize that an individual's specific life experiences affect behaviors, including the individual's investment style, later in life. We consider several potentially relevant, and exogenous, life experiences of individuals: 1) Macroeconomic experiences, 2) Impressionable years, and 3) Rearing environment. More specifically, we examine whether experiencing an adverse and significant macroeconomic event, e.g., growing up during the Great Depression, affects an individual's value versus growth orientation. We also analyze other impressionable years during an individual's life course, e.g., the economic conditions when an individual entered the job market for the first time. Finally, we also examine the socio-economic status of the rearing environment in which the individual grew up.

Benjamin Graham and T. Rowe Price, Jr., constitute a colorful illustration of some of our hypotheses. Graham is commonly dubbed the "Father of Value Investing" because he preferred stocks with comparatively low valuation ratios and other characteristics that subsequently came to define value investing. Price, the founder of the large money management company with his name, is often referred to as the "Father of Growth Investing" because of his preference for companies characterized by strong earnings growth, R&D intensity, and innovative technology. So why did Graham become a value investor, while Price became a growth investor? Their different investment styles may very well have a biological basis, but this is not possible to examine without data on their genetic differences. Interestingly, Graham grew up very poor, his father passing away unexpectedly when he was young, and his mother losing the family's savings in the Panic of 1907. Among his

[4]For further details and references, see, e.g., Giele and Elder (1998) and Elder et al. (2003).

brothers, Graham was often tasked with "bargain hunting" at different grocery stores (e.g., Carlen (2012)). In comparison, Price had a privileged upbringing, his father being an M.D. who served as a surgeon his entire professional career for a rapidly expanding railroad company, a growth company at that time. We hypothesize that their different life experiences contributed to their different investment styles.

To empirically decompose variation in investment styles across a large sample of individual investors we use two ingredients. First, we employ data on identical and fraternal twins from the world's largest twin registry, the Swedish Twin Registry (STR), matched with detailed data on these individuals' stock and mutual fund portfolios from the Swedish Tax Agency. Data on twins are commonly used for decomposition of variation across individuals into genetic and environmental sources.[5] We do not expect a dichotomous classification of value versus growth investors to be empirically relevant so we categorize each investor's value versus growth "orientation" on a continuum. Second, we use empirical methods from quantitative behavioral genetics research which have recently been employed also in research in economics (e.g., Cesarini et al. (2009)). This methodology involves maximum likelihood estimation of a random effects model, but relies on an intuitive and simple insight: Identical twins share 100% of their genes, while the average proportion of shared genes is only 50% for fraternal twins, so if identical twins are more similar with respect to their investment styles than are fraternal twins, then there is evidence that value versus growth orientation is partly explained by genetic predispositions. To preview our findings, the correlation among identical twins is 0.32 for the average price-to-earnings (P/E) ratio of the stock portfolio, compared to only 0.20 among same-sex fraternal twins; the corresponding correlations are 0.30 versus 0.16 for the average Value-Growth Score by Morningstar for the mutual fund portfolio. That is, genetically more similar investors have more similar investment styles.

Our research contributes a new perspective to the long-standing value/growth debate in finance. First, an investor's style has a biological basis – a preference for value versus growth stocks is partially ingrained in an investor already from birth. We estimate that genetic differences across individuals explain 18% of the cross-sectional variation in value versus growth orientation, if using

[5] Research in economics has a long tradition of using data on twins; see, e.g., Behrman and Taubman (1976, 1989), Taubman (1976), Ashenfelter and Krueger (1994), and Black et al. (2007).

P/E ratios as an investment style measure, and 25% if using Morningstar's Value-Growth Score. Second, investors who a priori are expected to take more financial risk have a preference for growth, not value, investing. This result is consistently found in data for exogenous proxies for risk taking propensity (e.g., gender and age) and also other individual characteristics (e.g., wealth). If value is riskier than growth, it may be surprising that those who are expected to take more (less) financial risk prefer growth (value) stock portfolios. Finally, an investor's style is explained by life course theory in that experiences, both earlier and later in life, are related to investment style. In particular, investors with adverse macroeconomic experiences have stronger preferences for value investing later in life. For example, those who grew up during the Great Depression have portfolios with average P/E ratios that are 2.2 (or about 10% at the median) lower, controlling for individual characteristics, several decades later in life. Consistent with an impressionable years hypothesis, those who enter the job market for the first time during an economic downturn are also more value oriented later on. We also find that those who grew up in a lower status socio-economic rearing environment also have a stronger value orientation later in life.

The paper is organized as follows. Section II reviews related research. Section III introduces our data, and Section IV our empirical methodology. Section V reports our results. Section VI discusses potential implications of our results, and Section VII concludes.

II Related Research

A Biological Predispositions and Investment Style

A.1 Risk Preferences

In standard models in financial economics, value and growth reflect differences in risk. A well-established empirical result is that a value/growth risk factor, referred to as HML ("high minus low") following the seminal work by Fama and French (1993), is a significant determinant of cross-sectional returns of stock portfolios. Different stocks and portfolios have different exposures to this HML factor, and as a result, different expected returns. If value-oriented portfolios have outperformed growth-oriented portfolios historically because of differences in risk, we would expect investors with a propensity to take more (less) financial risk to prefer value (growth) stocks and mutual funds.

Several recent studies have shown that a significant portion, or about 30%, of the cross-sectional variation in financial risk preferences is explained by biological predispositions. It is important to emphasize that risk-taking in those studies is not defined from the perspective of exposure to a value/growth risk factor, but risk preferences are either elicited from experiments (e.g., Cesarini et al. (2009)) or involve measures such as the share in equities (e.g., Barnea, Cronqvist, and Siegel (2010) and Cesarini et al. (2010)).[6] Some research in the intersection of finance and neuroscience has even identified specific candidate genes involved in explaining differences in financial risk taking across individuals (e.g., Kuhnen and Chiao (2009), Dreber et al. (2009), and Zhong et al. (2009)).[7]

The aforementioned studies suggest a relation between, on the one hand, biological predispositions, and on the other hand, risk preferences. As a result, if we find that genetic differences across investors explain their value versus growth orientation, differential genetic propensities to financial risk taking is a potential explanation which would be consistent with standard models in finance.

A.2 Behavioral Biases

While there is consensus among most financial economists that value stocks historically have produced higher returns than growth stocks, the interpretation of why this is the case is much more controversial.[8] For example, Lakonishok, Shleifer, and Vishny (1994) argue that the return of growth, or "glamour," stocks is the result of investor sentiment, and provide evidence that value stocks produce higher returns because they exploit some of the "behavioral biases" of investors, and not because of risk. Daniel and Titman (1997) show that the return premium on value stocks does not arise because of the comovement of these stocks with a risk factor – it is the characteristics, rather than the covariance structure of returns, that explain the cross-sectional variation in stock returns. In behavioral models, the value premium reflects positive feedback trading (e.g., De Long, Shleifer, Summers, and Waldmann (1990), Hong and Stein (1999), and Barberis and Shleifer (2003)),

[6]Standard models show that, in a frictionless market, differences in risk preferences explain cross-sectional variation in the share in equities (e.g., Merton (1969) and Samuelson (1969)).

[7]The even deeper question is why risk preferences are genetic. Some of the theoretical work by Robson (2001b) addresses fundamental questions such as why nature has endowed individuals with utility functions. For further details and references, we refer to Robson (2001a).

[8]For a review of empirical evidence related to value and growth investing, see, e.g., Chan and Lakonishok (2004).

conservatism and representativeness (e.g., Barberis, Shleifer, and Vishny (1998)), or overconfidence (e.g., Daniel, Hirshleifer, and Subrahmanyam (1998) and Daniel, Titman, and Wei (2001)).

Recent research suggests a relation between, on the one hand, biological predispositions, and on the other hand, the aforementioned behavioral biases (e.g., Cesarini et al. (2012) and Cronqvist and Siegel (2013)). As a result, if we find that genetic differences across investors explain their value versus growth orientation, differential genetic behavioral biases is a potential explanation which would be consistent with behavioral finance models.[9]

B Life Course Theory and Investment Style

B.1 Macroeconomic Experiences

Experiencing an adverse and significant macroeconomic event may have pervasive effects on an individual's behaviors later in life.[10] In their "Depression Babies" study, Malmendier and Nagel (2011) show that individuals who have experienced relatively low stock market returns in their lives subsequently do not participate in the stock market and they take significantly less financial risk if they do participate. Other economists have also found that macro events have long-term effects on individual preferences. For example, Alesina and Fuchs-Schüendeln (2005) examine the experiment of German reunification and find that East Germans (particularly older cohorts) have stronger preferences for, e.g., redistribution than West Germans post-reunification. Malmendier and Nagel (2013) show that differences in life experiences of high or low inflation predict differences in subjective inflation expectations and also preferences for fixed versus variable rate investments.

If an adverse macroeconomic experience results in less risk taking later in life, and if value is riskier than growth investing, we would expect investors who grew up during the Great Depression to prefer growth investing. An alternative hypothesis, not necessarily based on a risk explanation, is

[9]Some of the theoretical work by Rayo and Becker (2007) and Brennan and Lo (2011) addresses why behaviors, even if not rational as defined in standard economic models, may survive human evolution. For further details and references, see, e.g., Cosmides and Tooby (1994), Chen et al. (2006), and Santos and Chen (2009).

[10]The Great Depression is the macro event that has so far been studied most in-depth in the social sciences, and a variety of outcomes later in life have been examined. We refer to Elder (1974) for one of the first and most comprehensive studies of the long-term effects of the Great Depression. Many researchers have argued that the Great Depression created a "depression generation," whose behavior affected the macroeconomy for decades after the depression ended. For example, Friedman and Schwartz (1963) suggested that the Great Depression "shattered" beliefs in capitalism.

that those who have more salient experiences of difficult economic conditions develop a value-oriented investment style, with a preference for relatively "cheaper" stocks.

B.2 Impressionable Years

A growing number of studies in social psychology suggest that experiences in early adulthood are particularly important for preferences later in life (e.g., Krosnick and Alwin (1989)). An individual's core attitudes, beliefs, and preferences crystallize during a period of great neurological plasticity in early adulthood – the so-called "impressionable years" – and remain largely unchanged afterwards. Recently, this research has made its way into economics and finance. For example, Giuliano and Spilimbergo (2013) show that experiencing an economic downturn during the impressionable years affects redistribution and political preferences later in life.

In this study, we focus on whether an individual started his or her first employment in an economic downturn. This measure comes with the caveat that it is less exogenous compared to a birth cohort measure such as the Great Depression because individuals may to some extent choose when they enter the job market by increasing their investment in education edogenously. We still find it informative to examine the time of an individual's first employment because it has been shown to be important in several studies for other economic outcomes (e.g., Oyer (2006, 2008), Malmendier et al. (2011), Oreopoulos et al. (2012), and Schoar and Zuo (2013)). This is also a period in their lives when many individuals start to invest in stocks and mutual funds.

B.3 Rearing Environment

The hypothesis that the rearing environment, and other early-life experiences, may have significant long-term effects on an individual's behaviors later in life has recently made its way into economic research. Most existing studies examine outcomes such as education and earnings. For example, economists have shown that birth order and family size (e.g., Black et al. (2005)) and birth weight (e.g., Black et al. (2007)) affect educational attainment and earnings later in life.[11] Relatively few studies examine outcomes of primary interest to financial economists. One exception is Chetty et al.

[11] For a review of the causes and consequences of inequality at birth, see, e.g., Currie (2011).

(2011) who report that the pre-school (kindergarten) environment explains, e.g., retirement savings behavior later in life.[12]

In this study, we focus on the rearing environment within the family during an individual's upbringing. More specifically, we hypothesize that the socioeconomic status (SES) of the rearing environment in which an individual grows up explains cross-sectional differences in investment style later in life. We also consider whether parents' life experiences transfer to their children and affect the investment style of the next generation. For example, if parents grew up during the Great Depression, it may affect not only their own investment style late in life, but potentially also their children's value versus growth orientation through parenting; see, e.g., Bisin and Verdier (2000, 2001) for work related to the social transmission of preferences and behavior from parents to their children.

III Data

A Individual Characteristics

We construct our data set by matching a large number of twins from the Swedish Twin Registry (STR), the world's largest twin registry, with data from individual tax filings and other databases. In Sweden, twins are registered at birth, and the STR collects additional data through in-depth interviews.[13] STR's data provide us with the zygosity of each twin pair: Identical or "monozygotic" (MZ) twins are genetically identical, while fraternal or "dizygotic" (DZ) twins are genetically different, and share on average 50% of their genes.[14]

[12]Even the pre-birth, i.e., "in utero," environment has been shown to predict subsequent economic outcomes and behaviors; see, e.g., Almond and Currie (2011) for further details and references. Some of this research has recently made its way into finance (e.g., Cronqvist, Previtero, Siegel, and White (2013)).

[13]STR's databases are organized by birth cohort. The Screening Across Lifespan Twin, or "SALT," database contains data on twins born 1886–1958. The Swedish Twin Studies of Adults: Genes and Environment database, or "STAGE," contains data on twins born 1959–1985. In addition to twin pairs, twin identifiers, and zygosity status, the databases contain variables based on STR's telephone interviews (for SALT), completed 1998–2002, and combined telephone interviews and Internet surveys (for STAGE), completed 2005–2006. For further details about STR, we refer to Lichtenstein et al. (2006).

[14]Zygosity is based on questions about intrapair similarities in childhood. One of the questions was: 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? STR has validated this method with DNA analysis as having 98 percent accuracy on a subsample of twins. For twin pairs for which DNA has been collected, zygosity status is based on DNA analysis.

Table 1 reports summary statistics for the twins in our data set and their individual characteristics. Panel A shows that we have data on a total of 10,490 identical twins, and 24,486 fraternal twins, who participate in the stock market. Opposite-sex twins are the most common (38%); identical male twins are the least common (13%). Panel B reports summary statistics for individual characteristics, including age, education, net worth, and disposable income, which we include as controls when we estimate models in Section V. The average size of the portfolios in our data set, about USD 33,500, is comparable to those in other data sets of a broad set of individual investors, e.g., EUR 24,600 in Grinblatt and Keloharju (2009).[15]

B Measures of Investment Style

Prior to the abolishment of the wealth tax in Sweden in 2007, all Swedish banks, brokerage firms, and other financial institutions were required by law to report to the Swedish Tax Authority information about individuals' portfolios (i.e., stocks, bonds, mutual funds, and other securities) owned on December 31. We have matched the individuals in our data set with portfolio data between 1999 and 2007, the entire period for which data are available. For each individual, our data set contains all securities owned at the end of the year (identified by each security's International Security Identification Number (ISIN)), the number of each security owned, and the end of the year value. Security level data have been provided by S&P CapitalIQ and Morningstar. In our data set, there is a total of 2,092 different stocks and 1,176 different mutual funds.

Table 2 reports summary statistics for our investment style measures. For stocks, we construct two measures of value versus growth orientation using different scaled price ratios: Price/Earnings (P/E) and Price/Book (P/B).[16] For each individual, we first compute the value-weighted average ratio for each year, and we then average these ratios over those years an individual is in the data set in order to reduce measurement error. For mutual funds, we construct two measures: i) Morningstar's Value-Growth Score, which varies from -100 (value) to +400 (growth). ii) Name-based value/growth measure, which is -1 if a fund's name contains "value," +1 if a fund's name contains

[15] We use the average end-of-year exchange rate 1999-2007 of 8.0179 Swedish Krona per U.S. dollar to convert summary statistics in the table. When we estimate models in Section V, all values are in Swedish Krona, i.e., not converted to U.S. dollars.

[16] Following CapitalIQ's practices, the scaled price ratios are censored at 0 and 300.

"growth" or "technology," and zero otherwise. We use the same method as for stocks to construct an average measure for each individual. Appendix Table A1 reports detailed definitions for each of our investment style measures. We find in Table 2 that while identical and fraternal twins are relatively similar with respect to these investment style measures, there is significant variation across different investors with respect to their value versus growth orientation.

IV Empirical Methodology and Identification

In this section, we describe the empirical methodology we employ to decompose the cross-sectional variation in individual investors' investment styles into genetic and environmental components. Specifically, we model "investment style," s_{ij}, for twin pair i and twin j (1 or 2) as a function of observable socioeconomic individual characteristics $\mathbf{X}_{ij}$ and three unobservable random effects, an additive genetic effect, a_{ij}, an effect of the environment common to both twins (e.g., upbringing), c_i, and an individual-specific effect, e_{ij}, which also absorbs idiosyncratic measurement error:

$$s_{ij} = \beta_0 + \beta_1 \mathbf{X}_{ij} + a_{ij} + c_i + e_{ij}. \tag{1}$$

In quantitative behavioral genetics research, this model is referred to as an "ACE model," where "A" stands for additive genetic effects, "C" for common environment, and "E" for individual-specific environment.[17] The additive genetic component a_{ij} in Equation (1) represents the sum of the genotypic values of all "genes" that influence an individual's behavior. Each individual has two, potentially different, versions (alleles) of each gene (one is from each parent), and each version is assumed to have a specific, additive effect on the individual's behavior. The genotypic value of a gene is the sum of the effects of both alleles present in a given individual. Consider, for example, two different alleles $A1$ and $A2$ for a given given gene and assume that the effect of the $A1$ allele on investment style is of magnitude α_1, while the effect of the $A2$ allele is α_2. An individual with genotype $A1A1$ would experience the genetic effect $2\alpha_1$, while genotype $A1A2$ would have a genetic

[17]See, e.g., Falconer and Mackay (1996) for a more detailed discussion of quantitative behavioral genetics research.

effect of $\alpha_1 + \alpha_2$.[18] We also assume that a_{ij}, c_i, and e_{ij} are uncorrelated with one another and across twin pairs and normally distributed with zero means and variances σ_a^2, σ_c^2, and σ_e^2, so that the total residual variance σ^2 is the sum of the three variance components ($\sigma^2 = \sigma_a^2 + \sigma_c^2 + \sigma_e^2$).

Identification of variation due to a_{ij}, c_i, and e_{ij} is possible due to constraints on the covariance matrices for these effects. These constraints are the result of the genetic similarity of twins and assumptions about upbringing and other aspects of the common environment. Consider two twin pairs $i = 1, 2$ with twins $j = 1, 2$ in each pair, where the first is a pair of identical twins and the second is a pair of fraternal twins. The additive genetic effects are: $a = (a_{11}, a_{12}, a_{21}, a_{22})'$. Identical and fraternal twin pairs differ in their genetic similarity, i.e., the off-diagonal elements related to identical twins in the matrix in (2) are 1 as the proportion of shared additive genetic variation is 100% between identical twins. In contrast, for fraternal twins the proportion of the shared additive genetic variation is on average only 50%, i.e., the off-diagonal elements related to fraternal twins in the matrix in (2) are 1/2.[19] As a result, for these two twin pairs, the covariance matrix with respect to a_{ij} is:

$$\text{Cov}(a) = \sigma_a^2 \begin{bmatrix} 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1/2 \\ 0 & 0 & 1/2 & 1 \end{bmatrix}. \tag{2}$$

The common environmental effects are: $c = (c_{11}, c_{12}, c_{21}, c_{22})'$. The model assumes that identical and fraternal twins experience the same degree of similarity in their common environments (the "Equal Environments Assumption"). That is, the off-diagonal elements related to either identical or fraternal twins in the matrix in (3) are 1. Assuming that identical and fraternal twins experience the same degree of similarity in their common environment, any excess similarity between identical twins is due to the greater proportion of genes shared by identical twins than by fraternal twins. As

[18]The extent to which the effect of two different alleles deviates from the sum of their individual effects is called "dominance deviation."

[19]For an intuitive explanation of the proportion of the shared additive genetic variation for fraternal twins as well as non-twin siblings, consider a single gene, of which one parent has allele A1 and A2, while the other parent has allele A3 and A4. Any of their off-spring will have one of the following combinations as they get one allele from each parent: A1A3, A1A4, A2A3, or A2A4. Suppose one fraternal twin is of A1A3 type. The overlap with the fraternal twin sibling will be: 1 if the sibling is of A1A3 type, 1/2 if type A1A4, 1/2 if type A2A3, and 0 if the type is A2A4. This implies an average overlap of 1/2. For a formal derivation, see, e.g., Falconer and Mackay (1996).

a result, for the two twin pairs, the covariance matrix with respect to c_i is:

$$\text{Cov}(c) = \sigma_c^2 \begin{bmatrix} 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 \end{bmatrix}. \tag{3}$$

The individual-specific environmental effects are: $e = (e_{11}, e_{12}, e_{21}, e_{22})'$. These error terms represent for example life experiences, but also idiosyncratic measurement error. That is, the off-diagonal elements related to either identical or fraternal twins in the matrix in (4) are 0. As a result, for the two twin pairs, the covariance matrix with respect to e_{ij} is:

$$\text{Cov}(e) = \sigma_e^2 \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}. \tag{4}$$

We use maximum likelihood to estimate the model in equation (1). Finally, we calculate the variance components A, C, and E. A is the proportion of the total residual variance that is related to an additive genetic factor:

$$A = \frac{\sigma_a^2}{\sigma^2} = \frac{\sigma_a^2}{\sigma_a^2 + \sigma_c^2 + \sigma_e^2} \tag{5}$$

The proportions attributable to the common environment (C) and individual-specific environmental effects (E) are computed analogously. Standard errors reported in the tables are bootstrapped with 1,000 repetitions.

V Results

A Biological Predispositions and Investment Style

In this section, we first report separate correlations for identical versus fraternal twins for each of our measures of investment style. We then provide formal estimation results from decomposing the cross-sectional variation in investment style into genetic and environmental components using the model specified in equation (1).

A.1 Evidence from Correlations

Figure 1 reports correlations by genetic similarity, i.e., for identical twins and fraternal twins (separately for same- and opposite-sex twins), for measures of value versus growth orientation. Panel A contains results for stocks and Panel B for mutual funds.

Several conclusions emerge from this evidence. First, we find that identical twins' investment styles are significantly more correlated compared to fraternal twins. For example, the Pearson correlation coefficient among identical twins is 0.32 for the average P/E ratio of the stock portfolio, compared to only 0.19 among fraternal twins (0.20 among same-sex fraternal twins). The correlation among identical twins is generally about double the correlation among fraternal twins. A similar conclusion emerges for mutual funds. For example, the Pearson correlation coefficient among identical twins is 0.30 for the average Value-Growth Score by Morningstar for the mutual fund portfolio, compared to only 0.14 among fraternal twins (0.16 among same-sex fraternal twins). That is, genetically more similar investors have more similar investment styles. This evidence strongly suggests that genetic differences affect value versus growth orientation among individual investors.

Second, we find that the correlations among identical twins are significantly below one. That is, even genetically identical investors show significant differences with respect to their investment styles. This evidence shows the importance of the environment (e.g., individual-specific experiences and events) in explaining an investor's value versus growth orientation, and emphasizes the importance of analyzing the effect on investment style of experiences and events during an individual's life course.

A.2 Evidence from Variance Decomposition

Table 3 reports estimation results from decomposing investment styles into genetic and environmental variation using maximum likelihood estimation of the random effects model specified in equation (1). We report A, C and, E as specified in equation (5), i.e., the proportions of the cross-sectional variation in investment styles across individuals that are explained by genetic, common environmental, and individual-specific environmental factors. More specifically, we first regress each investment style measure on a set of individual characteristics, and then we decompose the residual variation using equation (1). We include the following individual characteristics: Education, marriage status, disposable income, and net worth.

The evidence from the variance decomposition confirms the correlation evidence, and shows that variation across investors with respect to value versus growth orientation is partially genetic.[20] The estimates of the A component vary from 18% to 24%, and are statistically significant for each investment style measure. The C component is significantly smaller, and varies from 0% to 10%. The remaining portion of the cross-sectional variation in investment style is explained by individual-specific experiences and events.[21]

While the evidence reported so far involves individual stocks, we also decompose the cross-sectional variation in investment style using data on mutual funds. We use two measures, the Value-Growth Score by Morningstar and a name-based value/growth measure. These measures provide a salient way for an individual investor to choose exposure based on his or her value versus growth preference. Our conclusions are similar compared to individual stocks. The estimates of the A component vary from 16% to 25%, and are statistically significant for each investment style measure, and the estimate of the C component is smaller and varies from 0% to 4%.

On the one hand, Tables 3 and 4 show that it is very difficult to estimate the A component for value versus growth orientation without wide confidence intervals. On the other hand, it is encouraging that each of the investment style measures paint a very consistent picture in the sense

[20]As a robustness check, we have also examined Price/Sales (P/S) and Price/Cash flow (P/C) ratios. The A components for these measures are similar, or larger, than those reported for standard value versus growth measures such as P/E and P/B ratios.

[21]The E component is also absorbing idiosyncratic measurement error. Because our data set comes from the Swedish Tax Agency, which obtains the data directly from financial institutions, reporting errors should be relatively rare.

of a statistically significant A component, for both stocks and mutual funds. It should also be emphasized that recent studies related to individual investor behavior have had difficulties explaining even 10% of the cross-sectional variation when including a large set of individual characteristics (e.g., Brunnermier and Nagel (2008)), so even the lower end of our confidence intervals represent economically significant effects. Overall, based on the reported evidence, we conclude that an individual's investment style has a biological basis, i.e., a preference for value versus growth stocks is partially ingrained in an investor from birth.

B Risk Preferences and Investment Style

If value-oriented portfolios have outperformed growth-oriented portfolios historically because of differences in risk, we would expect investors with a preference for more (less) financial risk to prefer value (growth) stocks and mutual funds. Surprisingly, there is not much previous research that directly relates proxies for an individual's risk taking propensity to the value versus growth orientation of the investor's portfolio. In this section, we therefore examine whether several proxies which a priori are expected to correlate with risk preferences also explain individuals' investment styles. The results are reported in Table 5.

B.1 Cross-Sectional Evidence

We start by examining whether gender is related to value versus growth orientation. Several previous studies in economics have found that men generally take more risk compared to women (see, e.g., Croson and Gneezy (2009) and Bertrand (2011) for extensive literature reviews). As a result, if value is riskier than growth investing, we would expect that men, on average, are more value orientated than women. Table 5 shows that we find the opposite result in data: Men have a stronger preference for growth investing compared to women. We find that men's stock portfolios have a P/E ratio that is on average 0.4 higher than women's, about 2% higher compared to the median P/E. Another way to quantify the size of this effect is to report that the median P/E ratio for a value fund based on a classification of the fund's name is 15.7, compared to 21.0 for growth funds, which means that an effect of 0.4 corresponds to about 8% of the difference between value and growth funds, which is an economically significant effect.

We also examine age because older investors are generally found to take less financial risk compared to younger investors (e.g., Barsky, Juster, Kimball, and Shapiro (1997) and Paulsen et al. (2012)). A risk preference explanation would predict that older investors are more growth oriented. Again, Table 5 shows that we find the opposite result in data: Older investors have a significantly stronger preference for value investing. The average P/E ratio of the stock portfolio of a 65 year old investor is 4.4 (or about 19% compared to the median) lower compared to a 25 year old.[22]

We also examine a larger set of proxies potentially related to an individual's risk taking propensity, including education, marriage status, disposable income, and net worth. Table 5 first includes these variables one by one, and then all at the same time. We find that those with a college education have more growth oriented portfolios compared to lower-education investors, with an average P/E ratio that is 2.4 (or about 11% compared to the median) higher. Investors who are married and who have higher disposable incomes and net worth also have a stronger preference for growth. For example, a one standard deviation change in the log of disposable income corresponds to an average P/E that is about 1.3 higher.

The overall conclusion from the above analysis is that investors who a priori are expected to take more financial risk have a preference for growth investing, not value investing. This result is consistently found in data for both more exogenous variables (e.g., gender and age) and other individual characteristics.

B.2 Evidence from Discordant Twins

One concern related to the above cross-sectional evidence is that individuals self-select into life experiences and events partly based on their genetic predispositions. Our specific data enables us to use a "discordant twin pair research methodology," which resembles a natural experiment, to address such concerns. More specifically, this methodology involves comparison of investment styles within pairs of identical twins, who match on genes and the common environment, but who differ

[22]Because some studies have found that the very oldest individuals in their samples do take more financial risk (e.g., Barsky et al. (1997)), we have checked that our conclusion is robust to excluding those over 70 years. Our results are indeed somewhat stronger when we drop the very oldest investors in our data (not tabulated).

(i.e., are "discordant") on other dimensions because of idiosyncratic life experiences.[23]

We model investment style, s_{ij}, for a pair i of identical twins ($j = 1, 2$) as a function of observable proxies for individual risk taking propensity $\mathbf{X}_{ij}$ and three unobservable effects related to genes and the common environment, a_i, c_i, and e_{ij}:

$$y_{ij} = \beta_0 + \beta\mathbf{X}_{ij} + a_i + c_i + e_{ij}. \tag{6}$$

By differencing equation (6) within each pair of identical twins we eliminate any effects of genes (a_i) and the common environment (c_i):

$$y_{i1} - y_{i2} = \beta(\mathbf{X}_{i1} - \mathbf{X}_{i2}) + e_{i1} - e_{i2}. \tag{7}$$

If we study the effect of, e.g., education on investment style this methodology enables us to control for the fact that IQ and cognitive ability is genetic to a significant extent. That is, we are able to examine the effect of education on value versus growth orientation that is not caused by genetic differences. The results are reported in Table 6.

We first re-estimate the cross-sectional model for identical twins only to check that the previous conclusions do not change. Most importantly, the discordant twin pair research methodology shows that the variables previously included are generally not statistically significant. That is, the effect of variables such as education and disposable income on investment style appear to be mostly driven by genetic and common environmental effect.

C Life Course Theory and Investment Style

In this section, we examine to what extent differential life experiences and events of individuals explain cross-sectional differences in investment styles later in life. Based on pre-existing research in social psychology we consider several types of potentially relevant, and exogenous, life experiences of individuals: 1) Macroeconomic experiences, 2) Impressionable years, and 3) Rearing environment. Table 7 reports the results.

[23] See Taubman (1976) for an early application of this empirical approach.

C.1 Macroeconomic Experiences

We start by examining adverse and significant macroeconomic experiences. First, we analyze whether there is a pervasive effect on an individual's investment style of growing up during the Great Depression. More specifically, we examine the effect on value versus growth orientation of being born between 1920 and 1929, following the "Depression Baby" definition in Schoar and Zuo (2013).[24] If an adverse macroeconomic experience results in less risk taking later in life, and if value is riskier than growth investing, we would expect investors who grew up during the Great Depression to prefer growth investing. An alternative hypothesis, not necessarily based on a risk explanation, is that those who have more salient experiences of difficult economic conditions develop a value-oriented investment style, with a preference for relatively "cheaper" stocks. The results in Panel A of Table 7 are consistent with the latter hypothesis: Individuals who grew up during the Great Depression show significantly more value-orientation in their stock portfolios several decades later in life. More specifically, we find that those who grew up during the Great Depression have portfolios with average P/E ratios that are 2.2 (or about 10% at the median) lower compared to those of other investors. It is important to emphasize that we control for disposable income and net worth, which may also be affected by a Great Depression experience.[25]

Second, we also analyze an individual's GDP growth experiences during his or her entire life so far. More specifically, we measure the average GDP growth from an individual's birth year until year 2000, i.e., the start of our data set. Experiencing poor GDP growth may reduce an individual's propensity to take risk later in life. A risk explanation for investment style would suggest that individuals with more negative GDP growth experiences become growth investors. An alternative hypothesis is that experiencing stronger GDP growth results in a growth oriented investment style. Our results are consistent with the latter hypothesis. We find that for a 100 basis points per year higher average GDP growth experience during the life, the average P/E ratio of the stock portfolio

[24] Sweden was affected by the Wall Street Crash of 1929, and was also the origin of the Kreuger Crash of 1932, with adverse international macroeconomic consequences deepening the Depression in several countries, including the U.S.

[25] The reported "Depression Baby" effect can not be empirically distinguished from a cohort effect unrelated to the Depression. First, it is not clear what would drive such an effect. One possibility is that those born between 1920 and 1929 had parents of similar age who had been affected by macroeconomic experiences, and that the parents transferred these experiences to their children. Our results are robust to controlling for parents' age (not tabulated). Second, our results related to impressionable years are not driven by one specific cohort.

of the investor is 1.2 (or about 6% at the median) higher compared to those of other investors, controlling for individual characteristics. While economically significant, we recognize that the effect is statistically weaker (t-statistic = 1.81) compared to the Great Depression, the most severe macro event someone in our sample experienced.[26]

These results are supportive of life course theory partially explaining an investor's value or growth orientation. An individual's GDP growth experiences, particularly adverse and significant macroeconomic experiences (e.g., the Great Depression) affect an individual's investment style later in life. The evidence is consistent with those who have more salient experiences of difficult economic conditions developing a value-oriented investment style, with a preference for relatively "cheaper" stocks.

C.2 Impressionable Years

We also analyze other impressionable years during an individual's life. More specifically, we consider whether an individual started his or her first employment in an economic downturn. There exists no similar classification of recessions to the NBER's business cycle database for Sweden, so we have analyzed a broad set of alternative measures of economic downturns. We start by defining a recession as a period with a year with negative GDP growth +/– 1 years.[27] Panel B of Table 7 shows that our results are consistent with the period of job market entry affecting an individual's long-term investment style. Individuals with their first employment in a recession show significantly more value-orientation in their stock portfolios later in life. We also report results for the most severe economic downturns someone in our sample experienced, corresponding to World War I, the Great Depression, and World War II. We find that those who entered the job market in a significant economic downturn have portfolios with average P/E ratios that are 2.2 (or about 10% at the median) lower compared to those of other investors, controlling for individual characteristics.

[26]We have also examined whether "Individual HML Experience," based on the returns of the HML portfolio by Fama and French (1993), explains subsequent investment styles. That is, do those who experienced lower HML returns develop into growth oriented investors? We construct a measure in a similar way as our "Individual GDP Growth Experience" measure. We do not find a robust and statistically significant relation between "Individual HML Experience" and value versus growth orientation (not tabulated).

[27]The results are somewhat stronger if we only include the years of negative GDP growth but that measure is more susceptible to criticism of exogeneity compared to a measure that also includes +/– 1 years.

Our result that the preference for value investing among those with their first employment in an economic downturn is robust to controlling for disposable income and net worth implies that there is a a direct effect of economic downturns during the impressionable years to investment style later in life, in addition to any indirect effect on investment style from lower income of those who entered the job market in economic downturns (e.g., Oreopoulos et al. (2012)). We report similar results if we examine whether an individual experienced a severe economic downturn when 18-25 years old.

These results are supportive of an impressionable years hypothesis: The economic conditions at the time of the first job market entry partially explain an individual's investment style later in life; the more severe the economic downturn, the more value oriented the individual is later on.

C.3 Rearing Environment

We also examine whether the rearing environment has significant long-term effects on an individual's investment style later in life. First, we examine the socioeconomic status (SES) of an individual's parents. We are not able to measure parents' SES exactly when an individual grew up, so we use parents' net worth at the start of our data set as a proxy. The results are reported in Panel C of Table 7. We find that individuals who grew up in a lower SES environment, i.e., relatively poor, show significantly more value-orientation in their stock portfolios later in their lives. Investors at the bottom of the parental wealth distribution (10th percentile) have portfolios with average P/E ratios that are 1.0 (or about 5% at the median) lower compared to investors at the top of the distribution (90th percentile). We show that this effect is robust also within each generation by controlling for birth cohort (decade) fixed effects, i.e., this result is not specific only to the Great Depression cohort. Second, we examine whether parents' life experiences transfer to their children and affect the investment style also of the next generation. We find evidence consistent with an inter-generational transfer of parental life experiences. Investors whose parents were born between 1920 and 1929, i.e., grew up during the Great Depression, show significantly more value orientation. Comparing the Great Depression effect on an individual's own investment style to the one of the next generation we find that about half of the effect is transmitted to the children.

The overall conclusion from the above analysis is that individuals' investment styles are affected also by the rearing environment in which they grew up, in particular their parents' socio-economic status and their parents' life experiences.

VI Discussion

In this section, we discuss some of the potential implications of our results.

Mechanisms? While our study shows that an individual's investment style is explained by both biological predispositions as well as experiences and events during the course of life, it is silent on the specific mechanisms than explain these effects. Using gene candidate studies or genome-wide association studies (GWAS) to identify the specific set of gene(s) that explain value versus growth orientation would be a natural next step. As the number of studies in economics and finance that support life course theory and an impressionable years hypothesis increases, another necessary next step is to uncover the mechanisms than explain why macroeconomic and other events are related to investment behavior decades later. For example, recent research on neurological development shows that, in the developing brain, the volume of gray matter in the cortex gradually increases until about the age of adolescence, but then sharply decreases as the brain prunes away neuronal connections that are deemed superfluous to the adult needs of the individual (e.g., Spear (2000)). Such evidence may provide a mechanism for early life experiences explaining an individual's investment behavior later in life, but more research is required.

Asset prices and the value premium? First, our results imply that the overall genetic composition in a market may affect the demand for value versus growth stocks, and in the end potentially equilibrium asset prices. In markets where the genes explaining a value preference are relatively more prevalent, we may expect stronger demand for value stocks, and as a result a relatively smaller equilibrium value premium (if the supply of value and growth stocks is not responding perfectly). Once the specific genes involved in explaining a value preference have been identified, researchers may analyze whether the relative prevalence of these genes in different markets affect the value premium in these markets. Second, our result that gender and age are related to value versus growth orientation implies that the the gender distribution and the age distribution in a market may partially explain the value premium. Markets with significant gender or age imbalances may provide researchers with opportunities to analyze this implication. Finally, the life experiences of the participants in a particular market may affect the demand for value versus growth stocks, potentially resulting in "legacy effects" of macro events that occurred a long time ago also for the value premium, similar to the implications of Friedman and Schwartz (1963) and Cogley and Sargent (2008) for the equity premium.

Inefficiency of investor portfolios? The finding that value stocks historically have outperformed growth portfolios is explained by risk in standard finance models. Casual evidence suggests that many individual investors do not seem to perceive value as riskier than growth portfolios. Many mutual fund companies also seem to promote this view. To provide only one examples, Fidelity explains the difference between value and growth funds to investors as follows on their website: "While growth funds are expected to offer the potential for higher returns, they also generally represent a greater risk when compared to value funds."[28] We find that investors who a priori are expected to take more financial risk have a preference for growth, not value, investing. If value actually is riskier than growth, for example because asset prices are set by institutional investors, individuals' mis-calibration imply that value (growth) investors may take significantly more (less) risk than they would have done if they were appropriately calibrated. As a consequence, many investors may end up with inefficient portfolios.

VII Conclusion

We report that several factors explain an investor's style, i.e., the value versus growth orientation of the investor's stock portfolio. First, an investor's style has a biological basis – a preference for value versus growth stocks is partially ingrained in an investor already from birth. We estimate that genetic differences across individuals explain 18% of the cross-sectional variation in value versus growth orientation, if using P/E ratios as an investment style measure, and 25% if using Morningstar's Value-Growth Score. This evidence contributes to a growing number of studies which show that individual characteristics of importance for portfolio choice are partly explained by an individual's biological predispositions and genetic composition (e.g., Cesarini et al. (2009), Kuhnen

[28]https://www.fidelity.com/learning-center/mutual-funds/growth-vs-value-investing.

and Chiao (2009), and Barnea, Cronqvist, and Siegel (2010)).

Second, investors who a priori are expected to take more financial risk have a preference for growth, not value, investing. This result is consistently found in data for exogenous proxies for risk taking propensity (e.g., gender and age) and also other individual characteristics (e.g., wealth). If value is riskier than growth, it may be surprising that those who are expected to take more (less) financial risk prefer growth (value) stock portfolios. This evidence suggests that either value is not riskier than growth, or that the average individual investor in mis-calibrated about the risk of value versus growth investing. In this sense, our research contributes a new perspective to the long-standing value/growth debate in finance (e.g., Fama and French (1992, 1993) Lakonishok, Shleifer, and Vishny (1994)). More specifically, we provide a new perspective on the source of the value premium by showing that individual investors' portfolio choices do not seem to be consistent with a risk explanation.

Finally, an investor's style is explained by life course theory in that experiences, both earlier and later in life, are related to investment style. In particular, investors with adverse macroeconomic experiences have stronger preferences for value investing later in life. For example, those who grew up during the Great Depression have portfolios with average P/E ratios that are 2.2 (or about 10% at the median) lower, controlling for individual characteristics, several decades later in life. Consistent with an impressionable years hypothesis, those who enter the job market for the first time during an economic downturn are also more value oriented later on. We also find that those who grew up in a lower status socio-economic rearing environment have a stronger value orientation later in life. This evidence contributes to several recent studies which show the importance of life experiences and events for economic behaviors later in life (e.g., Oyer (2006), Kaustia and Knüpfer (2008), Malmendier and Nagel (2011), and Giuliano and Spilimbergo (2013)).

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Table 1
Summary Statistics: Individual Characteristics
Panel A: Number of Twins by Zygosity and Gender

	All Twins	**Identical Twins**			**Fraternal Twins**			
		Male	Female	Total	Male	Female	Sex	Total
Number of twins (*N*)	34,976	4,496	5,994	10,490	5,064	6,300	13,122	24,486
Percentage	100%	13%	17%	30%	14%	18%	38%	70%

Panel B: Individual Characteristics

	All Twins	**Identical Twins**			**Fraternal Twins**		
	N	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.
Age	34,976	47.08	48.00	17.64	53.06	55.00	15.51
High School	34,976	22%	0%	41%	26%	0%	44%
College or More	34,976	58%	100%	49%	47%	0%	50%
No Education Data Available	34,976	6%	0%	23%	6%	0%	24%
Married	34,976	46%	0%	50%	54%	100%	50%
Net Worth (USD)	34,976	87,554	39,661	210,778	103,892	51,634	480,174
Disposable Income (USD)	34,976	31,305	25,443	24,944	34,797	27,563	33,425

Table 1 reports summary statistics for the individuals (Panel A) in our data set and their characteristics (Panel B). The variables are defined in detail in Appendix Table A1.

Table 2
Summary Statistics: Investment Style Measures

		Identical Twins			Fraternal Twins		
	N	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.
Stocks							
P/E	17,952	24.2	22.8	14.6	23.0	21.3	13.1
P/B	18,337	3.3	2.8	2.4	3.2	2.5	2.3
Mutual Funds							
Morningstar's Value-Growth Score	25,729	156.4	149.2	21.4	155.2	148.6	21.0
Name-Based Value/Growth Measure	27,397	0.1	149.2	0.2	0.1	0.0	0.2

Table 2 reports summary statistics for the measures of investment style. The variables are defined in detail in Appendix Table A1.

Table 3
Evidence from Variance Decomposition of Investment Style: Stocks

	P/E	**P/B**
A Share	0.181**	0.241**
	0.076	0.118
C Share	0.101*	0.080
	0.056	0.096
E Share	0.718***	0.679***
	0.030	0.046
Individual Characteristics Included	Yes	Yes
N	10,618	10,640

Table 3 reports results from maximum likelihood estimation. The different investment style measures are modeled as linear functions of observable individual characteristics and unobservable random effects representing additive genetic effects (A), shared environmental effects (C), as well as an individual-specific error (E). For each estimated model, we report the variance fraction of the residual explained by each unobserved effect (*A* Share – for the additive genetic effect, *C* Share – for common environmental effect, *E* Share – for the individual-specific environmental effect) as well as the bootstrapped standard errors (1,000 resamples). The variables are defined in detail in Appendix Table A1.

Table 4
Evidence from Variance Decomposition of Investment Style: Mutual Funds

	Morningstar's Value-Growth Score	Name-Based Value/Growth Measure
A Share	0.249***	0.159**
	0.026	0.065
C Share	0.000	0.036
	0.009	0.040
E Share	0.751***	0.805***
	0.022	0.031
Individual Characteristics Included	Yes	Yes
N	17,534	17,650

Table 4 reports results from maximum likelihood estimation. The different investment style measures are modeled as linear functions of observable individual characteristics and unobservable random effects representing additive genetic effects (A), shared environmental effects (C), as well as an individual-specific error (E). For each estimated model, we report the variance fraction of the residual explained by each unobserved effect (*A* Share – for the additive genetic effect, *C* Share – for common environmental effect, *E* Share – for the individual-specific environmental effect) as well as the bootstrapped standard errors (1,000 resamples). The variables are defined in detail in Appendix Table A1.

Table 5
Cross-Sectional Evidence: Investment Style and Proxies for Risk Preferences

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Male	0.88***						0.40*
	0.21						0.21
Age		-0.07***					-0.11***
		0.01					0.01
College or More			3.56***				2.36***
			0.28				0.30
High School			1.11***				0.75**
			0.31				0.32
No Education Data Available			0.60				1.69***
			0.43				0.48
Married				0.16			0.77***
				0.22			0.22
Log (Disposable Income)					0.78***		1.93***
					0.16		0.20
Log (Net Worth)						0.04	0.10***
						0.03	0.03
Constant	22.85***	26.97***	21.26***	23.24***	23.28***	13.71***	2.15
	0.15	0.45	0.23	0.17	0.12	2.06	2.17
N	17,952	17,952	17,952	17,951	17,952	17,943	17,943
R-squared	0.00	0.01	0.01	0.00	0.00	0.00	0.02

Table 5 reports results from linear regressions of P/E ratio onto individual characteristics. For each estimated model, we report the coefficient estimates as well as the corresponding standard errors. Robust standard errors are adjusted based on correlation between twins in a twin pair. The variables are defined in detail in Appendix Table A1.

Table 6
Evidence from Discordant Twins: Investment Style and Proxies for Risk Preferences

	Cross-Section	**Discordant Twins**
Male	1.59***	
	0.44	
Age	-0.12***	
	0.02	
College or More	1.77***	2.86
	0.66	1.76
High School	0.23	2.39
	0.70	1.51
No Education Data Available	1.50	3.81
	0.99	2.85
Married	1.12**	-0.22
	0.44	0.68
Log (Disposable Income)	1.73***	0.61
	0.40	0.68
Log (Net Worth)	0.07	0.21
	0.07	0.13
Constant	5.54	-0.21
	4.39	0.39
N	5,201	1,877
R-squared	0.02	0.01

Table 6 reports results from linear regressions of P/E ratio (column "Cross-Section") onto individual characteristics, and intra twin-pair difference in the P/E ratio on differences in individual characteristics (column "Discordant Twins"). For each estimated model, we report the coefficient estimates as well as the corresponding standard errors. Robust standard errors are adjusted based on correlation between twins in a twin pair. The variables are defined in detail in Appendix Table A1.

Table 7
Life Course Theory and Investment Style

Panel A: Macroeconomic Experiences

	(1)	(2)
Depression Baby	-2.17***	
	0.53	
Individual GDP Growth Experience		1.23*
		0.68
Constant	2.12	-0.48
	2.17	2.61
Individual Characteristics Included	Yes	Yes
N	17,943	17,943
R-squared	0.02	0.02

Panel B: Impressionable Years

	(1)	(2)	(3)
First Job in Recession	-0.78**		
	-0.35		
First Job in Severe Recession		-2.18***	
		0.57	
18-25 Years Old in Severe Recession			-3.83***
			0.71
Constant	3.73	3.87*	3.86*
	2.32	2.32	2.31
Individual Characteristics Included	Yes	Yes	Yes
N	16,462	16,462	16,462
R-squared	0.02	0.02	0.02

Panel C: Rearing Environment

	(1)	(2)	(3)	(4)
Log (Parents' Net Worth)	0.26**	0.27**	0.30***	0.30***
	0.11	0.11	0.11	0.11
Depression Baby Parents			-1.33***	-1.20**
			0.47	0.5
Constant	5.12	4.94	4.74	4.69
	3.59	4.73	3.59	4.73
Individual Characteristics Included	Yes	Yes	Yes	Yes
Birth Cohort (Decade) Fixed Effects	No	Yes	No	Yes
N	8,101	8,101	8,101	8,101
R-squared	0.02	0.02	0.02	0.02

Table 7 reports results from linear regressions of P/E ratio onto macroeconomic experience variables (Panel A), impressionable years variables (Panel B), and rearing environment variables (Panel C). For each estimated model, we report the coefficient estimates as well as the corresponding standard errors. Robust standard errors are adjusted based on correlation between twins in a twin pair. The variables are defined in detail in Appendix Table A1.

Appendix Table A1
Variable Definitions

Category / Variable	Description
Individual Characteristics	
Male	An indicator variable that equals 1 if an individual is male, and 0 otherwise. Data
Age	Average age across the years an individual is in the data set. Data from Statistics Sweden.
College or More	An indicator variable that equals 1 if an individual has attended university, and 0 otherwise. Data from Statistics Sweden.
High School	An indicator variable that equals 1 if an individual has completed high school ("gymnasium"), and 0 otherwise. Data from Statistics Sweden.
No Education Data Available	An indicator variable that equals 1 if no educational data are available for an individual, and 0 otherwise. Data from Statistics Sweden.
Married	Average of an annual indicator variable that equals 1 if an individual is married, and 0 otherwise. Averaged across those years an individual is in the data set. Data from Statistics Sweden.
Disposable Income	Average individual disposable income, i.e., the sum of income from labor, business, and investment, plus received transfers, less taxes, and alimony payments. Averaged across those years an individual is in the data set. Expressed in nominal Swedish Krona (SEK). Data from Statistics Sweden.
Net Worth	Average difference between the end-of-year market value of an individual's assets and liabilities. Averaged across those years an individual is in the data set. Expressed in nominal Swedish Krona (SEK). Data from Statistics Sweden.
Investment Style	
P/E	The value-weighted price to earnings ratio for each year, averaged across those years an individual is in the data set. Data from CapitalIQ.
P/B	The value-weighted market value to book value of equity ratio for each year, averaged across those years an individual is in the data set. Data from CapitalIQ.
Morningstar's Value-Growth Score	Morningstar's score of value/growth from -100 (value) to +400 (growth). The variable is value-weighted for each year and averaged across those years an individual is in the data set.
Name-based Value/Growth Measure	A variable that equals -1 if a fund's name contains "value," equals +1 if a fund's name contains "growth" or "high tech," and zero otherwise. The variable is value-weighted for each year and averaged across those years an individual is in the data
Experience and Events	
Depression Baby	An indicator variable that equals 1 if a individual was born 1920-1929, and otherwise 0.
Individual GDP Growth Experience	The average of GDP growth in Sweden from an individual's birth to year 2000.
First Job in Recession	A "Recession Year" is a year with negative GDP growth. The variable is an indicator variable that equals 1 if an individual entered the job market for the first time during a recession year +/- 1 year, and 0 otherwise.
First Job in Severe Recession	The variable is an indicator variable that equals 1 if an individual entered the job market for the first time during World War I, the Great Depression, or World War II, and 0 otherwise.
Parents' Net Worth	An individual's parents' net worth.
Depression Baby Parents	An indicator variable that equals 1 if both parents of an individual were born 1920-1929, and 0 otherwise.

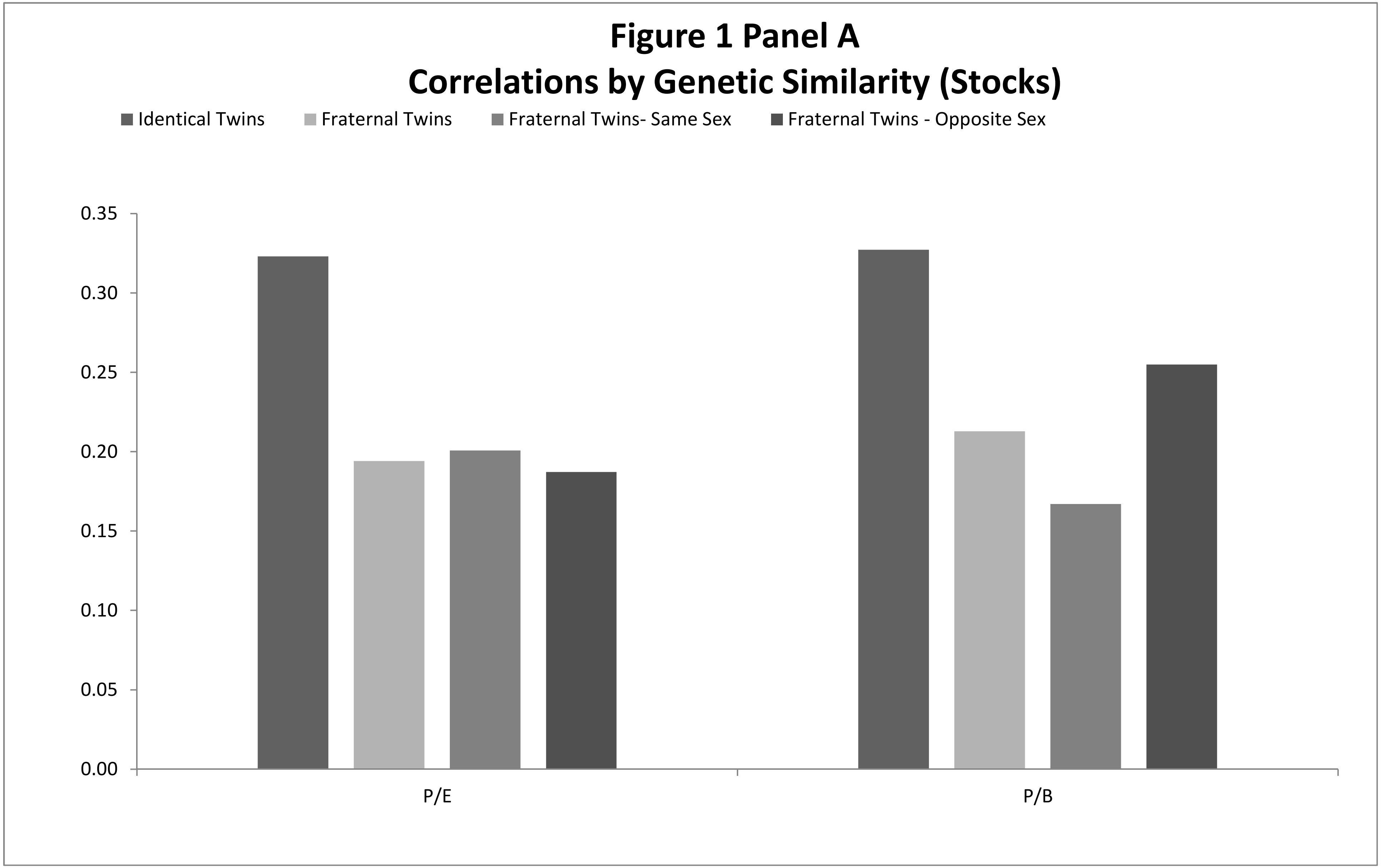
Figure 1 Panel A
Correlations by Genetic Similarity (Stocks)
Identical Twins
Fraternal Twins
Fraternal Twins- Same Sex
Fraternal Twins - Opposite Sex
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
P/E
P/B

Figure 1 Panel B
Correlations by Genetic Similarity (Mutual Funds)