Why Women Earn Lower Real Estate Returns *

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Abstract

Using repeat-sales data on apartments in Sweden, we estimate the gender gap in housing returns. We confirm that single women's returns gross of renovations are lower than single men's by more than 2%, that half of this gap is due to market timing, and that the gender gap is concentrated in short holding period. Adding administrative data on renovation expenses and traders' background, we find that women are much less likely to specialize in real estate professional activities and undertake renovations. Professional transactions have short holding periods and account for 25% of all transactions, even though they represent only 10% of the housing stock. Among sellers who are not real estate professionals, the gender gap shrinks to 0.3%, and it fully disappears once renovations are accounted for. We find no evidence supporting the alternative explanation that women are unwilling to bargain hard for housing.

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JEL Classifications: G5, G11

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1 Introduction

Housing is the biggest component of most households' wealth. By nature, it is also a major source of underdiversification (Giacoletti, 2021), and for this reason contributes to the development of wealth inequality over time (Bach et al., 2020). What would make those features of housing wealth even more worrisome is if, on top of being highly dispersed across households, returns on real estate wealth turned out to be predictable across welfare-relevant dimensions. For instance, Goldsmith-Pinkham and Shue (Forthcoming) (henceforth GPS) find that, relative to single men, single women grow their housing wealth from acquisition to sale at a substantially lower rate. In this paper, we investigate whether this return differential is caused by differences in investor ability and experience across gender or instead reflects a lower propensity among women to invest further money and time into their housing assets via renovations and improvements between acquisition and sale.

What makes this question so empirically challenging is that houses are typically unique assets trading at infrequent dates, in between which some additional capital investments (i.e., renovations) may be made. Furthermore, since the goal is to identify whether and how individuals' gender affects returns, it is essential to also have access to detailed biographical information on buyers and sellers involved in real estate transactions.

In this paper, we address this data challenge using a new dataset of apartment transactions in Sweden over the period 2003-2016. The dataset is exhaustive because it comes from the tax registry. In Sweden, all apartment sales must be reported to tax authorities in order to levy capital gains taxes. These tax forms provide several pieces of information which are key for the measurement of housing returns: the price and date of acquisition of the flat and the expenses incurred for the maintenance and renovation of the flat in between acquisition and sale. Importantly, the latter information is exhaustively reported since renovation expenses increase the tax basis for capital gain assessments, which gives individuals a strong incentive to report. Such data allow us to compute actual housing returns from repeat sales, thus addressing one of the major challenges posed by the peculiarity of real estate assets. More importantly, we can measure returns both gross and net of renovations, which has been shown to matter greatly for the first and second moments of real estate returns (Giacoletti (2021), Nowak and Smith (2020), Chambers et al. (2021), Eichholtz et al. (2021)). Using individuals' social security numbers, the transaction data is perfectly matched with other Swedish registries already used in previous

research (Bach et al. (2020), Girshina (2019)), giving us information on the stock of housing held by individuals, their occupational history, family relationships and school grades, among other individual characteristics of buyers and sellers.

The combination of rich apartment sales data with traders' individual characteristics provides us with an opportunity to investigate the role played by the gender of buyers and sellers on the returns earned on the real estate market. Our results are as follows. First, we find that in annual terms, and before accounting for market timing effects and renovations, the geometric average return on apartment repeat-sales is 2.2 percentage point lowers for single women relative to single men. This result is qualitatively and quantitatively in line with the results obtained by GPS in a large repeat-sales sample of US-based housing transactions.

Second, we investigate the role of transaction market timing and property characteristics on this raw gender gap in returns. We find that roughly half of the gender gap in returns before renovations is driven by local housing market cycles, while observable transaction and property characteristics, such as apartment size, do not explain any of the gender gap in repeat sales returns. This substantial residual gender gap is again similar to the results in GPS but is significantly larger than what has been estimated in a sample of Danish real estate transactions (Andersen et al., 2021), in which no gap in repeat sales returns could be identified between male and female real estate owners after property characteristics were taken into account.

Third, we investigate the role played by trading experience in the residual gender gap we identify. We call real estate professionals those individuals who have experience in the construction sector or sell apartments in which they have never lived. We show that such individuals represent a much larger share of the real estate market in terms of transactions than in terms of holdings. At the same time, there is a very strong self-selection of males into this category: there are three times as many transactions by males as by females among professionals, while there is an almost equal frequency of genders among sellers who are not real estate experts. As a result, gender gaps estimated on transaction data are not representative of most housing situations: among non-professionals, who own more than 90% of the housing stock but represent only 75% of transactions, the residual gender gap drops to 0.3 percentage points, down from 1.2 in the entire set of transactions, while we do not find that female real estate professionals underperform male real estate professionals. Three-fourths of the residual gender gap in transaction data is therefore driven by self-selection of males into real-estate-relevant occupations. Because

this self-selection is correlated with trading frequency, the aggregate wealth impact of such self-selection into real estate professions is far more limited than what the transaction-based evidence suggests.

Fourth, we investigate the role played by renovations in explaining the residual gap in repeat sales returns between men and women who are not real estate professionals. Over the life cycle of their housing investments, renovation expenses reported by men are 20% larger than those made by women. Because these renovation costs are capitalized almost one-for-one into resale prices, the residual gender gap in returns after renovations fully disappears.

Fifth, we seek to explain the difference in renovation behavior between male and female sellers. Selling women earn lower labor income and may be more financially constrained in their home improvements. Women also tend to initially buy housing in better shape and more expensive. Yet, after taking into account those sensible explanations, the renovation gap only drops by 10%, which suggests that this gap, and the subsequent gender gap in real estate returns among non-professionals, are primarily driven by differences in preferences between male and female property owners.

Sixth, we study the possibility of other mechanisms beyond renovations which could explain the gender gap in returns. The bargaining hypothesis specifies that women may have a preference against hard negotiation which would lead them to earn lower returns due to poorer execution prices. Our data allow us to investigate some market microstructure features of real estate sales in our sample. We find that the repeat sales return based on the listing price of resale is indeed significantly lower among women. However, accounting for renovations attenuates this gap to the extent that women on average entirely recoup this initial low starting point in negotiations, as they obtain, as sellers, a significantly higher premium between the execution price and the listing price. Overall, we fail to detect any strong bargaining disadvantage for Swedish women compared to men.

Summing up, our findings are highly suggestive that women experience lower house price growth than men primarily because they also put less money and effort into their house after the acquisition. The money that is not spent on renovations may be saved elsewhere by those women so the real estate market does not by itself prevent women from building up household wealth over time.

The findings in the paper provide new insights on the origins of the gender wealth gap

(Ponthieux and Meurs, 2015). A well-established channel is that women earn less on the labor market, in part due to occupational segregation (Blau and Kahn, 2017). In this paper, we show that the segregation of women outside of real-estate-relevant occupations is strongly associated with their tendency to build housing wealth at a slower rate than men. Such segregation has also been documented in the US and, contrary to other kinds of occupational segregation by gender, it has definitely not subsided over the last four decades (Blau et al., 2013). [1]

Another channel through which one could explain wealth growth patterns by gender is saving behavior. A lot of attention has in particular been paid to differences in asset allocation between men and women, with the latter being regularly documented as more risk-averse in their allocation decisions (Sunden and Surette, 1998). Our results rather suggest that more attention must be paid to differences in active saving behavior between men and women: housing renovations are one way to save out of disposable income and women engage in those much less intensely than men, mostly out of lack of appetite but also because renovations require putting money upfront and women are prevented from doing this by financial constraints.

The paper also connects with the literature on the measurement of real estate returns. We follow the conventional approach of measuring returns via repeat sales. It has long been established that the approach delivers biased estimates of returns in the presence of renovations. To compute the first repeat-sales index, Case and Shiller (1987) focus on transactions where there is no evidence that the housing structure was altered in any way between the initial acquisition and the resale of the housing unit. Goetzmann and Spiegel (1995) use the same sample as Case and Shiller (1987) and estimate that the same house could well be bought and sold at very different prices almost from one day to the other, which they can only assign to home improvements not reported in the Case-Shiller data. Since these two seminal papers, US-based research has sought to circumvent the problem either by the inclusion of building permit data Giacoletti (2021) or via machine learning techniques applied to property listings (GPS, Nowak and Smith (2020)). Compared to these, our approach to measuring renovations, based on tax reports, has the advantage that renovators have a strong monetary incentive to precisely and extensively report incurred home improvement expenses. We show that accounting for properly-measured renovation expenses has a very strong effect on the first moment of real estate returns. Thanks to having data on both holdings and transactions of real estate, we are

[1] The origins of segregation of construction jobs by gender could be linked to the physical requirements of such jobs and their inflexible time schedules (Cortes and Pan, 2018).

able to quantify the bias introduced by real estate professionals over the size of the gender gap. We confirm that their weight in transactions is much larger than their weight in the general population.

Our paper is closest to two recent contributions by GPS and Andersen et al. (2021), who estimate the gender gap in housing returns in the US and Danish contexts, respectively. While the former finds a strong gender gap in favor of men, the latter cannot detect any such gap in repeat sales returns. Our paper confirms the existence of a gender gap in real estate returns gross of renovations of similar size as in GPS. Yet, once we measure real estate returns net of renovations, we recover the null result from Andersen et al. (2021). Therefore, our paper helps clarify the apparent contradiction between those two recent contributions. It also suggests that, rather than being a matter of differences in negotiating style, the differences in housing wealth growth between men and women are down to differences in active investment into renovations, whose origins must be investigated further.

The rest of the paper is as follows. Section 2 describes the data and the empirical methodology. Section 3 provides the results from the empirical analysis. Section 4 concludes.

2 Data and Methodology

2.1 Data Description

This paper uses an administrative dataset containing the universe of all apartment sales in Sweden during the period 2005 to 2016 with properties acquired from 1990 onward. The data is collected by Statistics Sweden from the tax form for transfers of a co-op apartment (Överlåtelse av bostadsrätt, KU55). The KU55 register records the seller, co-op association identifier, sale price, prior purchase price, ownership share, and transaction type of both the prior acquisition and the current sale. Conditional upon a sale, we know the exact period during which the seller owned the apartment. We obtain detailed hedonic characteristics from a commercial dataset maintained by Svensk Mäklarstatistik (the Swedish Real Estate Agent Association, henceforth MKS), which collects the data directly from its members on real estate transaction. The MKS dataset provides also information on coop fees and sale features, such as the listing price and listing date. We obtain the apartment geographical location at the level of 250×250 meter blocks

using the Apartment Register (Lägenhetsregistret). Finally, we merge the housing transaction data with demographics, employment, and schooling registers maintained by Statistics Sweden to control for individual characteristics. In particular, we obtain traders' residence, gender, occupation, business sector, as well as high school grades as a proxy of individual ability.

A unique feature of this paper is the possibility of computing returns net of renovation costs. We expect the quality of the renovation data to be exceptionally high for at least four reasons. First, in Sweden all apartment sellers are required to submit a tax form upon the sale of a co-op apartment (Försäljning av Bostadsrätt, K6), in which renovation, maintenance and sale costs can be reported. Second, these costs are deductible towards the real estate capital gain tax, which, in addition to the mandatory filing of the K6 form, creates a uniquely strong incentive for sellers to accurately declare to the tax authorities.[2] Third, the deductions should include all improvements, renovation, repair and maintenance costs that represent an investment in the property. Indeed, the guidelines provided by the Swedish tax authority recommend deduction at cost of new constructions (e.g. new guest house in the garden), extensions (e.g. adding a new floor), renovations (e.g. changing floors from carpet to parquet) or major improvements (e.g. installing a security door). Instead, ordinary maintenance, improvements and repairs, such as re-painting walls or the renovation of kitchen/bathroom, should be deducted after depreciation and up to five fiscal years after they are performed. The only limitations are that costs must be larger than 5,000 SEK and cannot include self-work. Finally, the K6 form also contains information on sale-related costs, as owners can also deduct real estate agent commissions, valuation fees and home-staging costs.

To the best of our knowledge, this paper is the first to access high quality and comprehensive administrative data on renovation and maintenance costs made during the entire ownership tenure of all transacted apartment. Recently, a handful of papers have been able to access information on renovation costs using hand collected data from ledger books of institutional investors (Chambers et al. (2021) and Eichholtz et al. (2021)), textual analysis of listing agents' written descriptions (GPS, Nowak and Smith (2020)), or building permits available in third-party commercial datasets (Giacoletti, 2021). Our data: 1. are available for the entire universe

[2]In 2004 the government introduced the possibility of deducting from taxable income the labor cost of reparation, remodelling, and renovation (reparation, ombyggnad, tillbyggnad, or *ROT*, in Swedish) up to 50,000 SEK. In 2013 the tax authorities specified that ROT deductions cannot be used against the capital gain tax and should not be reported in the K6 form. We have access to the ROT data and add the costs declared through ROT to the total renovation and maintenance costs we observe in the K6 form from 2013 onward.

of transaction, and thus free from selection bias, 2. report all maintenance and renovation costs that represent property investment excluding those that constitute housing consumption but including those unrelated to major remodelling events that require approvals by the authorities, 3. are directly provided by owners upon sale, who are likely to be the most informed party.

We apply several filters to the raw KU55 data. First, we keep only sales of the entire property, and thus exclude partial sales, gifts or bequests, and property divisions between spouses. Second, we exclude all observations for which the tax form is not filled in accordance with the official rules, as outlined in the taxation brochures published annually by the Swedish tax authority. For example, we exclude observations with missing fields (e.g. missing acquisition date or transaction price), or when the sum of the transferred ownership shares does not sum up to 100%. Third, we keep only transactions between individuals, excluding all transactions that involve a legal entity. Fourth, we drop transactions which took place less than a year after the conversion of a rental building to co-op (bostadsrätt), as acquisition prices at the time of conversion do not represent market valuations. Similarly, we drop the few transactions with acquisition before 1990, as we can observe only repeat-sales with purchase price from 2005 onward. Fifth, we exclude transactions with abnormally low prices[3], or between members of the same family, to filter out non arm's length transactions and distressed sales.[4] We follow GPS and drop transactions with holding periods of fewer than 90 days. Finally, we exclude observations which have experienced extreme price growth in a short period of time, i.e. those in the top and bottom 1 basis point of the distribution of annualized log-returns across all years. The resulting KU55 repeat-sale data, combined with the K6 cost data, is the backbone of our empirical analysis and allows us to precisely measure returns and renovation costs as described in section 2.2.

For the purpose of this project, we attribute repeat-sale returns to a single person if 100% of the property was bought and sold by the same individual (male or female). We refer to a "woman" ("man") or "female" ("male") repeat sale when it is executed (at purchase and at sale) by the same single woman (single man). The only other repeat-sales considered in the paper are those from couples. We attribute a sale to a couple when the same two individuals bought and sold the property with unchanged ownership shares. We exclude all transactions

[3]More precisely, we exclude transactions with prices below the highest of 1,000 SEK and the first percentile of the municipality price distribution across all years

[4]Family members include: parents, spouses, children, siblings, grandparents, aunts/uncles, parent-in-laws, siblings-in-law, children-in-law, nephews/nieces, and grandchildren.

with more than two owners or with a change in ownership share between acquisition and sale. Finally, we drop the few cases in which the apartment is sold by a minor. The resulting dataset has 194,554 repeat-sale pairs executed by 233,254 unique individuals.

2.2 Adjusted Returns and Renovations

We use the 290 municipalities in which Sweden is divided to create local areas (clusters) with enough transactions per year to build local indexes. We employ a max-p-region algorithm to aggregate adjacent municipalities into clusters with at least 25 sales of unique properties per year, and obtain 147 municipality clusters.[5] Figure 1 shows on a map of Sweden how the 290 municipalities are aggregated into the 147 clusters chosen by the algorithm for index formation purposes.

We build indexes following a standard repeated sales methodology. The index $I_{c,t}$ for cluster c at time t is given by:

$$I_{c,t} = \frac{e^{U_{c,t}}}{e^{U_{c,t_0}}} * 100 \tag{1}$$

where t_0 is 1990, and $U_{c,t}$ are time fixed effects estimated from a repeat-sales regression of all apartments sold in cluster c during our sample period. Specifically, we regress the selling price $P_{j,t}$ in logs of each apartment j sold in cluster c on time fixed effects $U_{c,t}$ and apartment fixed effects F_j:

$$log(P_{j,t}) = a + U_{c,t} + F_j + \epsilon_{j,t} \tag{2}$$

The market index is calculated in the same way but all sales are included in regression (2).

Table 1 reports key statistics for the market index and the mean and cross sectional dispersion of the same statistics for local indexes. In Figure 2 and 3, we plot the corresponding market and cluster-specific indexes . The apartment market appreciated 11.52% per year in our sample period, with a standard deviation of 6.1%. The second and third rows of table 1 report a substantial cross sectional dispersion in municipality cluster indexes as can be clearly seen in Figure 3.

We construct two measures of repeat-sale returns. The first does not take into account apartment renovation and maintenance costs, but is directly comparable to the findings of the

[5]We use the the GeoDa open-source implementation of the max-p-region algorithm available at https://geodacenter.github.io (see Duque et al. (2012)). The shape files of all municipalities in Sweden are provided by Lantmäteriet.

existing literature. The unadjusted return $r^u_{i,j,t,T}$ of apartment j bought at time t and sold at time T by individual or couple i is just the difference in logs between the sale and purchase price of that apartment over i's tenure:

$$r^u_{i,j,t,T} = log(P_{j,T}) - log(P_{j,t}). \tag{3}$$

The second version is adjusted for investments in maintenance and renovation and represents one of the main innovations of this paper. We assume that renovations are entirely made at time of purchase[6], and calculate returns net of renovation costs by adding $c_{j,T}$ to the purchasing price $P_{j,t}$:

$$r^a_{i,j,t,T} = log(P_{j,T}) - log(P_{j,t} + c_{j,t}). \tag{4}$$

In an efficient real estate market, renovation costs should impact one-to-one unadjusted returns. Indeed, if a renovated apartment would cost as much as an identical unrenovated apartment plus renovation expenses, the difference in unadjusted returns between the unrenovated and renovated apartment would be equal to:[7]

$$log(P_{j,T}) - log(P_{j,t})) - [log(P_{j,T}) - log(P_{j,t} + c_{j,t})] = log(1 + \frac{c_{j,t}}{P_{j,t}}) \tag{5}$$

Table 2, column (1) reports the regressions of unadjusted returns on renovation costs as measured by (5). The impact of renovation costs is strikingly close to unity and precisely estimated. In addition, since the value of self-work cannot be expensed, the point estimate slightly greater than one is consistent with self-work being correlated with renovation costs that are tax deductible. Overall, these results confirm the quality of our renovation measure, the assumption that renovations are mainly done at purchase and that unaccounted renovation costs are a small fraction of overall renovation expenses. Yet, as we show next, even negligible unaccounted costs might have a large effect on annualized returns for short holding periods. The annualized version of (adjusted or unadjusted) return $r^x_{i,j}$ of apartment j bought at time $t_{i,j}$ and sold at time

[6]In table IA.I of the appendix, we show that our main results are strikingly similar when we assume the opposite, but less plausible case, in which all renovations are assumed to be undertaken at time of sale

[7]When renovations are assumed to be made at sale, the impact of renovations on returns is equal to $-log(1 - \frac{c_{j,T}}{P_{j,T}})$.

$T_{i,j}$ by individual or couple i is defined as:

$$r^x_{i,j} = \frac{r^x_{i,j,t_{i,j},T_{i,j}}}{T_{i,j} - t_{i,j}} 365,\ x \in \{u, a\} \tag{6}$$

Failing to account for renovation costs might have a huge impact on annualized returns. The difference between annualized returns adjusted and unadjusted for renovation:

$$r^u_{i,j} - r^a_{i,j} = \frac{365}{T_{i,j} - t_{i,j}}[log(P_{j,t} + c_{j,t}) - log(P_{j,t})] = \frac{365}{T_{i,j} - t_{i,j}} log(1 + \frac{c_{j,t}}{P_{j,t}}) \tag{7}$$

converges to infinity as holding periods become small, i.e. $T_{i,j}$ approaches $t_{i,j}$. By the same logic, unobserved renovations (as self-work) can dramatically inflate even adjusted returns for short holding periods. In column (2) of table 2, we perform the same regression as in column (1) but with annualized returns and annualized renovation costs as in equation (7). As expected, the impact of renovation costs on returns is much higher than unity with a point estimate of 1.33: unobserved renovations have exponential impact on returns for shorter and shorter holding periods.

3 The Gender Gap in Real Estate Returns

To study the role of different channels for gender gap in real estate returns, we employ standard regression analysis. We start with a simple gender regression, where we regress unadjusted annualized real estate returns $r_{i,j}$, specified in equation 3, for a person/couple i and property j on identifiers for $Female_{i,j}$ and $Couple_{i,j}$:

$$r_{i,j} = \alpha + \beta^{Female}\ Female_{i,j} + \beta^{Couple}\ Couple_{i,j} + \epsilon_{i,j}$$

The results are reported in Table 3. In our sample, single men earn the average repeat-sale return gross of renovation and maintenance costs of 14.1% per year, whereas single female earn 11.9%. In raw unadjusted returns, the gender gap is thus about 2.2 percentage points (pp) with women earning an 18% lower return than men on a yearly basis. Couples earn lower returns than men by about 3.6 pp and are thus faring worse than both men and women. Perhaps

surprisingly, the gender gap in Sweden is even larger than in the US, where GPS documents that single women earn lower returns than single men by 1.5 pp and that the gap between couples and single men is 1.9 pp.

3.1 The role of property characteristics, location, and timing

We next turn to exploring the role of property characteristics, market timing and the choice of property location. As shown in Table 4, single women buy somewhat larger apartments than single men - by about 1 sqm (61.1 sqm vs 59.2 sqm respectively), but otherwise hold remarkably similar properties. Couples, on the other hand, choose larger apartments (by about 30% or 17 sqm, and with one more room on average) in somewhat newer buildings that are more likely to have an elevator. Consistently, in column (2) of Table 3, we find that property characteristics do not explain the gender gap but account for 50bp of the lower returns earned by couples.

To explore the role of location and timing, we follow GPS and augment the regression with municipality x year-month of sale, municipality x year-month of purchase, and year-month of sale x year-month of buy fixed effects. Accounting for local market timing decisions helps explaining about half of the gender gap in real estate returns, with the coefficient on the $Female$ dummy going down from -2.17 to -1.17. We also find a large effect on the $Couple$ coefficient, which falls by more than two-thirds to -0.85. [8] These results confirm the finding of GPS that, in the US, market timing explains about half of the gender gap in returns and about three quarter of the return differential between single men and couples.

To summarize, whereas differences in property characteristics account for part of the difference in returns between men and couples, they do not explain the gender gap since single women and men hold similar properties. Market timing, on the other hand, helps to account for about half of the gender gap and for about two-thirds of the lower returns earned by the couples, consistently with the findings of GPS in the US. Yet a significant return differential with single men of -1.17pp and -0.85pp remain. In the next sections, we turn to studying the role of occupational selection and investment in maintenance and renovation for real estate returns, which is the main contribution of this paper.

[8] Table IA.II shows the role of location, location x time, and timing fixed effects in turn. Municipality FEs by themselves have a negligible impact on the gender gap. SaleYM x BuyYM fixed effects alone account for 70bp, whereas location x time FEs reduce the gender gap by 40bp.

3.2 Accounting for renovations, occupational selection, and longevity

In this section, we study the role of occupational selection and renovations in explaining the gender gap in real estate returns. We think of renovations as of a combination of reported, or monetary, costs and "sweat equity". As is discussed in Section 2.2, failing to account for either leads to the mismeasurement of actual returns on real estate, which is particularly pronounced for short holding periods. If on top of that, women renovate less than men - either in terms of monetary costs or unaccounted effort - the gender gap in real estate returns is overestimated if these costs are not taken into account. Below, we investigate the role of these channels.

3.2.1 Real estate professionals

We start by exploiting the richness of our data to identify real estate market professionals and their impact on the gender gap documented in the previous sections. Giacoletti and Westrupp (2017) argues that experienced asset flippers earn a sizable abnormal performance in real estate markets. More generally, real estate professionals might be able to earn higher returns not only due to their professional activity but also using the experience they gained in their line of work. In this section we explore the extent to which the real estate gender gap is driven by the returns earned by real estate professionals.

It is notoriously difficult to identify professional segment of the real estate market. We employ a wide definition by building a proxy based on two data sources. First, we identify persons who have experience in construction by using historical information on occupation and sector of employment. Specifically, we identify individuals with construction experience as those who have being employed in the construction sector or as construction worker in the year of sale or at any point in the two years before sale.[9] [10] To identify "flippers" we unfortunately cannot rely on employment information as there is no professional occupation or sector defined as such. We instead use detailed information on persons addresses and exact moving dates to identify owners that have never lived in the transacted apartment.

A transaction is considered as part of the professional segment of the real estate market if the owner has construction experience or never lived in the transacted apartment.

[9] More precisely, we define construction workers as those individuals whose profession is defined as *"Craftsmen in construction and manufacturing"*.

[10] A couple has construction experience if at least one person in the couple does.

In Table 5, we show the difference in returns, holding periods, renovations as well as demographic composition between the "Professional" and "Non-professional" segments of the real estate market. First of all, professional transactions are mostly executed by men. More than half of the transactions which we assign to the professional market segment are carried out by single males, compared to 35% among the non-professionals. On the contrary, only 18% of the professional segment transactions are executed by women, compared to 37% among the non-professionals. At the same time, professionals earn almost twice as high returns as non-professionals (19.7% vs 10.4%), report much higher renovations, and have faster turn-around times by almost a year (3.7 years vs 4.5 years).

Following Giacoletti (2021) and GPS, we analyze the term structure of real estate returns and of the gender gap in Figure 4. We confirm their findings that on the real estate market as a whole, returns are substantially higher over shorter holding periods and so is the gender gap (panels (a) and (b)). Specifically, for properties held less than one year, the average annualized return is around 40% with a gender gap of about 15pp. As the holding period decreases, the average return on the market goes down to around 10% and the gender gap becomes virtually non-existent.

Figure 4 panels (c) and (d), however, reveal that this dynamics is largely driven by the professional segment of the market. More specifically, the average yearly return among professional men with holding period less than one year is around 70%, compared to less than 30% for non-professionals. Female professionals also earn very high returns of 60% for short holding periods (just 10pp lower than men), whereas non-professional women have on average returns of only 25% (or less than 5pp lower than men's) for short holding periods. Thus, short-term professional transactions are largely responsible for the term-structure of real estate returns on the overall market. In addition, since the professional segment of the market is dominated by men, short-term professional transactions have a large impact on the average gender gap in returns.

We next zoom in into the professional market segment. To study the gender gap among professionals, we interact the $Female$ dummy with being a professional on real estate market. As shown in Table 7, while non-professional women earn lower real estate return compared to non-professional men, there is no gender gap among real estate professionals, with both women and men earning 4.5pp higher returns than the non-professional segment on the yearly basis.

Finally, it is important to note that, since executed over shorter holding periods, professional transactions constitute a large fraction of overall market transactions - thus driving estimates of average returns. Yet, professional ownership only accounts for a small share of the aggregate apartment stock. As shown in Figure 5, professional transactions constitute about 25% of the total number of transactions, but professional ownership accounts for only 7% to 10% of apartment wealth.

Motivated by all these facts, in the rest of the paper we focus on the non-professional real estate market segment to account for the heterogeneous selection into real estate professionals between women and men.

3.2.2 Retired

We next focus on apartment owners that are retired to consider another selection issue relevant for the observed gender gap in real estate returns. Contrary to the case with real estate market professionals, the retired are over-represented by women: 46% of retired are females compared to only 25% of males (Table 6). At the same time, retirees earn lower returns (10.8% vs 12.5%), renovate less and hold apartments 2.5 years longer, on average. Thus again, women constitute a large part of the socio-demographic group that fair relatively worse on the real estate market.

Consistently with the descriptive evidence, Table 8 shows that retirees earn on average 2.5pp lower returns even after accounting for property characteristics and local housing market cycles. Interestingly however, the gender dynamic among retirees is different compared to the rest of the population as retired women on average earn higher returns than retired men by about 0.6pp.

3.2.3 Role of occupational selection and the difference in longevity for real estate returns

We report the results for the non-professional real estate market segment and controlling for the retirement status in Table 3 column 4. Accounting for these two characteristics reduces the gender gap by around 75%: from -1.2pp to -0.32pp. It also drives down the coefficient on *Couple* to -0.14pp.

Overall, the results of this section so far suggest that a large part of the gender gap in real estate returns is driven by the fact that women are under-represented in the professional real-estate market segment, which also earns higher returns and renovate more, and are over-represented among retirees who, on the contrary, earn lower returns and renovate less. This differential selection explains 3/4 of the gender gap in real estate returns, after accounting for property characteristics and market timing. We now turn to studying the role of reported renovation expenses and uncovering the drivers behind the remaining gender gap in real estate returns.

3.2.4 The role of renovations

In this section, we explicitly account for the reported maintenance and renovation expenses occurred during the holding period.

Figure 6 plots annualized renovation costs to sell price, defined in equation 7, by gender over the entire sample period. Throughout, men reported substantially higher renovation expenditures, by about 40%.

We then control for annualized renovation in column (5) of Table 3. Once the heterogeneity in renovations is taken into account, no gender gap in real estate returns remains. Further, the estimated coefficient on *Couple* is also affected and turns positive to a level of 14bp.

To investigate what drives differences in renovations between males and females, we test a number of alternative channels. First, we account for the fact that women tend to buy more expensive higher quality apartments. Then we test whether there is room for differential general ability or ability specifically related to construction work acquired through professional education. Finally, we test if the fact that women earn lower labor income and thus face more binding financial constraints can explain differential willingness to undertake renovation works. As reported in Table 11, all these factors correlate with renovations, but only decrease the renovation gender-gap by 8% (from -0.29 to -0.27) even when taken together. This suggests that women choose to renovate less than men due to unobservable characteristics, such as preferences.

3.3 The role of negotiation ability in listing and execution prices

In this section, we analyze an alternative explanations for the gender gap in real estate returns, namely the bargaining on the real estate markets and the idea that women can be more reluctant to negotiate aggressively. In fact, simple summary statistics, shown in the Table 9, would suggest that women buy at higher prices compared to men and pay a higher premium at the purchase. Yet, at the same time women also sell at higher prices, leaving the "net" gender difference in bargaining unclear.

To understand the role of this channel in explaining the gender gap in real estate returns, we focus on the bidding process and study differences in listing premium across gender groups. We follow GPS and define the listing premium as the percentage difference in the final sale price and the listing sale price: *log(sale price)-log(list sale price)*.[11]

Gender differences in this premium can arise for two reasons. On the one hand, women might be setting lower listing prices to start with, which would lead to lower returns among women even if the premium is the same across genders. On the other hand, given the listing price, women and men might be able to negotiate different premia during the bidding process. In this case, higher premia would indeed imply higher returns.

To account for both channels, we decompose returns into two components: the increase from the purchase price to the listing sell price and the premium to the listing price:

$$return = log(sale\ price) - log(list\ sale\ price) + log(list\ sale\ price) - log(buy\ price) \quad (8)$$

Table 10 shows the results. Columns 1 and 3 suggest that in a sample of non-professionals and after accounting for property characteristics, full set of location and time fixed effect and the heterogeneity in the retirement status, women attain a 37bp-higher listing premium compared to men, but at the same time set the listing price substantially lower, with the increment compared to buy price of 108bp less. These two estimates combined would imply a gender difference in holding period returns of 71 bp, with women faring worse.

To understand why women set starting selling prices relative to the purchase price so much lower than men, we conjecture that the difference in listing price may arise not only for strategic

[11] We define it it as a "premium" rather than as a "discount" since in the Swedish residential market the prices are typically bid up in the negotiation process.

or behavioral reasons (for example, to attract more viewings or if women are too shy to set a higher price), but also from the fact that it may reflect the difference in the apartment quality and, therefore, in transformations it underwent during the ownership tenure.

To test this hypothesis and disentangle the two channels, we simply account for the fact that women renovate less than men, which would explain why they start bargaining at a lower list price. We find that renovations strongly impact the listing sale price: a 1pp increase in renovations expenditures relative to purchase price translates to a 0.93pp increase in listing price relative to the purchase price. We also find that renovations have a small yet significant impact on the sale premium, suggesting that sellers are shy of fully integrating renovations into the list price. Altogether the renovations affect holding period returns one for one: 1pp increase in renovations increases holding period returns by 1pp.

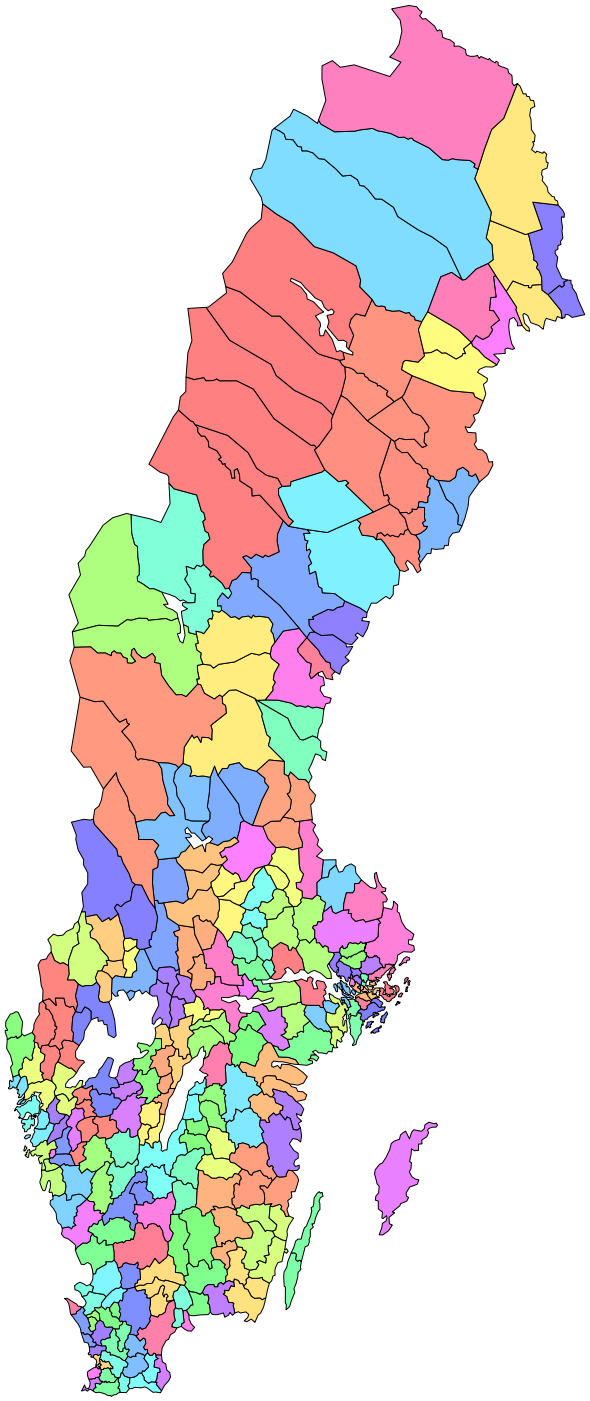
Most importantly, once we account for the heterogeneity in renovation expenditures across gender, the lower listing price set by women is exactly compensated by the higher premium they obtain in the bidding (columns 2 and 4). That is, while it is true that, even after adjusting for renovations, women start with a lower listing price compared to men, they are also able to negotiate a higher premium. Put together, these findings result in no gender difference in returns from negotiation.

4 Conclusions

In this paper, we have used a novel repeat-sales data on apartments in Sweden to study the gender gap in real estate returns. We have confirmed the finding that women's returns gross of renovations are lower than men's, especially over short holding periods. Adding administrative data on renovation expenses and traders' personal background, we have shown that single women are less likely to participate in the professional real estate market, have less construction-related experience than single men, and undertake fewer renovations. After accounting for this heterogeneity, there is no gender gap in real estate returns. We have found no evidence supporting the alternative explanation that women are unwilling to bargain hard for housing, as the lower listing price that women advertise on average reflects lower investment in renovations.

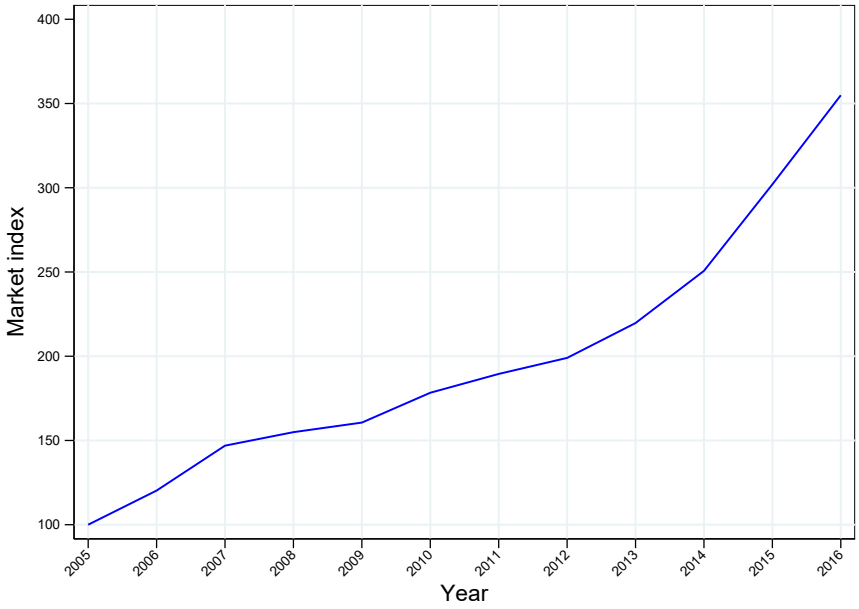
5 Figures

Figure 1: Geographical distribution of clusters in Sweden



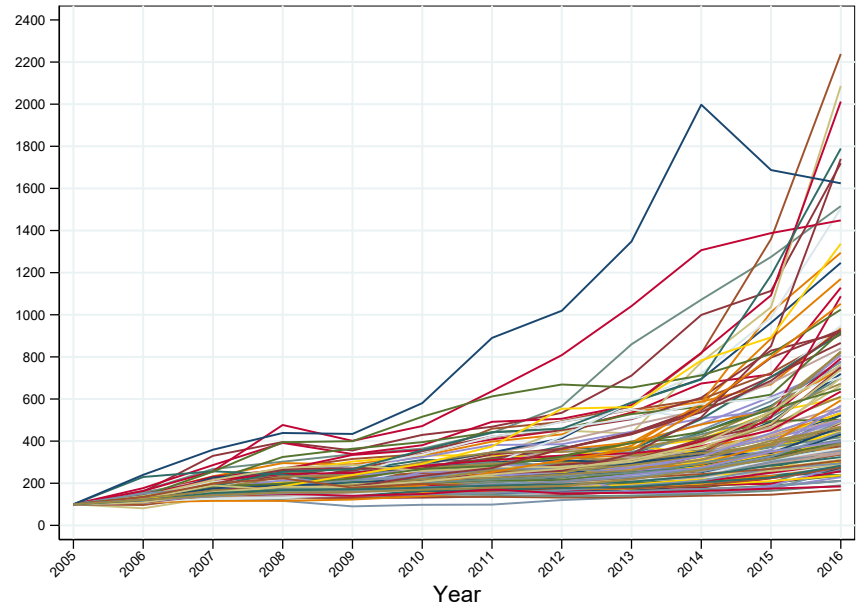
Note: The figure shows how 290 Swedish municipalities are aggregated into 147 clusters by the algorithm for index formation purposes. As described in Section 2.2, we employ a max-p-region algorithm to aggregate adjacent municipalities into cluster with at least 25 sales of unique properties per year.

Figure 2: Market index



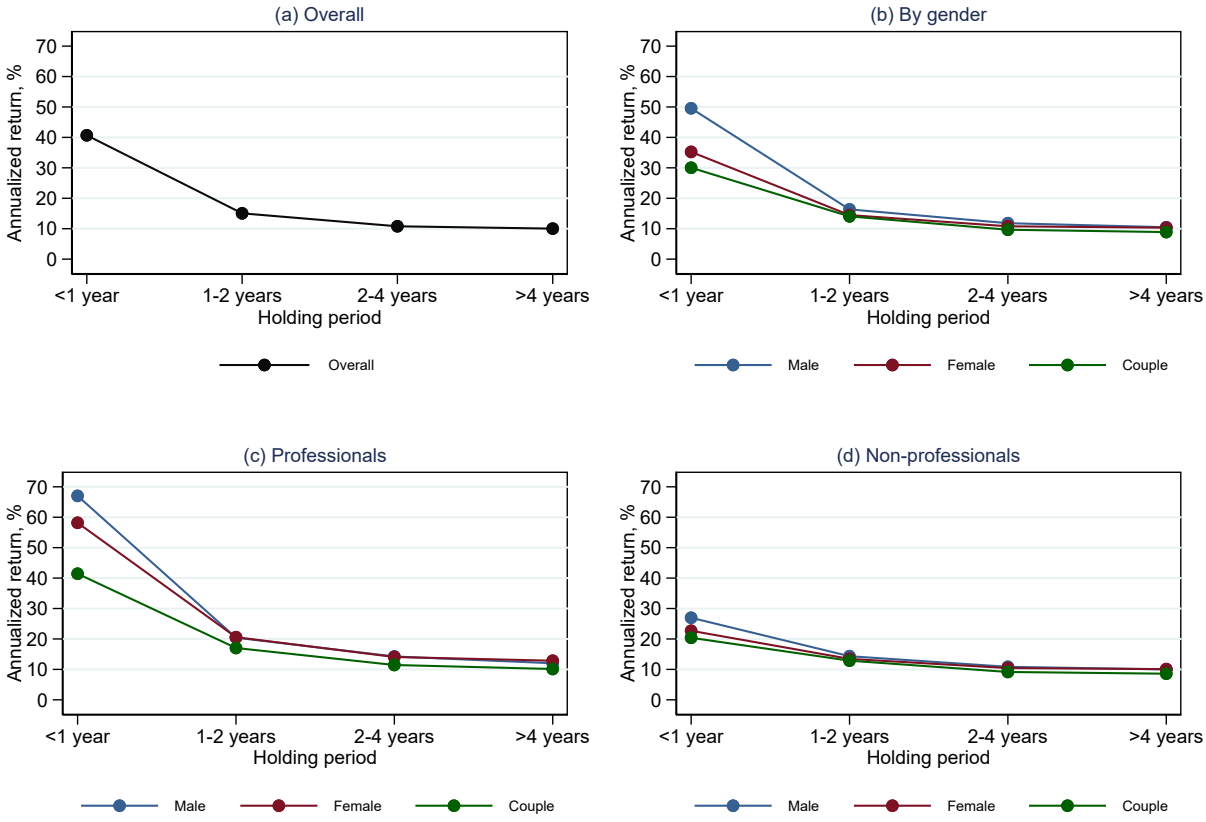
Note: The figure shows the market index between years 2005 and 2016. The market index is constructed according to equation 2 as described in section 2.2.

Figure 3: Cluster indexes



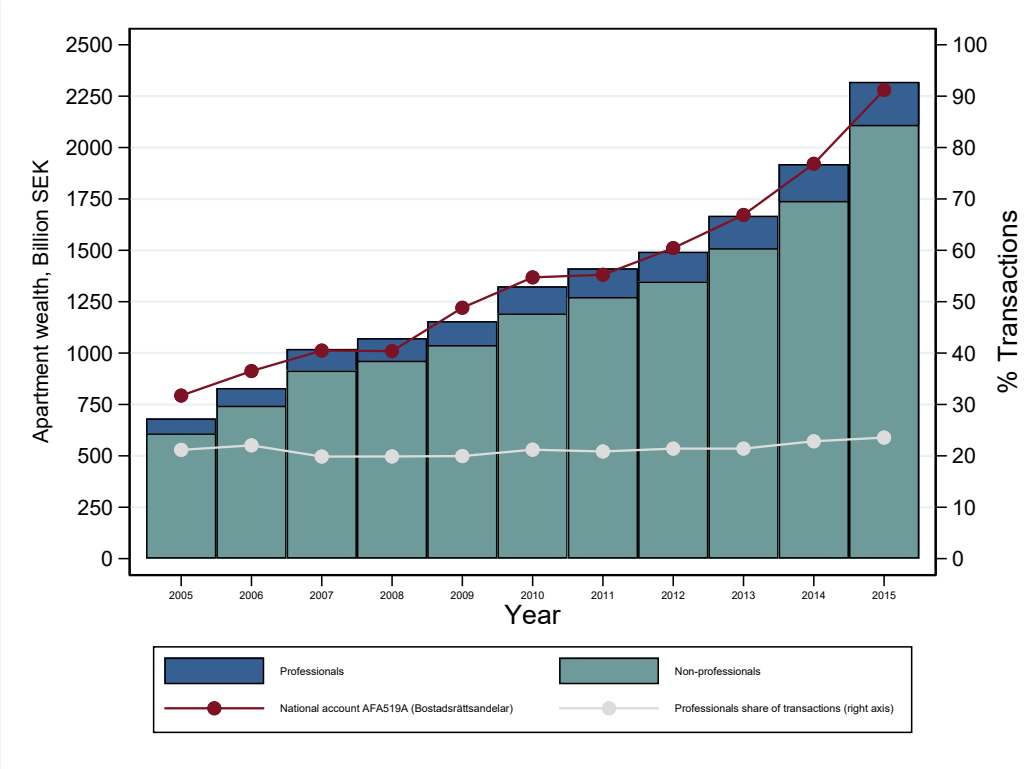
Note: The figure shows the cluster-specific indexes between 2005 and 2016. The 147 cluster indexes are constructed using equation 2 as described in Section 2.2.

Figure 4: Heterogeneity by holding period



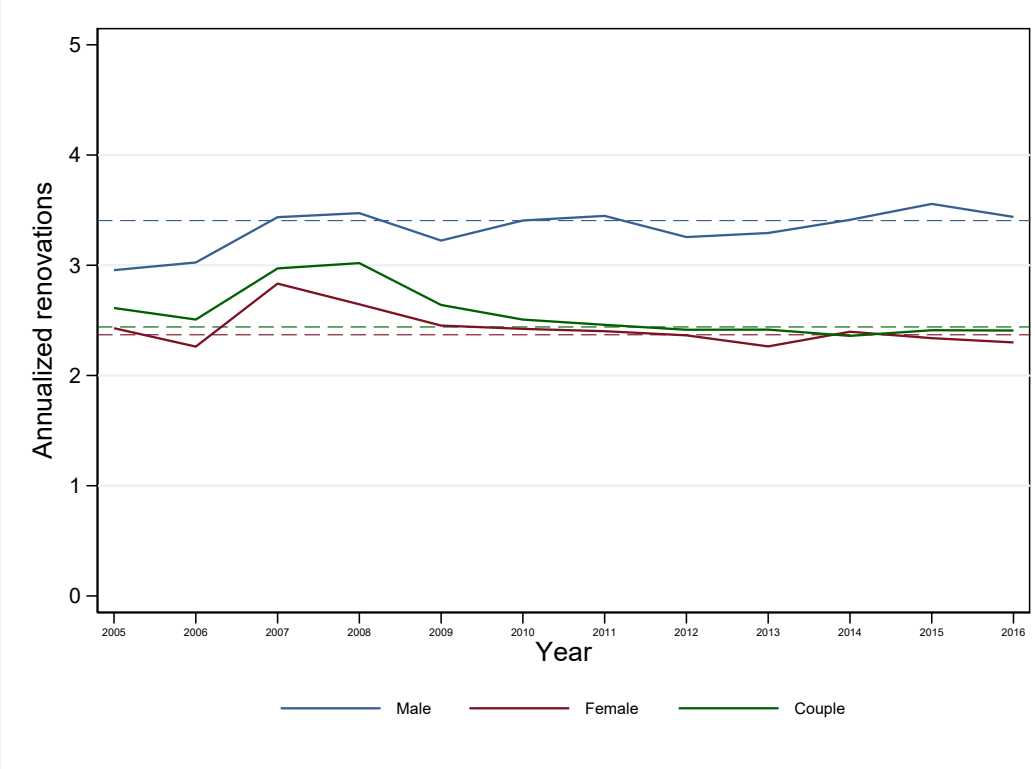
Note: The figure shows the heterogeneity of annualized returns (as defined in equation 6) by holding period and gender, for different subgroups. Panel (a) reports the overall mean of the annualized returns across all gender groups. Panel (b) reports the mean annualized return by gender. Panel (c) and (d) reports the annualized return by gender for real estate professionals and non-professionals, respectively. Real estate professionals ($Professionals$) is an indicator if the transaction was carried out by a real estate professional as defined in section 3.2.1 .The sample consists of apartment repeat-sales in Sweden in the period 2005-2016.

Figure 5: Real estate professionals: apartment wealth and transaction share



Note: This figures show the share of total apartment wealth by year for the Swedish population, decomposed into real estate professionals and non-professionals. Real estate professionals ($Professionals$) is an indicator if the apartment was/is owned by a real estate professional as defined in section 3.2.1. National account AFA519A refers to the comparable apartment wealth post in the national accounts of Sweden. On the right axis, the share of transactions performed by the professionals in our sample are plotted.

Figure 6: Gender difference in renovation expenses



Note: The figure shows the gender differences in *Annualized Renovation* as defined in equation 7. Solid lines represents the mean by year of sale, and dashed lines represents the mean across all sale years. The sample consists of apartment repeat-sales in Sweden in the period 2005-2016.

6 Tables

Table 1: Summary Statistics - Indexes

	Mean	Median	St. dev.	p25.	p75
Market return, %	11.52	10.46	6.11	5.31	18.44
Cluster returns (mean), %	14.56	13.66	11.30	6.04	23.00
Cluster returns (sd), %	5.18	5.72	4.96	4.51	8.54

Note: The table reports distribution of market and cluster-specific indexes. The index methodology is outlined in section 2.2.

Table 2: Annualizing returns and renovations

	Return	Annualized Return
	(1)	(2)
Renovation	1.018***	
	(0.008)	
Annualized Renovation		1.328***
		(0.019)
Observations	170,901	170,901
Adjusted R2	0.821	0.692
Mean DV	45.989	12.506
Municipality-SaleYM FE	Yes	Yes
Municipality-BuyYM FE	Yes	Yes
SaleYM x BuyYM FE	Yes	Yes

Note: The table reports the return and annualized return on renovation and annualized renovation. The renovation (*Renovation*) is defined in equation 5 and the annualized renovation (*Annualized Renovation*) is defined in equation 7. Both columns include a municipality-year-month of sale fixed effect, a municipality-year-month of buy fixed effect, and a year-month buy $\times$ year-month sale fixed effect. The sample consists of apartment repeat-sales in Sweden in the period 2005-2016. Standard errors are heteroscedasticity robust and clustered at the cluster and apartment level. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 3: Gender gap in real estate returns

	Full sample			Non-professionals	
	(1)	(2)	(3)	(4)	(5)
Female	-2.174***	-2.199***	-1.166***	-0.324***	0.048
	(0.113)	(0.113)	(0.092)	(0.063)	(0.050)
Couple	-3.586***	-3.088***	-0.853***	-0.143**	0.140**
	(0.107)	(0.118)	(0.097)	(0.070)	(0.056)
Annualized renovations					1.282***
					(0.021)
Observations	161,063	161,063	161,063	122,193	122,193
Adjusted R2	0.007	0.021	0.471	0.464	0.660
Mean DV Male	14.116	14.116	14.116	10.832	10.832
Property char.	No	Yes	Yes	Yes	Yes
Municipality-SaleYM FE	No	No	Yes	Yes	Yes
Municipality-BuyYM FE	No	No	Yes	Yes	Yes
SaleYM x BuyYM FE	No	No	Yes	Yes	Yes
Retired dummy	No	No	No	Yes	Yes

Note: The table reports the gender gap in the annualized returns. Columns (1) to (3) considers the full sample and columns (4) to (5) considers the subsample of transactions not carried out by real estate professionals. Real estate professionals are defined in section 3.2.1. All but the first column include property characteristics (*Property char.*) consisting of living area, number of rooms, apartment floor, building year, dummy for an elevator, and monthly fee per sqm. Column (4) and (5) include a retirement dummy (*Retired*) that is an indicator if a person is older than 64 years old measured at the time of sale. Column (3) to (5) include a municipality-year-month of sale fixed effect, a municipality-year-month of buy fixed effect, and a year-month buy × year-month sale fixed effect. In column (5) Annualized renovation (*Annualized Renovation*) is included and it is defined in equation 7. The full sample consists of apartment repeat-sales in Sweden in the period 2005-2016. Standard errors are heteroscedasticity robust and clustered at the cluster and apartment level. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 4: Summary Statistics - Property Characteristics

	Female		Male		Couple		Overall	
	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.
Living area, sqm.	61.08	22.01	59.19	20.70	77.74	22.96	65.14	23.24
Building year	1961	27	1960	32	1966	37	1962	32
Number of rooms	2.24	0.95	2.14	0.87	2.96	0.96	2.41	0.99
Apartment floor	2.28	1.61	2.40	1.66	2.37	1.72	2.35	1.66
Elevator exist	0.39	0.49	0.40	0.49	0.46	0.50	0.41	0.49
Monthly fee, SEK/sqm	56.64	11.02	56.24	11.03	55.13	10.79	56.05	10.98
Observations	53,062		61,773		46,228		161,063	

Note: The table reports the property characteristics by gender. The sample consists of apartment repeat-sales in Sweden in the period 2005-2016.

Table 5: Summary Statistics - professional and non-professional transactions

	Professionals	Non-professionals	Overall
Female	0.18	0.37	0.33
Male	0.52	0.35	0.38
Couple	0.30	0.28	0.29
Annualized return	19.66	10.39	12.37
Renovation (=1 if renovated)	0.73	0.72	0.72
Annualized renovation	5.10	1.91	2.59
Holding period (years)	3.72	4.51	4.34
Observations	34,344	126,719	161,063

Note: The table reports summary statistics for real estate professionals. Real estate professional (*Professionals*) is an indicator if the transaction was carried out by a real estate professional as defined in section 3.2.1. The *Annualized return* is defined in equation 6. The *Renovation* variable is an indicator if the apartment was renovated during the holding period, defined as having a non-zero renovation expense. The *Annualized renovation* is defined in equation 7. *Holding period* is the number of years between the purchase and sale date. The sample consists of apartment repeat-sales in Sweden in the period 2005-2016.

Table 6: Summary Statistics - retired

	Retired	Non-retired	Overall
Female	0.46	0.32	0.33
Male	0.25	0.40	0.38
Couple	0.29	0.29	0.29
Annualized return	10.78	12.51	12.37
Renovation (=1 if renovated)	0.69	0.72	0.72
Annualized renovation	1.93	2.65	2.59
Holding period (years)	6.61	4.14	4.34
Observations	13,291	147,772	161,063

Note: The table reports summary statistics for transactions performed by retired individuals. The retirement dummy (*Retired*) is an indicator if a person is older than 64 years old measured at the time of sale. The *Annualized return* is defined in equation 6. The *Renovation* variable is an indicator if the apartment was renovated during the holding period, defined as having a non-zero renovation expense. The *Annualized renovation* is defined in equation 7. *Holding period* is the number of years between the purchase and sale date. The sample consists of apartment repeat-sales in Sweden in the period 2005-2016.

Table 7: Gender gap among real estate professionals

	Full sample		
	(1)	(2)	(3)
Female	-2.174***	-1.166***	-0.373***
	(0.113)	(0.092)	(0.077)
Couple	-3.586***	-0.853***	-0.132
	(0.107)	(0.097)	(0.090)
Retired			-2.051***
			(0.174)
Professionals			4.491***
			(0.177)
Professionals × Female			0.062
			(0.433)
Professionals × Couple			-2.534***
			(0.265)
Observations	161,063	161,063	161,063
Adjusted R2	0.007	0.471	0.478
Mean DV Male	14.116	14.116	14.116
Property char.	No	Yes	Yes
Municipality-SaleYM FE	No	Yes	Yes
Municipality-BuyYM FE	No	Yes	Yes
SaleYM x BuyYM FE	No	Yes	Yes
Retired dummy	No	No	Yes

Note: The table reports the gender gap in the annualized returns for real estate professionals. Real estate professionals ($Professionals$) is an indicator if the transaction was carried out by a real estate professional as defined in section 3.2.1. The second column include property characteristics (*Property char.*) consisting of living area, number of rooms, apartment floor, building year, dummy for an elevator, and monthly fee per sqm. The third column include a retirement dummy (*Retired*) that is an indicator if a person is older than 64 years old measured at the time of sale. The second and third column include a municipality-year-month of sale fixed effect, a municipality-year-month of buy fixed effect, and a year-month buy × year-month sale fixed effect. The sample consists of apartment repeat-sales in Sweden in the period 2005-2016. Standard errors are heteroscedasticity robust and clustered at the cluster and apartment level. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 8: Gender gap among retired

	Non-professionals		
	(1)	(2)	(3)
Female	-0.443***	-0.394***	-0.378***
	(0.075)	(0.063)	(0.065)
Couple	-1.611***	-0.173**	-0.190***
	(0.073)	(0.070)	(0.072)
Retired			-2.437***
			(0.216)
Retired × Female			0.979***
			(0.262)
Retired × Couple			0.901***
			(0.278)
Observations	122,193	122,193	122,193
Adjusted R2	0.004	0.462	0.464
Mean DV Male	10.832	10.832	10.832
Property char.	No	Yes	Yes
Municipality-SaleYM FE	No	Yes	Yes
Municipality-BuyYM FE	No	Yes	Yes
SaleYM x BuyYM FE	No	Yes	Yes

Note: The table reports the gender gap in the annualized returns among retired individuals. *Retired* is an indicator if a person is older than 64 years old measured at the time of sale. Column (2) and (3) include property characteristics (*Property char.*) consisting of living area, number of rooms, apartment floor, building year, dummy for an elevator, and monthly fee per sqm, as well as a municipality-year-month of sale fixed effect, a municipality-year-month of buy fixed effect, and a year-month buy × year-month sale fixed effect. The sample of Non-professionals consists of apartment repeat-sales in Sweden in the period 2005-2016 that was not carried out by real estate professionals. Real estate professionals ($Professionals$) is an indicator if the transaction was carried out by a real estate professional as defined in section 3.2.1. Standard errors are heteroscedasticity robust and clustered at the cluster and apartment level. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 9: Summary statistics - listing and execution prices

	Female		Male		Couple		Overall	
	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.
Purchase price	1,124,146	890,385	1,098,965	920,897	1,643,118	1,242,111	1,263,443	1,042,780
Selling price	1,617,606	1,144,533	1,589,784	1,186,008	2,231,629	1,594,257	1,783,171	1,334,775
Purchase listing price	1,145,889	738,848	1,123,603	769,021	1,568,280	1,014,751	1,259,561	861,619
Sale listing price	1,443,648	962,346	1,415,782	982,182	2,003,828	1,303,572	1,593,742	1,109,344
Premium at purchase, %	11.63	15.53	10.57	15.05	9.96	14.25	10.74	15.00
Premium at sale, %	12.02	14.16	12.01	13.95	10.21	12.75	11.50	13.71
Weeks on the market	3.93	5.76	4.06	5.98	4.30	6.31	4.08	6.01
Observations	53,062		61,773		46,228		161,063	

Note: The table reports summary statistics of listing and execution prices by gender. The variable *Premium at purchase* is defined as *Purchase price/Purchase listing price* -1 in percent. Similarly, the variable *Premium at sale* is defined as *Selling price/Sale listing price* -1 in percent. The variable *Weeks on the market* is the number of weeks between the listing date and the selling date. The sample consists of apartment repeat-sales in Sweden in the period 2005-2016.

Table 10: Returns - listing and execution prices

	Log(sale price) - log(list sale price)		Log(list sale price) - log(buy price)	
	(1)	(2)	(3)	(4)
Female	0.373***	0.418***	-1.083***	-0.413***
	(0.100)	(0.100)	(0.162)	(0.143)
Couple	0.588***	0.627***	-1.136***	-0.553***
	(0.102)	(0.101)	(0.176)	(0.152)
Renovations		0.062***		0.934***
		(0.005)		(0.009)
Observations	122,193	122,193	122,193	122,193
Adjusted R2	0.222	0.224	0.758	0.811
Mean DV Male	10.734	10.734	33.889	33.889
Property char.	Yes	Yes	Yes	Yes
Municipality-SaleYM FE	Yes	Yes	Yes	Yes
Municipality-BuyYM FE	Yes	Yes	Yes	Yes
SaleYM x BuyYM FE	Yes	Yes	Yes	Yes
Retired dummy	Yes	Yes	Yes	Yes

Note: The table reports the gender gap in listing premium at sale (*log(sale price)-log(list sale price)*) and in listing price relative to purchase price (*log(list sale price)-log(buy price)*). All columns include controls of property characteristics (living area, number of rooms, apartment floor, building year, dummy for an elevator, and monthly fee per sqm), a retirement dummy (*Retired*) that is an indicator if a person is older than 64 years old measured at the time of sale, as well as a municipality-year-month of sale fixed effect, a municipality-year-month of buy fixed effect, and a year-month buy $\times$ year-month sale fixed effect. In column (2) and column (4), *Renovations* are included, as defined in equation 5. The sample consists of apartment repeat-sales in Sweden in the period 2005-2016 that was not carried out by real estate professionals. Real estate professionals ($Professionals$) is an indicator if the transaction was carried out by a real estate professional as defined in section 3.2.1. Standard errors are heteroscedasticity robust and clustered at the cluster and apartment level. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 11: Explaining gender difference in renovations

	Non-professionals				
	(1)	(2)	(3)	(4)	(5)
Female	-0.290***	-0.282***	-0.281***	-0.276***	-0.267***
	(0.030)	(0.029)	(0.029)	(0.029)	(0.029)
Couple	-0.221***	0.003	0.003	-0.016	-0.018
	(0.033)	(0.032)	(0.032)	(0.033)	(0.033)
Log of purchase price		-2.325***	-2.314***	-2.320***	-2.319***
		(0.060)	(0.061)	(0.061)	(0.061)
Ability above median			-0.068***	-0.075***	-0.075***
			(0.025)	(0.025)	(0.025)
Log of labor income				0.029***	0.029***
				(0.010)	(0.010)
Renovation Education					0.357***
					(0.080)
Observations	122,193	122,193	122,193	122,193	122,193
Adjusted R2	0.290	0.329	0.329	0.329	0.329
Mean DV Male	1.997	1.997	1.997	1.997	1.997
Property char.	Yes	Yes	Yes	Yes	Yes
Municipality-SaleYM FE	Yes	Yes	Yes	Yes	Yes
Municipality-BuyYM FE	Yes	Yes	Yes	Yes	Yes
SaleYM x BuyYM FE	Yes	Yes	Yes	Yes	Yes
Retired dummy	Yes	Yes	Yes	Yes	Yes

Note: The table reports the gender gap in *Annualized renovation* as defined in equation 7. All columns include controls of property characteristics (living area, number of rooms, apartment floor, building year, dummy for an elevator, and monthly fee per sqm), a retirement dummy (*Retired*) that is an indicator if a person is older than 64 years old measured at the time of sale, as well as a municipality-year-month of sale fixed effect, a municipality-year-month of buy fixed effect, and a year-month buy $\times$ year-month sale fixed effect. The variable *Ability above median* is a measure of ability constructed using innate ability measure from military records and high school grades, age of graduation and birth cohort. For couples, it is defined as the average ability in the couple. The variable *Renovation education* is an indicator if the individual has an education with the education code 582 as defined by SUN (Svensk utbildningsnomenklatur), for example an education within construction, painting, plumbing, craftsmanship and masonry. For couples, it takes the value one if one or more of the individuals have the renovation education. The sample consists of apartment repeat-sales in Sweden in the period 2005-2016 that was not carried out by real estate professionals. Real estate professionals ($Professionals$) is an indicator if the transaction was carried out by a real estate professional as defined in section 3.2.1. Standard errors are heteroscedasticity robust and clustered at the cluster and apartment level. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

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Online Appendix to "Soft Negotiators or Modest Builders? Why Women Earn Lower Real Estate Returns"

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Table IA.I: Renovation timing at sale: Gender gap in real estate returns

	Full sample			Non-professionals	
	(1)	(2)	(3)	(4)	(5)
Female	-2.174***	-2.199***	-1.166***	-0.324***	-0.039
	(0.113)	(0.113)	(0.092)	(0.063)	(0.055)
Couple	-3.586***	-3.088***	-0.853***	-0.143**	0.073
	(0.107)	(0.118)	(0.097)	(0.070)	(0.061)
Annualized renovations, sale					1.331***
					(0.042)
Observations	161,063	161,063	161,063	122,193	122,193
Adjusted R2	0.007	0.021	0.471	0.464	0.585
Mean DV Male	14.116	14.116	14.116	10.832	10.832
Property char.	No	Yes	Yes	Yes	Yes
Municipality-SaleYM FE	No	No	Yes	Yes	Yes
Municipality-BuyYM FE	No	No	Yes	Yes	Yes
SaleYM x BuyYM FE	No	No	Yes	Yes	Yes
Retired dummy	No	No	No	Yes	Yes

Note: The table reports the gender gap in the annualized returns. Columns (1) to (3) considers the full sample and columns (4) to (5) considers the subsample of transactions not carried out by real estate professionals. Real estate professionals are defined in section 3.2.1. All but the first column include property characteristics (*Property char.*) consisting of living area, number of rooms, apartment floor, building year, dummy for an elevator, and monthly fee per sqm. Column (4) and (5) include a retirement dummy (*Retired*) that is an indicator if a person is older than 64 years old measured at the time of sale. Column (3) to (5) include a municipality-year-month of sale fixed effect, a municipality-year-month of buy fixed effect, and a year-month buy $\times$ year-month sale fixed effect. In column (5) the sale version of the Annualized renovation (*Annualized Renovation , sale*) is included and it is defined in a footnote of section 2.2. The full sample consists of apartment repeat-sales in Sweden in the period 2005-2016. Standard errors are heteroscedasticity robust and clustered at the cluster and apartment level. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table IA.II: Location or timing - Gender gap in real estate returns

	Full sample					
	(1)	(2)	(3)	(4)	(5)	(6)
Female	-2.199***	-2.042***	-2.009***	-1.778***	-1.380***	-1.166***
	(0.113)	(0.111)	(0.109)	(0.105)	(0.093)	(0.092)
Couple	-3.088***	-2.741***	-2.334***	-2.304***	-1.210***	-0.853***
	(0.118)	(0.116)	(0.117)	(0.115)	(0.095)	(0.097)
Observations	161,063	161,063	161,063	161,063	161,063	161,063
Adjusted R2	0.021	0.054	0.114	0.268	0.365	0.471
Mean DV Male	14.116	14.116	14.116	14.116	14.116	14.116
Property char.	Yes	Yes	Yes	Yes	Yes	Yes
Municipality FE	No	Yes	No	No	No	No
Municipality-SaleYM FE	No	No	Yes	Yes	No	Yes
Municipality-BuyYM FE	No	No	No	Yes	No	Yes
SaleYM x BuyYM FE	No	No	No	No	Yes	Yes

Note: The table reports the gender gap in the annualized returns. All columns include property characteristics (*Property char.*) consisting of living area, number of rooms, apartment floor, building year, dummy for an elevator, and monthly fee per sqm. The full sample consists of apartment repeat-sales in Sweden in the period 2005-2016. Standard errors are heteroscedasticity robust and clustered at the cluster and apartment level. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.