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Individual investors and gender similarities in an emerging stock market ☆

Lei Feng [a], Mark S. Seasholes [b,*]

[a] *Goldman Sachs, 1 New York Plaza, New York, NY 10004, USA*
[b] *U.C. Berkeley Haas School of Business, 545 Student Services Bldg., Berkeley CA 94720, USA*

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Abstract

We study the investment behavior of men and women in an emerging stock market. Unlike developed markets, men and women in the People's Republic of China are equally represented. Men have larger average portfolios than women (RMB 155,121 vs. RMB 118,461) and place slightly larger trades (RMB 37,479 vs. RMB 33,861). More importantly, males and females exhibit similar behavior along three key dimensions: (1) The degree of home bias is similar across genders – both men and women over-weight local stocks by 9% relative to the market portfolio. (2) The portfolio performances of males and females are not statistically different. (3) Men appear to trade more intensively than women *before* controlling for factors such as number of stocks held and number of trading rights. *After* controlling for these factors, there is no significant difference in trading intensity. We use survival analysis to control for both observable and unobservable characteristics when studying trading intensity. These controls prove crucial when comparing behavior across groups of investors.

JEL classification: G15; F3; D1
Keywords: Behavioral finance; Gender; Emerging markets

1. Introduction

Over the past 8 years, work by Odean (1998a,b, 1999) and Barber and Odean (1999, 2000a, 2001) has taught financial economists much about individual investor behavior. In fact, many of the

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* Corresponding author. Tel.: +1 510 642 3421; fax: +1 510 642 4700.
E-mail address: mss@haas.berkeley.edu (M.S. Seasholes).

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stylized facts we know about investors stem from these papers and papers that use the same data. For example, investors tend to trade too much, trading greatly decreases an investor's net profits, and investors are reluctant to realize their losses. The papers also highlight gender differences. In the United States, men represent approximately 80% of investors while women represent only 20%. Barber and Odean (2001) show "that men trade 45 percent more than women. Trading reduces men's net returns by 2.65 percentage points a year as opposed to 1.72 percentage points for women."

The goal of this paper is to better understand gender similarities and/or differences in an emerging stock market. Do we see different levels of participation by males and females? Do we see different investment behavior? And, do we see differences in performance based on gender? The aforementioned finding that men trade 45% more than women is arguably the best known result regarding gender and financial economics and is now a common belief in the field. Our data and methodology provide an out-of-sample test of gender differences and are a direct test of the Barber and Odean (2001) findings.

The main contribution of this paper comes from answering questions about the role of gender in financial markets. Our results differ markedly from existing studies. We show that male and female investors are equally represented in the People's Republic of China ("PRC"). Males have larger portfolios, on average, and make slightly larger trades. At the same time, men and women exhibit similar investment behavior along three key dimensions: First, both genders suffer equally from home bias. Second, we form calendar–time portfolios to investigate the profitability of trades by men and women. Men invest in stocks with slightly higher betas (1.0374 vs. 1.0255). Stocks men buy slightly under-perform stocks women buy. However, stocks men sell go down by more than stocks women sell. Overall, the performance (buys minus sells) of male and female investors is not statistically different.

The third, and the most interesting, set of results concerns gender similarity when measuring trading intensity. Men appear to trade more than women *before* controlling for factors such as number of stocks held and number of trading rights.[1] *After* controlling for these factors, men and women trade with similar levels of intensity (i.e., similar turnover). Our results suggest that gender differences are related to factors such as availability of phone trading and computer trading. Such an interpretation is consistent with the Barber and Odean (2002) study of young men who are active traders. In other words, a select sub-sample of men trades very frequently. Cross-sectional statistics may very well be affected by active male traders even if they represent a small fraction of all investors. The methodology used in our paper avoids the problem of small sub-samples overly influencing population averages. We use survival analysis to control for observed and unobserved differences between investors.

This paper provides an in-depth study of trading in the PRC. We examine trades and holdings from over 50,000 different individuals. Our data consist of approximately USD 1 billion in common stock holdings and over 3 million transactions. The data come from 15 branch offices of a national brokerage firm. We show the median individual in the PRC holds two stocks in his portfolio which is similar to holdings in the United States. We show a high degree of home bias. Individuals in the PRC over-weight local stocks by 9.10% more than a CAPM investor – a result which is again similar to the 14% to 18% over-weighting found in the United States. Finally, the average amount traded is USD 4500 and the average amount held by individuals in USD 17,000. Average trade sizes and holdings in the United States are less than three times larger than the corresponding amounts in the PRC even though GDP per capita in the United States is approximately ten times higher than in the PRC.

[1] An example of a trading right is the ability to place trades by phone. Not all accounts have this right.

The next section of the paper, Section 2, briefly reviews existing literature in the field of investor behavior. Section 3 discusses the structure of brokerage accounts in the PRC and our data. Section 4 presents results regarding gender and five areas of investment behavior: (1) holdings; (2) transaction amounts; (3) home bias; (4) portfolio performance; and (5) trading intensity. Section 5 concludes and discusses possible future research.

2. Existing studies of individual behavior

High-quality, account-level data are hard to come by, though their availability have increased over the past decade. We briefly review existing data sets. Specific findings are compared and contrasted with our results in Section 4.

2.1. United States

Pre-1990 studies that use account-level data are rare. Notable exceptions include a series of articles by Lease et al. (1974), Cohn et al. (1975), and Schlarbaum et al. (1978a,b). Data for these papers consist of approximately 3000 accounts and trading records from 1964 to 1970.

Badrinath and Lewellen (1991) study 80,000 round-trip investments by approximately 3000 individuals between 1971 and 1979. The accounts are from the same large, retail brokerage house used in the papers mentioned above.

Odean (1998a,b, 1999) and Barber and Odean (1999, 2000a, 2001) have greatly expanded our understanding of the individual investors. Odean (1998a,b) studies the disposition effect with 10,000 customer accounts and 162,948 transactions from January 1987 to December 1993. Odean (1999) uses the same data to test whether investors trade too much. Barber and Odean (1999) present the disposition effect results in a practitioner journal. Barber and Odean (2000a,b) increase the size of their original sample sevenfold. They study 78,000 households and 1,969,701 transactions. Barber and Odean (2001) use a subset of their expanded dataset (37,664 households) to study gender differences.

Over the past 5 years, the Barber and Odean (2000a) data have been used in many papers including: Dhar and Kumar (2002); Goetzmann and Kumar (2002); Ivkovic, Poterba, Weisbenner (2005); Ivkovic and Weisbenner (2005); Graham and Kumar (2006); Dhar and Zhu (2006); Seasholes and Zhu (2006).

2.2. Europe

Shapira and Venezia (2000) study the disposition effect, trading frequency, volume, and profitability using 4330 accounts that are randomly drawn from an Israeli bank/brokerage firm. Grinblatt and Keloharju (2000a,b, 2001) study the holdings and trades of essentially all Finnish investors. Given the enormous size of the dataset, the authors don't focus on statistics such as number of accounts. Instead, the authors concentrate on trading in the largest stocks. Massa and Simonov (2006) study holdings and portfolio diversification in Sweden. Bodnaruk (2004) studies proximity and holdings also in Sweden. Dorn et al. (in press) study correlated trading using German retail accounts.

2.3. East Asia

In addition to this paper, researchers have recently begun to study trading the People's Republic of China. Feng and Seasholes (2004a,b, 2005) study the same accounts used in this paper. Their published work includes studies of correlated trading behavior and the disposition

Table 1
Branch location and regional statistics

(1)	(2)	(3)	(4)	(5)	(6)
Province	Number of branches (#)	Province population (# mm)	Area (km^2)	GDP per capita (RMB)	Average monthly household income (RMB)
Beijing	1	11.1	16,800	19,846	1184
Guangdong	4	73.0	170,000	11,728	1337
Heilongjiang	1	36.6	453,900	7660	490
Hubei	1	59.4	187,000	6514	754
Shandong	1	89.2	153,800	8673	794
Shanghai	5	13.1	6340	30,805	1422
Sichuan	2	83.6	570,000	4452	722
Total	**15**	**366.0**	**1,557,840**	–	–
Average	–	–	–	**8998**	**883**

Individual account data are from a national brokerage firm in the People's Republic of China (PRC) over the time period Jan-1999 to Dec-2000. We have data from 15 branch offices located throughout the country. The majority of the offices are located near one of the two stock exchanges in the PRC (Guangdong Province and the Shanghai Municipality.) Total province population in Column (3) is from the brokerage firm. Column (4) has the size (in km^2) of the province or municipality as provided by central government of the PRC. The GDP per capita in Column (5) is also from the central government. Column (6) shows the results of a private survey and gives a rough measure of wealth distribution in the country. At the bottom of Columns (5) and (6), we show population-weighted averages.

effect. Chen et al. (2004) study brokerage account data in the PRC and a number of different biases. Krause et al. (2007) also study the disposition effect.

3. Individual investors and account data in the PRC

Our data are provided by a national brokerage firm from the People's Republic of China. The data include information about individual account-holders, their holdings, and their trades between January 1999 and December 2000. Brokerage accounts in the PRC are both similar to, and different from, those in the United States. A brokerage firm may have branch offices throughout the country. Many brokerage firms in the PRC are regionally focused and have branches in only one province. Our data come from 15 nationwide branches of the same firm.

By law, individuals may only open one stock account in the PRC. Accounts use internal passport numbers or National Identity Card numbers as identification. Despite these rules, stories abound of entrepreneurial types who collect many internal passports and open many accounts. Our data *have been aggregated* by the brokerage firm at what is called the "fund account" level. An individual may control multiple "stock accounts" at a brokerage firm, but s/he can have only one fund account.[2] In the PRC, after an individual chooses a brokerage firm and branch office, they conduct all their transactions through this *one* branch office. This market structure gives rise to the location identification used in Feng and Seasholes (2004a,b).

The data used in this paper come from 1 firm and 15 different branch offices. Table 1 shows where the 15 branch offices are located. Four of the fifteen branches are located in Guangdong Province and five are in the Shanghai Municipality. Such a level of concentration is not too surprising since the two stock exchanges in the PRC are located in these two provinces. Table 1

[2] Data in Feng and Seasholes (2004a,b, 2005) are also aggregated at the fund account level as are data in Krause et al. (2007).

also shows the province population (Column (3)) and province size in km^2 (Column (4)). The GDP per capita in Column (5) is from the central government. Shanghai has approximately seven times higher GDP per capita than Sichuan Province. Column (6) shows the results of a private survey (provided to us by the brokerage office) and gives a measure of wealth distribution in the country. There is a wide dispersion of wealth in China. According to the survey, residents in Shanghai earn approximately three times more than residents in Heilongjiang earn.

3.1. Database structure

Our account-level data are in three main databases. The first database has demographic information about each individual investor. For each individual, we know the gender and birth date. We also know what trading rights each investor has. An example of a trading right is the ability to place trades by phone and not all accounts have this right. The second database has transaction information. Each record is dated and has the associated fund account number, stock code, shares, transaction price, and taxes. The third database is a monthly position (holdings) file. Stock positions are derived from the transaction database and an initial position file provided by the brokerage firm. We also have daily price, volume, and return information for all listed stocks.

3.2. Number of investors

Table 2 presents overview statistics for our data. There are 51,218 investors who are active (trade during our sample period), have non-zero holdings, and for whom we have demographic information. We have a total of 14,559 investors from the five branch offices in Shanghai.

Table 2
Overview of individual investors by age and gender

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Branch location	Number of active stock investors (#)	MALE Fraction of active stock investors (%)	FEMALE Fraction of active stock investors (%)	Age less than 25 years (%)	Age between 25 and 35 years (%)	Age between 35 and 45 years (%)	Age between 45 and 55 years (%)	Age between 55 and 65 years (%)	Age above 65 years (%)
Beijing	7604	53.3	46.7	7.9	31.5	32.6	16.5	8.1	3.5
Guangdong	6488	51.6	48.4	7.3	45.8	26.9	10.5	6.2	3.3
Heilongjiang	7408	47.3	52.7	4.9	27.9	39.3	19.8	5.9	2.2
Hubei	4399	50.5	49.5	5.6	27.4	32.7	20.5	10.0	3.9
Shandong	5299	50.2	49.8	4.4	22.5	36.5	25.7	8.0	2.9
Shanghai	14,559	49.3	50.7	4.3	16.5	29.9	31.0	11.9	6.4
Sichuan	5461	48.1	51.9	6.7	28.6	27.2	24.3	9.7	3.6
Total	**51,218**	–	–	–	–	–	–	–	–
Average	–	**50.0**	**50.0**	**5.7**	**26.9**	**31.9**	**22.5**	**8.9**	**4.1**

This table shows the number of investors in our sample, gender distribution, and age distribution. Individual account data are from a national brokerage firm in the People's Republic of China (PRC) over the time period Jan-1999 to Dec-2000. The total number of individuals for whom we have demographic information, holdings data, and trading data is shown in Column (2). The breakdown by gender is shown in Columns (3) and (4). The distribution of investor ages is given in Columns (5) through (10).

Interestingly, we have 7408 investors from Heilongjiang which is the poorest province in our sample. An associated appendix compares the size of our sample with existing studies. The appendix is available from the authors upon request.

3.3. Gender

Table 2, Columns (3) and (4), show that half of the investors are men and half are women. An equal number of male and female investors, such as in the PRC, is not found elsewhere in the world. Lease et al. (1974) find that 80% of U.S. investors are males in the 1960s. Barber and Odean (2001) show that not much has changed in the U.S. over the past thirty years. A full 78.7% of their sample is male. Gender comparisons can be seen in tabular form in the associated appendix.

3.4. Investor age

Table 2 gives a rough distribution of investor age. Column (5) shows that 5.7% of investors are under 25 years old. This is a little surprising since one might expect that young professionals in an emerging market to be some of the first people to invest in stocks. On the other hand, it is possible that young adults stay in school until their mid-twenties thus delaying their entrance into the job force. A delayed start of one's working life may be desirable in countries aiming to have 100% employment. The largest single age bracket is in the 35- to 45-year-old age range which has 31.9% of investors. Chen et al. (2004) confirm our findings and show the largest number of accounts comes from 29- to 49-year-old investors in their data.

Fig. 1. Birth year of active stock investors. This figure shows the distribution of birth years for investors in our dataset. Individual account data are from a national brokerage firm in the People's Republic of China (PRC) over the time period Jan-1999 to Dec-2000.

Not surprisingly, investors in the PRC are younger than those in the U.S. This result is most likely driven by three factors: (i) A longer life expectancy in the U.S. than in the PRC. (ii) Younger people are usually considered "early adopters" and stock markets were recently opened in the PRC. (iii) Common stocks are not traditionally used in retirement planning in the PRC so there is no reason to expect older people to own stock. We compare age distributions with existing studies in the associated appendix (available from the authors).

Fig. 1 graphs the distribution of birth years and is fairly smooth. Interestingly, there are two prominent dips; one around 1960 and the other around 1967. The first dip may be related to the Great Leap Forward which occurred between the years 1958 and 1962. Also, a drought in 1960 affected much of the cultivated land and may be responsible for the decline in births. The dip around 1967 is a bit harder to explain. The second dip occurred eighteen years after the founding of the modern country-state (the PRC) in 1949. A large number of deaths during World War II and the ensuing civil war could explain a lack of people of prime childbearing age in 1967. While beyond the scope of this paper, the population dips are both interesting and a potential avenue for future research.

One reason for graphing birth years is to check the integrity of the data. Without knowing much about the distribution of ages in the PRC, our data certainly look as if they are free from biases. For example, our sample contains investors ranging in age from those in their late teens to the those in their nineties. As further checks, we also graph the month-of-birth and day-of-birth for investors in our sample. Results are available from authors upon request. Month-of-birth results shows some seasonality with more people being born between October and January than in any other four-month period. Day-of-birth shows a smooth distribution. About half as many people are born on the thirty-first of the month than on the thirtieth – a fact that is reassuring. The month-of-birth and day-of-birth graphs (not shown) also help to confirm the integrity of our data.

4. Results regarding gender similarities and differences

4.1. Portfolio holdings and gender

We now turn to our portfolio data. These data record the monthly holdings (positions) of the investors in our dataset. Schlarbaum et al. (1978a,b) show that the aggregate value of holdings in their sample almost doubles from 1963 to 1968 before falling back near its original level in 1970. In an emerging stock market like the PRC, investors may be building their portfolios over time. In order to focus on cross-sectional differences, we present summary statistics for 1-Jun-2000 only.

Table 3, Column (2), shows we have 51,218 active investors with positive portfolio balances on 1-Jun-2000. The median number of positions is 2 (Column (3)) while investors hold 3.2 stocks on average (not reported). Column (4) shows the median balance on 1-Jun-2000 is RMB 34,442. Column (5) shows the average balance across investors is RMB 136,777 or USD 17,097 when using an approximate exchange rate of 8 RMB to 1 USD. The average balance in Chen et al. (2004) is RMB 113,455 and helps confirm our findings.

Not surprisingly, there is a long right-hand-side tail to the distribution of portfolio holdings in our data. Fig. 2 graphs the distribution of individual portfolio values. We can see the distribution is roughly log-normal (by inspection only). There are eighty-one individuals with holdings of RMB 8 million or more on 1-Jun-2000 (i.e., more than USD 1 million). The largest average holdings are RMB 273,194 and from Guangdong. This finding is confirmed by Chen et al. (2004). The largest holdings in their data average RMB 313,712 and are from Shenzhen in Guangdong province.

Table 3
Portfolio holdings and gender

(1) Branch location	(2) Investors (#)	(3) Median stocks per investor (#)	(4) Median portfolio value (RMB)	(5) Average portfolio value (RMB)	(6) MALE Average portfolio value (RMB)	(7) FEMALE Average portfolio value (RMB)	(8) Total value held by investors (RMB million)
Beijing	7604	3	34,745	134,209	134,258	134,152	1020.5
Guangdong	6488	2	53,105	273,194	284,179	261,481	1772.5
Heilongjiang	7408	2	22,889	48,187	48,179	47,547	357.0
Hubei	4399	2	32,455	90,893	102,471	79,097	399.8
Shandong	5299	2	26,650	78,145	94,740	61,419	414.1
Shanghai	14,559	3	44,060	162,069	203,202	122,024	2359.6
Sichuan	5461	2	28,752	124,878	138,596	112,180	682.0
Total	**51,218**	–	–	–	–	–	–
Average	–	**2**	**34,442**	**136,777**	**155,121**	**118,461**	**7005.4**

This table shows portfolio holdings at one point of time (01-Jun-2000). Individual account data are from a national brokerage firm in the People's Republic of China (PRC). Column (2) shows the number of investors with demographic information, non-zero holdings, and trading data. Column (3) shows the median number of stocks held. Column (4) shows the median portfolio value held. Columns (5), (6), and (7) show the average portfolio values in RMB across all investors, male investors, and female investors. Column (8) shows the total amount of common stock held by all investors in our sample expressed in RMB millions.

There are two important observations to be made regarding portfolio balances and regional wealth. First, there is a 0.81 correlation between average portfolio value by branch (from Table 3, Column (5)) and average monthly household income (from Table 1, Column (6)). There is a 0.33 correlation between average portfolio value by branch and GDP per capita (from Table 1, Column (5)). The wealth differences we see across our branches mirror wealth differences within the PRC. Second, Table 3, Column (8) shows our data consist of over RMB 7 billion in holdings which is slightly less than USD 1 billion. The number of investors and the amount of invested money reinforce the validity of our findings.

Table 3 also contains results regarding gender. Columns (6) and (7) show the average portfolio values, by province, for males and females. In all provinces, men hold more stock than women on average – though the values are almost equal in Beijing. The average amount held by men and women is significantly different at all conventional levels. Interestingly, we find that gender differences regarding holdings are *larger* in richer provinces than in poorer provinces. We calculate the ratio of average male portfolio values to average female portfolio values for each of the seven provinces (Table 3, Column (6) divided by Column (7)). This ratio of male-to-female portfolio values has a 0.39 correlation with GDP per capita. We also calculate the ratio of total holdings by gender (total holdings equal the average amount held multiplied by the number of investors). This ratio has a 0.49 correlation with GDP per capita. Though surprising, our findings are consistent with the wealth/gender distribution in the United States. The United States is a very rich country and it has a very high ratio of male to female holdings.[3] Future research can collect

[3] All correlations are based on only seven province-observations. Therefore, levels of statistical significance have been omitted. Results remain consistent if we calculate the difference between the average male portfolio value and the average female portfolio value by province. There is a 0.61 correlation of this difference measure with GDP per capita. There is a 0.86 correlation between the difference of total holdings by gender-portfolio and GDP per capita-province.

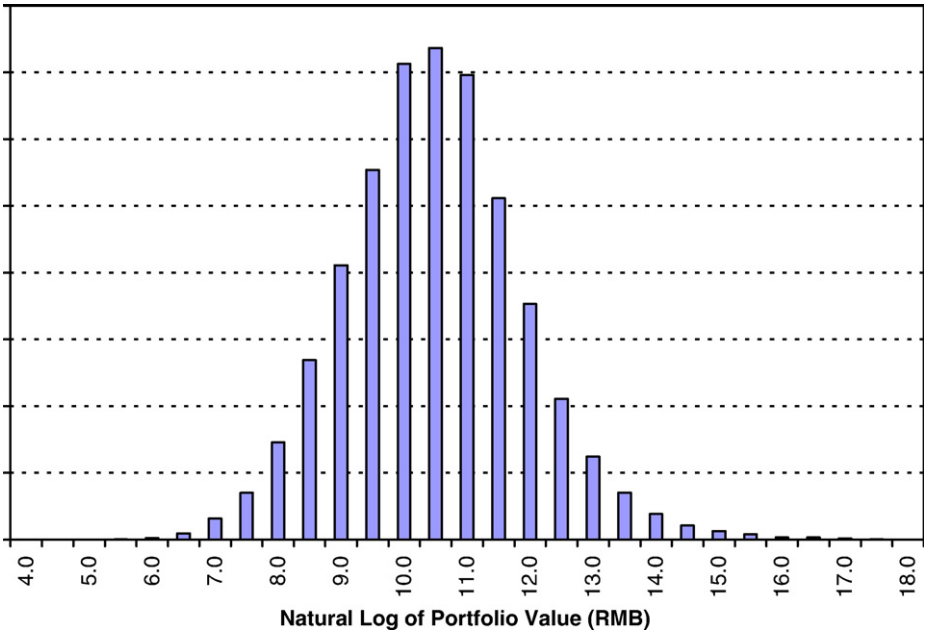

Fig. 2. Portfolio balances of active stock investors. This figure shows the distribution of log portfolio value (in RMB) for all investors as of 1-Jun-2000. A log value of 11.0 corresponds to RMB 59,874. If we use a rough exchange rate of 8 RMB to 1 USD, this works out to USD 7484. On the upper tail of the distribution, 81 portfolios are worth at least RMB 8,000,000 (log value of 15.89) or USD 1,000,000.

more data from other provinces in the PRC and then test the relationship between average wealth (GDP per capital) and average portfolio values.

4.2. Transactions amounts and gender

Our data contain detailed information about trades. We aggregate all transactions by investor account number, stock ticker, date, and buy/sell indicator. Table 4, Column (2) shows our data contain 3,063,013 account-stock-day-buy/sell transactions. Although reported only in the associated appendix, we find that 53.1% of our transactions are buys. Barber and Odean (2000a,b) report that 54.9% of their sample comes from buys. Column (3) shows men account for 52% of the account-stock-day-buy/sell transactions. Column (4) shows women account for the other 48% of transactions.

Table 4, Column (5), shows that males purchase average positions of RMB 37,479 which works out to USD 4685 when using a rough 8 RMB to 1 USD exchange rate.[4] Column (6) shows that males sell positions of RMB 39,113 or USD 4889 on average. Shapira and Venezia (2000) show the average purchase/sale in Israel is approximately USD 7300. Barber and Odean (2000a,b) find sales are bigger than buys in the United States (USD 13,707 vs. USD 11,205). The average trade size in Israel is less than twice the average trade size in the PRC. The average trade in the U.S. is

[4] Feng and Seasholes (2005) show that 69.15% of all positions consist of a single purchase followed by a single sale. Positions built up through multiple purchases on the same day are accounted for with our daily aggregation. Positions built up over multiple days lead our averages to slightly under-estimate the average amount of a position.

Table 4
Transaction amounts and gender

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Branch location	Number of account-stock-day transactions (#)	MALE Number of account-stock-day transactions (#)	FEMALE Number of account-stock-day transactions (#)	MALE BUY average amount of acct-stock-days (RMB)	MALE SELL average amount of acct-stock-days (RMB)	FEMALE BUY average amount of acct-stock-days (RMB)	FEMALE SELL average amount of acct-stock-days (RMB)	Value of all round-trip transactions (RMB million)
Beijing	347,993	195,101	152,892	36,550	38,484	66,113	71,284	17,802
Guangdong	370,637	199,839	170,798	59,982	61,554	65,385	67,830	23,513
Heilongjiang	350,064	182,539	167,525	13,530	14,343	12,399	13,419	4701
Hubei	287,651	154,587	133,064	31,605	32,978	26,681	27,708	8607
Shandong	308,246	161,131	147,115	42,353	45,282	29,346	31,365	11,513
Shanghai	1,105,865	548,447	557,418	37,992	39,349	25,789	26,860	35,865
Sichuan	292,557	153,509	139,048	37,092	38,724	29,595	30,460	9991
Total	**3,063,013**	**1,595,153**	**1,467,860**	–	–	–	–	**111,991**
Average	–	–	–	**37,479**	**39,113**	**33,861**	**35,592**	–

This table gives an overview of round-trip transactions in our data. Round-trip transactions encompass buys and sales of common listed stocks. Individual account data are from a national brokerage firm in the People's Republic of China (PRC) over the time period Jan-1999 to Dec-2000. Data are aggregated each day by account number, stock ticker, date, and buy/sell indicator. Column (2) shows the total number of account-stock-day-transactions. Columns (3) and (4) show the distribution of account-stock-day-buy/sell transactions by gender. Columns (5), (6), (7), and (8) show the average amount an investor buys or sells of a single stock on a single day by gender. Column (9) shows the value (in RMB million) of all round-trip transactions.

about three times larger than in the PRC. The similarities in trade sizes are a little surprising since U.S. GDP per capita and average income are about ten times larger than in the PRC.

The average value of both buys and sells for females is smaller than for males. The respective values of RMB 33,861 and RMB 35,592 are shown in Columns (7) and (8). The transactions amounts from men and women are significantly different at all conventional levels. For the most part, males consistently place larger buy and sell orders when we look at results by province. The one anomaly is Beijing where women appear to place orders that are almost twice as large as the orders of their male counterparts. We have no explanation for such a finding at this time.

We end our analysis of transaction amounts by forming round-trips. We group trades by investor account number and stock ticker. Consider an individual investor who is trading a single stock. A round-trip transaction starts with the investor holding no shares of the given stock. The first date of the round-trip transaction corresponds to the initial purchase of the stock (there is no short selling in the PRC). The round-trip transaction ends when the investor's holdings in the particular stock return to zero. Column (9) shows that the total value of all round-trip transactions is RMB 111,991 million or approximately USD 14 billion. We calculate the value of a round-trip transaction by summing purchase amounts. We later use these round-trip transactions when studying trading intensity in Section 4.5.

4.3. Home bias and gender

We confirm that investors in the PRC tend to invest a high fraction of their portfolios locally. A local stock is defined as a stock whose headquarters is in the same province where the investor

Table 5
Home bias and gender

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Branch location	Average weight of investor portfolio invested locally (#)	Weight of local stocks in market portfolio (#)	Home bias over-weight (Col (2)−Col (3)) (#)	MALE Investor home bias (#)	FEMALE Investor Home Bias (#)	Home bias difference M vs. F (*P*-value)
Beijing	0.1042	0.0723	0.0320	0.0360	0.0274	0.11
Guangdong	0.3131	0.1489	0.1642	0.1561	0.1729	0.00
Heilongjiang	0.0691	0.0274	0.0417	0.0425	0.0409	0.79
Hubei	0.1067	0.0403	0.0664	0.0629	0.0701	0.08
Shandong	0.0351	0.0060	0.0292	0.0280	0.0303	0.75
Shanghai	0.3724	0.2161	0.1563	0.1553	0.1573	0.83
Sichuan	0.1077	0.0490	0.0587	0.0558	0.0614	0.43
Average	**0.1953**	**0.1043**	**0.0910**	**0.0897**	**0.0923**	**0.29** [a]

This table shows the amount of home bias in investor portfolios. Individual account data are from a national brokerage firm in the People's Republic of China (PRC) at one point in time (01-Jun-2000). Column (2) reports the average fraction of an investor's portfolio invested locally (in the same province as the branch office). Column (3) shows the fraction of total market capitalization headquartered in the same province. Column (4) reports a measure of home bias (equal to the difference between Columns (2) and Column (3)). Columns (5) and (6) repeat the same home bias measure for males and females separately. Column (7) presents the results of a statistical test that the measure of home bias is equal across genders.
[a] Joint test across all branches.

lives. Table 5, Column (2), shows that 19.53% (on average) of investors' portfolios are invested locally. We next measure the fraction of the market (all available stocks) invested in the same province. Column (3) shows the fraction of the market that is locally headquartered varies across provinces. Column (4) is our measure of home bias and is simply the difference between Column (2) and Column (3). Individuals in the PRC invest 9.10% more of their portfolios in local stocks than a CAPM investor would invest in the same stocks.

The degree of home bias in the PRC compares with finding in the United Sates. For example, Seasholes and Zhu (2006) show that individuals invest approximately 14% more in stocks headquartered within a 100-km radius than the CAPM predicts. They show the measure of home bias is 15% when considering a 100-mile radius and is 18% when considering a 250-mile radius.[5]

Table 5 shows that the degree of home bias does not vary significantly across genders. For the whole sample, males exhibit a 8.97% over-weighting of local stocks and females exhibit a 9.23% over-weighting. These values are not significantly different as the 0.29 p-value in Column (7) indicates. Within each province, males and females have similar degrees of home bias. Guangdong is the only province with a difference that is significant at the 5% level. In Guangdong, males have a 15.61% over-weighting and females have a 17.29% over-weighting. While the home bias measures in Guangdong are economically similar, Column (7) shows their difference is statistically significant with a 0.00 *p*-value.

[5] If provinces in the PRC were circular, data in Table 1, Column (4), can be used to show radii would vary between 45 km and 425 km. A more complete analysis of home bias in the PRC, cultural affinity, and location of trade is in Feng and Seasholes (2004b).

4.4. Portfolio performance and gender

We investigate the profitability of trading with calendar–time portfolios. Every time an investor buys a particular stock, we place the same number of shares of the stock in a calendar–time portfolio. We then hold the shares for a set number of days. For the purposes of this paper, we consider a twenty-day holding period. The number of shares is *not* re-balanced as we follow a buy-and-hold strategy. Rather, the value and return of the calendar–time portfolio is calculated each day based on stocks in the portfolio, market prices, and returns. One calendar–time portfolio produces one time series and controls for cross-sectional correlation of returns.

To compare performance across genders, we use four separate calendar–time portfolios: (1) Male Buys; (2) Male Sells; (3) Female Buys; and (4) Female Sells. We evaluate the average return of each of the four portfolios as well as the average return of differences between portfolios. Risk adjustment is achieved by regressing calendar–time portfolio returns on a constant and the market returns. Seasholes and Zhu (2006) discuss the benefits of calendar–time portfolios – especially when it comes to evaluating the performance of individual investors. Our calendar–time portfolios are *not* subject to microstructure effects for two main reasons. First, we skip a day between the date an investor buys a stock and when it is added to our portfolio. Thus, if buys tend to take place at the ask, we avoid bid–ask bounce. Second, we are interested in the difference of two calendar–time portfolios (e.g., Male Buys minus Female Buys). Each portfolio contains hundreds of stocks. The difference of two well-diversified portfolios no longer has microstructure "noise" that might affect calculations of average returns (i.e., variance due to bid–ask bounce is diversified away).

Table 6, Panel A, shows that our data have 16.37 round-trip transactions for the average male and 15.69 round-trip transactions for the average female. Stocks females buy outperform stocks males

Table 6
Portfolio performance and gender

Panel A: Overview of portfolios returns

(1)	(2)	(3)	(4)	(5)
	Average number of round-trip transactions per investor (#)	BUY	SELL	Beta of calendar–time BUY portfolio (#)
		Average daily calendar–time portfolio return (#)	Average daily calendar–time portfolio return (#)	
Male	16.37	0.001246	0.001280	1.0374
Female	15.69	0.001379	0.001401	1.0255

Panel B: Differences of portfolio returns

(1)	(2)	(3)	(4)
Portfolio	BUY	SELL	BUY–SELL
	(Male − Female) (#)	(Male − Female) (#)	(Male − Female) (#)
Average daily calendar–time portfolio return	−0.000133	−0.000121	−0.000012
Z-stat	−1.11	−1.23	−0.09

Individual account data are from a national brokerage firm in the People's Republic of China (PRC) over the time period Jan-1999 to Dec-2000. All trades are aggregated each day at the account-stock-day-transaction level. We form four calendar–time portfolios: (1) Male buys; (2) Male sells; (3) Female buys; (4) Female sells. Holding periods start 1 day after an observed trade and last for 20 days. Our portfolio holdings are based on actual number of shares traded. Panel A shows raw returns. Panel B shows the difference in returns between two calendar–time portfolios.

buy over the 20-day holding period. However, stocks female sell also outperform stocks males sell over the same period. Table 6, Panel B, calculates differences between calendar–time portfolios. When considering stocks bought, males under-perform females by −1.33 basis points ("bp") per day though this value only has a −1.11 *Z*-stat. Stocks males sell perform worse than stocks females sell (which bodes well for male investors) by −1.21 bp with a −1.23 *Z*-stat. We also look at difference-of-difference portfolios (Male Buys minus Sells compared with Female Buys minus Sells). The difference-of-difference portfolio has an average return of only −0.12 bp per day across genders.

Table 6, Panel A, also shows that men buy slightly more risky stocks ($\beta^{M,Buy}=1.0374$) than women buy ($\beta^{F,Buy}=1.0255$). This difference is not economically significant though a *T*-test of the difference is statistically significant at all conventional levels. We also calculate risk-adjusted α values for the differences of calendar–time portfolios. The α values are not economically different from return differences shown in Panel B and are available from the authors upon request. In short, we conclude the performance of male and female investors is economically and statistically indistinguishable in the PRC.

4.5. Trading intensity and gender

In this section we test whether men trade "more intensively" than women. We answer this question by building a statistical model of trading behavior. Our definition of "more intensively" is based on survival analysis and hazard ratios. If both a man and a woman hold the same stock, we ask: Who is more likely to sell the stock first? We control for the number of trading rights an investor has, the number of stocks an investor initially holds, and an investor's age. Survival analysis provides a logical methodology for studying investor behavior since financial economists want to measure cross-sectional differences *while controlling for* time-series effects. This methodology has recently been exploited by Feng and Seasholes (2005) to study the disposition effect and by Ivkovic et al. (2005) to study tax-loss selling.

Each week t after a stock is bought, we calculate the conditional probability of the stock being sold (i.e., conditional on the stock surviving in the portfolio up until week $t-1$). This conditional probability on any date t is called the baseline "hazard rate" or $h_0(t)$. We regress a sell/hold indicator variable on the baseline hazard function and fixed differences across investors.[6] These fixed differences are conveniently called "fixed covariates". In particular, we are interested in a *Gender* indicator and it's interaction with other covariates. Regression coefficients (β values) are estimated using maximum likelihood:

$$h(t,p,X) = h_0(t)\exp(X\beta + \varepsilon_t) \tag{1}$$

There is no set functional form for the baseline hazard function and nonparametric approaches are possible. We use a Weibull hazard function in order to capture non-constant changes in the baseline hazard function. The Weibull function can be described succinctly with parameter p and constant of integration λ:

$$h_0(t) = p\lambda t^{p-1} \tag{2}$$

Rather than reporting regression coefficients (β values) from Eq. (1), we follow convention and report hazard ratios. The hazard ratio of a coefficient β is equal to e^{β}. We can think of a

[6] Due to the amount of data needed in survival analysis, we use the same sample as Feng and Seasholes (2005). A lengthy description of survival analysis is given in their paper.

Table 7
Trading intensity and gender

	Reg. 1	Reg. 2	Reg. 3	Reg. 4
Gender (0=F, 1=M)	1.2073	1.2059	1.2014	0.8960
(z-stat)	*(10.6)*	*(4.2)*	*(4.1)*	*(−0.6)*
Number of trading rights			1.0365	1.0061
(z-stat)			*(2.1)*	*(0.2)*
Diversification indicator			1.2672	1.2174
(z-stat)			*(4.0)*	*(2.3)*
Age∈(25,35]			1.1641	1.1643
(std. err)			*(2.5)*	*(2.5)*
Age∈(35,45]			1.0064	1.0102
(std. err)			*(0.1)*	*(0.1)*
Age∈(45,55]			1.2102	1.2104
(std. err)			*(2.1)*	*(2.1)*
Age>55			1.0707	1.0793
(std. err)			*(0.7)*	*(0.8)*
Gender×Number of trading rights				1.0532
(z-stat)				*(1.5)*
Gender×Diversification indicator				1.0845
(z-stat)				*(0.7)*
Control for unobserved heterogeneity	No	Yes	Yes	Yes

This table presents hazard ratios associated with an individual's decision to sell/hold stocks. The left-hand-side variable takes a value of zero every week an individual holds a stock, and one every week s/he sells a stock. We include demographic variables that are fixed over time, but vary across individuals. The variables include a gender indicator, an individual's number of trading rights, an indicator of initial portfolio diversification, and age-bracket indicators. In Regression 4, we interact gender with the number of trading rights and the indicator of initial portfolio diversification. We use a Weibull distribution with parameter "p" to parameterize the hazard function. We also include a control for unobserved heterogeneity (frailty) across investors. Data are from January 1999 to December 2000. Z-stats, shown in parenthesis below the hazard ratios, are based on robust standard errors.

coefficient's hazard ratio as reporting a change in the hazard rate when the independent variable changes from zero to one. Thus, interpreting the economic significance of an indicator variable such as Gender becomes particularly easy:

$$\begin{aligned}\text{Hazard Ratio}(\text{Gender}) &= \frac{h\left(t,p,X^{\text{Gender}}=1\right)}{h\left(t,p,X^{\text{Gender}}=0\right)}\\ &= \exp\left(\beta^{\text{Gender}}\right)\end{aligned}$$

Table 7 presents our results of trading intensity. Regression 1 has only a *Gender* indicator on the right-hand side (along with the baseline hazard function). We see that, relative to the baseline hazard function, men are 20.73% more likely to sell than women are. The difference in trading intensity due to *Gender* is statistically significant with a 10.6 Z-stat. Our finding, however, is considerably lower than the 45% difference in trading (men vs. women) found by Barber and Odean (2001). One explanation for the difference in findings may stem from methodology. Barber and Odean (2001) employ a simple measure of portfolio turnover while our survival analysis builds a statistical model of individual trading behavior (e.g., the baseline hazard function).

Table 7, Regression 2, includes a control for unobserved heterogeneity, called "frailty", which is analogous to random effects in panel regressions. We parameterize the frailty with a gamma function. Our hazard function for investor i becomes: $h(\alpha,t,p,X)=\alpha_i h_0(t)\exp(X\beta+\varepsilon_t)$. We see this

control has no economic effect though statistical significance of the Gender hazard ratio drops to a 4.2 *Z*-stat. In Regression 3, we include a number of other controls such as the number of trading rights each investor has, an indicator of whether an investor started his investing life with one stock or more (the "Diversification Indicator"), and indicators of age brackets. Regression 3 continues to show men trade more intensively than women.

Table 7, Regression 4 interacts the Gender indicator with the number of trading rights. We also interact the Gender indicator with the diversification indicator. Results become extremely interesting. Men no longer trade differently than women. The Gender indicator has a 0.8960 hazard ratio which is not significantly different from zero. We find that men with more trading rights, actually trade more than the baseline hazard function predicts – the hazard ratio is 1.0532 though it is not significantly different from zero. Better diversified men also trade more than the baseline hazard function predicts – the hazard ratio is 1.0845 though it is also not significantly different from zero.

4.6. Discussion of gender results

We show that men and women behave similarly in the PRC. Both genders are under-diversified and exhibit home bias. Performance and trading intensity are statistically and economically similar. Our results are starkly different from findings in Barber and Odean (2001). It is possible that cultural differences (PRC vs. USA) drive some of our results. However, there is evidence that culture cannot explain all of our findings. When we initially measure trading intensity, we find men have approximately 20% higher hazard ratios (Table 7, Reg. 1) than women. After adjusting for demographic differences across investors, gender-based hazard ratio differences disappear (Table 7, Reg. 4).

There is anecdotal evidence to support our findings based on financial advisors in the United States. Hamacher (2001) claims "differences within each gender are actually greater than the differences between the genders". The author argues that "gender matters less than personal style, age, and education when it comes to rendering good planning advice".

As mentioned in the Introduction, our results are also consistent with the Barber and Odean (2002) finding that "young men who are active traders … are more likely to switch to online trading." It is possible that observed gender differences in the United States are proxying for demographic differences such as access to online trading (or other, unobserved effects). Felton et al. (2003) provide experimental evidence that the "well documented gender difference in investment strategies of men and women may be due to a specific sub-group of males". The use of survival analysis allows us to parameterize unobserved heterogeneity in a manner similar to allowing for random effects. In addition, maximum likelihood estimation allows for right-hand-side control variables such as number of trading rights. Studying gender differences in the United States is an area with considerable potential.

5. Conclusions

We study the investment decisions of over 50,000 individuals from the PRC. Our data are provided by 15 branch offices of a national brokerage firm and contain over 3 million account-stock-day transactions. The data are representative of investing in the PRC. We report cross-sectional statistics of holdings on a single day and find our investors own almost USD 1 billion of common stock. The average portfolio value by province has a 0.81 correlation with the average monthly income by province. The correlation is 0.33 with GDP per capita.

In the course of our analysis, we document a number of facts pertaining to emerging market investors. Individuals hold a median of two stocks. Local stocks receive 9.1% more weight in investors' portfolios than the CAPM indicates. The average amount traded is USD 4500 and the

average amount held is USD 17,000. Sells are slightly larger than buys. All of these findings match behavior found in the United States.

Our most important results concern gender. Men and women are equally represented in the PRC. Men hold larger portfolios and make slightly larger trades. Importantly, men and women exhibit similar behavior along three key dimensions. First, both genders exhibit similar degrees of home bias. Second, there is no discernable difference in performance. We test and show that calendar–time portfolio returns (buys minus sells) are not statistically different by gender. Third, men initially appear to trade more intensively than women. We use survival analysis and find men have a 20.73% higher hazard of selling than women. After controlling for number of trading rights and initial portfolio diversification, the difference in hazard ratios disappears. As mentioned in the previous section, studying gender differences in the United States is clearly an area with considerable potential.

We conclude by suggesting that additional research of PRC investors might focus on intranational differences. Our paper highlights two outstanding questions. How similar or different is behavior across provinces within the PRC? Can wealth or language group explain observed patterns in trading behavior?

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