Is There a Gender Difference in Real Estate Investment Performance?

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Abstract

By examining administrative databases of Taiwan, we find that men significantly outperform women in real estate investments. This is in sharp contrast to the previous findings in the literature that women outperform men in the stock market. Other than traditional financial explanations, we propose a new hypothesis: sex discrimination derived from a patriarchal tradition. Taiwanese elders tend to help their sons to inherit or acquire more "promising" lands, which results in males' superficially higher investment returns. A causal interpretation is supported by a finding that this gender difference is significant only for men who have female siblings.

Keywords: gender differences; gender discrimination; real estate; land transactions; investor behaviors.

JEL codes: D19; G50; R51

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1. Introduction

It has been long debated whether gender differences exist in investment behaviors and performance. On the one hand, an extensive list of studies based on experiments, surveys, proprietary client dataset, and household database provide abundant evidence indicating that women are more risk averse and invest less in riskier assets (Barsky, Juster, Kimball, and Shapiro, 1997; Sunden and Surette, 1998; Charness and Gneezy, 2012); thus, their investment performance differs from that of men's (e.g., Barber and Odean, 2001; Croson and Gneezy, 2009).[1] However, most prior studies and their data are based on securities and liquid assets, making gender differences' impact with respect to the most substantial part of household wealth—real estate—unexplored.[2] It is well known that real estate accounts for over 50% of U.S. household wealth (Yao and Zhang, 2005; Bucciol and Miniaci, 2011). Thus, ignoring households' real estate holdings biases analyses of their risk tolerance (Bucciol and Miniaci, 2011) and asset allocation decisions (Liu, Hartzell, Grissom, and Greig, 1990).[3] This void in the literature with respect to gender differences in real estate investing, if any, can be attributed to the lack of comprehensive databases of individuals' profiles and wealth (Meriküll, Kukk, and Rõõm, 2020).

In this study, we manage to combine several administrative tax-related databases from the Fiscal Information Agency (FIA) of the Ministry of Finance, Taiwan, to analyze the comprehensive profiles of Taiwanese households' wealth allocation and investment performance. Our primary database is the Land Value Increment Tax (LVIT) database, which includes all details of every land transaction such as assessed value, location, size, and especially the de-identified national ID number of each land owner. This ID number identifies individuals' gender, cities of birth, and family background information,[4] all of which enables us to link land transactions to other databases, including those that contain comprehensive income records and wealth records in five

[1] Some studies argue that gender differences in investment behaviors can be attributed to fundamental differences in physical conditions (Sapienza, Zingales, and Maestripieri, 2009), psychological variation (Seiler, Seiler, Traub, and Harrison, 2008; Hibbert, Lawrence, and Prakash, 2018), and financial knowledge and experience (Lusardi and Mitchell, 2008; Halko, Kaustia, and Alanko, 2012).

[2] To our knowledge, Andersen, Marx, Nielsen, and Vesterlund (2020) and Goldsmith-Pinkham and Shue (2020) are the only two studies that use large-scale transaction data to examine gender differences in real estate investment. We will compare our paper with theirs later in this section.

[3] When compared to financial assets, real estate transactions occur less frequently. Moreover, real estate investment is often highly leveraged and relatively illiquid, which makes the transactions and returns on this investment vehicle very relevant to households' wealth and liquidity.

[4] The national ID number consists of one English letter followed by nine numbers. The English letter is assigned by birth city, and the first number designates gender (1 is for male and 2 is for female).

taxable asset categories: houses (i.e., buildings), lands, stock shares, savings/deposits, and cars.[5]

There are two important institutional features about real estate transactions in Taiwan: First, houses and lands have been taxed separately in Taiwan until 2016. Second, both classes of assets are taxed based on government-assessed values;[6] thus, we calculate the returns on them based on government-assessed prices instead of market values. The first feature allows us to separate the values of both asset classes and thus focuses on land value that weighs more in real estate (especially in Asia) and is free of depreciation. While the second feature is a common limitation in administrative household data, it would not bias our gender difference analysis because the assessment procedure is unrelated to the genders of land owners. In fact, since market prices of real estate are subject to *negotiations* in which gender difference plays a role (Harding, Rosenthal, and Sirmans, 2003; Andersen, Marx, Nielsen, and Vesterlund, 2020; Goldsmith-Pinkham and Shue, 2020), our returns based on government-assessed prices are thus free from any negotiation effect.

Since the five taxable categories we consider constitute the majority of assets individuals can hold, our combined database has a comprehensive coverage of individual wealth in Taiwan: it covers the wealth of 10,566,464 individuals, which accounts for 46.4% of the total Taiwanese population in 2005. We focus on individuals who are above 45 years old because these people are mature and wealthy enough to make investments (nevertheless, our main results hold without this age threshold). Another important reason to impose this age threshold is to include the gifts and heritage these individuals receive from their parents (who will be old enough to consider wealth transfer to descendants). We find that lands account for almost 60% of the wealth of these individuals in Taiwan, which highlights the critical role that real estate plays in terms of Taiwanese household wealth (as shown in Figure 1). Throughout the paper, we focus on land value and return in our discussions of real estate investment because houses/buildings only weigh below 8% in individual wealth.

It is well known that real estate transactions tend to be concentrated in wealthy individuals,

[5] Broadly speaking, Taiwan's income tax structure (such as capital gains from land transactions) is very much the same as that in most developed countries covered in the World Wealth and Income Database (WID). The details of information concerning tax rules in Taiwan can be found in Chu, Chou, and Hu (2015) at the webpage of WID.

[6] The assessed values of housing and land are adjusted yearly by each county assessment committee. These publicly-assessed prices are recorded in the tax authorities' files, and serve as the basis for property taxes. While the committee's assessment may unavoidably underestimate the values of housing and land, their assessment is also neutral and objective.

and even more so for the wealthiest groups of individuals. Our data present a similar pattern: the distribution weight of land transaction frequencies increases with individuals' wealth rank (as shown in Figure 2). More importantly, we observe exponential growth starting at the top 10th percentile of wealth rank: for example, the top 1% wealthiest individuals conducted 21.2% of total land transactions in their respective age cohort. Moreover, the top 3%, top 5%, and top 10% of the wealthiest individuals conducted a total of 30.0%, 35.8%, and 45.6% land transactions, respectively.

In addition, we also find that the majority of Taiwanese hold over 25% in cash and only invest 12% of their wealth in stocks. Only when an individual's wealth reaches the 98th or 99th percentile will that individual hold less cash and invest more in stocks. These statistics suggest that only the top 2% wealthiest Taiwanese seriously consider asset allocations and actively trade real estate and stocks.

To assess individuals' performance in real estate investment, we calculate the rate of return (ROR) based on each land's assessed prices in the purchase year and sale year, which is unlevered and does not include rental income. We find that men's ROR is much higher than women's among the top 10% wealthiest individuals (as later shown in Figure 3). As we discussed earlier, this group of individuals conducts a substantial number of real estate transactions. Among the top 1% (10%) wealthiest individuals, men's ROR outperforms women's by 1.04 (0.61) percentage points per year. This difference cannot be explained by the duration of a holding period because men's average duration is only 0.5 to 1 year longer than that of women's. In terms of economic significance, the accumulated profits per person from real estate are as high as NTD 670 million (roughly USD 22 million) among men in the 99th percentile but merely NTD 172 million among women in the same percentile.

We propose that men's great advantage in real estate investment in Taiwan is driven by sex discrimination in wealth transfer, a prevailing phenomenon in most Asian countries.[7] Modern Taiwanese civil law codes adopt *portio legitima* and explicitly disallow discretionarily unfair treatment of sons and daughters through inheritance, such as primogeniture (i.e., the right of succession belonging to the firstborn child). However, there is no law that prohibits parents from

[7] Sex discrimination has been a prevailing phenomenon in most Asian countries until recently (Croll, 2000). In particular, sex discrimination in family wealth transfer can be attributed to parental utility for the succession of family name as well as maintaining and promoting the family's social status and wealth (Chu, 1991).

inter vivos transferring their wealth to their children unequally. Wealthy parents have the ability and tax incentive to transfer wealth to their sons through lands to gain from *inter vivos* tax-free quota, to avoid inheritance tax, and to circumvent the *portio legitima* rule.[8] It is a common practice in Taiwan that parents transfer their wealth by providing the down payment in their sons' real estate purchase with the annual *inter vivos* tax-free quota.[9] There is also a tax-related incentive for parents to transfer their wealth through real estate instead of cash: as discussed earlier, the tax base of real estate is calculated according to the assessed price, which is usually lower than its market value. As a result, real estate investment allows wealthy parents to achieve unequal transfers to sons. Such discrimination is expected to be reflected in the choice of real estate investment: wealthy parents tend to pass more (less) promising real estate to sons (daughters) and/or are more (less) willing to help sons (daughters) to purchase promising real estate, which leads to gender differences in real estate payoffs.

To test our hypothesis, we analyze the acquiring types for all land acquisitions and assign them into four types: *inter vivos* gifts, supported purchases (i.e., parental assistance), bequests, and pure purchases. The samples of gifts and supported purchases, both of which may reflect parents' sex discrimination, comprise about 80% of all land transactions. We focus on only the individuals in the 98th and 99th percentile because, as we discussed earlier, these individuals and their families are most likely to use land transactions to transfer wealth and are also most likely to engage in real estate investment. We find that males' ROR outperform females' by 0.93% per year in the samples of gifts and supported purchase. Additionally, when we include family fixed effects in our regressions, we find that within-family gender differences in ROR increase to 3.84%, suggesting that the driving forces could happen *within* families.

We further propose an identification test to support our hypothesis that sex discrimination leads to gender difference in real estate ROR. We regress transaction-level ROR on an indicator variable that equals one if individuals have siblings of the other gender (and zero otherwise) and its interaction with an indicator variable for males. When we do so, we find significantly positive coefficients on the interaction term among individuals who sold lands that were gifts or purchased

[8] The preference for real estate also reflects the elder generation's belief in continuously escalating land prices and the fact that real estate cannot be easily liquidated.

[9] Poterba (2001) shows that U.S. families under-utilized tax-free *inter vivos* giving in intergenerational wealth transfers. Bernheim, Lemke, and Scholz (2004) find that U.S. parents significantly reduced *inter vivos* transfers when there was a reduction in the tax disadvantage of bequests relative to gifts.

with parents' help. This test offers a causal interpretation for our empirical results because (i) wealthy parents can exercise gender discrimination only when they have children of different genders, and (ii) the existence of siblings of different genders is unlikely to affect real estate ROR except through parents' discrimination. Moreover, if gender differences in real estate ROR are due to omitted variables, then these variables must be correlated with siblings' gender composition – which does not seem plausible. Thus, our analyses indicate sex discrimination as the most plausible explanation for men's advantage in real estate returns.

We also examine gender differences in Taiwanese stock investment and find an *opposite* pattern: women's ROR in stock investment is significantly higher than that of men's in almost all percentiles in the top half of the population. While this finding is consistent with Barber and Odean (2001), it also makes gender differences in real estate investing even more unique and thus deserves investigation. On the other hand, we also compare the economic magnitude of women's advantage in stock investment to that of men's advantage in real estate investment. The accumulated profits from stock investing are NTD 85 million among men in the 99th percentile and NTD 97 million among women in the same percentile. As the payoff disparity from real estate (NTD 670 million among men vs. NTD 172 million among women) is much greater than that from stock investment. As a result, income disparity in Taiwan can be attributed to the distribution of real estate, which has important implications for social mobility and welfare.

Our paper is parallel yet closely related to Andersen, Marx, Nielsen, and Vesterlund (2020) and Goldsmith-Pinkham and Shue (2020). Different from those two studies that focus on gender differences in negotiation based on the seminal work of Harding, Rosenthal, and Sirmans (2003), we propose a sex discrimination explanation that is based on cultural and social norms. Andersen et al. (2020) analyze administrative data of residential real estate transactions in Denmark from 1994-2013, and conclude that there is no gender gap after controlling for unobserved property characteristics. Goldsmith-Pinkham and Shue (2020) use over 50 million housing transaction data collected by CoreLogic from 1991-2017, and find that men outperform women by about 1.5% in unlevered annualized returns studies (which is close to our estimate of 1%). Even though they find that such gender differences can be attributed to market timing (i.e., men perform better in choosing where and when to buy, and when to sell) and a willingness to negotiate, they conclude that the unexplained part of these differences remain large.

We also examine several conventional explanations for gender difference in investments documented in the literature: risk preference, experience, loss aversion, and optimism. First, as it is well documented that men tend to take more risk than women,[10] the former may prefer riskier real estate investment and thus post higher ROR. Second, reflecting the patriarchal tradition in Taiwan, men are expected to be responsible for housing after marriage (Chu, Lin, and Tsay, 2020). Thus, men could be more experienced in real estate investment, and thus may be able to gain in that market.[11] The third and fourth explanations are related to behavioral factors. Men may be more loss-averse in investment due to their inclination toward overconfidence and competitiveness (Gneezy, Niederle, and Rustichini, 2003; Niederle and Vesterlund, 2007; Reuben, Sapienza, and Zingales, 2015); as a result, they are likely unwilling to sell at a loss,[12] which makes men's average ROR appears to be higher than that of women's. In addition, men are found to remain optimistic even after suffering from a prior loss (Hibbert, Lawrence, and Prakash, 2018), which may lead to a higher return target for real estate investment.[13] Our empirical evidence shows that gender differences in real estate returns cannot be fully explained by these reasons.

Our paper is related to two streams of the economics literature. First, it adds to the literature on sex discrimination, which is an important and widely discussed issue in the economics literature.[14] Our empirical analyses offer novel, micro-level evidence to show that Taiwanese wealthy parents use real estate transactions to transfer their wealth to sons before their deaths, so

[10] According to Croson and Gneezy (2009), gender differences in risk preference can be attributed to emotions, overconfidence, the perception of risk (challenge or threat), and experience. For example, Sapienza, Zingales, and Maestripieri (2009) show that levels of testosterone in female MBA students affect their risk-taking in career choices. Also, Dohmen and Falk (2011) show that women are less likely to select variable-pay schemes that are perceived to be riskier than fixed-pay schemes. More interestingly, Hibbert, Lawrence, and Prakash (2018) survey finance professors, presumably those most knowledgeable in financial investment, and still find that male professors tend to invest more in stocks than their female peers.

[11] Lusardi and Mitchell (2008) find that women score lower in financial literacy tests, but Atkinson, Baird, and Frye (2003) show that the difference in fixed income managers' allocation is driven by knowledge and capital constraints rather than gender differences. Using a large-scale Finland dataset, Halko, Kaustia, and Alanko (2012) find that financial knowledge explains gender differences in asset allocation. Nevertheless, financial knowledge is unlikely to explain our findings that gender differences go in opposite directions across real estate and stock markets.

[12] Loss aversion is commonly observed in real estate investment (Genesove and Mayer, 2001). Seiler, Seiler, Traub, and Harrison (2008) survey MBA students' regret aversion in real estate investment and find that women were more susceptible to regret aversion and false reference points than men.

[13] The survey of Jacobsen, Lee, Marquering, and Zhang (2014) shows that men tend to be more optimistic than women and thus hold more stocks.

[14] Prior studies have examined parents' differential treatment of sons and daughters in many aspects, including mother's nutrition intake during pregnancy (Bharadwaj and Lakdawala, 2013; Lin, Liu, and Qian, 2014), sex-selection through abortion (Chen, Li, and Meng, 2013), childhood nutrition and health care (Gupta, 1987), education opportunities (Chu and Yu, 2010; Yu and Su, 2006), and bequest and inheritance decisions (Chu and Yu, 2010; Deininger, Goyal, and Nagarajan, 2013).

they may avoid the rule of *portio legitima* in inheritance laws.

Our study also provides new insights to research on gender differences in investments. Existing research has documented that women are more risk averse than men in investment choices, such as stocks versus bonds.[15] Using a proprietary data set of households' common stock investments of 37,664 households from a large brokerage firm, Barber and Odean (2001) show that men tend to trade stocks more frequently and thus underperform women in stock investment performance.[16] Since then, most prior studies have focused on experiments or security investments, and leave real estate, the largest portion of household wealth, largely unexplored. This study based on administrative data of all taxable property in Taiwan not only quantifies the economic magnitude of gender differences across stock and real estate investments, but also provides a new behavioral explanation for such a gap.

2. Data

2.1 Data sources, summary statistics, and wealth composition

In this study, we collect the following datasets from the Fiscal Information Agency (FIA) of the Ministry of Finance, Taiwan: (1) the Land Value Increment Tax (LVIT) Database, which includes the details of all taxable land transfers from 2005 to 2015; (2) the Personal Income Tax Database, which includes all taxable salary, bonuses, dividends, interests, and other personal income items in annual tax filings from 2001 to 2015; and (3) the Nationwide Personal Property

[15] Sunden and Surette (1998) and Agnew, Balduzzi, and Sundén (2003) show that male investors allocate a higher portion of wealth in stocks in retirement accounts. In addition, women prefer bonds over stocks in their portfolios as the former is subject to less volatile income (Bajtelsmit and VanDerhei, 1997; Hinz, McCarthy, and Turner, 1997; Bernasek and Shwiff, 2001; Halko, Kaustia, and Alanko, 2012). Hinz, McCarthy, and Turner (1997) show that women invest their pension assets more conservatively than men do using the federal government's Thrift Savings Plan. Bernasek and Shwiff (2001) find that women invest less in stocks in a survey of five universities in Colorado. Dwyer, Gilkeson, and List (2002) find women's portfolios are less risky than men's in a sample of 2000 mutual fund investors. Beckmann and Menkhoff (2008) survey 649 fund managers in four countries and find that female managers reveal higher risk awareness. Charness and Gneezy (2012) use experimental data to show that women are more risk averse and invest less. Eckel and Grossman (2008) and Croson and Gneezy (2009) provide great reviews of the literature on gender differences in risk preference.

[16] On the other hand, some research has shown that there is no significant gender difference in the risk-adjusted performance of U.S. fund managers. Atkinson, Baird, and Frye (2003) find that male- and female-managed fixed income funds do not significantly differ in their performance, risk, and other fund characteristics. Niessen and Ruenzi (2006) find that although male mutual fund managers tend to achieve more extreme performance outcomes, they do not outperform female ones on average. More interestingly, Green, Jegadeesh, and Tang (2009) report a mixed pattern: while female stock analysts make less accurate earnings forecasts, they are more likely to be nominated as star analysts than male ones.

Database, which includes savings/deposits, stocks, housing, land, and car ownership information from 2003 to 2015. All these datasets are connected through de-identified national ID numbers. Moreover, tax authorities collect the family information of all individuals in the FIA combined family database,[17] which enables us to understand the family conditions and identify within-family wealth and land transfers. Since housing and lands were taxed separately until 2016, we have separate estimated values for housing and lands. We provide more details about these databases in the Appendix.

The valuation of land is based on government-assessed values rather than negotiated prices. We acknowledge that our wealth data do not cover rare collections (e.g., antiques, arts); nevertheless, rare collections are hard to value and of high illiquidity. We calculate an individual's wealth as the sum of all values of his/her assets in our database.[18]

Combining these databases enables us to estimate the total (domestic) wealth of 10,566,464 individuals in Taiwan, which covers about 46.4% of the total population (2005 data). We then focus on 3,456,551 individuals who are above 45 years old. In Panel A of Table 1, we present the following summary statistics of the estimated values of all five major asset categories (savings/deposits, stocks, lands, houses, and cars) of the population: the mean, standard deviation, and the 1st, 25th, 50th, 75th, and 99th percentiles. In Panel B of Table 1, we separate individuals in our sample by gender. When we do so, we find that while men's and women's asset values in savings/deposits, houses, and cars are comparable, the former hold substantially more valuable stocks and lands. In fact, the average land value held by men is NTD 6.2 million, which is more than double of that held by women (NTD 3.0 million). These statistics suggest that gender differences in wealth mainly result from stocks and lands.

To begin our study, which is one of the first to combine almost all assets in Taiwan, we first investigate the wealth composition among wealthy people. In Figure 1, we present the composition

[17] The FIA established the combined family database by combining the tax paying records it held and the household records maintained by the Household Registration Administrations in Taiwan. Children can be identified when individuals are registered as "dependent" of parents to qualify for tax credits, and couples can be identified when they file their taxes together (which is permitted by the tax law only for couples).

[18] We use the term "wealth" with caution and acknowledge that our use of the assessed value of lands, houses, and cars in calculating the total wealth could be subject to a leverage bias. For example, even if a land worth of 1 million dollar is purchased with 50% debt, this land is counted as 1 million in individual wealth. It is challenging to adjust/correct this bias because we do not have loan data at the individual or asset level. We have repeated the analysis based on various hypothetical loan percentages of land, and the results remain qualitatively the same.

of five main asset categories (stocks, houses, lands, savings/deposits, and cars) of all individuals with above-median wealth. The horizontal axis denotes the percentile in wealth (based on their wealth in 2005, the first year of our observations), and the vertical axis denotes the percentage of each asset category for all individuals within each percentile. We use a bold line to denote the weight of stocks, a dashed line to denote the weight of lands, a solid line to denote the weight of housing, a dotted line to denote the weight of savings/deposits, and a dash-dotted line to denote the weight of cars.

The most noticeable pattern in Figure 1 is that land-related wealth accounts for over 60% of total wealth across most groups, which not only suggests the dominant role that real estate investment plays with respect to Taiwanese wealth and asset allocation, but also highlights the importance of this research. Since the value of houses is much lower than that of lands, the value of real estate in Taiwanese households mainly concentrates in lands. Therefore, in our subsequent empirical analyses of real estate investments, we mainly focus on lands.[19]

In addition to real estate, savings/deposits also play a major investment role for the Taiwanese: these particular investments amount to around 25% of total wealth among all groups, except for the 98th and 99th percentiles. Stocks, on the other hand, only amount to roughly 10% to 15% of total wealth for almost all groups, except for the 98th and 99th percentiles; rather, stocks amount to 19.0% and 37.4% for the 98th and 99th percentiles, respectively. These findings depict a very interesting pattern: in addition to real estate investment, savings/deposits (i.e., cash) dominates stock investments for most of the Taiwanese in our study. Thus, 25% of cash holdings serves as a common "precautionary savings" level among Taiwanese that cannot be used for investment purpose. An extended implication is that only the top 2% of the wealthiest Taiwanese, who presume that they have sufficient cash savings, seriously consider asset allocation and, thus, start to invest in assets. In other words, perhaps only these wealthy individuals have resources to heavily engage in investment activities in real estate and stocks. Thus, to understand the real estate transactions driven by investment purposes, we must pay close attention to these particular wealthy individuals.

To further understand the trading patterns of real estate investment in Taiwan, we examine

[19] We also implement our analysis based on the return on the sum of lands and houses; our results are qualitatively the same.

the frequencies of land transactions in Taiwan in our sample period.[20] In Figure 2, we plot the frequencies of land transactions initiated by individuals in different wealth percentiles (based on 2005 data). We find real estate trading increases with individual wealth. Moreover, we observe a surge in land transactions starting in the 95th percentile, as individuals in the top 1%, 3%, and 5% initiate 990,375, 1,399,525, and 1,669,895 land transactions, which correspond to 21.2%, 30.0%, and 35.8%, respectively, of the total Taiwanese land transactions in the sample period (a total of 4,665,907 transactions). These findings suggest that wealthy Taiwanese invest heavily in real estate. More importantly, our findings also suggest that the wealthiest Taiwanese disproportionately invest in land transactions, which echoes our finding in Figure 1; specifically, only the top 2% of the wealthiest Taiwanese are indeed wealthy enough to consider frequent adjustments in their asset allocations, and their trading in real estate is thus more likely driven by investment motives rather than residential arrangements.

2.2 Rates of returns (ROR) on real estate investment

We then calculate the investment return from real estate investment as follows. We let S_{ijt}^{l} be the assessed price of land item *j* possessed by individual *i* in the selling year *t*, and let $C_{ij(t-\tau_j)}^{l}$ be the assessed price of land item *j* that was acquired in year $t-\tau_j$. $S_{ijt}^{l}/C_{ij(t-\tau_j)}^{l}$ then denotes the gross value appreciation of land item *j* over the past τ_j years. Land *j*'s corresponding annual ROR for individual *i*, denoted R_{ijt}^{l}, is then calculated as $\sqrt[\tau_j]{S_{ijt}^{l}/C_{ij(t-\tau_j)}^{l}} - 1 \equiv R_{ijt}^{l}$.

We also let the number of land pieces owned by individual *i* to be n_i in our sample period. The average ROR of individual *i* in our sample period, denoted R_i^l, can be expressed as

$$\sum\nolimits_{j=1}^{n_i} R_{ijt}^{l} \cdot \left(\frac{S_{ijt_j}^{l}}{\sum_{k=1}^{n_i} S_{ikt_k}^{l}}\right) \equiv R_i^l$$

in which t_j is the selling time of land *j*.[21]

[20] We only consider land transactions sold by individuals, and do not consider land transactions sold by legal entities.
[21] We calculate individual *i*'s weighted real estate returns in a period by weighing all lands individual *i* held within that period by the selling price ($S_{ijt_j}^{l}$). This weighted approach aims to prevent *i*'s average land return from being dominated by some small pieces of land with high returns.

The average ROR (R_i^l) measures real estate investment performance at the individual level.[22] However, different lands sold by the same individual can be transacted under very different conditions (e.g. marriage status, liquidity requirements, market conditions). In order to control for these types of transaction-related factors, we also examine RORs at the transaction level (R_{ijt}^l) in later analyses.

2.3 ROR and duration: men vs. women

In Figure 3, we visualize our first probe into gender differences in real estate investment. We present the ROR of men and women across all percentiles above the population median. The horizontal axis denotes the percentile in wealth (the same as in Figure 1), and the vertical axis denotes the average ROR of men and women (in solid and dashed lines, respectively) for each wealth percentile. We find a clear pattern for individuals who are above the 90th wealth percentile: men's ROR are consistently higher than that of women's. More interestingly, the gap in ROR widens with wealth: it is as high as 0.60% and 1.04% per year in the 98th and 99th percentiles, respectively. Such a gap, together with the frequent transactions made by these wealthiest people, results in a huge difference in wealth accumulation.

To further highlight the wealth implications of our results, we calculate the profits from lands for men and women in each wealth percentile and plot them in Figure 4. The solid line denotes men's profits, while the dashed line denotes women's profits. Over our sample period, the profits from lands are as high as NTD 670 million among men in the 99th percentile and NTD 172 million among women in the same percentile.[23] These percentiles amount to 1,256 and 322 times the average annual income per capita in Taiwan (NTD 533,752 in our sample period). Further, these results suggest two important findings. First, wealthy Taiwanese derive a high portion of their income from real estate investments. Second, such a substantial gender difference in payoffs, especially relative to an average household's income level, has important implications for not only social welfare, but also asset allocation research; hence, this substantial gender difference calls for explanations. On the other hand, we notice that women's average profit is not very different from

[22] As discussed earlier, this return measure is unlevered and does not include property taxes, rental income, or maintenance costs.

[23] As discussed earlier, the profit from each transaction is calculated based on the assessed price in the selling year minus the assessed price in the acquired year. We then sum up the profits across all transactions made by each individual.

that of men's in the remaining percentiles, although an incidental, opposite pattern may be driven by some outlier observations.

Holding duration is another important dimension in real estate investment because, when compared to other investment vehicles, real estate investment is associated with lower turnover frequencies. In Figure 5, we present the average holding period of land transactions (in years) of men and women across all percentiles above the population median: the holding periods of men and women are denoted by solid and dotted lines, respectively. We observe two clear patterns for individuals who are below the 99th percentile: the majority of population holds their lands for a stable period of time (13-15 years). In addition, men hold lands for an average of 1.3 years longer than women. On the other hand, when we look at the individuals in the 99th percentile, we find that the holding period drops steeply to below 10 years, and the difference in holding periods between genders drops steeply to 0.5 years in the 99th percentile, indicating that the wealthiest group engages in land transactions more frequently, regardless of gender. The fact that the wealthiest Taiwanese hold lands for a much shorter period echoes our earlier argument: only the top 2% of the wealthiest Taiwanese treat real estate as investments; for the rest of the population, real estate serves only a residential purpose.

If liquidity is a major contributing factor to gender differences in ROR, then a difference of 0.5 years in a holding period is not sufficiently long (relative to the average holding periods of 13 years) to explain the gender variation of 1.04% *per year* in the 99th percentile. Similarly, the difference of 0.5 years in a holding period cannot explain the deep gap in accumulated profits (NTD 670 million among men vs. NTD 172 million among women) in the 99th percentile.

3. An Explanation based on Sex Discrimination

In this section, we empirically examine if gender differences in real estate payoffs can be (at least partially) attributed to gender discrimination in wealth transfers. As discussed in the Introduction, wealthy parents will utilize lands to transfer wealth to their male descendants to not only avoid inheritance tax, but also circumvent the *portio legitima* rule in modern civil laws that disallows discretionarily unfair treatment of sons and daughters. In this section, we first discuss the acquiring types of land and then conduct empirical tests to specify the effect of sex discrimination. Lastly, we use the existence of siblings of different genders as an identification test

to confirm the role of sex discrimination.

3.1 Acquiring types

We classify all sold lands into four acquiring types based on how they were acquired: pure purchases, supported purchases, (*inter vivos*) gifts, and bequests. Gifts and bequests are clearly defined by laws. Purchases, on the other hand, can also serve as an alternative form of a gift, as parents can pay for the down payment for children's real estate purchases (using the tax-free gift amount of NTD 2.2 million per year). This is a common practice in Taiwan, and we label this type of purchase as a "supported purchase." Thus, we track how lands that were purchased into supported purchases and pure purchases by comparing the wealth reduction on parents' side to the assessed prices of lands purchased by their respective children for each transaction. If parents' liquid wealth (defined as savings/deposits plus stock) reduction in the same year is above 25% of the assessed price of the land bought by a particular child,[24] we define the land purchase as a supported purchase and, in turn, treat it as another type of gift. In Figure 6, we provide the numbers of lands that are acquired by our sample individuals (and that are later sold, so we may calculate ROR) by acquiring types across all wealth percentiles that are above median wealth.

We find that 72.34% of traded lands are acquired through supported purchases and 5.66% are gifts from parents among all transactions in our sample. These statistics suggest that nearly *80%* of land transactions can be related to wealth transfer from parents at will, and hence highlight the possibility that discriminatory wealth transfer explains gender differences in real estate investment. On the other hand, 11.47% of traded lands are bequests and only 10.54% are acquired through pure purchases.

To further understand the magnitude of wealth transfer through real estate, we present the profits in supported purchases plus gifts, bequests, and pure purchases in Figure 7 (Panel A for men and Panel B for women). We find that, among the top 1% wealthiest individuals in Taiwan, men earn NTD 1,449 million, 4 million, and 99 million per person in real estate acquired through supported purchases plus gifts, bequests, and pure purchases, respectively, during our sample period. These findings suggest that a large portion of family wealth transfer indeed took place in

[24] As we discussed earlier, the FIA combined family database allows us to track the wealth changes of the parents of a child who purchased land. Parents' liquid wealth is the sum of the father's and the mother's liquid wealth. We have also tried 15%, 20%, 30% and 35% as thresholds, and our results are qualitatively the same.

real estate trading. On the other hand, women earn NTD 255 million, 4 million, and 16 million in these three categories. More importantly, men outperform women by NTD 1,194 million, 0.5 million, and 83 million in real estate acquired through supported purchases plus gifts, bequests, and pure purchases, respectively. Such a huge difference across acquiring types strongly indicates that wealth transfer is largely attributable to sex discrimination. On the other hand, the relatively small gender difference in bequests is consistent with *portio legitima* in modern civil laws.

In addition to wealth transfer, Figures 6 and 7 also highlight an important issue that has rarely been discussed in the economics and finance literature: a substantial part of individuals' real estate payoffs result from (various ways of) heritage that are beyond descendants' asset allocation decisions. Thus, a careful analysis of wealth windfall such as inheritance is needed to understand the behaviors, motives, and decisions associated with investments.

3.2 Regression analysis

To formally analyze the association between sex discrimination in wealth transfer and gender differences in ROR, we estimate the following equations using weighted least squares regressions:

$$R_{ijt}^{l} = \alpha + \beta_1 Male_i + \sum Year\ FE_t + \sum Family\ FE_f + \varepsilon_{ijt}, \quad (1)$$

in which R_{ijt}^{l} denotes the annual ROR of land *j* sold in year *t* by individual *i* from family *f* (we discussed this particular calculation in Section 2.2). $Male_i$ denotes an indicator variable that equals one if individual *i* is male and zero otherwise. $\sum Year\ FE_t$ denotes the fixed effects for years to control for real estate cycles, and $\sum Family\ FE_f$ denotes the fixed effects for families to help us estimate the "within-family" effect in gender differences. Given the great variation in the values of land transactions, we use weighted least squares to weigh the value of transaction *j* in family *f*. In Table 2, we present our estimation results of Equation (1) using supported purchases plus gifts (as we explained earlier, these two types are possibly subject to sex discrimination and account for nearly 80% of land transactions) as our regression sample.

In Model 1 of Table 2, we report our estimation results without year and family fixed effects. We find that the coefficient on *Male* is 0.93% with statistical significance. This coefficient estimate suggests that males outperform females by 0.93% per year in selling lands acquired with help from their parents. In Model 2, when we include year fixed effects in Equation (1), we find that the coefficient on *Male* becomes 0.72% with statistical significance. This estimate indicates that, even

if we control for business cycles in real estate markets, men still earn 0.7% more per year than women in selling real estate acquired with help from their parents. In Model 3, when we further include family fixed effects in Equation (1), the coefficient on *Male* is as high as 3.84% with statistical significance. When we compare the coefficients on *Male* across all three models, we find that the average gender difference is 0.72%-0.93%, while the within-family gender difference is 3.84%. The fact that we observe a stronger within-family relation suggests that the driving force behind this phenomenon is gender-specific and is unrelated to time-invariant family characteristics.

It is worth mentioning that, to construct our observations for Table 2, we define supported purchases based on parents' liquid wealth reduction to be above 25% of the assessed price of the land bought by the child. We also consider higher thresholds to define supported purchases, such as 15%, 20%, 30%, and 35%; when we do so, we obtain consistent results using those alternative thresholds to estimate Equation (1).

3.3 Identification test: siblings of different genders

The gender distribution of siblings helps us establish the causal effect of sex discrimination on return differences. Our notion is that rich parents' gender discrimination can be exercised only when they have sons and daughters; otherwise, there is no need and room for gender discrimination to contribute to our results. In Table 3, we split our sample of individuals in the 98th and 99th percentiles into three groups based on the structure of siblings within a particular family. The Single Child group includes individuals who are single children, the Same-sex Siblings group includes individuals from families of either all sons or all daughters, and the Mixed-sex Siblings group includes individuals who are different from at least one sibling in gender. We note that the Mixed-sex Siblings group is much larger than other two groups and amounts to 83% of all observations. We find several interesting patterns when we compare gender differences in the ROR of lands from supported purchases plus gifts. First, we find no significant gender differences in land ROR in the Single Child group and the Same-sex Siblings group. These findings support the notion that when there is no room for discrimination, sons and daughters receive lands of the same quality. Second, men outperform women by 1.15% when they are in the Mixed-sex Siblings group (7.42% vs. 6.27%).[25] This comparison thus offers additional support to our sex discrimination

[25] We compare the value-weighted averages between men and women.

explanation.

To further verify our sex discrimination explanation, we introduce an indicator variable *Sibling* for the existence of sibling of the other gender. We then exclude individuals who are in single-child families (which accounts for 5.10% of our sample) and estimate the following regression including the indicator variable and control for other variables:

$$R_{ijt}^{l} = \alpha + \beta_1 Male_i + \beta_2 Male_i \times Sibling_f + \beta_3 Male_i \times Control_{ijt} + \sum FE_t + \varepsilon_{ijt}, \quad (2)$$

in which $Sibling_f$ is an indicator variable that equals one if family f has children of different genders. After excluding individuals from single-child families, we find that individuals that have siblings of a different gender account for 85.84% of the remaining samples.[26] $Control_{ijt}$ denotes a vector of three control variables that help us separate the effect of sex discrimination from other effects: *Out-of-Taipei*, *Marriage*, and *Income Drop*. *Out-of-Taipei* is an indicator variable that equals one when an individual is born outside Taipei City and zero otherwise. This variable reflects the observation that Taipei City is more globalized and may thus be less subject to patriarchal tradition. *Marriage* is an indicator variable that equals one if the land owner is married when s/he acquired the land and zero otherwise.[27] This variable is included because it is related to parents' intentions with respect to wealth transfer, as the wealth accumulated in marriage is subject to equal division when a couple divorces, according to laws in Taiwan. *Income Drop* is an indicator variable that equals one when the income of the land owner (or the married couple) drops by 30% in the year and zero otherwise.[28] This variable is included because one may sell lands due to financial difficulties. We defined all other variables in the prior section.

Testing if the coefficient on the interaction term, $Male_i \times Sibling_f$, of Equation (2) is significantly positive can be treated as an identification test for gender discrimination *causing* gender differences in real estate ROR for the following reasons. First, rich parents' gender discrimination can be exercised only when they have sons and daughters; otherwise, there is no need and room for gender discrimination to contribute to our results. Second, it is difficult to rationalize how the existence of sibling of different genders would influence individuals' ROR in

[26] To ensure comprehensiveness, we also run a regression for families with a single child. For these families, we find that gender differences in ROR are either insignificant or even slightly in favor of females, indicating that parents do not tend to transfer more promising lands to their only boy (as opposed to their only girl).
[27] We identify marital status by comparing one's marriage year and the year of land acquisition.
[28] We use annual income instead of wealth to define the occurrence of financial difficulties.

land trading, except through the discriminative land transfers from parents (who help their sons buy more promising lands). Third, Equation (2) also helps rule out omitted variables that affect both males' transactions and their respective RORs. If there exist such omitted variables, they must be positively correlated with one's sibling composition. As it is difficult to think of any omitted variable that satisfies such a condition, a more reasonable interpretation for a significantly positive coefficient on the interaction term in Equation (2) will be an outcome of sex discrimination (i.e., rich parents who transfer promising lands to sons).

We present our estimation results for Equation (2) in Table 4; with respect to these results, Model 1 does not include control variables, but Model 2 does. In Panel A, we find that the coefficient on $Male_i \times Sibling_f$ is 2.09% with statistical significance, and the coefficient on $Male_i$ is -1.07% with statistical significance. This negative coefficient can be explained in two ways. First, individuals with siblings of different genders account for 85.84% of our sample in Table 3; among these individuals, men outperform women in real estate returns by 1% per year.[29] Second, for men in the rest 14.16% individuals with $Male_i \times Sibling_f = 0$, they were born in families with multiple sons and likely receive diluted resources for real estate.

In Model 2 of Table 4, we include more control variables to isolate the pure effect of sex discrimination. We find that the coefficient on $Male_i \times Sibling_f$ is 2.01% with statistical significance. Similar to Model 1, the coefficient on $Male_i$ is negative (-1.42%) with statistical significance. Table 4 thus presents a consistent pattern: the effect of being male on land ROR is more pronounced among individuals with siblings of different genders, and thus supports a causal effect of sex discrimination on gender differences in real estate payoffs, which leads to large-scale, unequal wealth transfer and likely exacerbates social inequality.

We also find other interesting patterns in Model 2 of Table 4. First, the coefficient on $Male \times Marriage$ is significantly negative, suggesting that gender differences in ROR decrease after marriage. This finding is fairly consistent with discriminatory wealth transfer because rich parents will prefer transferring wealth to sons before their marriage, so they may avoid wealth dilution due to equal division upon divorce. Second, the coefficient on $Male \times$ *Out-of-Taipei* is significantly positive. This can be explained by the fact that discrimination is more severe out of

[29] Overall, the positive coefficient on $Male_i \times Sibling_f$ (for 86% of the sample) dominates the negative coefficient on $Male_i$ and thus explains males' higher ROR across the entire sample.

Taipei City. Third, the coefficient on $Male \times Income\ Drop$ is significantly positive, which seemingly supports the argument that women are more likely to liquidate their land assets, even at the cost of incurring lower ROR, when their family faces an income-drop pressure. This may be another kind of disadvantage women face.[30]

4. Stock Investments: Men vs. Women

In this section, we revisit an important issue in behavioral finance research: gender differences in stock investment returns. As we discussed earlier, we use all available shareholding data of Taiwanese to calculate the stock investment returns across genders.

In Figure 8 Panel A, we present men's and women's stock investment ROR across all percentiles above the population median.[31] The horizontal axis denotes the percentile in wealth (for the top half), and the vertical axis denotes the average ROR of men and women (in solid and dashed lines, respectively) for each wealth percentile. We find a clear pattern for individuals in all percentiles: men's RORs are consistently *lower* than those of women's. Such a gap in ROR fluctuates between 0.5% and 1% per year. Our finding of women's advantage in stock investment is consistent with prior studies and thus provides evidence from Asia to support the literature.

Interestingly, gender-related differences in ROR across stocks and real estate present intriguing opposite patterns. Lands have traditionally been regarded as the most valuable long-term assets in Taiwan, and are frequently used to transfer family wealth. Stocks, on the other hand, have not been treated as heirlooms. Moreover, stocks are fairly liquid and may not be able to help parents transfer family wealth to future generations.

We calculate the average profits from stocks for men and women in each wealth percentile and plot them in Figure 8 Panel B. In the 99th percentile, the accumulated profits from stocks are NTD 85 million for men and NTD 97 million for women. These numbers are fairly small when

[30] We also run the same regression for individuals above 45 years old in the 95th to 99th wealth percentile. The results are consistent except for the significance level of *Male* × *Income Drop* has declined.

[31] In our database, publicly-traded stock shares are valued at the market closing price of each stock on its ex-right date. We use stock price records from the Taiwan Economic Journal (TEJ) database at the ex-right date of each year. We can therefore track the difference in a shareholder's portfolio for each year. For individuals who purchase shares of the same company several times before selling them, we apply a first-in-first-out assumption. Moreover, we account both the CPI-adjusted price difference and accumulated dividends as returns when we calculate the average annual ROR in stock investment. To calculate individuals' RORs in stocks, we use the procedure for calculating ROR in lands in Section 2.2. For companies that do not distribute dividends, shares are valued at the market closing price on 31 July. Stocks that are not publicly traded are priced by face value.

compared with the real estate profits based on land transactions that we reported in Figure 4: the profits from lands are as high as NTD 670 million among men and NTD 172 million among women in the 99th percentile. Such a disparity in profits to wealthy Taiwanese confirms our intuition that a high portion of these individuals' income is attributable to real estate investments rather than stock investments.

In sum, we use large-scale administrative wealth data of Taiwanese to perform comprehensive analyses of their trading behaviors in stocks and real estate, so we may provide important implications for the behavioral economics and finance literature.

5. Alternative Explanations

In this section, we examine if our results can be explained by possible alternative explanations proposed in the literature, including risk preference, experience, loss aversion, and optimism.

3.1 Risk preference

We first examine if men's higher returns in real estate investment simply reflects men's preference for risky assets (Sunden and Surette, 1998). We acknowledge the difficulty in measuring individuals' risk preferences, and propose the following two measures: the cash-to-wealth ratio and the volatility of ROR in the past. We focus on the ROR of individuals in the 98th and 99th percentiles, and we split them into subsamples based on the two measures. The cash-to-asset ratio is defined as an individual's savings/deposits scaled by her/his wealth in 2005. Since cash is a riskless asset, holding more cash reflects one's degree of risk aversion. The volatility of ROR is defined as the standard deviation of one's ROR across her/his land transactions in the 2006-2010 period. A higher volatility of ROR reflects a higher risk preference in the past and, in turn, suggests that individuals with this preference may thus take riskier bets in future real estate investment.

In Table 5, we present the ROR of men and women in the 98th and 99th percentiles but who are of different risk preferences. In Panel A, we assign all individuals into one of three groups based on their cash-to-wealth ratios and then calculate the average ROR of men and women within each group for the 2006-2015 period. While men's ROR slightly decreases as cash-to-wealth ratios

increase, women's ROR appears similar in all three groups, suggesting that ROR does correlate with risk preference as measured by cash position (especially among men). However, the gender difference in ROR remains significant in all three groups as well. Specifically, the difference is 1.05%, 0.78%, and 0.70% in the low, middle, and high cash holding groups, respectively. It is noteworthy that, even for the high cash holding group, the gender gap in ROR is as high as 0.70%. These findings thus suggest that risk preference cannot satisfactorily explain the gender difference that we document.

In Table 5 Panel B, we assign all individuals with at least two transactions in the 2006-2010 period into three groups based on their volatility of ROR, and then track these groups' average ROR in the 2011-2015 period. We find that both men's and women's ROR substantially increase with higher risk preference (as measured by prior ROR volatility). Specifically, men's ROR are 6.50%, 6.78%, and 7.89%, while women's ROR are 5.78%, 6.42%, and 7.34% in the low, middle, and high risk preference groups, respectively. These results are consistent with the notion that investors tolerating higher risk earn higher returns. On the other hand, the gender difference in ROR is 0.72%, 0.36%, and 0.55% in the low, middle, and high risk preference groups, respectively. The magnitude of such a gap is significant in all three groups, but it does not increase with risk preferences. In fact, the greatest gender gap (0.72%) appears in the low risk preference group in which volatility is below 1.4% (which is only one-third of the lower-bound volatility of the high risk preference group). This finding suggests that risk preference cannot adequately explain gender differences in land ROR.

Overall, while Table 5 provides evidence for the relation between individuals' risk preference and their real estate investment returns, it also shows that risk preference cannot explain the large gender difference that we document.

3.2 Experience

It is well known that real estate constitutes a significant portion of heritage, especially in Asia. In Taiwan, there has been a patriarchal tradition for fathers to pass lands to sons and/or to provide housing to sons who plan to get married (Chu, Lin, and Wang, 2020). Thus, men may have gained more experience in handling land transactions, and such experience makes men more likely to engage in and gain from real estate investment. This explanation is also related to the market timing explanation of Goldsmith-Pinkham and Shue (2020). To examine this viewpoint, we use

individuals' frequencies of land transactions in the past to proxy for their experience in real estate investment. We focus on the ROR of individuals in the 98th and 99th percentiles, and we split them into subsamples based on individuals' land trading frequencies in the 2006-2010 period. We then calculate the average ROR of men and women within each group for the 2011-2015 period.

Table 6 shows that both men's and women's RORs increase with past experience. Men's ROR are 6.56%, 6.77%, and 7.18% in the low, middle, and high experience groups, respectively. On the other hand, women's ROR are 6.00%, 6.08%, and 6.72% in the low, middle, and high experience groups, respectively. These increasing patterns confirm the importance of experience, as individuals who sold more lands in the past also tend to make higher profits in the future. Nevertheless, our findings in Table 6 fail to explain the gender difference in ROR in two ways. First, as reported in the rightmost columns, the ratios of females are similar across three groups (28.5%, 27.2%, and 26.4%), suggesting that females are not *less* experienced than males in trading real estate. Second, gender differences in ROR are 0.56%, 0.69%, and 0.46% in the low, middle, and high experience groups, respectively, and these differences do not increase with experience. As a result, although individuals' experience indeed explains some real estate investment performance, it does not explain the gender difference.

3.3 Loss aversion and optimism

As we discussed earlier, males may be subject to particular behavioral biases, which lead to higher ROR. On the one hand, since men are more competitive (Gneezy, Niederle, and Rustichini, 2003; Niederle and Vesterlund, 2007; Reuben, Sapienza, and Zingales, 2015), they may not be willing to accept failure in real estate investments and thus do not trade in loss. We label this behavior as "loss aversion." On the other hand, males tend to be more optimistic or even overconfident; as a result, they are only willing to sell lands in high target prices. We label this behavior as "optimism." These two behaviors will lead to men's higher ROR because they are more reluctant to liquidate their positions in loss or those with low returns.

Although it is empirically challenging to test this explanation because we only have *realized* land transactions, we exploit the real estate cycles to examine those behavioral explanations. If men only sell lands in (higher) profits, then we should expect them to sell much fewer lands than women in market downturns. We use the Sinyi Realty housing price index to assign all years in our sample period into three sub-periods: bad years (2008, 2009, 2015), good years (2007, 2011-

2013), and other years (2006, 2010, and 2014).[32] Within each sub-period, we calculate the percentages of land transactions made by males and females (and their average ROR) who are in the 98th and 99th percentiles. In Table 7, we show that men account for 74.9% of land sales in bad years, 75.5% in good years, and 74.7% in other years. These findings suggest that males do not sell substantially fewer (more) lands in bad (good) years, and thus do not support the explanations of loss aversion and optimism.

We also calculate the average return of males and females in three sub-periods and find the following patterns. First, men's average return is 5.85%, 6.49%, and 6.58% in bad, good, and other years, respectively. On the other hand, women's average return is 5.90%, 5.73%, and 5.90% in bad, good, and other years, respectively. The fact that men's average return in good years is higher than that in bad years (6.49% vs. 5.85%) while women's average return is similar in these two sub-periods (5.90% vs. 5.73%) partially explains the role of men's optimism. Second, our observations that the gender difference in average returns is 0.67% in normal years (in which men do not particularly trade more or less than women) and that such a gap is close to the difference of 0.76% in good years *contradict* the explanation with respect to optimism that predicts men will sell more land (and gain higher profits) in booming times.

Finally, our finding that the average returns of men and women are very close (5.85% vs. 5.90%) in bad years, together with the consistent frequencies of land trading of men and women across different sub-periods, implies that men are *not* unwilling to realize their losses in market downturns. Thus, these findings do not provide strong support to a loss aversion explanation. As a result, our findings in Table 7 suggest that gender gap cannot be fully explained by the two types of behavioral biases that we propose.

6. Conclusion

Real estate investment has historically been perceived as the most common investment vehicle in many cultures, but particularly in Asia. In fact, Asian countries have witnessed very strong housing price inflation in recent decades, which makes real estate investment a major source of household wealth (and income disparity). However, it is challenging to analyze investment

[32] Sinyi Realty is a dominant real estate agent in Taiwan. The index is available at: https://www.macromicro.me/collections/15/tw-housing-relative/361/sinyi-house-price-index-taiwan

behaviors in real estate due to data limitation. In this study, we manage to collect and combine several large-scale datasets that cover almost all assets and income sources from the Fiscal Information Agency (FIA) of the Ministry of Finance, Taiwan to conduct a comprehensive investigation of investor behaviors in real estate in Taiwan. We find that only the top 2% of Taiwanese in wealth rank actively traded real estate. Moreover, we confirm that a large portion of income disparity in Taiwan can be attributed to the distribution and transfer of real estate, a finding that has important implications with respect to social mobility and welfare.

Our main finding is that men outperform women in investment return by about 1% per year in this group, which creates a significant difference in wealth distribution. Further analyses suggest that such a gender difference may not be fully explained by risk preferences, experiences, loss aversion, and/or optimism.

We propose a novel explanation for this phenomenon: sex discrimination associated with wealth transfers. Wealthy parents have the ability and tax incentive to transfer wealth to their sons through lands to gain from *inter vivos* tax-free quota, to avoid inheritance tax, and to circumvent the *portio legitima* rule. We show that about 80% of all real estate transactions in our sample period are *inter vivos* wealth transfers from parents. Moreover, wealthy parents tend to pass more (less) promising lands to sons (daughters), which leads to gender differences in payoffs. Among the top 1% wealthiest individuals, men earn NTD 1,194 million more than women do on average in real estate acquired through such wealth transfers. We further propose to use the existence of siblings of different genders to strengthen a causal interpretation of our baseline results. When we do so, we find that men's advantage in real estate investment is stronger among those with sisters, which is consistent with the notion that rich parents' sex discrimination only occurs when they have both sons and daughters.

Finally, we also conduct comprehensive analyses of trading behaviors in stocks and show that women outperform men in stock investment in Taiwan. However, such an advantage is insufficient to compensate for the disadvantage in real estate. As real estate investments play a dominating role in household wealth (especially in Asia) and may be subject to more behavioral biases, our investigation of Taiwanese real estate investments provides new insights to behavioral economics and household finance. Furthermore, our study delivers important implications with respect to social income disparity, tax structure, and economic growth. When the majority of

household wealth is concentrated in real estate, sex discrimination in parents' wealth transfers through real estate trading could exacerbate gender-specific income disparity.

References

Agnew, J., Balduzzi, P., & Sundén, A. (2003). Portfolio choice and trading in a large 401 (k) plan. *American Economic Review, 93*(1), 193-215.

Altonji, J. G., & Blank, R. M. (1999). Race and gender in the labor market. *Handbook of Labor Economics, 3*, 3143-3259.

Andersen, S., Marx, J., Nielsen, K. M., & Vesterlund, L. (2020). *Gender Differences in Negotiation: Evidence from Real Estate Transactions.* (NBER Working Paper No. w27318). Retrieved from National Bureau of Economic Research website: https://www.nber.org/papers/w27318

Atkinson, S. M., Baird, S. B., & Frye, M. B. (2003). Do female mutual fund managers manage differently? *Journal of Financial Research, 26*(1), 1-18.

Bajtelsmit, V. L., & VanDerhei, J. L. (1997). Risk aversion and pension investment choices. In Gordon, M. S., Mitchell, O. S., & Twinney, M. M. (Eds.), *Positioning pensions for the twenty-first century* (pp. 45-66). Philadelphia: University of Pennsylvania Press.

Barber, B. M., & Odean, T. (2001). Boys will be boys: Gender, overconfidence, and common stock investment. *The Quarterly Journal of Economics, 116*(1), 261-292.

Barsky, R. B., Juster, F. T., Kimball, M. S., & Shapiro, M. D. (1997). Preference parameters and behavioral heterogeneity: An experimental approach in the health and retirement study. *The Quarterly Journal of Economics*, 112(2), 537-579.

Beckmann, D., & Menkhoff, L. (2008). Will women be women? Analyzing the gender difference among financial experts. *Kyklos, 61*(3), 364-384.

Bernasek, A., & Shwiff, S. (2001). Gender, risk, and retirement. *Journal of Economic Issues, 35*(2), 345-356.

Bernheim, B. D., Lemke, R. J., & Scholz, J. K. (2004) Do estate and gift taxes affect the timing of private transfers?, *Journal of Public Economics*, 88, 2617-2634

Bertrand, M. (2011). New perspectives on gender. *Handbook of Labor Economics, 4*, 1543-1590.

Bhalotra, S., & Rawlings, S. B. (2011). Intergenerational persistence in health in developing countries: The penalty of gender inequality? *Journal of Public Economics, 95*(3-4), 286-299.

Bharadwaj, P., & Lakdawala, L. K. (2013). Discrimination begins in the womb: Evidence of sex-selective prenatal investments. *Journal of Human Resources, 48*(1), 71-113.

Brunetti, M., & Torricelli, C. (2015). Second homes: Households' life dream or (wrong)

investment?. CEIS Working Paper No. 351, Available at SSRN: https://ssrn.com/abstract=2639739 or http://dx.doi.org/10.2139/ssrn.2639739

Bucciol, A., & Miniaci, R. (2011). Household portfolios and implicit risk preference. *Review of Economics and Statistics, 93*(4), 1235-1250.

Case, K. E., Quigley, J. M., & Shiller, R. J. (2005). Comparing wealth effects: The stock market versus the housing market. *Advances in Macroeconomics, 5*(1), 1-34.

Charness, G., & Gneezy, U. (2012). Strong evidence for gender differences in risk taking. *Journal of Economic Behavior & Organization, 83*(1), 50-58.

Chen, Y., Li, H., & Meng, L. (2013). Prenatal sex selection and missing girls in China: Evidence from the diffusion of diagnostic ultrasound. *Journal of Human Resources, 48*(1), 36-70.

Chu, C. C. (1991). Primogeniture. *Journal of Political Economy, 99*(1), 78-99.

Chu, C. C., & Yu, R. R. (2010). *Understanding Chinese families: A comparative study of Taiwan and Southeast China.* New York: Oxford University Press.

Chu, C. C., Chou, T., & Hu, S. C. (2015). *Top Incomes in Taiwan, 1977-2013,* No. 201506, Working Papers, World Inequality Lab.

Chu, C. C., Lin, J., & Tsay, W. J. (2020). Males' housing wealth and their marriage market advantage. *Journal of Population Economics*, 33, 1005-1023.

Croll, E. (2000). *Endangered daughters: Discrimination and development in Asia.* London: Routledge.

Croson, R., & Gneezy, U. (2009). Gender differences in preferences. *Journal of Economic Literature, 47*(2), 448-74.

Deininger, K., Goyal, A., & Nagarajan, H. (2013). Women's inheritance rights and intergenerational transmission of resources in India. *Journal of Human Resources, 48*(1), 114-141.

Dohmen, T., & Falk, A. (2011). Performance pay and multidimensional sorting: Productivity, preferences, and gender. *American Economic Review, 101*(2), 556-90.

Dwyer, P. D., Gilkeson, J. H., & List, J. A. (2002). Gender differences in revealed risk taking: Evidence from mutual fund investors. *Economics Letters, 76*(2), 151-158.

Eckel, C. C., & Grossman, P. J. (2008). Men, women and risk aversion: Experimental evidence. *Handbook of Experimental Economics Results, 1*, 1061-1073.

Genesove, D., & Mayer, C. (2001). Loss aversion and seller behavior: Evidence from the

housing market. *The Quarterly Journal of Economics, 116*(4), 1233-1260.

Gerlach, R., Wilson, P., & Zurbruegg, R. (2006). Structural breaks and diversification: The impact of the 1997 Asian financial crisis on the integration of Asia-Pacific real estate markets. *Journal of International Money and Finance, 25*(6), 974-991.

Glindro, E. T., Subhanij, T., Szeto, J., & Zhu, H. (2008). *Determinants of house prices in nine Asia-Pacific economies*. BIS working paper, 263.

Gneezy, U., Niederle, M., & Rustichini, A. (2003). Performance in Competitive Environments: Gender Differences. *The Quarterly Journal of Economics, 118*(3), 1049-1074.

Goldsmith-Pinkham, P., & Shue, K. (2020). *The Gender Gap in Housing Returns* (NBER Working Paper No. w26914). Retrieved from National Bureau of Economic Research website: https://www.nber.org/papers/w26914

Green, C., Jegadeesh, N., & Tang, Y. (2009). Gender and job performance: Evidence from Wall Street. *Financial Analysts Journal, 65*(6), 65-78.

Gupta, M. D. (1987). Selective discrimination against female children in rural Punjab, India. *Population and Development Review, 13*(1), 77-100.

Halko, M. L., Kaustia, M., & Alanko, E. (2012). The gender effect in risky asset holdings. *Journal of Economic Behavior & Organization, 83*(1), 66-81.

Harding, J. P., Rosenthal, S. S., & Sirmans, C. F. (2003). Estimating bargaining power in the market for existing homes. *Review of Economics and Statistics, 85*(1), 178-188.

Hibbert, A. M., Lawrence, E. R., & Prakash, A. J. (2018). The Effect of Prior Investment Outcomes on Future Investment Decisions: Is There a Gender Difference? *Review of Finance, 22*(3), 1195-1212.

Hinz, R. P., McCarthy, D. D., & Turner, J. A. (1997). Are women conservative investors? Gender differences in participant-directed pension investments. In Gordon, M. S., Mitchell, O. S., & Twinney, M. M. (Eds.), *Positioning pensions for the twenty-first century*, (pp. 91-103). University of Pennsylvania Press.

Jacobsen, B., Lee, J. B., Marquering, W., & Zhang, C. Y. (2014). Gender differences in optimism and asset allocation. *Journal of Economic Behavior & Organization, 107*, 630-651.

Levy, O., & Galili, I. (2008). Stock purchase and the weather: Individual differences. *Journal of Economic Behavior & Organization, 67*(3-4), 755-767.

Lin, M. J., Liu, J. T., & Qian, N. (2014). More missing women, fewer dying girls: The impact of

sex-selective abortion on sex at birth and relative female mortality in Taiwan. *Journal of the European Economic Association, 12*(4), 899-926.

Liu, C. H., Hartzell, D. J., Grissom, T. V., & Greig, W. (1990). The composition of the market portfolio and real estate investment performance. *Real Estate Economics, 18*(1), 49-75.

Lusardi, A., & Mitchell, O. S. (2008). Planning and financial literacy: How do women fare? *American Economic Review, 98*(2), 413-17.

Meriküll, J., Kukk, M., & Rõõm, T. (2020). *What explains the gender gap in wealth? Evidence from administrative data* (NBER Working Paper No. w26920). Retrieved from National Bureau of Economic Research website: https://www.nber.org/papers/w26920

Niederle, M., & Vesterlund, L. (2007). Do women shy away from competition? Do men compete too much? *The Quarterly Journal of Economics, 122*(3), 1067-1101.

Niessen, A., & Ruenzi, S. (2007). *Sex matters: Gender differences in a professional setting* (No. 06-01). CFR Working Paper.

Poterba, J. (2001). Estate and gift taxes and incentives for inter vivos giving in the United States, *Journal of Public Economics*, 79, 237-264.

Reuben, E., Sapienza, P., & Zingales, L. (2015). *Taste for competition and the gender gap among young business professionals* (NBER Working Paper No. w21695). Retrieved from National Bureau of Economic Research website: https://www.nber.org/papers/w21695

Sapienza, P., Zingales, L., & Maestripieri, D. (2009). Gender differences in financial risk aversion and career choices are affected by testosterone. *Proceedings of the National Academy of Sciences, 106*(36), 15268-15273.

Seiler, M., Seiler, V., Traub, S., & Harrison, D. (2008). Regret aversion and false reference points in residential real estate. *Journal of Real Estate Research, 30*(4), 461-474.

Sunden, A. E., & Surette, B. J. (1998). Gender differences in the allocation of assets in retirement savings plans. *The American Economic Review, 88*(2), 207-211.

Thaler, R. H. (1990). Anomalies: Saving, fungibility, and mental accounts. *Journal of Economic Perspectives, 4*(1), 193-205.

Yao, R., & Zhang, H. H. (2005). Optimal consumption and portfolio choices with risky housing and borrowing constraints. *The Review of Financial Studies, 18*(1), 197-239.

Yu, W. H., & Su, K. H. (2006). Gender, sibship structure, and educational inequality in Taiwan: Son preference revisited. *Journal of Marriage and Family, 68*(4), 1057-1068.

Appendix: Introduction to the FIA Database

1. Land Value Increment Tax (LVIT) Database:

The Land Value Increment Tax database includes the details of all taxable land transfers from 2005 to 2015. The transferred land area, land value, holding period of the original title owner (with the starting and ending date of ownership specified), and the de-identified national ID numbers of the two parties are documented. Land value increment tax is collected on the total incremental value at the time of the transfer of the title of the land. For land transferred with compensation (e.g. commercial transactions), the original title owner is obligated to pay the increment tax, while the acquired title owner should pay in cases of transfers without compensation (e.g. gift and inheritance).

2. Personal Income Tax Database:

The Personal Income Tax database includes personal income items in annual tax filings from 2001 to 2015. The main categories include salary, income from professional practice, bonuses, dividends, interests, and other personal income items. In our study, we match the personal income data to land transaction records with the seller's de-identified ID. This allows us to observe whether a seller is faced with a drastic drop in income the year the land is sold, and thus affected by liquidity concerns.

3. Nationwide Personal Property Database:

The Nationwide Personal Property database includes the savings/deposits, stocks, housing, lands, and car ownership dataset from 2003 to 2015. Savings/deposits is extrapolated by taxable interest income; publicly-traded stocks are valued at the market closing price on its ex-rights date (31 July if the ex-rights date is not available) and other stocks are priced by face value; housing and land value are based on government assessments; and car value is approximated by the documented engine size and brand. In the lands dataset, the most recent reason for land registration is documented (e.g., purchase, inheritance, entrust). We only focus on “realized” return in our paper, so if an inherited land has considerably appreciated but remained unsold, the appreciation will not be included in a land owner’s average return. For lands that are transacted in our sample period, we match the reason for registration to the LVIT database to identify how the original title owner acquired the land.

4. Family Database:

The Family database includes individuals’ date of birth, date of marriage, and de-identified national ID numbers of spouse and parents (or adoptive parents).

The FIA built the family database by combining the tax-paying records it held and the household records maintained by the Household Registration Administrations in Taiwan. A parent-child relationship can be identified when an individual is registered as a “dependent” to qualify for tax cuts, and couples can be identified when they file their taxes together. In our study, the family database allows us to:

(a) Connect the wealth data of the land sellers’ parents to the LVIT database.
(b) Identify whether an individual has siblings (people with the same biological father ID) of a different gender.

All of these datasets can be connected through a de-identified national ID number.

External Database:

Taiwan Economic Journal (TEJ) financial database:

The Taiwan Economic Journal (TEJ) financial database provides detailed corporate information necessary for fundamental analysis in the security market, including basic information of a corporation (e.g. owner, industry, number of employees, capital), items from a company's financial report, stock price, etc. In our study, we use stock price information to value the shares documented in the stock ownership dataset of the Nationwide Personal Property database.

Table 1: Summary Statistics of Five Asset Categories

In this table, we present the following summary statistics of the estimated values of all five major asset categories (savings/deposits, stocks, lands, houses, and cars) of the population: the mean, standard deviation, and the 1st, 25th, 50th, 75th, and 99th percentiles. Panel A includes all individuals, and Panel B separates these individuals into men and women. We collect the following datasets from the Fiscal Information Agency (FIA) of the Ministry of Finance, Taiwan: (1) the Land Value Increment Tax (LVIT) Database, which includes the details of all taxable land transfers from 2005 to 2015; (2) the Personal Income Tax Database, which includes all taxable salary, bonuses, dividends, interests, and other personal income items in annual tax filings from 2001 to 2015; and (3) the Nationwide Personal Property Database, which includes savings/deposits, stocks, housing, land, and car ownership information from 2003 to 2015. All these datasets are connected through de-identified national ID numbers. We then focus on 3,456,551 individuals who are above 45 years old.

Panel A: All observations

All (Observations: 3,456,551)					
	Savings & Deposits	**Stock**	**Land**	**House**	**Car**
Mean	1,777,454	1,609,143	4,583,400	295,690	98,970
Standard Deviation	4,664,524	60,900,000	24,100,000	1,060,813	210,123
1st percentile	0	0	0	0	0
25th percentile	0	0	0	0	0
50th percentile	204,171	0	1,340,880	138,634	0
75th percentile	1,413,626	500,000	4,151,254	368,981	135,419
99th percentile	22,400,000	20,900,000	49,600,000	2,481,175	750,280

Panel B: Men and women

Male (Observations:1,706,600)					
	Savings & Deposits	**Stock**	**Land**	**House**	**Car**
Mean	1,821,164	2,072,558	6,203,049	325,430	103,975
Standard Deviation	5,057,200	82,300,000	30,900,000	1,381,590	208,867
1st percentile	0	0	0	0	0
25th percentile	0	0	0	0	0
50th percentile	108,073	0	1,912,627	155,700	0
75th percentile	1,178,309	585,927	5,693,049	387,000	135,419
99th percentile	24,800,000	26,600,000	65,400,000	2,812,473	724,420

Female (Observations:1,749,951)					
	Savings & Deposits	**Stock**	**Land**	**House**	**Car**
Mean	1,734,827	1,157,207	3,003,873	266,686	94,090
Standard Deviation	4,246,317	26,700,000	14,700,000	599,635	211,226
1st percentile	0	0	0	0	0
25th percentile	0	0	0	0	0
50th percentile	336,392	0	884,777	117,566	0
75th percentile	1,594,093	442,976	3,017,811	350,820	135,419
99th percentile	20,100,000	15,400,000	31,200,000	2,174,561	772,479

Table 2: Regression Analysis on Gender Difference

We focus on all sold lands that were acquired through supported purchases plus gifts. We estimate the following equations using weighted least squares regressions:

$$R_{ijt}^{l} = \alpha + \beta_1 Male_i + \sum Year\ FE_t + \sum Family\ FE_f + \varepsilon_{ijt},$$

in which R_{ijt}^{l} denotes the annual ROR of land *j* sold in year *t* by individual *i* from family *f* (we discussed this particular calculation in Section 2.2). $Male_i$ denotes an indicator variable that equals one if individual *i* is male and zero otherwise. $\sum Year\ FE_t$ denotes the fixed effects for years to control for real estate cycles, and $\sum Family\ FE_f$ denotes the fixed effects for families to help us estimate the "within-family" effect in gender differences. Given the great variation in the values of land transactions, we use weighted least squares to weigh the value of transaction *j* in family *f*. In Model 1, we report our estimation results without year fixed effects. In Model 2, we report our estimation results with year fixed effects. In Model 3, we include year and family fixed effects.

Dependent variable: ROR from Gifts and Supported Purchases			
Model 1: without fixed effects (Observations: 347,754)			
Independent variables	**Coefficient**	**St. errors**	**P-Value**
Male	0.93%	0.08%	0.000
Model 2: with year fixed effects (Observations: 347,754)			
Independent variables	**Coefficient**	**St. errors**	**P-Value**
Male	0.72%	0.08%	0.000
Model 3: with year fixed effects and family fixed effects (Observations: 339,133)			
Independent variables	**Coefficient**	**St. errors**	**P-Value**
Male	3.84%	1.12%	0.001

Table 3: ROR Across Different Sibship Structures

We focus on all sold lands that were acquired through supported purchases plus gifts. We split our sample of individuals into three groups based on the structure of siblings within a particular family. The Single Child group includes individuals who are single children, the Same-sex Siblings group includes individuals from families of either all sons or all daughters, and the Mixed-sex Siblings group includes individuals who are different from at least one sibling in gender. Within each group, we present the average ROR and the number of observations. We also calculate the statistical significance of the difference in ROR between men and women in each group. *** denotes $p < 0.01$, ** denotes $p < 0.05$, and * denotes $p < 0.1$.

Sibship Structure	**ROR**		
	Male	**Female**	**Male - Female**
Single Child	4.49%	4.95%	-0.46%
Same-sex Siblings	5.39%	5.13%	0.26%
Mixed-sex Siblings	7.42%	6.27%	1.15% ***

Table 4: Regression Analysis on Gender Difference with Siblings

We focus on all sold lands that were acquired through supported purchases plus gifts. We exclude individuals from single-child families. We estimate the following equations using weighted least squares regressions:

$$R_{ijt}^{l} = \alpha + \beta_1 Male_i + \beta_2 Male_i \times Sibling_f + \beta_3 Male_i \times Control_{ijt} + \sum Year\ FE_t + \varepsilon_{ijt},$$

in which $Sibling_f$ is an indicator variable that equals one if family *f* has children of different genders. $Control_{ijt}$ denotes a vector of three control variables that help us separate the effect of sex discrimination from other effects: *Out-of-Taipei*, *Marriage*, and *Income Drop*. *Out-of-Taipei* is an indicator variable that equals one when an individual is born outside Taipei City and zero otherwise. *Marriage* is an indicator variable that equals one if the land owner is married when s/he acquired the land and zero otherwise. *Income Drop* is an indicator variable that equals one when the income of the land owner (or the married couple) drops by 30% in the year and zero otherwise. *** denotes p < 0.01, ** denotes p < 0.05, and * denotes p < 0.1. In Model 1, we do not include control variables. In Model 2, we include all control variables.

Dependent variable: ROR from Gifts and Supported Purchases			
Model 1: without control variables (Observations: 347,754)			
Variables	**Coefficient**	**St. errors**	**P-Value**
Male * Siblings	2.09%	0.10%	0.000
Male	-1.07%	0.12%	0.000
Control Selling Year		Yes	
Model 2: with control variables (Observations: 347,754)			
Variables	**Coefficient**	**St. errors**	**P-Value**
Male * Siblings	2.01%	0.10%	0.000
Male	-1.42%	0.18%	0.000
Male * Non-Taipei	0.52%	0.14%	0.000
Male * Marriage	-0.47%	0.08%	0.000
Male * Income Drop	0.63%	0.18%	0.001
Income Drop	0.02%	0.16%	0.924
Control Selling Year		Yes	

Table 5: ROR within Three Risk Preference Groups

In this table, we first propose two measures: the cash-to-wealth ratio and the volatility of ROR in the past. We focus on the ROR of individuals in our sample, and we split them into subsamples based on the two measures. The cash-to-asset ratio is defined as an individual's savings/deposits scaled by her/his wealth in 2005. Since cash is a riskless asset, holding more cash reflects one's degree of risk aversion. The volatility of ROR is defined as the standard deviation of one's ROR across her/his land transactions in the 2006-2010 period. A higher volatility of ROR suggests a higher risk preference in the past and, in turn, suggests that individuals with this preference may thus take riskier bets in future real estate investment. We present the ROR, the range of cash-to-wealth ratio, the range of volatility of ROR, and the number of observations. ROR are based on 2006-2015 in Panel A, and 2011-2015 in Panel B. We also calculate the statistical significance of the difference in ROR between men and women. *** denotes $p < 0.01$, ** denotes $p < 0.05$, and * denotes $p < 0.1$.

Panel A: Cash-to-wealth ratio in 2005

Risk preference	ROR			Cash-to-wealth Ratio	Observations	
	Male	Female	Male - Female		Male	Female
High	7.15%	6.10%	1.05% ***	0 – 0.46%	17,808 (77.33%)	5,221 (22.67%)
Medium	7.04%	6.26%	0.78% ***	0.46% - 5.78%	16,996 (73.81%)	6,032 (26.19%)
Low	6.62%	5.92%	0.70% ***	5.78% - 100%	14,960 (64.96%)	8,068 (35.04%)

Panel B: Standard deviations of ROR in 2006-2010

Risk preference	ROR (2011-2015)			Standard Deviation	Observations	
	Male	Female	Male - Female		Male	Female
Low	6.50%	5.78%	0.72% ***	0 – 1.40%	5,035 (71.64%)	1,993 (28.36%)
Medium	6.78%	6.42%	0.36% *	1.40% - 4.44%	5,077 (72.25%)	1,950 (27.75%)
High	7.89%	7.34%	0.55% **	> 4.44%	5,351 (76.15%)	1,676 (23.85%)

Table 6: ROR Across Different Experience Levels

In this table, we use individuals' land trading frequencies (the number of land transactions) in the 2006-2010 period as a proxy of one's experiences. We focus on the ROR of individuals in our sample, and we split them into subsamples based on individuals' land trading frequencies. We then calculate the average ROR of men and women within each group for the 2011-2015 period. We present the ROR, the range of the number of land transactions, and the number of observations. We also calculate the statistical significance of the difference in ROR between men and women. *** denotes $p < 0.01$, ** denotes $p < 0.05$, and * denotes $p < 0.1$.

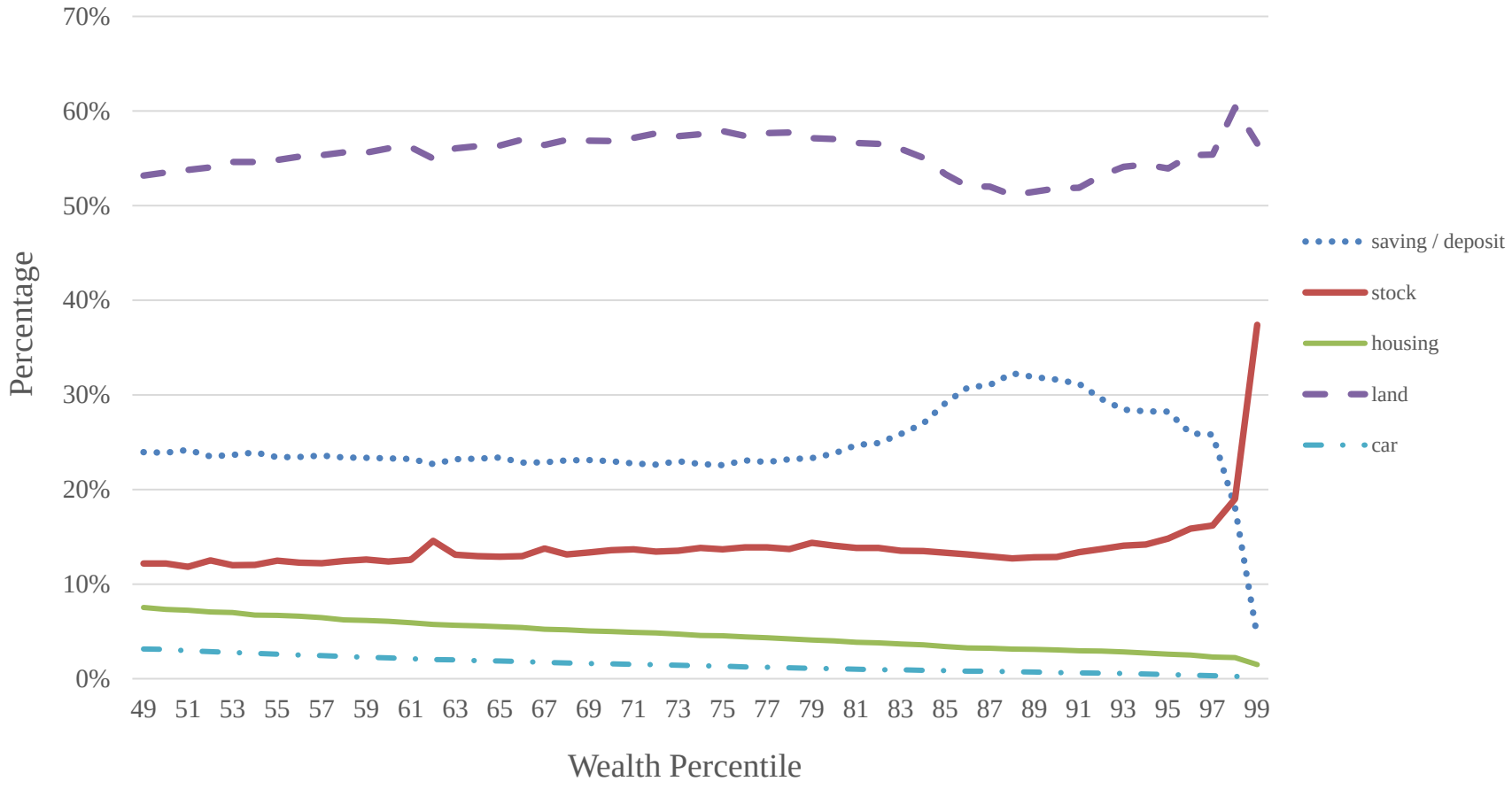
Experience Level	**ROR (2011-2015)**			**Number of Transactions**	**Observations**	
	Male	Female	Male - Female		Male	Female
Low	6.56%	6.00%	0.56% ***	0	13,563 (71.51%)	5,404 (28.49%)
Medium	6.77%	6.08%	0.69% ***	1 - 3	9,365 (72.81%)	3,498 (27.19%)
High	7.18%	6.72%	0.46% ***	> 3	10,566 (73.56%)	3,798 (26.44%)

Table 7: Average Return and Number of Transactions under Different Market Conditions

We use the Sinyi Realty housing price index to assign all years in our sample period into three sub-periods: bad years (2008, 2009, 2015), good years (2007, 2011-2013), and other years (2006, 2010, and 2014). Within each sub-period, we calculate the percentages of land transactions made by males and females (and their average ROR) in our sample. We present the average ROR and the number of observations. We also calculate the statistical significance of the difference in ROR between men and women. *** denotes $p < 0.01$, ** denotes $p < 0.05$, and * denotes $p < 0.1$.

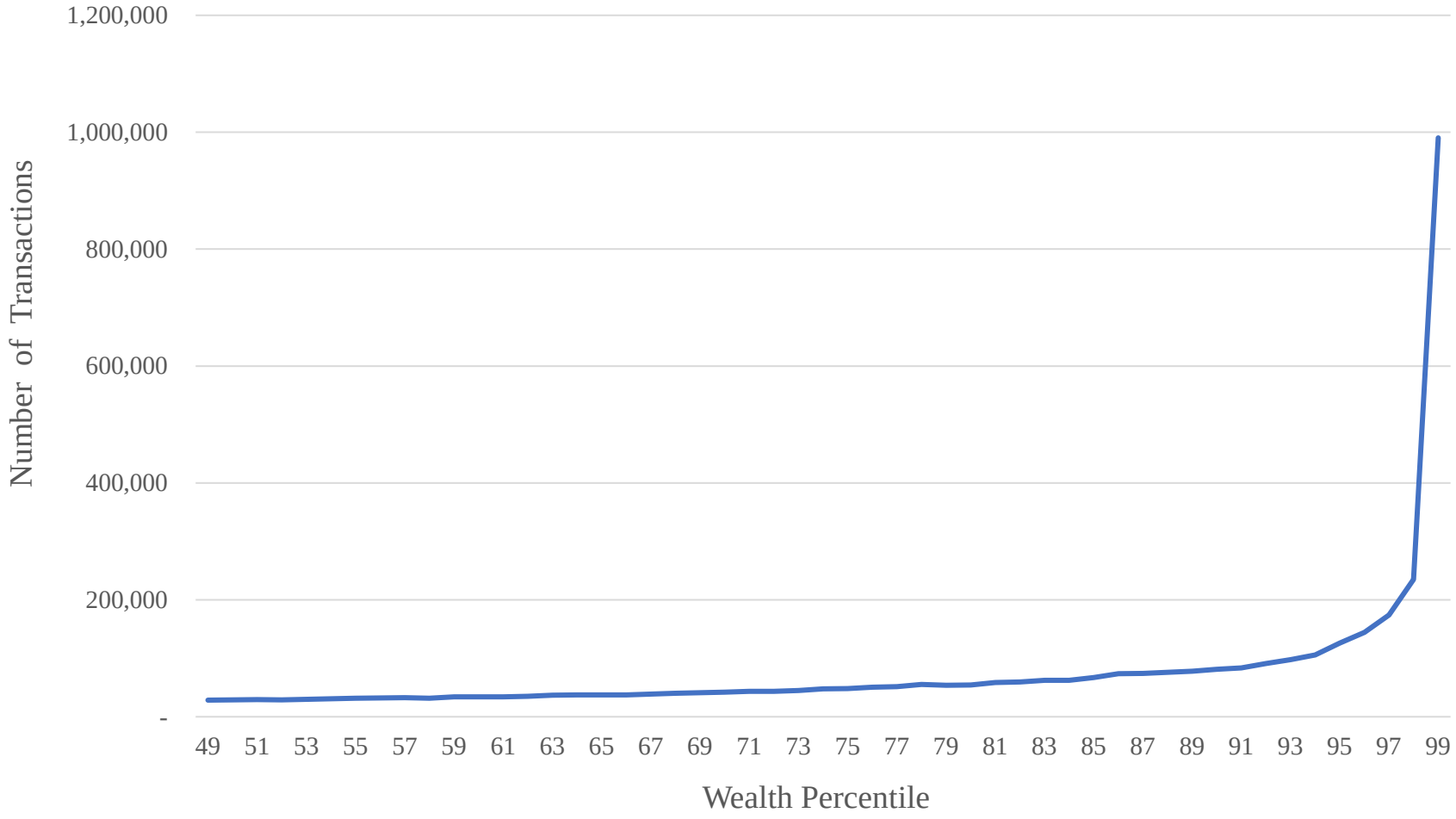
Market Conditions	**Average return**			**Observations**	
	Male	Female	Male - Female	Male	Female
Bad Years	5.85%	5.90%	-0.05%	251,087 (74.86%)	84,321 (25.14%)
Good Years	6.49%	5.73%	0.76% ***	373,443 (75.50%)	121,184 (24.50%)
Other Years	6.58%	5.90%	0.67% ***	281,669 (74.74%)	95,196 (25.26%)

Figure 1. Wealth Composition of Taiwanese Individuals



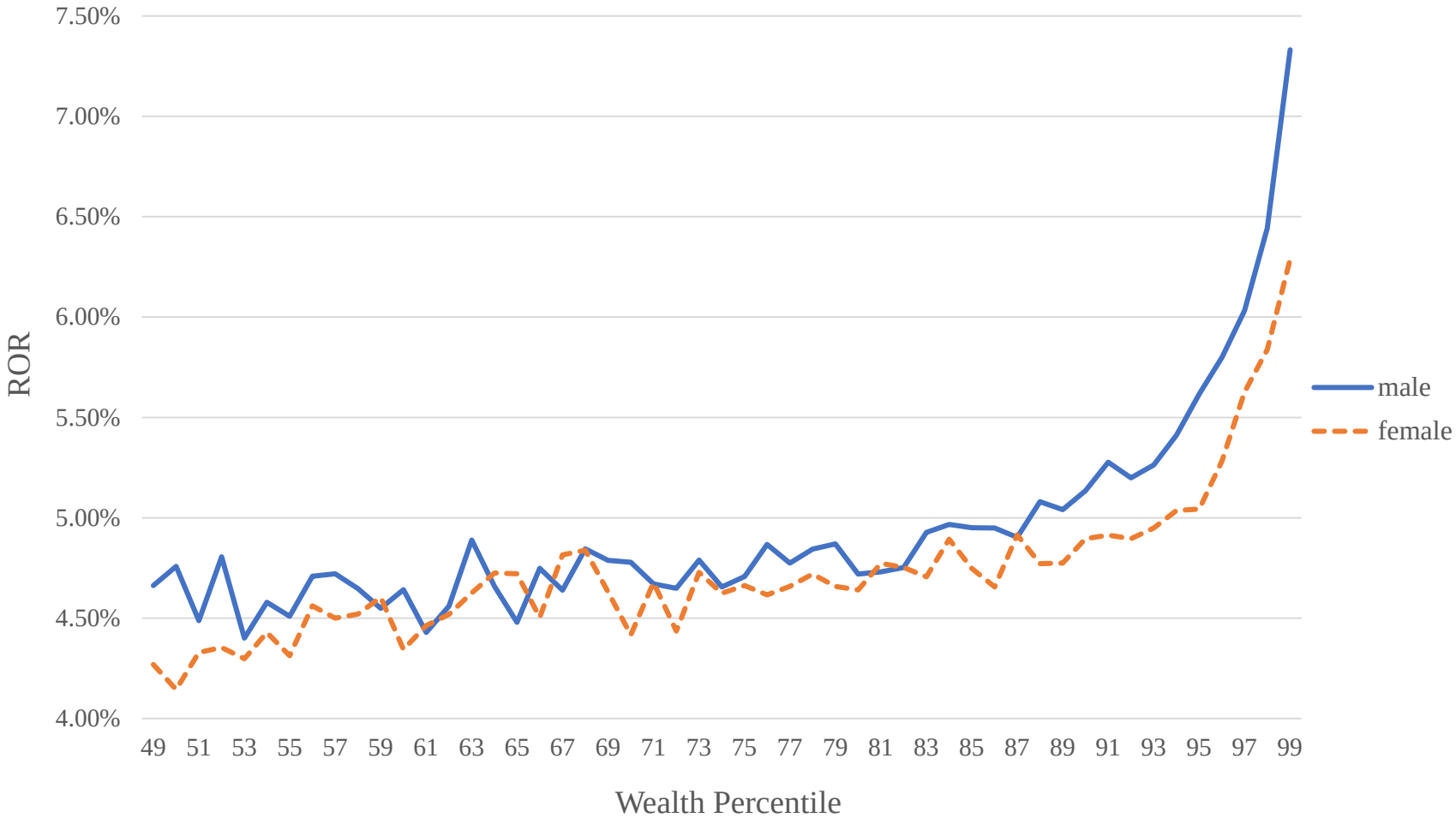
In this figure, we present the composition of five main asset categories (stocks, housing, lands, savings/deposits, and cars) of all individuals with above-median wealth. Data sources are described in the note of Table 1. We then focus on 3,456,551 individuals who are above 45 years old. The horizontal axis denotes the percentile in wealth (based on their wealth in 2005, the first year of our observations), and the vertical axis denotes the percentage of each asset category for all individuals within each percentile.

Figure 2. Taiwanese Land Transaction Frequencies



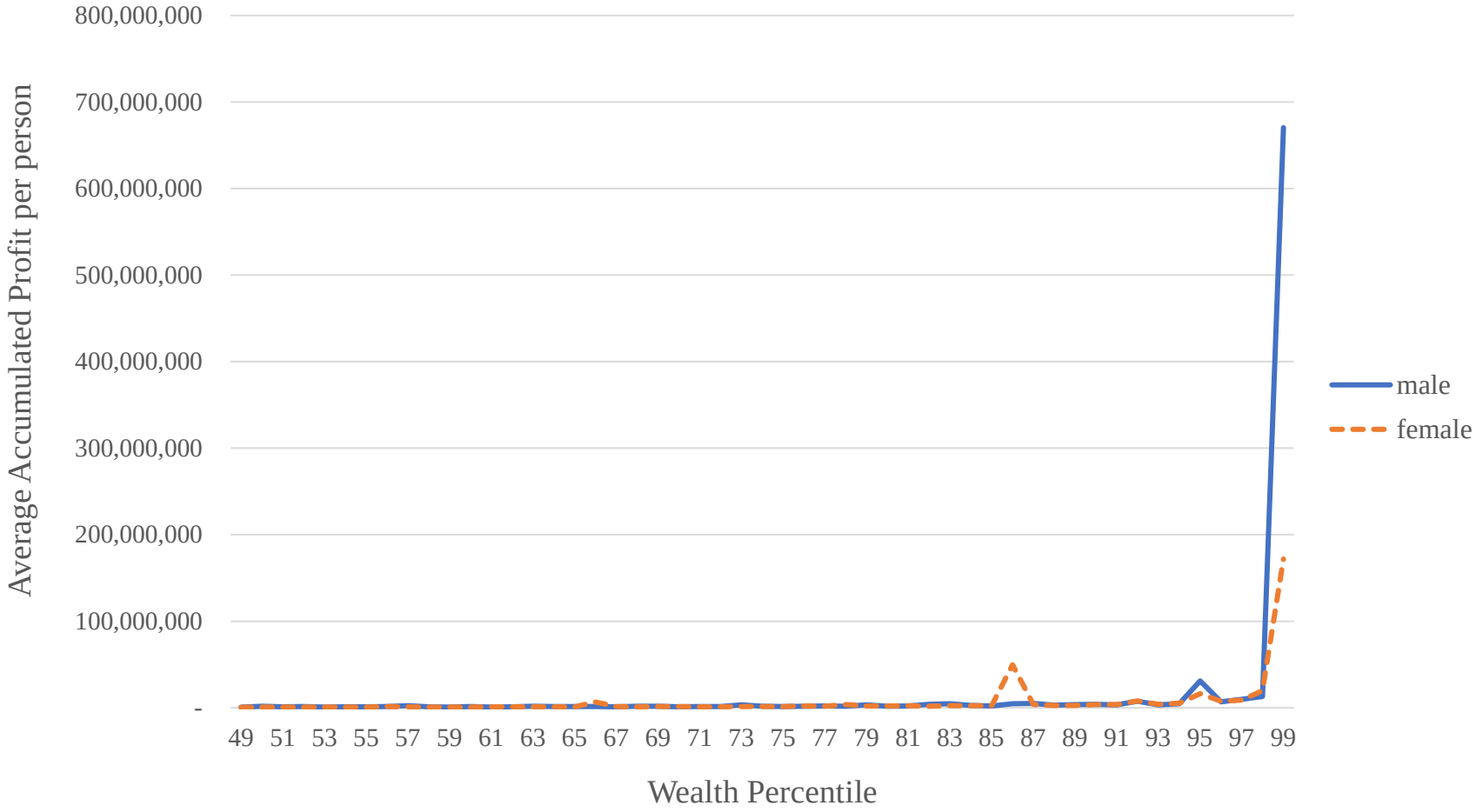
In this figure, we present the frequencies of land transactions of all individuals in our sample by wealth rank. The horizontal axis denotes the percentile in wealth (based on their wealth in 2005, the first year of our observations), and the vertical axis denotes the number of land sold by all individuals within each percentile.

Figure 3. Gender-specific Land Investment RORs



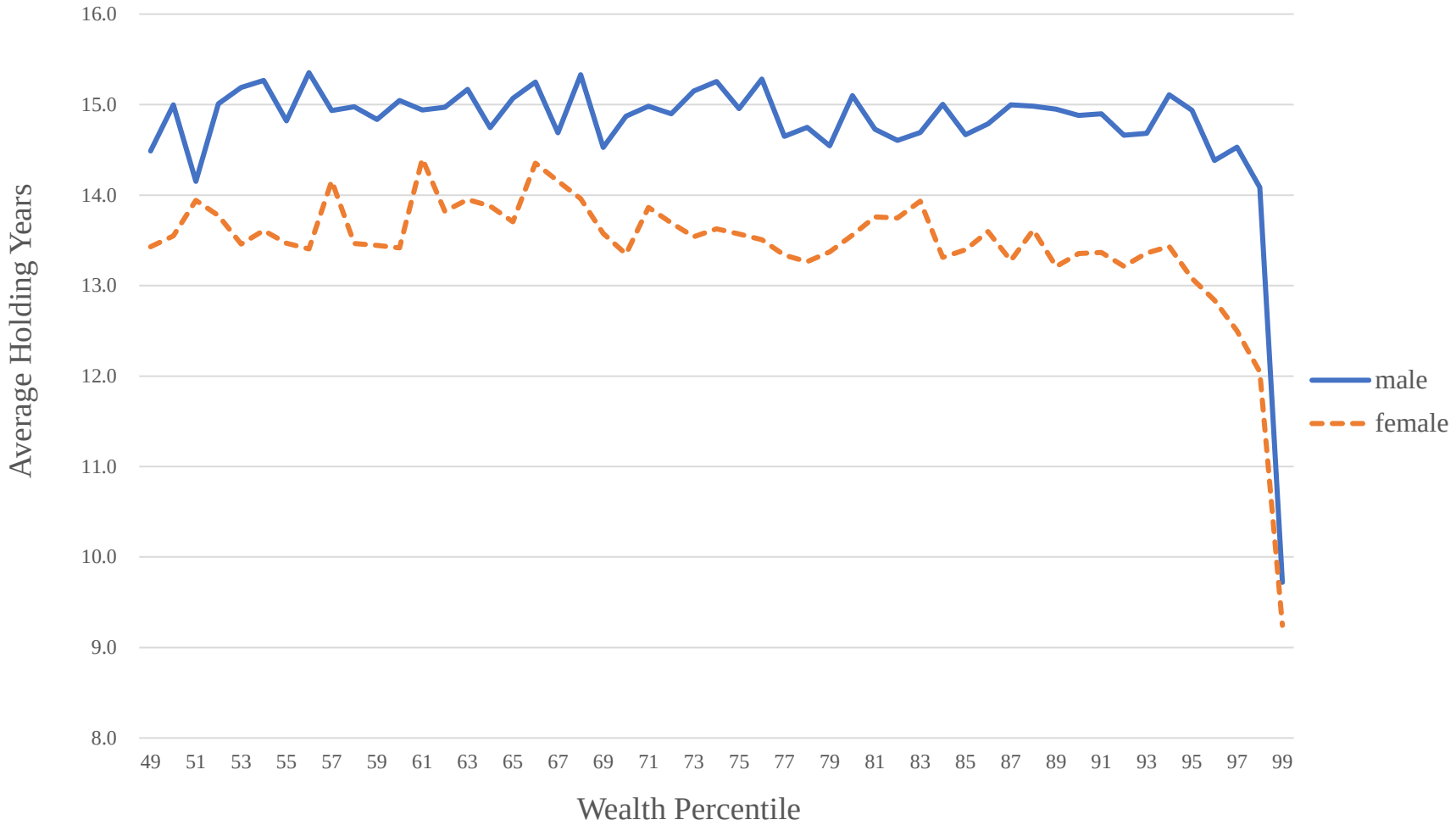
In this figure, we present the average ROR of all men and women in our sample by wealth rank. The ROR is based on individual ROR and has been defined in Section 2.2. The horizontal axis denotes the percentile in wealth (the same as in Figure 1), and the vertical axis denotes the average ROR of men and women (in solid and dashed lines, respectively) for each wealth percentile.

Figure 4. Average Profits from Land Transactions



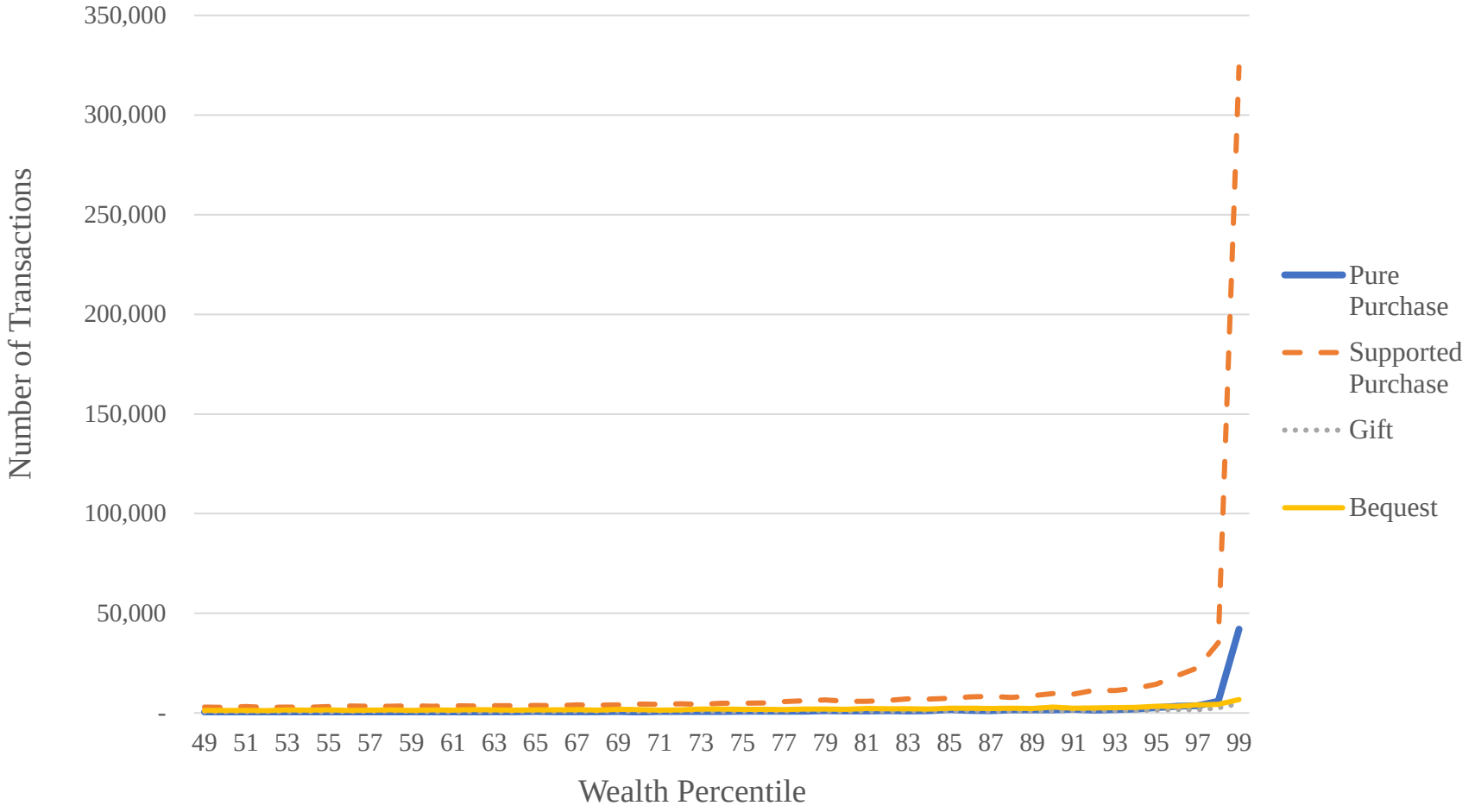
In this figure, we present the average profits of all men and women in our sample by wealth rank. We sum up the profits across all transactions made by each individual, and the profit from each transaction is the sale price minus the purchase price. The horizontal axis denotes the percentile in wealth (the same as in Figure 1), and the vertical axis denotes the average profit of men and women (in solid and dashed lines, respectively) for each wealth percentile.

Figure 5. Average Holding Period of Land Transactions



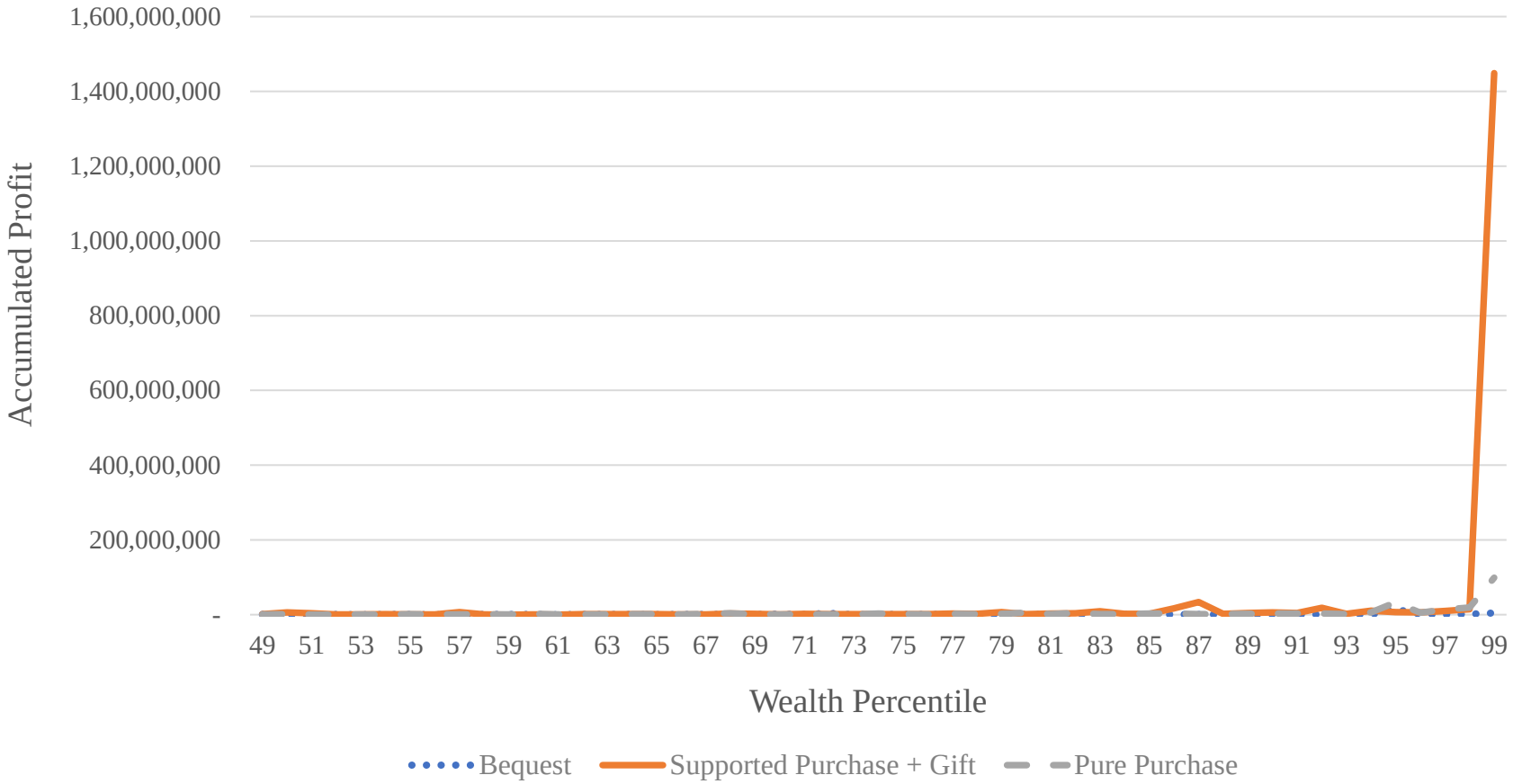
In this figure, we present the average holding period (in years) of lands held by all men and women in our sample by wealth rank. We average the holding period across all transactions made by each individual, and then average across all individuals in the same percentile. The horizontal axis denotes the percentile in wealth (the same as in Figure 1), and the vertical axis denotes the average holding period of men and women (in solid and dashed lines, respectively) for each wealth percentile.

Figure 6. Number of Transactions by Types of Acquisition



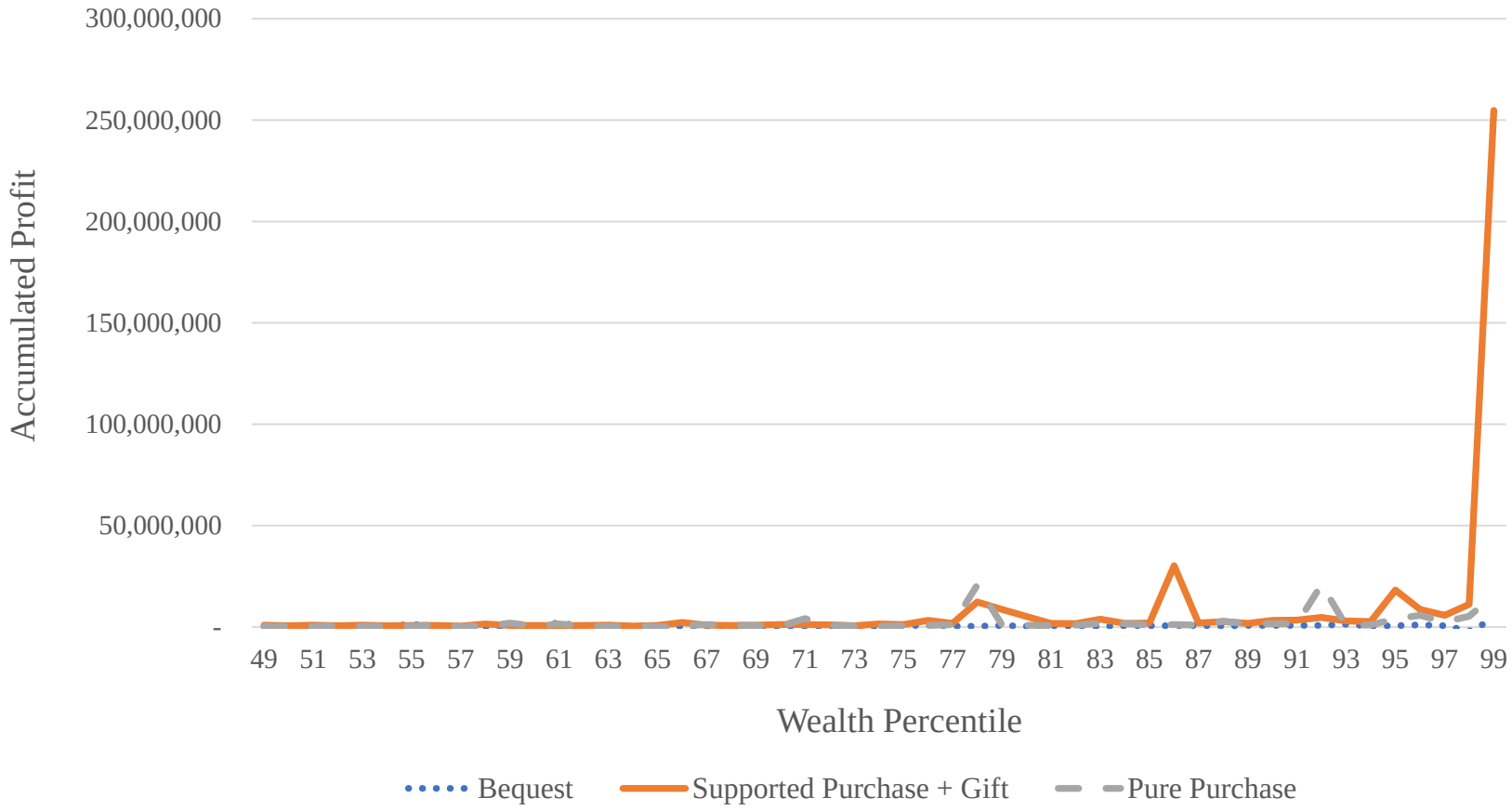
In this figure, we provide the numbers of lands that are acquired by our sample individuals by acquiring types across all wealth percentiles that are above median wealth. We consider four acquiring types: pure purchases, supported purchases, (*inter vivos*) gifts, and bequests. Gifts and bequests are clearly defined by laws. For supported purchase and pure purchase, we compare the wealth reduction on parents' side to the prices of the land bought by their respective children for each transaction. If parents' liquid wealth reduction in the same year is above 25% of the price of the land bought by a particular child, then we define the purchase as a supported purchase; otherwise, we define the purchase as pure purchase.

Figure 7.A Profits from Land by Types of Acquisition (Male)

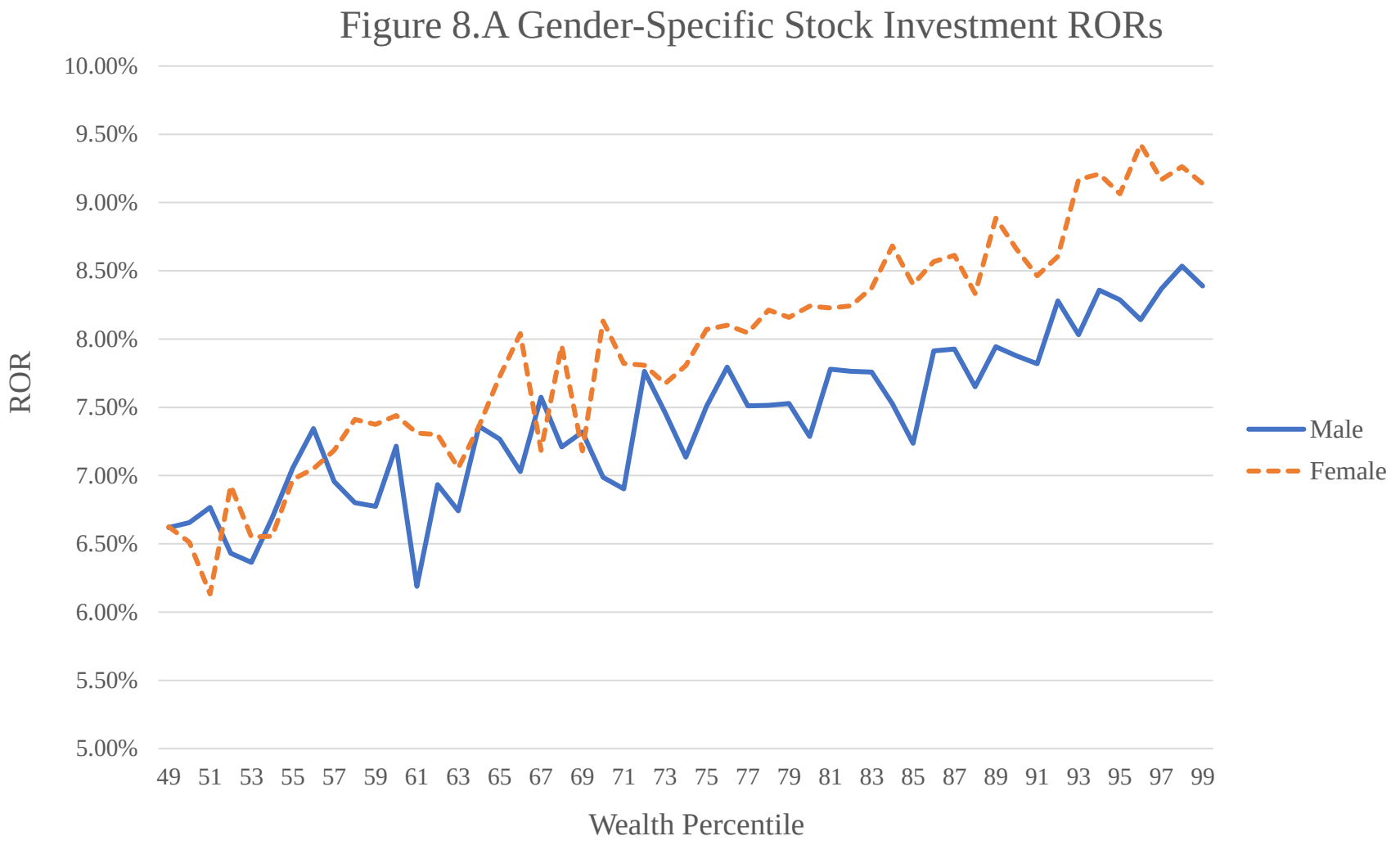


In this figure, we present the average profits from supported purchases plus gifts, bequests, and pure purchases among men in our sample. We sum up the profits across all transactions made by each man, and we present the accumulated profits of men within each wealth percentile above median wealth. We combine supported purchases and (*inter vivos*) gifts because these two types are supported by families.

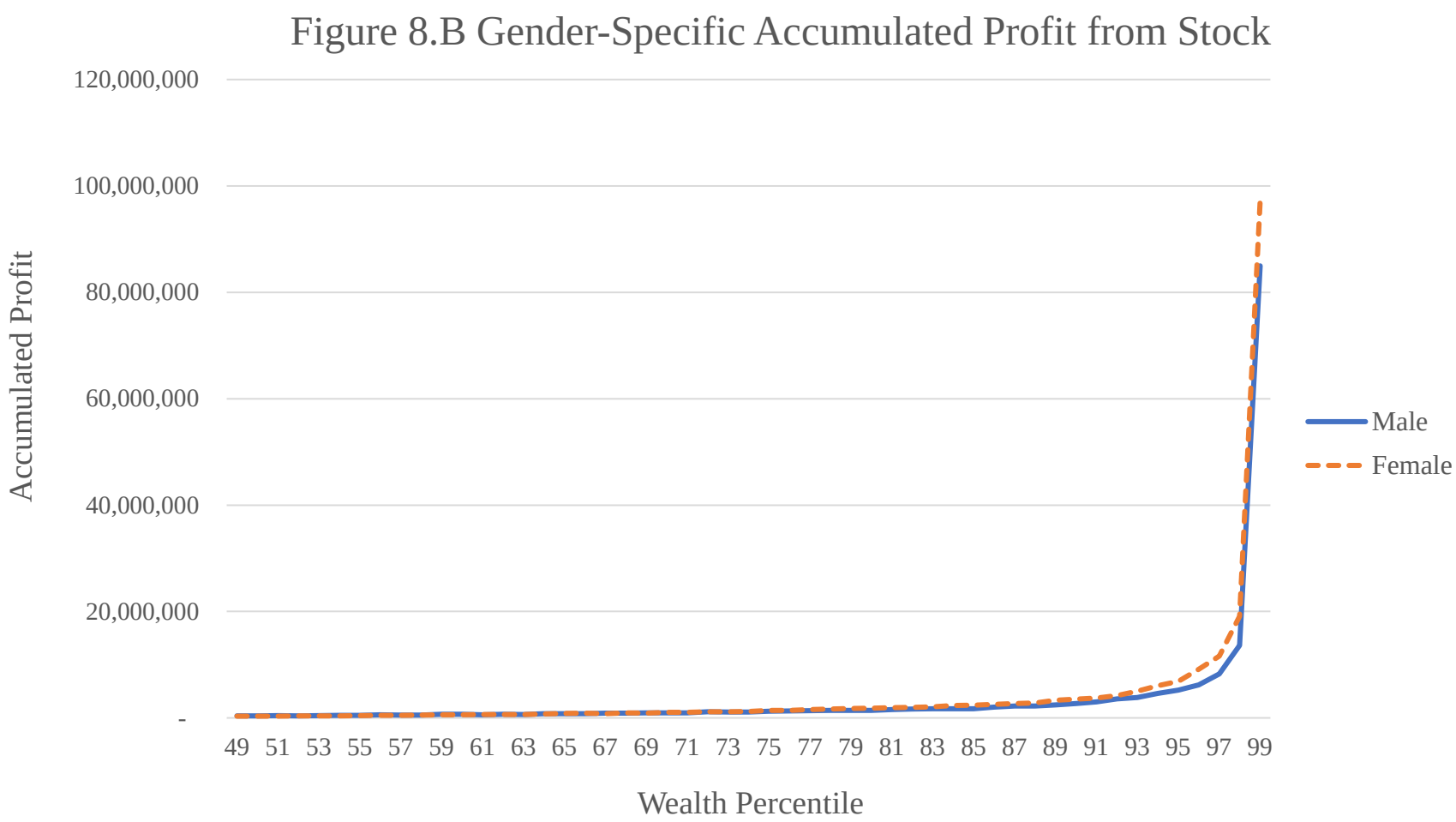
Figure 7.B Profits from Land by Types of Acquisition (Female)



In this figure, we present the average profits from supported purchases plus gifts, bequests, and pure purchases among women in our sample. We sum up the profits across all transactions made by each woman, and we present the accumulated profits of women within each wealth percentile above median wealth. We combine supported purchases and (*inter vivos*) gifts because these two types are supported by families.



In this figure, we present the average stock ROR of all men and women in our sample by wealth rank. The individual stock ROR has been defined in Section 5. The horizontal axis denotes the percentile in wealth (the same as in Figure 1), and the vertical axis denotes the average ROR of men and women (in solid and dashed lines, respectively) for each wealth percentile.



In this figure, we present the average stock profits of all men and women in our sample by wealth rank. We sum up the stock profits across all stock transactions made by each individual. The profit in stock transactions is defined in Section 5. The horizontal axis denotes the percentile in wealth (the same as in Figure 1), and the vertical axis denotes the accumulated stock profit of men and women (in solid and dashed lines, respectively) for each wealth percentile.