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ABSTRACT

We estimate the size of the likely unofficial income of a household with a government official by the difference between the income that would be necessary to explain their observed home purchase behavior and the official income. Using unique and comprehensive administrative records on the House Provident Fund and home purchases between 2006 and 2013 in a large Chinese city, we reach three conclusions. First, an average official's unofficial income is 83% of her official income; this percentage increases sharply with the official's rank. Second, about 13% of the officials have an unofficial income, and the proportion also increases with rank. Third, government officials are not underpaid, and their unofficial incomes are not a compensation for low government salaries. Additionally, evidence suggests unofficial incomes have declined since the recent anti-corruption campaign. An analysis of a separate cross-city dataset corroborates the key conclusion.

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1. Introduction

Given the toxic impact of corruption on corporate governance, the economy, and society, both the finance and economics literature have sought to measure the size and severity of corruption.[1] Whereas previous work typically focuses on measuring the average level of corruption or corruption at the top, research on the proportion of government officials who appear to take unofficial incomes is scarce.

Gauging both the pervasiveness and level of unofficial incomes is essential for evaluating bureaucratic quality. For example, a combination of a high unofficial income and a low official income could reflect the type of people in the government. Caselli and Morelli (2004) have suggested one reason that corruption may persist: dishonest people may have a comparative advantage in working in the government. They do not mind working in a low-paying government job, because they expect to obtain bribes. In addition, they may set the legal wage of the public sector to be low enough to drive out competent and honest people. Honest people find accepting unofficial payments to be psychologically more painful, but they are also unwilling to accept a government salary that is below their reservation wage; dishonest people would have neither of the two problems. In other words, the combination of a low official salary and a high unofficial (or corrupt) income could be a stable but socially undesirable equilibrium.

Understanding the proportion of government officials who take unofficial incomes is also important for designing an effective anti-corruption strategy. In principle, two kinds of corruption equilibria are possible: one in which a small number of extremely corrupt officials co-exist with an otherwise clean bureaucracy versus one in which corruption is more widespread across the bureaucracy. The two scenarios may call for different anti-corruption strategies in order to be effective. If corruption is concentrated at the top but otherwise is not widespread in the bureaucracy, one worries more about the quality of policymaking and less about red tape or the cost of doing business in general. In terms of anti-corruption strategies, removing the top corrupt heads through elections or impeachment (e.g., as witnessed in Brazil in August 2016 or South Korea in March 2017) might be sufficient to achieve the

[1] See, for example, Shleifer and Vishny (1993), Wei (2000), Kaufmann and Wei (2000), and Besley (2004).

goal. By contrast, if taking unofficial incomes is a widespread phenomenon permeating the entire bureaucracy, the cost of doing business can be high for most firms. In such a situation, investment is discouraged, and economic growth suffers even if the top government officials are technically competent. For an anti-corruption strategy to be effective, one would have to focus on the general rent-seeking opportunities available to bureaucrats, the temptation to take unofficial incomes, the likelihood of discovering wrongdoing, and the penalty for rank-and-file bureaucrats taking bribes.

Neither the pervasiveness nor the level of unofficial incomes is easy to estimate, because they are meant to be "under the table." By necessity, measures of unofficial incomes will be indirect and can only be inferred from other observables. In this paper, we propose an empirical methodology for estimating both the prevalence of corruption and the relative size of the unofficial and legal incomes of government officials. We do so by combining data on observable big-ticket purchases by the near universe of households in a large city with the officials' and other people's verified legal incomes. Under the premise of a stable relationship between big-ticket purchases and household lifetime income (i.e., an Engel-curve relationship), we infer unofficial income from the gap between the value of the big-ticket purchase and the lifetime income that could be expected from the observed legal income. As an innovation of the paper, we are also able to extract information on the proportion of officials with unofficial incomes by comparing the estimated density function of "unexplained incomes" of officials with that of non-officials.

We apply the framework to China, where unofficial income is euphemistically known as "grey income." Combining two comprehensive datasets — the administrative records of the House Provident Fund (HPF) contribution and the transaction data of home purchases from a large city in China—we uncover the secrets of asset purchases by government officials. The use of HPF contribution records is important (and unique) because they provide a detailed hisotry of the legal income of every individual in the sample. By contrast, many studies in the literature adopt self-reported incomes, which are likely to be noisier and susceptible to selection bias. In addition, although the house-purchase decision is made at the household level, the incomes of the husband and the wife are often not able to be matched. In our datasets, we have information on the husband's and wife's income histories, employment status, and

nature of employers (e.g., government agency or not). In other words, the information on housing value, official incomes, and employer types are of very high quality.

Our estimation indicates that during our sample period between 2006 and 2013, an average government official's unofficial income amounts to 83% of her official income. More interestingly, we find the unofficial income (as a percentage of the official's legal income) increases with her rank and the prerogative power of her government bureau. For example, the unofficial income of a director general of a government department (which is ranked at the *zheng ju* level, equivalent to the level of a mayor of most medium or small cities in the Chinese political hierarchy) is more than 424% of the official income. In terms of the prevalence of corruption, about 13% of officials are estimated to obtain unofficial incomes, and this proportion also tends to increase with the official's rank. For example, whereas 8% of non-official government employees take unofficial incomes, 65% of *zheng ju* officials—the highest-ranking officials in the sample—are likely to have unofficial incomes. Our data also find the officials tend to be paid somewhat better than their private-sector counterparts, on average, conditional on observable personal characteristics. Therefore, we reject the hypothesis that unofficial incomes are compensation for earning a low official salary in the public sector. Thus, increasing public-sector pay per se may not be enough to prevent government officials from taking unofficial incomes.

Because the estimation of corruption and its prevalence is indirect, we devote a significant amount of effort in the paper to discussing our identifying assumptions and what may jeopardize their validity. For example, if government officials are more risk averse or have less risky income streams, they may allocate a greater proportion of their wealth to buying a house. Alternatively, if official households have a comparative advantage in choosing real estate that will have better-than-average appreciation in subsequent periods, or have more non-monetary but legal benefits in their compensation package (e.g., subsidies for heating and medical service), they may also choose to purchase a larger apartment. We examine each of these possibilities in a series of robustness checks. For example, to examine the possibility that government officials have a more stable income, we conduct an exercise to compare them with other households that work in quasi-government entities in which job security is also high, rather than with all non-official households. To rule out the possibility of comparative advantage in

identifying real estate with better appreciation potential, we compute and compare the realized appreciation rates between apartments purchased by government officials and those purchased by non-officials. We also investigate the possibility that officials may receive discounts on the prices of the apartments that they buy (Fang, Gu, and Zhou, 2019), or higher credit lines (Agarwal et al., 2020a). In each case, our conclusion is not materially affected.

Several additional findings further bolster our confidence in our conclusion. First, as discussed earlier, the unofficial incomes estimated by our methodology increase with the rank of the officials. They also tend to be greater for officials in those government bureaus with greater prerogative power in resource allocation. Because the degree of risk aversion, unmeasured legal wealth, and other confounding factors are unlikely to change systematically with official ranks—all higher-ranking officials come from lower-ranking officials at some point—our estimates of unofficial incomes are likely related to the rent-extraction ability of the official positions.

Second, we make use of the information on a subset of city government bureaus with very corrupt top officials, as revealed by the anti-corruption campaign after 2013 (i.e., after the end of our sample). Multiple media reports suggest corrupt top officials are more likely to have corrupt subordinates. Therefore, if the estimated unofficial incomes are related to corruption, we would expect them to be especially big for officials working in these bureaus. We find such reports to be true indeed. This finding provides additional confirmation that the estimated unofficial incomes are likely related to corruption.

Third, we explore variations in the unofficial incomes using an alternative dataset on home purchases in 99 cities during 2005–2018. We find the unofficial incomes estimated by our methodology are systematically and significantly higher in cities whose chief leaders (the party secretary or mayor) are subsequently removed for corruption during the anti-corruption campaign. In addition, we find the unofficial incomes implied in newly purchased homes decreased significantly after the anti-corruption campaign starting in 2013, especially in places where the officials have witnessed a crackdown on corrupt local chiefs. All these findings support the linkage between officials' unofficial incomes and corruption.

This paper is related to but goes beyond the literature on measuring the level of corruption. McMillan and Zoido (2004) study the bribery of judges, parliamentarians, cabinet ministers, and TV station owners by President Fujimori's spymaster in Peru in the 1990s. Gorodnichenko and Peter (2007) show public-sector workers in Ukraine tend to be paid less than their counterparts in enterprises but have a similar level of expenditures and asset holdings. Using a compensating differential framework, they suggest these public-sector workers must have unreported incomes. Fisman, Schultz, and Vig (2014) take advantage of the legal requirement in India for candidates for the parliament to declare their wealth, and the authors find individuals who won elections increased their assets significantly faster than those who lost. However, because non-elected bureaucrats are not typically required to declare their assets, this approach cannot be used to estimate the prevalence and magnitude of unofficial incomes across the entire segment of public officials. O'Donovan, Wagner, and Zeume (2019) exploit one of the largest data leaks and identify 338 listed firms as users of secret offshore vehicles, and document these vehicles are used to finance corruption, avoid taxes, and expropriate shareholders. They find the leak erased $174 billion in market capitalization among implicated firms, and one in seven firms have offshore secrets. Additionally, the finance and accounting field has a rich literature that adopts various data leaks and clever identification methods to explore otherwise hard-to-measure corporate fraud (Desai, Dyck, and Zingales, 2007; Dyck, Morse, and Zingales, 2010) and tax evasion (Braguinsky, Mityakov, and Liscovich, 2014; Clotfelter, 1983; Feinstein, 1991; Feldman and Slemrod, 2007; Fisman and Wei, 2004; Pissarides and Weber, 1989).

Several papers use micro-level financial data to unveil corruption in China. For instance, Chen and Kung (2019) study discounts in land transactions offered to political elites in China between 2004 and 2016. Using home purchase prices reported in mortgage contracts from a bank, Fang, Gu, and Zhou (2019) find bureaucrats in their sample received a discount on their home purchases. Using credit card data from a Chinese bank, Agarwal et al. (2020a) find government bureaucrats receive 16% higher credit lines than non-bureaucrats. They also find anti-corruption campaigns mitigate such corruptions. These studies do not estimate the proportion of officials who may take bribes, nor do they study how unofficial income may vary by official rank.

This paper makes three main contributions to the existing literature. First, instead of focusing on a small sample of firms or individuals, the framework we propose is implemented based on administrative records that theoretically cover all employees with formal jobs, including government officials, in a large city. The administrative data provide wage and salary information supplied or verified by the employers rather than self-reported by homebuyers. The near-universal coverage in a city enables us to investigate how the size and proportion of unofficial incomes change with the rank of an official and the type of government employer in terms of power over resource allocation. The literature has not examined their impacts on the size of the unofficial income. Second, to our knowledge, this study is the first to estimate the proportion of government officials who accept corrupt unofficial incomes. Third, we investigate whether government officials are systematically paid less than their counterparts outside the government, when we control for age, gender, educational level, and professional qualification. The answer is no. Therefore, unofficial income cannot be regarded as a form of compensation for the underpayment of government officials; in other words, raising public-sector pay alone cannot eliminate rent-seeking by officials. This paper also appears to be the first statistical assessment of this question in the literature.

Acknowledging the potential limitations of the study is also useful. Our methodology relies on three assumptions. We discuss them in detail in the paper. Although we go through a long list of scenarios in which they may fail and present evidence that our results are likely to be robust, the study would still benefit from cross-validation from other datasets in China or other countries.

The rest of the paper is organized as follows. We present the research methodology and the data in section 2 and report the baseline estimates and several extensions in section 3. The external validity analysis based on a multi-city dataset is presented in section 4. We conclude in section 5.

2. Research Strategy and Data

2.1. Empirical specification

The basic framework assumes a stable relationship between a big-ticket purchase (a home purchase

in this case) and the true permanent income (or the annuity of total wealth).[2] The underlying logic dates back to the neoclassical housing-demand theory from the 1960s (Muth, 1960; Olsen, 1969).[3] The general form of a household's housing demand function is

$$V = f(Y, P_H, P_O, H), \tag{1}$$

where V is the value of housing demand of the household, Y is the permanent income of the household, P_H is the housing price, P_O is the price of all non-housing goods and services, and H includes all other household characteristics that could affect a household's preference for housing consumption, such as the age and education level of the household members. As suggested by eq. (1), controlling for other factors, a stable linkage exists between a household's permanent income and its housing demand, which is the key assumption in our method.

In the empirical analysis, we consider a log-linearized version of eq. (1):

$$\ln V = \alpha_Y \bullet \ln Y + \beta \bullet L + \gamma \bullet T + \delta \bullet H + \varepsilon, \tag{2}$$

where V is the total value of the housing unit purchased, Y is the household's permanent income, with an income elasticity of α_Y, L is a control for spatial (submarket/district) fixed effects, and T is a control for time (year) fixed effects. Both L and T are used to capture the heterogeneity in prices of all housing and non-housing goods/services, as well as other unobserved macro-level factors affecting households' housing consumption. H is a vector of household characteristics other than income, and ε is an error term.

In our empirical implementation, instead of a single log-linear relationship between household permanent income and the value of home purchase, we allow for a more flexible relationship between the two, using a piecewise function for household income. Specifically, we divide the household incomes into five quintiles and allow the slope of household income (i.e., α_Y) to be different across the

[2] Housing purchase is quantitatively the most important means for households to preserve and build wealth in recent decades, both in China and other economies. Wu, Gyourko, and Deng (2012, 2016) document the home-purchasing behavior in major Chinese cities. Badarinza and Ramadorai (2018) also document the importance of the "safe-haven" motivation for home purchases in the London housing market.

[3] Arnott (1987) and Smith, Rosen, and Fallis (1988) provide a literature review on the neoclassical housing-demand theory and economic models of housing markets.

quintiles. In other words, we allow for potentially different elasticities of home value to household income at different income brackets.

Household permanent income is decomposed into two components. The first part can be inferred from the official income, Y_o, and the second part is based on the (unreported) unofficial income, Y_u. Let y_u represent the ratio of the unofficial income to the official income. We have

$$Y=Y_o+Y_u=Y_o+Y_o \bullet y_u=Y_o \bullet (1+y_u) \quad . \tag{3}$$

Accordingly, eq. (2) becomes

$$\ln V = \alpha_Y \bullet \ln Y_o + \alpha_Y \bullet \ln(1+y_u) + \beta \bullet L + \gamma \bullet T + \delta \bullet H + \quad \varepsilon \, . \tag{4}$$

We assume only government officials can have unofficial incomes (this assumption tends to underestimate the relative size of officials' unofficial incomes and the proportion of officials with unofficial incomes). We use a dummy variable, *OFFICIAL*, to represent households with at least one member serving as a government official. Eq. (4) can be rewritten as

$$\ln V = \alpha_Y \bullet \ln Y_o + \alpha_{OFFICIAL} \bullet OFFICIAL + \beta \bullet L + \gamma \bullet T + \delta \bullet H + \quad \varepsilon \, . \tag{4'}$$

From eq. (4) and eq. (4'), because

$$\alpha_Y \bullet \ln(1+y_u) = \alpha_{OFFICIAL}, \tag{5}$$

we have

$$y_u = \exp(\alpha_{OFFICIAL} / \alpha_Y)-1. \tag{5'}$$

In other words, we can estimate the unofficial income of the government officials based on their "unexplained" home value, which can be quantitatively measured as a multiple of the official income by comparing the two slope coefficients, $\alpha_{OFFICIAL}$ and α_Y, in eq. (4').

Besides the relative size of unofficial incomes, this methodology can also estimate the prevalence of corruption, that is, the proportion of officials who are likely to take unofficial incomes. For this purpose, we compute the residue of the housing-demand function for each household and investigate the resulting distribution. Specifically, we reestimate eq. (2) based on the sample of households with *no*

one working in the government. Then, assuming the estimated model gives the true relationship between household lifetime income and home value, we use the estimated coefficients to calculate the "unexplained wealth" or the residue of eq. (2) for each household, including those with someone working in the government.

Not all official households with a positive residue should be interpreted as acquiring unofficial incomes. Other unobserved household characteristics, such as an idiosyncratic taste for a large home, can also produce positive residuals. Assuming all unobserved household characteristics have the same distribution for official and non-official households, we can use the distribution of the residuals for households with no one working in the government to gauge their impact on other types of households. By this logic, we may define only those official households with an abnormally high positive housing-demand residue as having unofficial incomes. They are the official households whose homes are more valuable than those owned by otherwise identical households with no one in the government. Note the phrase "otherwise identical" means not only holding constant a household's legal income, education levels, and ages of both the husband and wife, as well as all other *observable* characteristics, but also the potential effect of *unobservable* attributes or preferences. Graphically, they are the official households in the shaded area in Appendix Figure A-1.

Following this strategy, we start with the distribution of housing-demand residues of both the official households and the households with no one working in the government. We place the residues of both groups into bins with a bandwidth of 0.01. For each bin of residues in $[j, j+0.01)$ with $j > 0$, if the density of the official household group, $D_{official,j}$, is higher than the corresponding density of the non-civil-servant household group, $D_{non\text{-}official,j}$, we infer that a density of $(D_{official,j}\text{-}D_{non\text{-}official,j})$ official households have unofficial incomes. Then, the proportion of official households with unofficial incomes can be calculated as

$$EM = \sum_{j>0}\left(D_{official,j} - D_{non-official,j}\right),\ if\ D_{official,j} > D_{non-official,j}\,. \qquad (6)$$

To the best of our knowledge, this paper is the first to propose a way to estimate the prevalence of corruption, or the proportion of official households with unofficial incomes.

2.2. Data

The key data for the study are the full sample of residential mortgage contracts from the HPF system in a large city in China.[4] Legally, each employee and their (full-time) employer have to contribute a specific percentage of their monthly income from the employer to the HPF account. The employees can then obtain a mortgage loan with a subsidized interest rate for home purchase (about 1.5 percentage points, or nearly 30%, lower than the commercial banks' mortgage rate; this interest rate is determined by the Ministry of Housing and Urban-Rural Development, and the same fixed rate applies to all borrowers).[5] Virtually all eligible homebuyers would apply for this mortgage before going to other funding sources such as commercial bank mortgage loans.[6] Mortgage refinancing is uncommon in China, and our sample contains no refinancing observations; in other words, each mortgage contract refers to a housing transaction. Therefore, the data cover the universe of all home purchases in the city that made use of an HPF mortgage loan (209,861 in total) from 2006 to 2013.

We clean the data with the following filters. First, we exclude 52,495 transactions on affordable housing units (intended for low-income households) to improve the comparability of the type of homes that officials and non-officials may purchase. Second, we focus on observations for which the incomes of both husbands and wives are recorded, thus removing another 49,995 observations from the dataset. The annual distribution of the final sample (107,371 observations in total) is listed in the first column of Appendix Table A-1.

For each transaction, we have the following information: (1) transaction date; (2) the total value of the dwelling unit;[7] (3) loan-level characteristics, including the loan-to-value ratio, mortgage interest rate, and maturity; (4) major attributes of the housing unit, including its size in square meters, floor level, and the address and name of the complex (which can then be converted to complex-level fixed

[4] The city remains anonymous per the request from the data provider.
[5] Chen and Han (2014) provide additional details about the HPF system in China.
[6] During our sample period, the Ministry of Housing and Urban-Rural Development only reported the national-level statistics of the HPF system for 2008. In that year, the total housing sales were 2.74 trillion yuan RMB in China. The HPF system issued 0.204 trillion yuan in mortgage loans, whereas commercial banks issued another 0.276 trillion yuan in mortgage loans. No similar statistics are available for the sample city.
[7] For each mortgage application, an independent professional real estate appraisal is obtained by the HPF system to verify the price of the housing unit.

effects); and (5) household characteristics, including the current monthly income (of both husbands and wives), current monthly consumption expenditures, total financial wealth (including bank deposits, stocks, and bonds owned), outstanding debt, the status of homeownership at the time of application, age, *hukou* (local residence registration) status, education level, and the professional titles of both the husband and the wife. The summary statistics of the key variables are listed in Appendix Table A-2. All the monetary variables are deflated using a CPI series in the city and presented in real terms of 2010.

As a key variable in the empirical analysis, the official permanent-income variable is imputed based on the following procedures. First, we start with the monthly income of the couple, which is defined as all incomes from wages and bonuses from the full-time jobs—before tax—of both the husband and the wife. Note this reported income is verified by both the payroll slips issued by the employers and the couple's contributions recorded in the HPF system.

Second, we estimate the cumulative income from the year of the home purchase to the year of the couple's retirement (with potentially different years of retirement for the husband and the wife). In the baseline case, we follow the Chinese labor law and assume men retire at 60, women with higher education (a bachelor's degree or above) retire at 55, and women without a bachelor's degree retire at 50. For future incomes, we need an assumption on the growth rate of household income. We have information on each household's reported and verified income from 2006 to 2013. Because GDP growth slowed down after 2013, the future income growth is unlikely to repeat the experience of 2006–2013, we assume the future annual growth is half of the realized rate during 2006–2013 for each household. Therefore, the relative differences in growth rates across households are preserved. We assume a discount rate of 5% and compute the present discounted value of lifetime wealth based on the assumed trajectory of the incomes.

In the lifetime-wealth calculation, we also include the self-reported financial wealth and outstanding debt at the time of the mortgage application.[8] For homebuyers who own other housing

[8] Note that unlike the salary information, monthly consumption expenditures, financial wealth, outstanding debt, and homeownership are self-reported and not independently verified. As a robustness check, we recompute lifetime income by ignoring all such information. That is, we compute (legal) lifetime income based solely on verified wage income. Such omission would be just noise if the distribution of non-wage income is similar between households with government officials

units, we impute their market values[9] and include them in the lifetime-wealth calculation. Finally, we calculate the annuity of lifetime wealth until the expected age of death (assumed to be 80 for men and 84 for women in the baseline case, which are the life expectancies at birth according to the *Life Insurance Mortal Rate Table* issued by the China Insurance Regulatory Commission). We treat this annuity as households' imputed lifetime (permanent) official income. This case serves as our baseline.

Another key variable is the employer type of household. As shown in Appendix Table A-1, 6,316 households (or 5.9% of the total) have a member who works as a civil servant (e.g., an administrative assistant) but not as a government official, and 5,364 households (or about 5.0% of the sample) have at least one member who works as a government official (at the *fu ke* level or higher). Of these, both spouses are government officials in 604 households (or 0.6% of the sample).

Government officials in our data can be ranked at six levels, from *fu ke* (Level I; deputy section chief) at the bottom to *zheng ke* (Level II; section chief), *fu chu* (Level III; deputy division chief), *zheng chu* (Level IV; division chief), *fu ju* (Level V; deputy director general), and finally to *zheng ju* (Level VI; director general). We report the summary statistics of households with a government official in Table 1, including their proportion in the data, average household income, and average home value.[10] Unsurprisingly, both their incomes and their home values tend to rise with the rank of the officials. At the same time, progressively fewer households are at ever higher official ranks. Note the current monthly income for households without government employees is about 11,500 yuan on average (column 2 of Table 1). This amount is higher than the average income of households with government officials (10,240 yuan). Because the average household without a government employee tends to be younger than the average household with an official, the gap in expected lifetime income (or wealth) is likely to be even bigger.

Note the names of official ranks and their levels are standardized throughout the Chinese

and those without them. Indeed, our results regarding the unofficial income estimates of officials still hold qualitatively.

[9] Because we do not have information on the size of the existing apartment units, we assume they are equal to the average housing size in this anonymous city. For the price per square meter, we adopt the average value for the corresponding district-year in the mortgage applications.

[10] Because some households have two government officials, the aggregated number of these six dummies is larger than the share of official households.

bureaucracy in both central government ministries and local governments. For example, mayors of small cities are typically ranked at *zheng chu* (division chief; Level IV) or *fu ju* (deputy director general; Level V), whereas mayors of large prefectural cities are often *zheng ju* (director general; Level VI). Whereas in the US, whether the police chief in the city of Cleveland is ranked higher or lower than a deputy director general in the federal Department of Education may not be clear, no such ambiguity exists in China. Every official position anywhere in the country is given a rank from a common set of nomenclature so that the relative hierarchical position is defined clearly and nationally. For example, if Boston were a city in China, its mayor would have the rank of *zheng ju* (Level VI) and its police chief would have been ranked *zheng chu* (Level IV).

Note this database does not capture officials ranked at or above the level of deputy minister (or deputy provincial governor), which is one step higher than *zheng ju*. As a result, we are not able to say anything about the unofficial incomes of the very senior officials in China. Nonetheless, we have captured non-official government employees and six core levels of government officials, which constitute the bulk of the bureaucracy.

We also categorize government bureaus into six groups: (1) the general offices of local Chinese Communist Party (CCP) committees and local governments; (2) bureaus in the legal system (police, courts, and prosecutor's office); (3) bureaus in charge of collecting or distributing financial and other resources (bureaus of finance, taxation, customs, land resources, and mining resources); (4) bureaus in charge of megaprojects (bureaus of transportation, highway, housing, and urban facilities); (5) bureaus in charge of the economic system (development and reform commission, state-owned assets supervision and admission commission, and urban planning bureau); and (6) other bureaus. We use these categorical variables to proxy for the prerogative power of government agencies and will test if differences in potential rent-seeking opportunities from the prerogative power of government bodies are also reflected in the differences in the implicit level of unofficial income.

Unconditionally, the value of the home purchased by the average household without a government employee is greater than that of the average household with a government official. As our regression results show, after conditioning on demographics and other variables, the pattern reverses. Also

noteworthy are the different home values for different types of official households. The average home value tends to increase with the rank of officials. Of course, the average income for households with officials also tends to increase with the rank of officials. Our subsequent regressions investigate if the increase in home value from low- to high-official ranks goes beyond what the difference in legal incomes can explain.

In Figure 1, we present a conditional plot of home value against estimated household lifetime income. The variable on the vertical axis has purged the influence of age, education level, and other demographic characteristics. On average, relative to their respective lifetime-income levels, households with a government official own a more expensive residential property than households without a government official.

Besides the HPF dataset in the sample city, we also introduce a second dataset covering multiple cities to check the external validity of our methodology. We work with the micro-level data of urban households from the China Family Panel Studies (CFPS), a bi-annual household survey launched by Peking University, China. Our data cover 99 cities around mainland China. In each city, households are chosen using a stratified three-stage approach (neighborhood, housing complex, and household) by probability proportional to size (PPS) random sampling. We start with the urban households in the waves of 2010, 2012, 2014, 2016, and 2018. Of the 6,326 households covered in the sample, 1,935 households from 99 cities reported purchases of housing units between 2005 and 2018. We focus on these home purchasers in the multi-city analysis.

For each respondent household, we focus on two variables. The first is the floor area of the dwelling unit that the household purchased. In the sample, only a small portion of home purchasers report the total value of the dwelling unit purchased, and hence, we choose to adopt unit size as the proxy of expenditures on big-ticket purchases in the multi-city analysis. Second, for each household, we identify whether at least one member of the couple serves as a government employee. Note this classification includes both officials and non-official government employees, and a shortcoming here is that we are not able to differentiate government employees by rank or office. We also have information on households' other attributes, such as age, *hukou* status, household size, and reported

household income. We also know the number of children (including the number of sons) in the household and the average education years of the couple's parents. Appendix Table A-3 reports the summary statistics of the key variables.

2.3. Discussion of the key identifying assumptions

Our identification relies on three essential assumptions. The first is that the procedure outlined in section 2.2 can appropriately depict permanent income for both official and non-official households. This assumption might fail if official and non-official households hold systematically different expectations about their future income. For example, government officials may anticipate higher income growth, a longer life, or a lower discount rate than non-officials. Those factors could cause them to purchase a larger home than non-official households with an equivalent level of current income.

The second key identifying assumption is that we are able to control for all major determinants of households' home-purchasing decisions. This assumption may be invalid if the mapping from the true total income to the value of the home purchase is also affected by other differences in personal characteristics. For example, government officials may be wealthier, have more affluent parents, or marry into wealth. Additionally, if government officials had more secure jobs than their non-official counterparts, they would be able to set aside a larger portion of their income to accumulate assets, and therefore prefer to buy a larger home for a given level of income. In all these cases, the total income backed out from the value of officials' home purchases may overstate the size of their unofficial incomes.

A third important identifying assumption is that officials and non-officials face the same choice set, in particular, the same unit price in the real estate market. However, real estate developers could offer a discount to government officials. Although the discount may be considered a form of bribery, the larger home purchases by the officials may partly reflect this unit-price advantage rather than the presence of a large unofficial income. Similarly, if government officials are better at judging which types of housing units are more likely to appreciate, they may choose to buy a more expensive home than their non-official counterparts, for a given level of official income. In these cases, our methodology may also lead to an upward bias in the estimated unofficial incomes.

We test whether the failure of each of these assumptions would affect our main findings. First, we consider the possibility that government officials may have higher future income growth rates, have higher job security or different degrees of risk aversion, expect to leave the government before retirement for a private-sector job, receive in-kind or other non-salary benefits, overpay for their home purchases due to inadequate market information, receive price discounts from real estate developers, or be more skilled or experienced in housing investments. We quantify each of these effects. We find none of them are large enough to fundamentally alter our main inferences.

Second, by exploring the nearly complete coverage of all home purchases in the sample city, we investigate the relative size of unofficial income and its prevalence for officials of different ranks and working in different government bureaus. If our estimate of unofficial incomes is related to corruption rather than reflecting idiosyncratic differences, one hallmark would be for estimated unofficial incomes to increase with officials' ranks and be greater in those government bureaus known to have more power over business licenses or approval authorities. In comparison, none of the alternatives discussed above would easily generate such a pattern.

Third, to see that the estimated unofficial income is linked to corruption rather than the differences in the characteristics between officials and non-officials, we examine the estimated unofficial incomes responding to a national anti-corruption campaign since 2013. The aggressive anti-corruption campaign has uncovered corruption in the top echelon of officials in a number of cities (the CFPS dataset). Similarly, in our sample city (the HPF dataset), the anti-corruption campaign has also uncovered corruption in a number of government bureaus. Although the corruption cases (and the associated arrests) took place after our sample period, the corrupt deeds typically occurred during our sample period. Such a setting provides us with a new way to check if the estimated unofficial incomes are related to corruption. In particular, are estimated unofficial incomes greater during our sample in cities later revealed to have more corruption? Are estimated unofficial incomes greater for officials working in those bureaus later revealed to have more corruption? Note that because the corruption discovery took place after our sample period, no "look-ahead bias" is present in the estimates of the unofficial incomes.

Corrupt top officials are more likely to have corrupt subordinates—partly because the corrupt top

officials may encourage corruption at lower levels so they can take a cut and partly because the top officials are less likely to put in place measures that would monitor or constrain rent-seeking behavior. We compare the relative size of unofficial incomes in bureaus/cities with corrupt top leaders and those in bureaus/cities without known corrupt top officials. In addition, because the CFPS dataset covers the periods both before and after the anti-corruption campaign, we can also investigate whether officials' unofficial incomes significantly decreased after the campaign. If the estimated unofficial incomes are driven by unmeasured characteristics of the officials, such as officials having a taste for larger homes or expecting to see faster growth in future legal income, they are unlikely to be related to the corruption cases in the ways described above, which provides a useful way to validate if the estimated unofficial incomes are related to corruption.

Admittedly, our calculation still relies on the assumption that our HPF dataset provides a representative sample of home purchases in the sample city. This assumption can also fail. In particular, our dataset does not contain house purchases that do not use HPF mortgages. Indeed, some bribery may take the form of someone simply giving a house or an apartment to a government official, and the most egregious form of bribe will not appear in our dataset. Another possibility is that a bribe-taking official would be concerned about revealing their wealth if it were embedded in the observed size or value of the house they purchase. We are not able to rule out these possibilities and do not have a clear way to systematically quantify these effects (other than reporting anecdotes). We note, however, these possibilities suggest the true size of unofficial incomes can be greater than what is estimated here.

3. Empirical Results

3.1. Relative size of unofficial incomes

Table 2 reports the results from the baseline specification (i.e., eq. (4')). The dependent variable is the total value of the home (apartment) purchased, expressed in the logarithm. In column 1, the main regressors of interest are (a) a dummy variable for households with civil servants who are not officials, (b) a dummy variable for households with at least one government official, and (c) the log of (imputed)

permanent household income. In principle, the slope of the Engel-curve relationship between income and home value can depend on income—although a household tends to buy a more valuable home as its income increases, the increment in the home value may not be linear. We allow for five separate coefficients for the five quintiles of household income to account for a potentially non-linear relationship between permanent household income and home value. We control for other observable household attributes, such as age, *hukou* status,[11] education level, the professional titles[12] of both the husband and wife, whether either of the couples works in the central districts,[13] and district-month fixed effects.[14] The standard errors are two-way clustered at district and month. The R-squared of the model reaches 0.499; in other words, the model can explain about half of the households' differences in expenditures on home purchases. Note such a degree of fitness significantly outperforms most existing micro-level empirical analyses in urban China (Cao, Chen, and Zhang, 2018; Han, 2010; Tang and Coulson, 2017).

For the first three income quintiles, the coefficients on the log permanent household income are all statistically significant at the 1% level, which confirms the value of home purchase increases with a household's (official) permanent income. A formal F-test for the equality of these three coefficients yields an F-statistic of 2.27, which is insignificant. In other words, we cannot reject the null that the three coefficients are the same. By contrast, neither of the coefficients for the next two quintiles on the log of permanent household income is different from zero at the 1% level. This pattern appears

[11] *Hukou* is a peculiarly Chinese system: every citizen of the country has a unique *hukou* designation that ties them to a particular location in the country, which is often, but not always, their birthplace. For example, people who live and work in Shanghai are separated into two groups: those with a Shanghai *hukou*, and those with a *hukou* from elsewhere. People in the first group enjoy more rights, such as the right to attend local schools. Migrant workers in the city typically do not have the local *hukou* and are generally expected to return to their place of origin once they stop working in the city. In some cities, migrant workers acquire local *hukou* once they become local homeowners; this benefit could give them extra incentive to own a home. In other cities, obtaining local *hukou* is very hard, even if a home is bought in that city. In the latter case, because people without a local *hukou* expect to leave the city when they retire, they may have less of an incentive to buy a home. In any case, households with or without a local *hukou* may differ in their home-purchase behaviors. We use a local *hukou* dummy as a regressor to allow for this difference. Note virtually all official households would have local *hukou*.

[12] A "professional title" (or *zhi cheng* in Chinese) is a government designation of one of four levels of professional qualification: (a) advanced level (*zheng gao ji*), which is equivalent to a full professor; (b) associate advanced level (*fu gao ji*), equivalent to an associate professor; (c) mid-level (*zhong ji*); and (d) no professional title.

[13] Whether household members work in the central districts of the city could also affect home-purchase behavior. Those who do work in the central districts may prefer to buy a home in or near it to save commuting time. Homes in or near the central districts tend to be more expensive than comparable ones more distant from the city center. Because we know the employer address of both the husband and wife, we include a central district dummy for households with at least one member working in the central districts of the city.

[14] We have also introduced separate fixed effects for sub-geographic units within the city, and month fixed effects, and the results are robust.

intuitively sensible: once a household is rich enough (and the house is big enough), the size of the house they want to buy is limited. The coefficients on other control variables are generally consistent with expectations. For example, the value of the home tends to be higher for purchasers with advanced education levels or advanced professional titles.

The dummy for households with non-official civil servants is positive (0.034) and statistically significant at the 1% level. Because the median value of official households' (official) income falls in the second quintile, the implied unofficial income is about 27% [=exp(0.034/0.142)-1] as a share of official permanent income.[15] The government-official dummy is also positive (0.086) and statistically significant at the 1% level. Most official households also fall in the second income quintile (though some are in the third income quintile). This finding implies the unofficial income is about 83% [=exp(0.086/0.142)-1] of the official income for an average household with at least one official.

A benefit of the dataset is that we can differentiate officials by their rank in the hierarchical system and by the type of government bureau. This differentiation allows us to investigate possible gradients of unofficial income so that we can answer this question: Do higher-ranked officials collect more unofficial income?

We report the results in column 2 of Table 2. If both the husband and the wife are officials, we use the higher of the two ranks. All coefficients for official ranks are positive and statistically significant; strikingly, the size of the point estimates indeed increases monotonically with rank. For most junior officials at the *fu ke* level (Level I), unofficial income is estimated to be 44% of their legal income. This amount increases to 83% for *zheng ke* officials (Level II), 88% for *fu chu* officials (Level III), 172% for *zheng chu* officials (Level IV), and 270% for *fu ju* (Level V). The most senior officials at the rank of *zheng ju* (Level VI) are found to have an unofficial income that is 424% of their reported official income. These estimated ratios of unofficial to official incomes by rank are presented in Figure 2 for easy inspection.

[15] When taking the unofficial income into consideration, the total income may jump to the next quintile. Nevertheless, as we highlight above, the difference between the income elasticities of the first three quintiles is not significant. Thus, we do not need to worry this change would dramatically affect our calculations.

One interesting pattern from the figure is that a director-general-level official (*zheng ju*; Level VI) tends to have an unofficial income multiple that is more than twice that of a division head (*zheng chu*; Level IV) within a department (424% vs. 172%), whereas the latter, in turn, has an unofficial income multiple that is more than twice that of a head of a section (*zheng ke*; Level II) within a division (172% vs. 83%). In comparison, their respective deputies (Level V, Level III, and Level I) have an unofficial income multiple that is only modestly higher than the head of a government office just below them. This observation suggests that, at a given level of government office, unofficial incomes accrue disproportionately to the head of the office relative to the deputy heads.

In column 3 of Table 2, we distinguish government bureaus by function. Although all the dummies are significantly positive, interesting variations exist. The magnitude of unofficial income is highest for two types of government bureaus: those in charge of taxes and government-controlled resources (e.g., land) and those in charge of investing in megaprojects, such as new highways or new water treatment plants. On average, an official in these offices could collect unofficial income worth 121% and 126%, respectively, of their official earnings. Officials in the general offices[16] and other less critical bureaus (in the "others" category) have much smaller unofficial incomes, namely, about 53% and 38% of their official incomes, respectively.

Column 4 contains both sets of dummies, which provide information on how the size of the unofficial income depends on a combination of an official's rank and the functionality of her office. For example, for an official at the *zheng chu* level (Level IV) in a bureau in charge of financial and resource affairs, the corresponding coefficient would be 0.195 (=0.128+0.067), indicating an unofficial income of about 295% of the official income. By contrast, an official at the bottom rank in the general office would only be able to collect an unofficial income of about 25% of the official income.

We seek additional confirmation that the estimated unofficial income is related to corruption, by exploring a particular form of cross-bureau variation in unofficial incomes. Since the turnover of

[16] Note one comment on the general offices of the local CCP committee and government: although these bureaus are critical at a macro level for operating a city, few direct links exist between them and market participants, meaning the chances to obtain unofficial income are limited. Separately, officials in these bureaus are possibly monitored more strictly and thus have fewer opportunities to seek unofficial incomes.

Chinese central government in late 2012, an aggressive anti-corruption campaign has been pursued, and many officials have been arrested or indicted for corruption. This anti-corruption campaign allows us to separate bureaus in the sample city into two categories: bureaus whose directors were found to be corrupt in subsequent years and bureaus in which no corruption cases were exposed at the top. One hypothesis of interest is that if the top leader(s) of a bureau is corrupt, the governance mechanism of the bureau is likely to have broken down, and the problem of unofficial incomes in the bureau, in general, is likely to be more severe than the city average even *before* the corruption cases of the bureau leaders are exposed.[17] Note some of the top bureau officials who have not been exposed to corruption could still be corrupt, and therefore, the bribe-taking behavior or embezzlement of their subordinates may not be different from that of their counterparts in bureaus with deposed top officials. Therefore, the estimated difference in unofficial incomes between bureaus with and without exposed corrupt top officials is a lower bound of its true magnitude.

To do this exercise, we manually collected information on all reported cases of corrupt government officials from the official website of the Commission for Discipline Inspection of the CCP in the sample city. We focus on the corrupt officials who satisfy three conditions simultaneously: (a) served as head or deputy head of a bureau, (b) were at or above the *fu chu* level (Level III), and (c) were accused of corruption between November 2012 and December 2016. In all 5,364 official households, 151, or 2.82%, worked in bureaus with the exposed "corrupt leaders" during our sample period.

In Table 3, we add an interaction term between the government-official dummy and a dummy for bureaus with exposed corruption at the top. According to column 1, the interaction term for government officials working in bureaus with corrupt leaders is positive and statistically significant at the 1% level. Based on these coefficients, the unofficial income is estimated to be 236% of their reported income, which is substantially higher than the average level. This finding is consistent with the idea that corrupt "tops" are more likely to have corrupt "bottoms." The data pattern also supports the idea that what we interpret as unofficial income is indeed linked to corruption. Meanwhile, also note the coefficient of the

[17] Dimmock, Gerken, and Graham (2018) show coworkers influence an individual's propensity to commit financial misconduct. This finding suggests the presence of corrupt colleagues may also increase the likelihood of an official accepting bribes.

government-official dummy (column 1) or various ranks/bureau types (columns 2–4) are almost unchanged compared with Table 2. Therefore, the baseline results do not entirely result from these bureaus with corrupt heads.

3.2. Distribution of unofficial incomes

The estimates so far reveal the average unofficial incomes for all officials for a given combination of ranks and office functions. However, an average value could originate from very different distributions. For example, unofficial incomes in a particular group could either all cluster around the mean or follow a bimodal distribution (e.g., reflecting a few very corrupt people among a majority of uncorrupt officials).

To investigate the distribution, as described in section 2.1, we reestimate eq. (2) based on the sample of households with *no one* working in the government and use the estimated coefficients to calculate the residue of eq. (2) for each household, including households with and without member(s) working in the government. In Figure 3, we plot separate density functions of the residues for these three groups: households with no one in the government, households with non-official civil servants, and households with government officials. The density of the unexplained wealth for households with officials is to the right of that for households with non-official civil servants, which in turn is to the right of that for households with no one working in the government. This pattern suggests "unofficial incomes" exist, and officials tend to take in more unofficial incomes than low-level civil servants who are not officials.

In Figure 4, we report the distribution of unexplained wealth for three subgroups of households with government officials: those at the *zheng ke* (Level II), *zheng chu* (Level IV), and *zheng ju* (Level VI) levels, respectively. (We skip the densities for the other three official ranks so as not to overcrowd the graph.) Strikingly, as the official ranks move up from *zheng ke* to *zheng chu* and to *zheng ju*, the corresponding density curves for unexplained wealth also move to the right. This finding reinforces the interpretation that the "grey income" tends to increase with official ranks.

Such a relative position of the curves is not surprising: from Table 2, we already know the average

ratio of the unofficial to official income is higher for households with a government official, and the proportion also increases with rank. The graphs reveal the results about the average are not driven by outliers. A formal computation of skewness and kurtosis indicates that although the density functions do not strictly follow a normal distribution, they are nonetheless approximately bell-shaped. One interpretation of the lack of obvious outliers is that taking unofficial incomes is a relatively widespread phenomenon rather than a phenomenon restricted to a small number of extremely corrupt individuals.

As a more conclusive analysis, we adopt eq. (6) outlined in section 2.1 to calculate the proportion of government officials who are likely to take unofficial incomes. The results are summarized in Figure 5. Based on this methodology, 13% of the official households are estimated to acquire an unofficial income. We can also perform separate calculations for each rank of the officials. This estimated proportion rises with official ranks, from 8% for non-official civil servants to 16% for *zheng ke* (Level II) households, and all the way to 65% for *zheng ju* (Level VI) officials. We can also calculate the proportions for each type of government bureau. Officials in government bureaus in charge of investing in megaprojects are most likely to have an unofficial income (42%). The proportion of officials with unofficial incomes varies more modestly across the other five categories, ranging from 14% in less critical bureaus (in the "others" category) to 23% in bureaus in charge of taxes and government-controlled resources.

3.3. Stress-testing the key identifying assumptions

In this section, we conduct a series of extensive robustness checks, especially focusing on whether the three key identifying assumptions stated in section 2.3 may fail and the potential effects of these failures on the main inferences of the paper.

(1) Assumptions on permanent income calculations

Our methodology is based on the premise that a household's lifetime income can be well measured by our procedure based on the observed income history and linear interpolation. We consider the following factors that might invalidate this assumption.

First, this assumption could fail if government officials anticipate much faster future income growth

than non-official households. Because we have the (legal) income history from 2006 to 2013 for all households in the sample, we can compare the actual income growth during this period. According to Appendix Table A-4, income growth in the recent past was, in fact, slower for households with a government official (10.6%) than for households with no one in the government (13.8%). On average, the more senior the official rank is, the slower the growth rates tend to be. Consequently, the actual data on income growth in the recent past do not support the notion that income growth is likely to be much faster for government officials.

Second, our procedure could have underestimated the officials' lifetime income if many of them expected to leave the government before retirement and work in a more lucrative private-sector job. Such a phenomenon is relatively common in the US and is known as a "revolving door." However, unlike in the US, the "revolving door" phenomenon is relatively uncommon in China. Because we know the employment history of all individuals during the eight-year (2006–2013) period, we can compute an average quit rate for government officials in the sample. We find the quit rate is 0.22% per annum. For an official who is 20 years away from retirement, the probability that she will stay in the government until retirement is 96% [=(1-0.0022)^20]. In other words, once they enter the government, an overwhelming majority of officials stay in the government until they retire. The low turnover rate would not be surprising if officials had the opportunity to obtain unofficial income by being in the government. Also, note government retirees do not work in general.

In column 1 of Table 4, we examine whether the results are sensitive to allowing government officials to quit their positions for better-paying jobs in the private sector before retirement. The average level of the permanent income of a non-official household is 200% higher than that of an official household. We assume a given official household can expect to leave the government job at a rate of 0.22% a year and see a jump in income that is commensurate with the private-sector job. We further assume that once an official leaves the government, they stay outside the government until retirement. As the table demonstrates, this modification reduces the implied unofficial income by a modest amount but does not fundamentally change our conclusion.

Third, some homebuyers in the sample already owned a home before the home purchase in the

database. In the basic specification, we impute the market value of the existing dwelling unit already owned and include it in the household's lifetime income. In column 2 of Table 4, we consider the effect of current homeownership in a different way. We use the sum of the values of the newly purchased apartment and the one already owned as the dependent variable; at the same time, we exclude from the lifetime-income calculation the estimated value of the dwelling already owned. The objective of the estimation is the same, which is to find out how much unofficial income is needed, if any, to justify the observed values of the house (apartment) purchases. The results on unofficial incomes are qualitatively consistent with the previous estimations.

Finally, our calculation of permanent household income involves information and assumptions about the income growth rate, discount rate, net wealth, expenditure spending, retirement age, and life expectancy. On the one hand, in column 3 of Table 4, we replace the imputed permanent income with the household-specific underlying factors, including current income and previous income growth for both the husband and wife, and net wealth. The basic qualitative features carry over. In particular, officials take unofficial incomes, and the size of unofficial incomes increases with rank. On the other hand, we investigate the sensitivity of the conclusions to variations in each of these parameters in Appendix B. All the main inferences turn out to be robust.

(2) Different attributes between official and non-official households

The second key identifying assumption underlying our approach is that households with and without government officials are similar beyond those characteristics already controlled for in Table 2. This assumption can fail if other unobserved differences (besides unofficial income) could cause them to behave systematically differently when purchasing homes. We consider the following potential unobserved differences.

First, could the two types of households face systematically different levels of risk and/or have different degrees of risk aversion? If government jobs are more secure (i.e., individuals are less likely to be fired from government jobs) than non-government jobs, households in which a member is working as an official may face a systematically lower level of risk. If they have the same degree of risk aversion,

official households may hence allocate a bigger fraction of their investment to a relatively riskier asset such as housing. In this scenario, official households may buy a more valuable home for a given level of income. On the other hand, if people with a higher degree of risk aversion are more likely to self-select to enter the government sector (attracted by its greater job security), official households may be more risk averse on average than other households. In this scenario, they may choose to invest less in risky assets such as housing (or invest more in housing if they treat housing as a less risky asset).

Our strategy for tackling the possible effects of risks and risk preference is to compare official households with those who are likely to face similar risks and with a similar level of risk aversion. First, we restrict the comparison group in the sample to those households with at least one member working in a government-affiliated public institution (known as *shi ye dan wei* in Chinese). As described in detail in Wong (2009) and Collins and Cottey (2018), the public institutions in China help corresponding government bureaus by providing public service as a "shadow government." In particular, public-institution employees share several key features with government employees: they both need to pass the official and public examinations to get the job; their (legal) incomes are part of fiscal expenditures of corresponding government bureaus; and they share the same ranks, which determines their legal compensation packages. Actually, the employees sof some public institutions are officially referred to as "quasi-civil servants." The jobs in these institutions are likely to be as secure as government jobs and, therefore, likely to attract individuals with a comparable degree of risk aversion. Nevertheless, public-institution employees cannot share powers as government officials, and are hence less likely to have unofficial incomes. The regression results are reported in column 1 of Table 5. We find the basic conclusions are qualitatively similar to the baseline estimation: public officials have unofficial incomes, and they tend to increase with the rank of the officials; in other words, our main conclusions are robust to allowing differences in the security of jobs and the degree of risk aversion between officials and non-officials.

In column 2 of Table 5, we replace the control group with employees of state-owned enterprises (SOEs), who arguably share similar job security with government officials and government-affiliated public-institution employees, whereas we adopt both government-affiliated public-institution

employees and SOE employees as the control group in column 3. The results remain robust in both columns.

Second, government officials may receive in-kind or other non-salary benefits, such as free medical care and allowances for winter heating expenses. Most importantly, government officials do not need to contribute to their pension plans but expect to receive a pension in retirement.[18] These implicit benefits do not show up as part of the payroll information recorded in the database but are nonetheless part of the officials' legal income. If we do not consider these benefits in their lifetime income, we may underestimate their true legally obtained wealth and therefore overstate the extent of the officials' unofficial incomes.

We now attempt to assign a monetary value to these benefits. After consulting government documents governing these benefits during the sample period, we identify three types of legal benefits that are not included in the salary, namely, free medical care, allowances for winter heating expenses, and free pension plans. By regulation, all other benefits should be counted in the official salary. (Note only officials at the rank of a *deputy minister* or higher have the use of a government car; this benefit is thus not relevant for the officials in our sample.) Banquets outside official functions are not formally allowed and should be considered part of the unofficial income. We impute the equivalent monetary values for these benefits based on the statistics on urban household consumption provided by the local statistics bureau in the sample city. For each type of benefit, we assume the monetary value is equal to the average of what the top 20% of households pay for that benefit in the city in the same year. As listed in Appendix Table A-5, for instance, in 2012, an average household in the top 20% of the household income distribution paid 380 yuan per year for central heating. We take this amount as the monetary value of free central heating to official households. We calculate the values for other benefits similarly. The total value of all non-salary benefits for an official was 2,947 yuan per year in 2012, which is substantially less than the unofficial income estimated previously.

In column 4 of Table 5, we reestimate the specification with a revised estimate of the officials'

[18] A change in the rules in January 2015 requires government officials and civil servants to contribute to their pensions.

lifetime income that takes into account the monetary value of these benefits. The results turn out to be very similar to the baseline case, with the estimated unofficial incomes being slightly smaller. Therefore, our results are unlikely to be driven by the omission of legal non-salary benefits.

In spite of these robustness checks, we should note some limitations. In particular, given that the HPF data do not include information on other household members, we are unable to discuss the potential differences in parental wealth between official and non-official households. In addition, official households may have a larger desire for housing as a status good and hence are willing to pay more for home purchases, either because of child-related incentives (Wei, Zhang, and Liu, 2017) or higher demand for conspicuous expenditures. We assess the importance of these two potential confounding factors with a different dataset (the CFPS), which contains richer information on household attributes. Also note that none of the unobserved household attributes discussed above are likely to co-vary with official rank or government bureau type—all higher-ranking officials were promoted from lower-ranking officials at some point. Therefore, the unofficial income gradients revealed in Table 2 suggest these factors may not be quantitatively important for our main findings.

(3) Different housing market conditions for official versus non-official households

Another key identifying assumption is that the officials and non-officials face the same unit price in the housing market. This assumption may fail in a number of ways. First, officials may overpay for their home purchases if they are less savvy in market transactions. Second, the opposite possibility is that real estate developers may offer a discount to officials. Although the discount may be a form of bribery, the lower unit price could induce the officials to buy a bigger home than their non-official counterparts. The difference in the value between the two house purchases, however, may not reflect the size of the unofficial income of the officials. We examine these possibilities in turn.

We start with the possibility that official households may overpay for housing transactions. Because many government officials are not directly involved in market activities, they may have less information about the "reasonable" price of a specific housing unit (information disadvantage) or be less skilled in bargaining with the sellers (skill disadvantage). In this case, they might have to spend

more for an otherwise equivalent housing unit. This hypothesis can be rejected in two ways. First, as shown in Appendix Table A-6, the results are robust for households with only one member working in the government; in other words, official households buy more expensive homes even when one household member works outside the government. Second, because the total value of a house can be written as the product of size (floor space in square meters) and unit cost (price in yuan per square meter), we run separate regressions with size and unit cost as the dependent variable, respectively. The results are reported in the first two columns of Table 6. We see official households' homes have a higher monetary value almost entirely because they buy physically larger homes. Indeed, the size of the home purchase tends to increase monotonically with the rank of the officials. Therefore, we reject the information-disadvantage or skill-disadvantage hypothesis.

An opposite story from the information- or skill-disadvantage story is the notion that government officials in offices with a discretionary power over permits, licenses, or other resource-allocation decisions on housing development may receive a discount from real estate developers when they buy a home. In this case, a discount may be a form of bribery, but the extra value of the home of government officials is no longer a result of the unofficial income alone. The discount is estimated by Fang, Gu, and Zhou (2019) to be 1.05%, on average, and may increase with the rank of the officials. We follow Fang et al.'s strategy to test whether a similar pattern exists in our data. Following Fang et al., we restrict the sample to only newly built units (when the purchase is made from real estate companies) and narrow the group of official households to those who may hold power over real estate companies, namely, those working in the following functions: development and reform commission, taxation, housing administration, land administration, and construction planning. In column 3 of Table 6, we indeed find some evidence of gradients in the discount, and the price discounts are especially significant for officials at the *zheng chu* (Level IV) and *zheng ju* (Level VI) levels. Overall, the discount seems small, which should have little impact on our results.[19]

Another alternative explanation is that the officials might be more skilled or experienced in

[19] The price discount is not significant if we include all official households or include the resale transactions. The results are available upon request.

housing investment because, for example, they can better understand future urban development or can better forecast future government policies that may affect housing values. In this case, allocating more assets to the housing sector is reasonable for the official households. However, this hypothesis is rejected by the results in column 4 of Table 6, which examines whether officials systematically pick house locations that exhibit faster price appreciation in subsequent periods. In this regression, the dependent variable is the cumulative local housing price growth (in the same submarket of the purchase) in the 12 months following the purchase. Controlling for other factors, although some positive and negative coefficients exist, we do not see systematic evidence that the official households are better at selecting apartment-purchase locations that outperform other locations.

Finally, we test whether government officials receive preferential treatment in their mortgage terms, such as lower interest rates, higher loan-to-value ratios, or longer length to maturity. The summary statistics in Appendix Table A-2 show no significant differences between households with and without government officials. We then use the interest rate, loan-to-value ratio, and length to maturity as the dependent variable, respectively. As reported in Appendix Table A-7, we find no systematic differences between the two types of households. In the last column of Table 6, we introduce these mortgage terms to the home-value regression as additional control variables. The results remain qualitatively similar.[20]

(4) Other robustness checks

We have undertaken additional robustness checks and extensions. In Table 2, the permanent income variable is winsorized at 1% to minimize the impact of possible outliers. If we use the un-winsorized data, as shown in Appendix Table A-8, all main results hold.

We also consider the correctness of model specification. In particular, we examine the consequences of a possible nonlinear mapping from household income to home value. In column 1 of

[20] Agarwal et al. (2020b) reveal that underreporting housing transaction prices for tax-evasion purposes is a prevalent phenomenon in China's resale housing market. If government officials are less like to conduct such tax-evasion behaviors, our results would also overestimate their unofficial incomes. We rule out its effect via the following two perspectives. First, as pointed out by Agarwal et al. (2020b), this phenomenon only exists in the resale housing market. Our baseline results still hold when we narrow the transaction samples to those in the newly built sector. Second, the authors of Agarwal et al. (2020b) helped run an additional test based on their sample, which suggests official and non-official households do not significantly differ in their tax-evasion behaviors in the resale housing market. The results are available upon requests.

Appendix Table A-9, we impose linearity on the effect of permanent household income on home value. In columns 2 and 3, we deal with potential nonlinearity by introducing the square and cubic terms of permanent household income. In columns 4 and 5, we introduce interaction terms between the husband's or wife's age cohorts and the lifetime-income segments. We do so to capture a more flexible Engel-curve relationship between official income and housing demand that may vary with the stage of a household's life cycle. Finally, we use a propensity score matching procedure to select non-official households that are most comparable to the official households. The results are in column 6. Our key findings remain robust in all these cases.

3.4. Is unofficial income a compensation for underpayment in the government?

One may wonder whether government officials are underpaid relative to their qualifications and whether unofficial income can thus be regarded as a form of compensation for the underpayment. Indeed, a common assertion is that government officials take unofficial incomes because they are poorly paid.

To evaluate this assertion, we estimate an individual-level wage equation:

$$\text{Log}\,(\textit{recorded wage}_{i,t}) = \beta \bullet \textit{D\_official}_i + \gamma_1 \bullet \textit{Male}_i + \gamma_2 \bullet \textit{Education}_i$$

$$+ \gamma_3 \bullet \textit{Professional\_Title}_i + \gamma_4 \bullet \textit{Age}_i + \gamma_5 \bullet \textit{Hukou}_i + \gamma_6 \bullet \textit{YearFixedEffects} + \varepsilon_{i,t.} \qquad (7)$$

The left-hand-side variable is the wage recorded in the payroll of individual *i* in year *t* as reported in the HPF contribution data, expressed in the logarithm. On the right-hand side, $\textit{D\_official}_i$ is a dummy for working in the government. We consider seven separate dummies for non-official civil servants and *fu ke*, *zheng ke*, *fu chu*, *zheng chu*, *fu ju*, and *zheng ju* officials (i.e., Level I to Level VI), respectively, with someone not working in the government as the left-out category.

As the most important control variable, the skill or competence of a person is measured in two ways. $\textit{Education}_i$ represents a person's educational attainment, including dummies for individuals with a high school diploma (but no higher degrees), a degree from a three-year college (but no higher), a degree from a four-year college (but no higher), a master's degree, and a Ph.D., respectively. The left-out

category is someone with no high school diploma (or better). *Professional_Title*$_i$ represents a person's professional recognition conferred by the local government, which indicates the levels of proficiency in a field. We have information on two types of professional titles and use two dummies to represent them correspondingly: an advanced professional title is for someone with a title such as full or associate professor, advanced engineer, or chief accountant; and a middle-level professional title is for someone with a title such as a lecturer, assistant engineer, or assistant accountant. These professional levels are defined, reviewed, and conferred by the local government.[21] The left-out category is individuals with no professional titles.

Male$_i$ is a dummy for the male gender. Age could be a proxy for experience. We use a piecewise linear specification allowing for potentially different coefficients for individuals in different age brackets: (30, 40], (40, 50], and over 50. (Age is rounded up to the nearest integer.) The left-out category is individuals who are 30 years old or younger. *Hukou*$_i$ indicates individuals with local *hukou*.

Our sample consists of all 331,322 individuals from the 209,861 HPF mortgage loans. The basic results are in column 1 of Table 7. Let us start by discussing the control variables. All else being equal, men are better paid by about 23%, which is a pattern found in most countries. The positive coefficient for age is consistent with the notion that wages increase with experience. On the other hand, across different age brackets, we do not see a monotonic pattern in the coefficients. The coefficient for local *hukou* is negative; one possible explanation is that people without a local *hukou* may choose to work harder.

Education generates a wage premium that increases with the level of educational attainment, consistent with the notion that human capital matters. Relative to no high school diploma, people with a high school diploma, a three-year college degree, a four-year college degree, or a master's degree are paid 26%, 44%, 49%, and 92% more, respectively. Interestingly but perhaps not surprisingly, Ph.D. holders are paid slightly less than master's degree holders (though still better than college graduates).

[21]A complete list of titles and their corresponding levels can be found at http://baike.baidu.com/link?url=ncnzZsgqMMQ91qrYgsebuUdvt8oHL8vZlEgCSznn2pehIleLbmSQbquQN6Eq-iUZTkbYqbqFTSeHo5t5hJHJKYgP8nmtJdoSaJfijdC_V1ekitm_LtPmHxXJQhAW_P9.

Possessing a professional title also matters for wage levels. Individuals with advanced titles are better paid than those with mid-level professional titles, who, in turn, are paid better than those without any professional titles. In sum, the signs and the estimates of the coefficients for all the control variables are intuitively reasonable.

We now discuss the key regressors of interest. Relative to the people working outside the government, non-official civil servants are paid about 4% more. This increased pay is already conditional on one's age, gender, *hukou* status, educational attainment, and skill recognition. The positive premium holds for government officials at all ranks and, in fact, increases with the rank monotonically. For example, *fu ke* officials (Level I) are paid 8% more, but *zheng ju* officials (Level VI) are paid 31% more.

About a quarter of the people in the wage-regression sample applied for an HPF mortgage in their names without their spouses or sought to buy an affordable home instead of one from the commercial real estate market; these individuals are not in the housing-regression sample used for Table 2. Therefore, we include the dummy for whether the individual is in the home-value-regression sample in the wage regression. We also introduce its interaction terms with the dummy for non-official civil servants and the dummy for government officials. Their coefficients are reported at the bottom of Table 7. On average, non-government employees in the home-value-regression sample have a slightly higher wage (by about 4.5%) than those outside the sample, whereas government officials in the home-value-regression sample have a slightly lower wage (by about 2%, or 6.7%–4.5%) than their counterparts outside the housing-regression sample.

In column 2 of Table 7, we further include a set of bureau-type dummies for government officials. This inclusion does not change the basic features of the wage pattern. In particular, we find no evidence that government officials are poorly paid, given their education, professional titles, age, and gender.

Given this wage pattern, we conclude the unofficial incomes of officials should not be regarded as compensation for a low government salary. This finding suggests raising public-sector pay per se may not eliminate rent-seeking by officials. Admittedly, we cannot rule out differences in unobserved ability

between officials and non-officials.

4. Multi-City Evidence

We now apply our methodology to the CFPS data and estimate unofficial incomes by government employees in 99 cities around China between 2005 and 2018. We use this multi-city analysis to perform three tasks.

First, we check the external validity of our methodology, that is, whether we can uncover the existence of unofficial incomes in this multi-city sample too. The results are shown in column 1 of Table 8. The dependent variable is the floor area of the dwelling unit purchased. For the right-hand side, besides the dummy indicating households with government employees, we also control for the households' legal income, including all pre-tax incomes, such as wages and bonuses, ages for both husbands and wives, household size, *hukou* status, and the city and year fixed effects. The standard errors are two-way clustered at city and year.

The coefficients on both the dummy variable for households with someone in the government and household legal income are positive and statistically significant. According to the results, controlling for households' official incomes, household attributes, and market conditions, the dwelling units purchased by households with member(s) working in the government are 12.6% [=exp(0.119)-1] larger in floor area than those purchased by households without government employees. The results from the multi-city dataset confirm unofficial income is a prevalent phenomenon, not unique to the single-city sample.

CFPS provides relatively rich information on household attributes, enabling us to further rule out confounding factors. One potential factor that may invalidate the second key identifying assumption discussed in section 2.3 is that government officials might have more affluent parents. Although we cannot directly observe parental incomes or wealth, the CFPS dataset provides information on parents' education attainment (measured by their average educational years), which can arguably serve as the proxy for parental income/wealth. Additionally, CFPS provides information on the total number of

children in the household, including the number of sons. Wei, Zhang, and Liu (2017) point out that couples with (more) sons are willing to spend more on housing as a status/prestige good, in order to give their sons an advantage in the future marriage/dating market. In column 2, we further control for these three variables (parental educational years, number of children, and number of sons), and the results remain robust. Nevertheless, due to other non-child-related incentives, official households may still have a higher propensity to view housing as a status or prestige good. To further exclude this possibility, in column 1 of Appendix Table A-10, we replace the dependent variable with a dummy indicating car ownership, another major status/prestige good in China. The dummy indicating government-employee households is not significant. Similarly, in column 2, we replace the dependent variable with households' financial investments, including stocks, bonds, trusts, and so on. Again, the government-employee household dummy is not significant.

In the second task of the multi-city analysis, we check if the officials' estimated unofficial incomes are systematically larger in cities that are known (ex post) to have very corrupt top officials, which should help further bolster the case in which what we interpret as unofficial income is indeed associated with "under the table" (i.e., unreported) payments. Similar to Table 3, we separate cities into two categories: cities whose party chiefs or mayors were found to be corrupt in the aggressive anti-corruption campaign by the end of 2021 and cities where no corruption cases at the top were exposed. The idea is that cities with corrupt top leaders (rotten tops) are likely to have tolerated or even encouraged corruption at lower levels of the government (rotten bottoms). In that case, if estimated unofficial incomes are linked to corruption, they are likely to be bigger in cities with corrupt top officials.

In column 3 of Table 8, we add an interaction term between a dummy for households with a government-sector employee and a dummy for cities with exposed corruption at the top of the city government. Indeed, the coefficient of the interaction term is positive and statistically significant. These results support the interpretation that the estimated unofficial incomes are linked to corruption, instead of driven by confounding factors such as households' unobserved characteristics.

Third, we are curious about the effect of the anti-corruption campaign on government officials' unofficial incomes. Facing increasing concerns about corruption, the new central government launched

the anti-corruption campaign almost immediately after the turnover in November 2012. The campaign had two remarkable starting points. On December 4, 2012, the Politburo of the Chinese Communist Party (CCP) Central Committee issued the so-called "Eight-Point Stipulations" (*ba xiang gui ding*), which released the first strong public signal of strengthening the party disciplines about anti-corruption. An even clearer signal of the unprecedented nature of the anti-corruption campaign arrived about half a year later. On May 17, 2013, the Central Commission for Discipline Inspection (CCDI) of CCP announced the CCDI would start to conduct regular central inspections (*zhong yang xun shi*) in all the provinces, which aimed at collecting information on bribery, embezzlement, or other corruption activities. We can reasonably expect that, if the anti-corruption strategies in the campaign were effective in curbing bribery and other corruption activities, government officials would experience or expect a substantial shrinkage in their unofficial incomes after the anti-corruption campaign, especially when they witness the crackdown of local corrupt top leaders.

In column 4 of Table 8, we add an interaction term between a dummy for government-employee households and a dummy for housing units purchased after 2013 (i.e., when CCDI launched its regular central inspection scheme, arguably the clearest signal of the anti-corruption campaign). The interaction term is statistically significant and negative. As expected, the anti-corruption campaign significantly decreases the magnitude of government officials' unofficial incomes. In column 5, we investigate the effect of the campaign from another perspective—we introduce an interaction term between the government-employee household dummy and a dummy indicating the period after the first local leader (including the party chief, the mayor of the city, and the corresponding provincial-level officials) crackdown event of the city after the campaign. The coefficient suggests an even larger drop in the magnitude of the unofficial incomes after the crackdown events. In the last column, we add the interaction terms in columns 4 and 5 simultaneously in the regression and find only the latter one is significant, which further suggests the real anti-corruption consequences are more effective than a policy shock alone. These results not only further support the relationship between the imputed unofficial income and corruption, but also reveal the potential effect of anti-corruption measures in reining government officials' unofficial incomes.

5. Conclusion

By combining home purchase data and administrative records on legal wages and other household attributes, the paper proposes a framework to infer both the average magnitude of the unofficial incomes of officials and the proportion of officials who are likely to have unofficial incomes,. Applying the analysis to China between 2006 and 2013, we find a wedge between the actual home values of officials and what can be expected from their legal incomes. We find the gaps in information, skills, risks, or risk preference between households with and without government officials are unlikely to explain this wedge. We interpret the wedge as evidence of corruption-linked unofficial income by government officials.

The estimated unofficial income as a multiple of legal income tends to rise steeply with the rank of government officials. For example, whereas officials at the bottom of the rank of *fu ke* (Level I) have unofficial incomes that are 44% of their legal income, the most senior officials in the data at the rank of *zheng ju* (Level VI) may have unofficial incomes that are more than 424% of their legal income. We estimate that 13% of the officials may have unofficial incomes, and this proportion is also an increasing function of the officials' ranks. At the *zheng ju* level, 65% of the officials may take unofficial incomes.

We check if government officials receive a lower salary than their private-sector counterparts, based on education, age, and gender, and find this notion can be rejected in the data. We therefore conclude that unofficial incomes should not be regarded as compensation for a low government salary.

We corroborate the basic findings in a second, cross-city dataset. Again, government officials appear to have sizable unexplained incomes. Furthermore, in cities with top leaders who are subsequently arrested or indicted on major corruption charges, we find a higher level of unofficial income among local officials. This result suggests the estimated unofficial incomes are indeed linked to corruption. We also find the magnitude of unofficial incomes declines significantly after the anti-corruption campaign.

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Table 1: Features of Households by Type

	Percentage	Current Monthly Household Income (in thousand yuan RMB)	Current Monthly Household Expenditure (in thousand yuan RMB)	Current Household Financial Wealth (in thousand yuan RMB)	Current Household Debt (in thousand yuan RMB)	Current Homeownership	Value of Home Purchased (in thousand yuan RMB)
HHs with no one working in the government	89.13%	11.50 (6.62)	1.17 (16.86)	236.65 (450.19)	0.97 (23.24)	0.15 (0.36)	1108.94 (600.27)
HHs with non-official civil servants	5.88%	9.21 (3.96)	0.93 (1.92)	179.06 (352.42)	0.45 (11.34)	0.23 (0.42)	943.96 (536.05)
HHs with government officials	4.99%	10.24 (3.97)	1.02 (4.57)	249.29 (485.45)	1.16 (24.28)	0.41 (0.49)	973.60 (597.18)
Fu Ke level (Level I)	1.85%	9.38 (3.40)	0.94 (1.14)	211.45 (365.96)	0.90 (20.39)	0.33 (0.47)	922.05 (542.29)
Zheng Ke level (Level II)	1.94%	10.13 (3.74)	1.09 (7.10)	246.81 (491.98)	0.90 (16.10)	0.42 (0.49)	953.75 (555.24)
Fu Chu level (Level III)	1.07%	10.99 (3.74)	1.29 (9.68)	289.35 (535.98)	1.85 (37.70)	0.49 (0.50)	995.98 (602.10)
Zheng Chu level (Level IV)	0.36%	12.78 (4.28)	1.04 (1.08)	322.35 (723.85)	1.05 (20.74)	0.52 (0.50)	1218.44 (777.71)
Fu Ju level (Level V)	0.06%	14.89 (5.88)	1.02 (0.99)	294.32 (406.24)	0 (0)	0.41 (0.50)	1477.00 (803.19)
Zheng Ju level (Level VI)	0.02%	17.32 (11.93)	0.93 (0.77)	235.70 (475.45)	0 (0)	0.47 (0.52)	1952.66 (1856.02)

General Government Offices	1.42%	10.17 (4.26)	1.12 (8.38)	227.94 (462.48)	0.78 (14.50)	0.44 (0.50)	923.46 (571.18)
Police, Courts, and Procuratorate	1.74%	9.99 (3.44)	0.96 (0.95)	239.85 (448.84)	1.40 (26.54)	0.37 (0.48)	976.98 (581.98)
Financial Regulatory/Supervisory Offices	0.58%	10.40 (3.58)	0.97 (1.47)	275.61 (542.68)	2.34 (46.69)	0.46 (0.50)	990.56 (628.94)
Bureaus on Megaprojects	0.09%	10.94 (4.49)	1.09 (1.02)	252.25 (563.12)	0 (0)	0.43 (0.50)	1113.05 (707.74)
Bureaus on Economic Supervision	0.50%	10.31 (3.89)	1.62 (14.14)	244.06 (471.01)	3.05 (50.03)	0.44 (0.50)	981.25 (603.52)
Others	1.35%	10.40 (3.78)	0.97 (1.11)	255.80 (499.42)	0.64 (12.30)	0.40 (0.49)	977.88 (587.66)

Note: Standard deviations in parentheses; all the monetary variables are in real terms (2010 yuan).

Table 2: Evidence of Unofficial Income - Baseline Specification

Dependent variable = Log home value	(1)	(2)	(3)	(4)
With Non-official Civil Servant(s)	0.034***	0.033***	0.033***	0.034***
	(0.007)	(0.007)	(0.007)	(0.007)
With Government Official(s)	0.086***	-	-	-
	(0.009)	-	-	-
Fu Ke Official (Level I)	-	0.051***	-	0.028
	-	(0.013)	-	(0.017)
Zheng Ke Official (Level II)	-	0.085***	-	0.065***
	-	(0.009)	-	(0.011)
Fu Chu Official (Level III)	-	0.089***	-	0.073***
	-	(0.016)	-	(0.019)
Zheng Chu Official (Level IV)	-	0.141***	-	0.128***
	-	(0.028)	-	(0.030)
Fu Ju Official (Level V)	-	0.184***	-	0.165***
	-	(0.054)	-	(0.057)
Zheng Ju Official (Level VI)	-	0.231**	-	0.215*
	-	(0.105)	-	(0.108)
General Offices	-	-	0.061***	0.004
	-	-	(0.010)	(0.012)
Police, Courts, and Procuratorate	-	-	0.075***	0.026*
	-	-	(0.009)	(0.013)
Financial Regulatory/Supervisory	-	-	0.113***	0.067***
Offices	-	-	(0.018)	(0.019)
Bureaus on Megaprojects	-	-	0.116**	0.066*
	-	-	(0.040)	(0.038)
Bureaus on Economic Supervision	-	-	0.071***	0.020
	-	-	(0.014)	(0.015)
Other Bureaus	-	-	0.046***	-
	-	-	(0.012)	-
log(Life Time Income)_1	0.103***	0.102***	0.103***	0.101***
	(0.015)	(0.015)	(0.015)	(0.015)
log(Life Time Income)_2	0.145***	0.144***	0.145***	0.145***
	(0.021)	(0.021)	(0.021)	(0.021)
log(Life Time Income)_3	0.121***	0.121***	0.121***	0.121***
	(0.032)	(0.032)	(0.032)	(0.032)
log(Life Time Income)_4	0.030**	0.029**	0.029**	0.029**
	(0.013)	(0.013)	(0.013)	(0.013)
log(Life Time Income)_5	0.003	0.003	0.003	0.003
	(0.003)	(0.003)	(0.003)	(0.003)
Gender of Applicant	-0.004	-0.004	-0.004	-0.004
	(0.003)	(0.003)	(0.003)	(0.003)
Age between (30, 40] – Husband	0.068***	0.068***	0.068***	0.068***
	(0.005)	(0.005)	(0.005)	(0.005)
Age between (40, 50] – Husband	0.162***	0.162***	0.163***	0.161***
	(0.009)	(0.009)	(0.009)	(0.009)
Age over 50 – Husband	0.206***	0.204***	0.207***	0.204***
	(0.016)	(0.016)	(0.016)	(0.016)
Age between (30, 40] – Wife	0.072***	0.072***	0.072***	0.072***
	(0.005)	(0.005)	(0.005)	(0.005)
Age between (40, 50] – Wife	0.148***	0.147***	0.148***	0.146***
	(0.008)	(0.008)	(0.008)	(0.008)
Age over 50 – Wife	0.163***	0.161***	0.164***	0.161***

	(0.015)	(0.015)	(0.015)	(0.015)
Local *HUKOU*	0.010	0.011	0.010	0.011
	(0.007)	(0.007)	(0.007)	(0.007)
Only high school diploma – Husband	0.083***	0.083***	0.084***	0.083***
	(0.018)	(0.018)	(0.018)	(0.018)
3-year college but no higher – Husband	0.143***	0.143***	0.144***	0.142***
	(0.018)	(0.018)	(0.018)	(0.018)
4-year college but no higher– Husband	0.194***	0.194***	0.195***	0.193***
	(0.022)	(0.022)	(0.022)	(0.023)
Master's degree but no Ph.D. – Husband	0.235***	0.234***	0.236***	0.234***
	(0.026)	(0.026)	(0.026)	(0.026)
Ph.D. – Husband	0.238***	0.237***	0.239***	0.237***
	(0.023)	(0.023)	(0.023)	(0.023)
Only high school diploma – Wife	0.060***	0.060***	0.060***	0.060***
	(0.012)	(0.012)	(0.012)	(0.012)
3-year college but no higher – Wife	0.100***	0.100***	0.100***	0.100***
	(0.012)	(0.012)	(0.012)	(0.012)
4-year college but no higher– Wife	0.134***	0.133***	0.133***	0.133***
	(0.014)	(0.014)	(0.014)	(0.014)
Master's degree but no Ph.D. – Wife	0.153***	0.153***	0.153***	0.153***
	(0.016)	(0.016)	(0.016)	(0.016)
Ph.D. – Wife	0.153***	0.153***	0.153***	0.153***
	(0.018)	(0.018)	(0.018)	(0.018)
Advanced Professional Title – Husband	0.098***	0.098***	0.098***	0.098***
	(0.009)	(0.009)	(0.009)	(0.009)
Middle-Level Professional Title – Husband	0.046***	0.046***	0.046***	0.046***
	(0.007)	(0.007)	(0.007)	(0.007)
Advanced Professional Title – Wife	0.058***	0.057***	0.058***	0.057***
	(0.010)	(0.010)	(0.010)	(0.010)
Middle-Level Professional Title – Wife	0.033***	0.033***	0.034***	0.033***
	(0.008)	(0.008)	(0.008)	(0.008)
Working in CBD	0.075***	0.075***	0.075***	0.075***
	(0.009)	(0.009)	(0.009)	(0.009)
District-Time Fixed Effects	YES	YES	YES	YES
N	105836	105836	105836	105836
R^2	0.499	0.499	0.499	0.499

Note: (1) Both the home value and lifetime-income variables are winsorized at 1%; (2) the default group for age is below 30, no high school diploma, and no professional title; (3) standard errors two-way clustered at city and month are reported in parentheses; (4) * significant at the 90% level; ** significant at the 95% level; *** significant at the 99% level.

Table 3: Unofficial Incomes in Bureaus with Exposed Corrupt Chiefs

Dependent variable = Log home value	(1)	(2)	(3)	(4)
With Non-official Civil Servant(s)	0.034***	0.033***	0.033***	0.033***
	(0.007)	(0.007)	(0.007)	(0.007)
With Government Official(s)	0.083***	-	-	-
	(0.009)	-	-	-
With Government Official(s) in Bureaus with Corrupted Chiefs	0.088***	0.078***	0.085***	0.069***
	(0.019)	(0.019)	(0.020)	(0.020)
Fu Ke Official (Level I)	-	0.049***	-	0.028
	-	(0.013)	-	(0.017)
Zheng Ke Official (Level II)	-	0.083***	-	0.064***
	-	(0.009)	-	(0.011)
Fu Chu Official (Level III)	-	0.086***	-	0.072***
	-	(0.016)	-	(0.019)
Zheng Chu Official (Level IV)	-	0.137***	-	0.125***
	-	(0.028)	-	(0.030)
Fu Ju Official (Level V)	-	0.181***	-	0.163***
	-	(0.054)	-	(0.057)
Zheng Ju Official (Level VI)	-	0.228**	-	0.213*
	-	(0.105)	-	(0.107)
General Government Offices	-	-	0.058***	0.003
	-	-	(0.010)	(0.012)
Police, Courts, and Procuratorate	-	-	0.074***	0.026*
	-	-	(0.009)	(0.013)
Financial Regulatory/Supervisory Offices	-	-	0.108***	0.064***
	-	-	(0.018)	(0.018)
Bureaus on Megaprojects	-	-	0.114**	0.066
	-	-	(0.041)	(0.039)
Bureaus on Economic Supervision	-	-	0.070***	0.019
	-	-	(0.014)	(0.015)
Other Bureaus	-	-	0.045***	-
	-	-	(0.012)	-
log(Lifetime Income)_1	0.103***	0.102***	0.103***	0.101***
	(0.015)	(0.015)	(0.015)	(0.015)
log(Lifetime Income)_2	0.145***	0.144***	0.145***	0.145***
	(0.021)	(0.01)	(0.021)	(0.021)
log(Lifetime Income)_3	0.121***	0.121***	0.121***	0.121***
	(0.032)	(0.032)	(0.032)	(0.032)
log(Lifetime Income)_4	0.030**	0.030**	0.030**	0.030**
	(0.013)	(0.013)	(0.013)	(0.013)
log(Lifetime Income)_5	0.003	0.003	0.003	0.003
	(0.003)	(0.003)	(0.003)	(0.003)
N	105836	105836	105836	105836
R^2	0.499	0.499	0.499	0.499

Note: (1) Both home-value and lifetime-income variables are winsorized at 1%; (2) standard errors two-way clustered at city and month are reported in parentheses; (3) * significant at the 90% level; ** significant at the 95% level; *** significant at the 99% level; (4) all other control variables in Table 2 are also included here but not reported to save space.

Table 4: Robustness Checks: Permanent Income Calculations

	Considering the "revolving door" effect	Including the current unit in the dependent variable	Replacing imputed permanent income with underlying factors
	(1)	(2)	(3)
With Non-official Civil Servant(s)	0.034***	0.049***	0.026***
	(0.007)	(0.007)	(0.007)
Fu Ke Official (Level I)	0.025	0.056***	0.024
	(0.017)	(0.018)	(0.015)
Zheng Ke Official (Level II)	0.063***	0.081***	0.051***
	(0.011)	(0.010)	(0.010)
Fu Chu Official (Level III)	0.072***	0.102***	0.055***
	(0.020)	(0.019)	(0.016)
Zheng Chu Official (Level IV)	0.127***	0.117***	0.112***
	(0.031)	(0.037)	(0.027)
Fu Ju Official (Level V)	0.164**	0.108	0.151***
	(0.057)	(0.064)	(0.051)
Zheng Ju Official (Level VI)	0.214*	0.262*	0.182*
	(0.107)	(0.131)	(0.096)
General Government Offices	0.003	0.030*	-0.002
	(0.012)	(0.016)	(0.010)
Police, Courts, and Procuratorate	0.025*	0.035*	0.020
	(0.013)	(0.017)	(0.012)
Financial Regulatory/Supervisory Offices	0.067***	0.076***	0.053**
	(0.019)	(0.019)	(0.019)
Bureaus on Megaprojects	0.066*	0.087**	0.051
	(0.038)	(0.039)	(0.038)
Bureaus on Economic Supervision	0.019	0.041	0.010
	(0.015)	(0.025)	(0.016)
log(Lifetime Income)_1	0.101***	0.317***	-
	(0.015)	(0.028)	-
log(Lifetime Income)_2	0.146***	0.392***	-
	(0.022)	(0.053)	-
log(Lifetime Income)_3	0.122***	0.282***	-
	(0.030)	(0.053)	-
log(Lifetime Income)_4	0.030**	0.079**	-
	(0.013)	(0.034)	-
log(Lifetime Income)_5	0.003	-0.011**	-
	(0.003)	(0.005)	-
log(Husband's Current Income)	-	-	0.106***
	-	-	(0.005)
log(Wife's Current Income)	-	-	0.097***
	-	-	(0.005)
Husband's Previous Income Growth Rate	-	-	-0.040
	-	-	(0.025)
Wife's Previous Income Growth Rate	-	-	0.014
	-	-	(0.032)
Current Net Wealth	-	-	-0.010
	-	-	(0.006)

N	105836	105836	106117
R^2	0.499	0.459	0.518

Note: (1) Both home-value and lifetime-income variables are winsorized at 1%; (2) standard errors two-way clustered at city and month are reported in parentheses; (3) * significant at the 90% level, ** significant at the 95% level, *** significant at the 99% level; (4) all other control variables in Table 2 are also included here but not reported to save space.

Table 5: Robustness Checks: Other Household Attribute Differences

Dependent variable = Log home value	(1) With employees of public institutions as the comparison group	(2) With employees of SOEs as the comparison group	(3) With employees of public institutions or SOEs as the comparison group	(4) Considering officials' non-wage benefits
With Non-official Civil Servant(s)	0.052***	0.014	0.044***	0.033***
	(0.007)	(0.009)	(0.007)	(0.007)
Fu Ke Official (Level I)	0.054***	0.006	0.041***	0.028
	(0.015)	(0.016)	(0.015)	(0.017)
Zheng Ke Official (Level II)	0.090***	0.040***	0.075***	0.065***
	(0.009)	(0.013)	(0.010)	(0.011)
Fu Chu Official (Level III)	0.106***	0.047**	0.086***	0.073***
	(0.016)	(0.020)	(0.018)	(0.019)
Zheng Chu Official (Level IV)	0.162***	0.100***	0.139***	0.128***
	(0.028)	(0.027)	(0.029)	(0.030)
Fu Ju Official (Level V)	0.213***	0.158**	0.184**	0.165***
	(0.062)	(0.058)	(0.065)	(0.057)
Zheng Ju Official (Level VI)	0.244**	0.176*	0.233**	0.215*
	(0.102)	(0.098)	(0.105)	(0.108)
General Government Offices	0.000	-0.004	0.002	0.004
	(0.012)	(0.011)	(0.012)	(0.012)
Police, Courts, and Procuratorate	0.024*	0.028**	0.027**	0.026*
	(0.013)	(0.013)	(0.013)	(0.013)
Financial Regulatory/Supervisory Offices	0.069***	0.060***	0.068***	0.067***
	(0.020)	(0.020)	(0.020)	(0.019)
Bureaus on Megaprojects	0.068	0.051	0.062	0.066*
	(0.042)	(0.039)	(0.042)	(0.038)
Bureaus on Economic Supervision	0.019	0.015	0.018	0.020
	(0.016)	(0.017)	(0.016)	(0.015)
log(Lifetime Income)_1	0.087***	0.140***	0.115***	0.101***
	(0.015)	(0.012)	(0.015)	(0.015)
log(Lifetime Income)_2	0.118***	0.130***	0.131***	0.145***
	(0.023)	(0.027)	(0.019)	(0.021)
log(Lifetime Income)_3	0.115***	0.105***	0.118***	0.121***
	(0.039)	(0.055)	(0.031)	(0.032)
log(Lifetime Income)_4	0.035	0.057**	0.046**	0.029**
	(0.025)	(0.029)	(0.022)	(0.013)
log(Lifetime Income)_5	0.001	0.004	0.005	0.003
	(0.006)	(0.009)	(0.006)	(0.003)
N	43590	28602	56573	105836
R^2	0.550	0.551	0.540	0.499

Note: (1) Both home value and lifetime income variables are winsorized at 1%; (2) standard errors two-way clustered at city and month are reported in parentheses; (3) * significant at the 90% level, ** significant at the 95% level, *** significant at the 99% level; (4) all other control variables in Table 2 are also included here but not reported to save space.

Table 6: Robustness Checks: Market Conditions

	(1) Full Sample log(unit price)	(2) Full Sample log(unit size)	(3) New Units log(unit price)	(4) Full Sample Cumulative house-price growth in the following 12 months	(5) Full Sample log(home value)
With Non-official Civil Servant(s)	0.001	0.031***	0.000	0.156	0.013
	(0.002)	(0.007)	(0.003)	(0.350)	(0.008)
Fu Ke Official (Level I)	0.008	0.034***	0.004	-0.883*	0.013
	(0.007)	(0.010)	(0.011)	(0.482)	(0.013)
Zheng Ke Official (Level II)	0.014*	0.058***	-0.003	-0.174	0.049***
	(0.008)	(0.008)	(0.012)	(0.469)	(0.010)
Fu Chu Official (Level III)	0.010	0.073***	-0.025	-1.260	0.073***
	(0.007)	(0.012)	(0.023)	(0.837)	(0.016)
Zheng Chu Official (Level IV)	0.011	0.103***	-0.091	-0.023	0.098***
	(0.012)	(0.021)	(0.057)	(1.258)	(0.023)
Fu Ju Official (Level V)	0.009	0.145***	0.066	-0.636	0.177***
	(0.026)	(0.034)	(0.041)	(1.999)	(0.053)
Zheng Ju Official (Level VI)	-0.031	0.240**	-0.152**	-8.163*	0.183**
	(0.063)	(0.099)	(0.069)	(4.388)	(0.073)
General Government Offices	-0.010	0.004	-	1.772	0.007
	(0.007)	(0.010)	-	(1.053)	(0.011)
Police, Courts, and Procuratorate	0.004	0.012	-	0.407	0.019*
	(0.007)	(0.011)	-	(0.595)	(0.011)
Financial Regulatory/ Supervisory Offices	0.011	0.035**	-	1.324	0.046***
	(0.012)	(0.013)	-	(1.019)	(0.016)
Bureaus on Megaprojects	0.020	0.004	-	-3.496	0.023
	(0.019)	(0.033)	-	(2.167)	(0.032)
Bureaus on Economic Supervision	-0.012	0.012	-	0.689	0.010
	(0.009)	(0.015)	-	(1.117)	(0.015)
log(Lifetime Income)_1	0.038***	0.067***	0.014***	-0.350	0.125***
	(0.007)	(0.010)	(0.004)	(0.472)	(0.013)
log(Lifetime Income)_2	0.057***	0.096***	0.019	-0.399	0.146***
	(0.016)	(0.012)	(0.011)	(0.985)	(0.016)
log(Lifetime Income)_3	0.013	0.100***	0.009	-0.899	0.129***
	(0.011)	(0.030)	(0.011)	(1.727)	(0.029)
log(Lifetime Income)_4	0.022**	-0.001	0.005	0.400	0.031***
	(0.007)	(0.011)	(0.008)	(0.553)	(0.010)
log(Lifetime Income)_5	-0.000	-0.003	0.000	0.024	0.013***
	(0.001)	(0.002)	(0.002)	(0.102)	(0.003)
Interest Rate	-	-	-	-	-0.180***
	-	-	-	-	(0.025)
Loan-to-Value Ratio	-	-	-	-	-1.316***
	-	-	-	-	(0.037)
log(Length to Maturity)	-	-	-	-	0.334***
	-	-	-	-	(0.014)
Unit Attributes	Yes	No	Yes	Yes	Yes
Complex Fixed Effects	Yes	No	Yes	Yes	Yes

N	100271	105836	48996	89365	105836
R^2	0.859	0.247	0.936	0.714	0.664

Note: (1) Unit size, unit price, and lifetime-income variables are winsorized at 1%; (2) standard errors two-way clustered at city and month are reported in parentheses; (3) * significant at the 90% level, ** significant at the 95% level, *** significant at the 99% level; (4) all other control variables in Table 2 are also included here but not reported to save space.

Table 7: Are Officials Underpaid?

Dependent variable = Log monthly wage	(1)	(2)
With Non-official Civil Servant(s)	0.036	0.036
	(0.024)	(0.024)
Fu Ke Official (Level I)	0.078**	0.077**
	(0.028)	(0.029)
Zheng Ke Official (Level II)	0.168***	0.168***
	(0.030)	(0.029)
Fu Chu Official (Level III)	0.251***	0.252***
	(0.036)	(0.033)
Zheng Chu Official (Level IV)	0.236***	0.241***
	(0.036)	(0.036)
Fu Ju Official (Level V)	0.223***	0.226***
	(0.037)	(0.037)
Zheng Ju Official (Level VI)	0.312***	0.312***
	(0.023)	(0.032)
General Government Offices	-	0.005
	-	(0.032)
Police, Courts, and Procuratorate	-	0.003
	-	(0.014)
Financial Regulatory/Supervisory Offices	-	0.066**
	-	(0.024)
Bureaus on Megaprojects	-	-0.045*
	-	(0.026)
Bureaus on Economic Supervision	-	-0.070**
	-	(0.026)
Male	0.226***	0.226***
	(0.009)	(0.009)
Age between (30, 40]	0.151***	0.151***
	(0.008)	(0.008)
Age between (40, 50]	0.228***	0.228***
	(0.015)	(0.015)
Age over 50	0.283***	0.283***
	(0.026)	(0.026)
Local *HUKOU*	-0.108***	-0.108***
	(0.018)	(0.018)
With only a high-school diploma	0.257***	0.257***
	(0.017)	(0.017)
3-year college but no higher	0.438***	0.438***
	(0.019)	(0.019)
4-year college but no higher	0.688***	0.688***
	(0.026)	(0.026)
Master's degree but no Ph.D.	0.920***	0.920***
	(0.030)	(0.030)
Ph.D.	0.890***	0.890***
	(0.021)	(0.020)
Advanced professional title	0.212***	0.213***
	(0.015)	(0.015)
Middle-level professional title	0.091***	0.091***
	(0.012)	(0.012)
Included in the Home-Value Model * Non-	-0.052*	-0.052*

official Civil Servant(s)	(0.025)	(0.025)
Included in the Home-Value Model	-0.067**	-0.069**
*Government Official(s)	(0.027)	(0.027)
Included in the Home-Value Model	0.045*	0.045*
	(0.022)	(0.022)
Time Fixed Effect	Yes	Yes
N	335528	335528
R^2	0.147	0.147

Note: (1) Lifetime income is winsorized at 1%; (2) the default group for age is (21, 30], for education, is only with lower than high school level education; and for professional title, is without any profession title; (3) standard errors two-way clustered at city and month are reported in parentheses; (4) * significant at the 90% level; ** significant at the 95% level; *** significant at the 99% level.

Table 8: Multi-City Evidence Based on CFPS Data

Dependent variable = Log home size	(1)	(2)	(3)	(4)	(5)	(6)
With Government Employee(s)	0.119***	0.131**	0.064	0.161**	0.155***	0.162**
	(0.038)	(0.045)	(0.047)	(0.057)	(0.050)	(0.056)
With Government Employee(s) * CorruptCityChief	-		0.214**			
	-		(0.088)			
With Government Employee(s) * POST_Campaign	-			-0.173*		-0.056
	-			(0.096)		(0.068)
With Government Employee(s) * POST_Crackdown	-				-0.329**	-0.280**
	-				(0.129)	(0.103)
log(HouseholdIncome)	0.027*	0.028	0.027	0.028	0.028	0.028
	(0.014)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
local *HUKOU*	0.056	0.040	0.044	0.040	0.040	0.040
	(0.050)	(0.050)	(0.051)	(0.051)	(0.051)	(0.051)
HouseholdSize	0.037**	0.037**	0.037**	0.037**	0.037**	0.037**
	(0.013)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
Age between (30, 40]– Husband	0.033	0.053	0.053	0.053	0.051	0.051
	(0.049)	(0.050)	(0.049)	(0.050)	(0.051)	(0.051)
Age between (40, 50]– Husband	0.072**	0.079**	0.075**	0.079**	0.078**	0.078**
	(0.033)	(0.033)	(0.032)	(0.032)	(0.033)	(0.033)
Age over 50 – Husband	0.012	-0.026	-0.031	-0.027	-0.029	-0.029
	(0.033)	(0.032)	(0.034)	(0.033)	(0.033)	(0.033)
Age between (30, 40]– Husband	-0.089**	-0.063*	-0.067*	-0.061*	-0.061*	-0.061*
	(0.034)	(0.035)	(0.035)	(0.034)	(0.034)	(0.034)
Age between (40, 50] – Husband	-0.054	-0.026	-0.022	-0.026	-0.024	-0.024
	(0.043)	(0.041)	(0.041)	(0.041)	(0.041)	(0.041)
Age over 50 – Husband	-0.054	-0.022	-0.021	-0.021	-0.022	-0.022
	(0.037)	(0.039)	(0.038)	(0.039)	(0.039)	(0.039)
Children Number	-	-0.033**	-0.034**	-0.033*	-0.033**	-0.033**
	-	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
Son Number	-	0.033*	0.034*	0.033*	0.033*	0.033*
	-	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
Parents' Education Years	-	-0.005*	-0.005	-0.005	-0.005*	-0.005*
	-	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
City FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
N	1,935	1,717	1,717	1,717	1,717	1,717
R^2	0.392	0.403	0.405	0.404	0.404	0.404

Note: (1) Both the home area and household income variables are winsorized at 1%; (2) the default group for age is (21, 30]; (3) standard errors two-way clustered at city and year are reported in parentheses; (4) * significant at the 90% level; ** significant at the 95% level; *** significant at the 99% level.

Figure 1: Relationship between Lifetime Income and Home Value Purchased

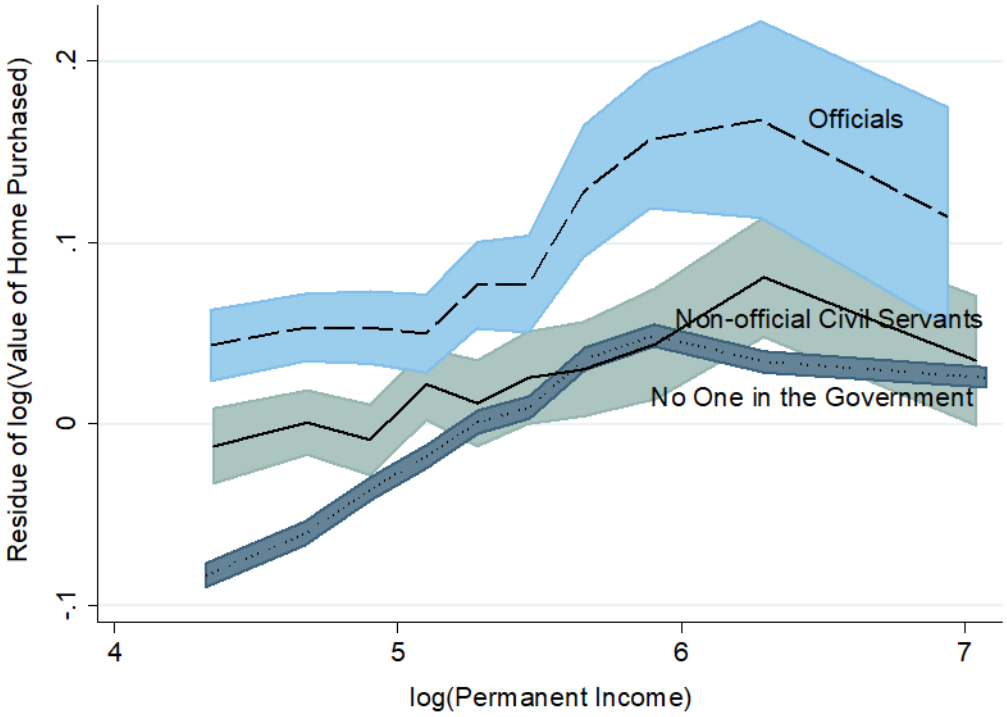


Figure 2: Mean Ratios of Unofficial to Official Incomes as a Function of Rank

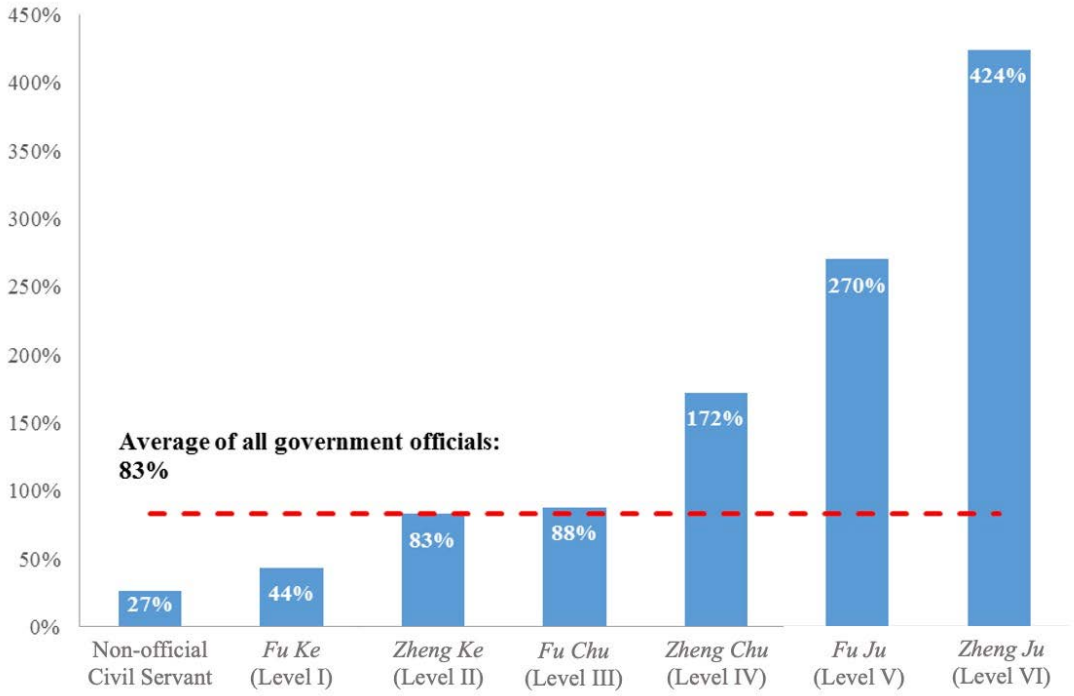


Figure 3: Distribution of Unofficial Income

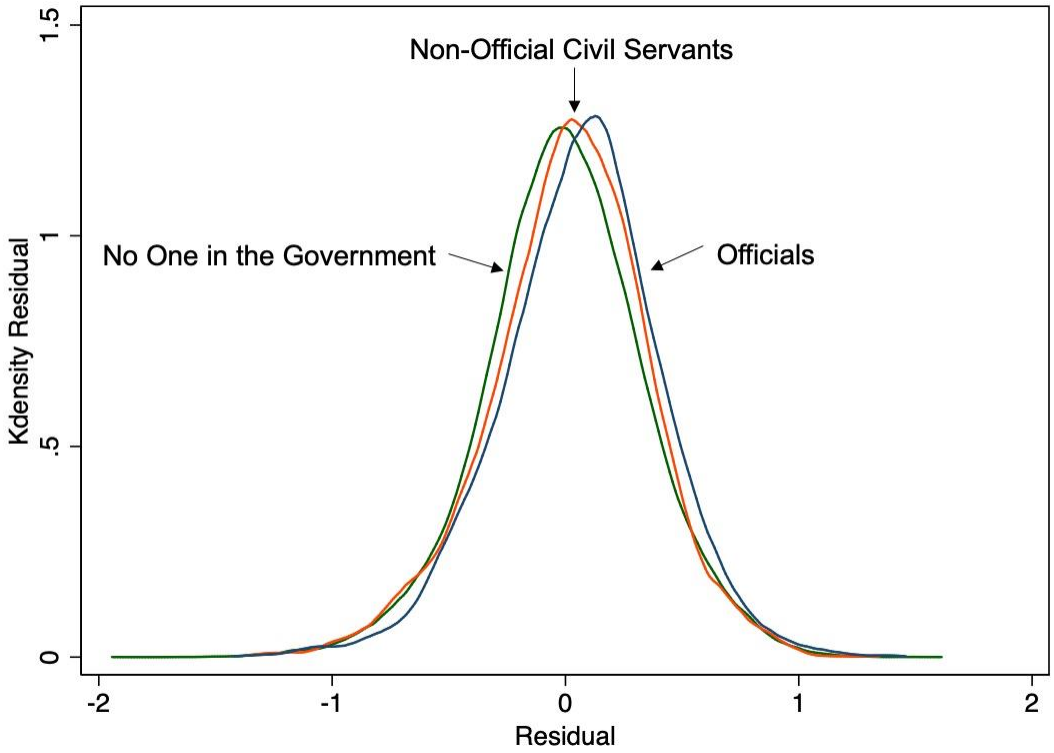


Figure 4: Distribution of Unofficial Income: By Rank

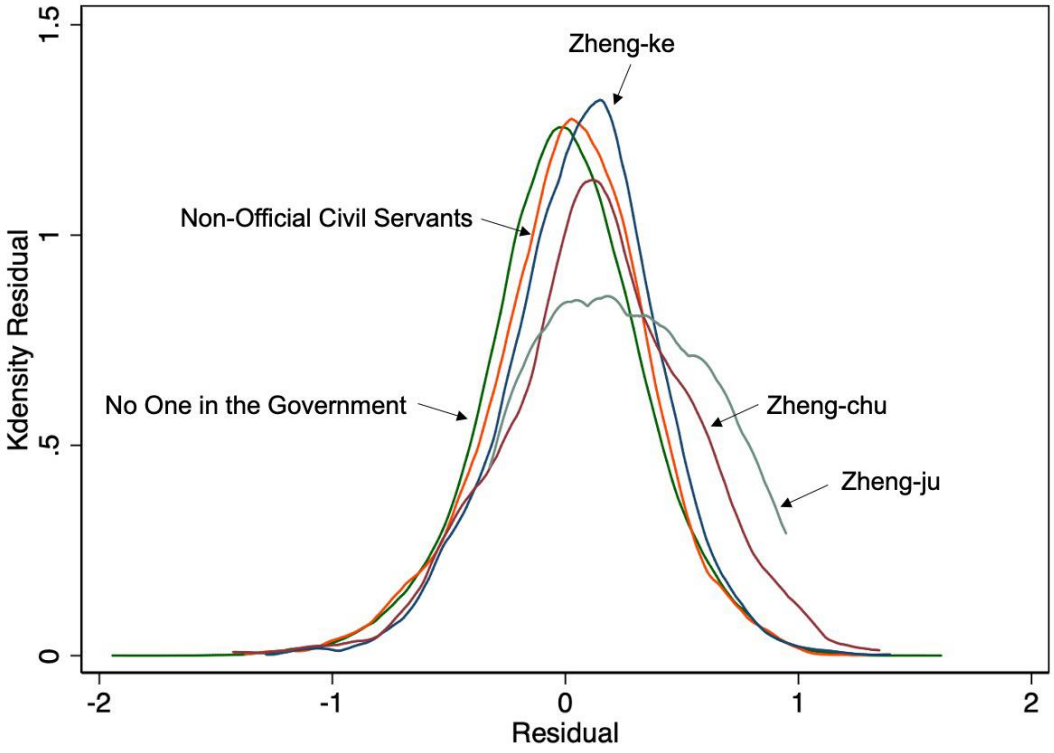
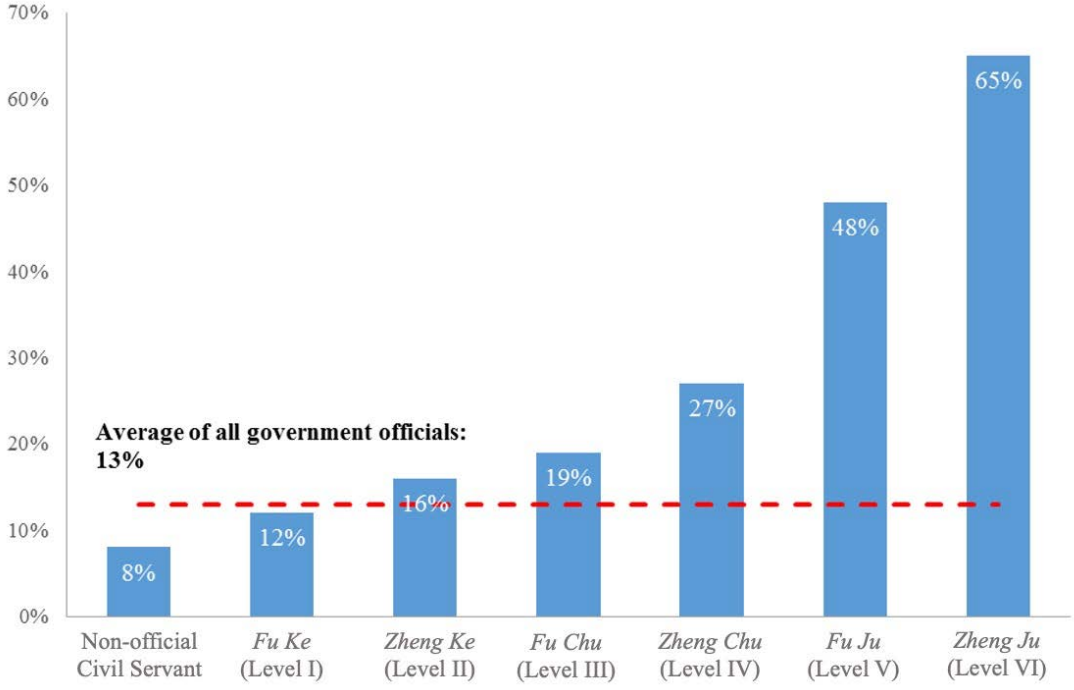


Figure 5: Imputed Proportions of Official Households with Unofficial Incomes



Secrets in Asset Purchases:
Estimating the Unofficial Income of Officials

Online Appendices

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Appendix A: Appendix Tables and Figures

Appendix Table A-1: Annual Sample Distribution

	Total	With No One Working in the Government	With Non-Official Civil Servants	With One Government Official	With Two Government Officials
2006	6573	5387 (81.96%)	550 (8.37%)	570 (8.67%)	66 (1.00%)
2007	5927	4574 (77.17%)	603 (10.17%)	671 (11.32%)	79 (1.33%)
2008	6194	5116 (82.60%)	498 (8.04%)	508 (8.20%)	72 (1.16%)
2009	16848	14535 (86.27%)	1141 (6.77%)	1043 (6.19%)	129 (0.77%)
2010	11266	9806 (87.04%)	714 (6.34%)	648 (5.75%)	98 (0.87%)
2011	9489	8813 (92.88%)	436 (4.59%)	226 (2.38%)	14 (0.15%)
2012	22697	21192 (93.37%)	936 (4.12%)	510 (2.25%)	59 (0.26%)
2013	28377	26275 (92.59%)	1438 (5.07%)	584 (2.06%)	80 (0.28%)
Total	107371	95698 (89.13%)	6316 (5.88%)	4760 (4.43%)	604 (0.56%)

Note: Share in parentheses.

Appendix Table A-2: Summary Statistics of Key Variables

	All Households		With Official		Without Civil Servant/Official	
	Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.
A. Transaction and Mortgage						
Total value of the unit (in thousand yuan RMB; in real terms of 2010)	1092.48	598.41	973.60	597.18	1108.94	600.27
Interest Rate (in %)			4.45	0.42	4.45	0.45
Loan-to-Value Ratio			0.57	0.17	0.62	0.16
Length to Maturity (in years)			19.74	7.35	23.02	7.09
B. Housing Attribute						
Floor level of the unit	6.76	5.34	6.44	4.98	6.80	5.38
Floor area of the unit (in square meters)	92.66	30.89	111.48	36.76	91.21	30.16
Unit price (in yuan per square meter; in real terms of 2010)	11671.29	5545.56	9008.51	5065.90	11956.97	5534.58
C. Household Characteristics						
Current reported monthly household income (in yuan RMB; in real terms of 2010)	11300.70	6410.87	10235.80	3967.31	11498.50	6618.53
Current reported monthly household consumption expenditures (in yuan RMB; in real terms of 2010)	1150.24	15956.08	1021.75	4570.64	1171.92	16859.26
Current reported household financial wealth (in thousand yuan RMB; in real terms of 2010)	233.89	447.09	249.29	485.45	236.65	450.19
Current reported household outstanding debt (in thousand yuan RMB; in real terms of 2010)	0.95	22.77	1.16	24.28	0.97	23.24
Current reported housing ownership (1=owning at least 1 unit; 0=o/w)	0.17	0.37	0.41	0.49	0.15	0.36
The applicant is male (1=yes; 0=o/w)	0.59	0.49	0.54	0.50	0.59	0.49
Age of the husband	34.63	6.92	40.33	7.05	34.25	6.73
Age of the wife	33.27	6.67	38.89	7.15	32.89	6.46
The household is with local *hukou* (1=yes; 0=o/w)	0.81	0.40	0.99	0.08	0.78	0.41
The husband has high school but no higher education (1=yes; 0=o/w)	0.14	0.35	0.11	0.31	0.14	0.35
The husband has a 3-year college degree but no higher education (1=yes; 0=o/w)	0.17	0.38	0.17	0.37	0.17	0.38
The husband has a 4-year college degree but no higher education (1=yes; 0=o/w)	0.46	0.50	0.58	0.49	0.45	0.50
The husband has a master's degree but no higher education (1=yes; 0=o/w)	0.18	0.38	0.12	0.32	0.18	0.39
The husband has a Ph.D. (1=yes; 0=o/w)	0.03	0.17	0.01	0.11	0.03	0.18
The wife has high school but no higher education (1=yes; 0=o/w)	0.14	0.35	0.17	0.38	0.14	0.34
The wife has a 3-year college degree but no higher education (1=yes; 0=o/w)	0.21	0.41	0.21	0.41	0.21	0.41
The wife has a 4-year college degree but no higher education (1=yes; 0=o/w)	0.46	0.50	0.51	0.50	0.46	0.50
The wife has a master's degree but no higher education (1=yes; 0=o/w)	0.16	0.36	0.09	0.28	0.17	0.37
The wife has a Ph.D. (1=yes; 0=o/w)	0.01	0.12	0.01	0.08	0.02	0.12
The husband has an advanced professional title (1=yes; 0=o/w)	0.06	0.23	0.05	0.22	0.06	0.24

The husband has a middle-level but no advanced professional title (1=yes; 0=o/w)	0.12	0.33	0.11	0.31	0.13	0.33
The wife has an advanced professional title (1=yes; 0=o/w)	0.04	0.19	0.05	0.22	0.04	0.19
The wife has a middle-level but no advanced professional title (1=yes; 0=o/w)	0.13	0.34	0.17	0.38	0.13	0.33
The husband or wife works in the central districts (1=yes; 0=o/w)	0.70	0.46	0.35	0.48	0.74	0.44

Appendix Table A-3: CFPS Data - Summary Statistics

VARIABLES	Explanation	N	Average	Std. Dev.	Min	Max
Home Size	Floor area of the unit (in square meters)	1,883	130.4	91.67	33	510
With Government Employee(s)	Either the husband or the wife is a government employee (1=yes; 0=no)	1,936	0.0702	0.256	0	1
CorruptCityChief	The prefectural-level chief in charge has already been cracked down until now (1=yes; 0=no)	1,936	0.332	0.471	0	1
POST_Campaign	The central inspections have been conducted (i.e., since 2014) (1=yes; 0=no)	1,936	0.206	0.405	0	1
POST_Crackdown	The prefectural-level or provincial-level chief has been cracked down (1=yes; 0=no)	1,936	0.0599	0.237	0	1
HouseholdIncome	Annual household income (in yuan RMB)	1,875	56,034	50,230	500	393,000
local HUKOU	The couple is with local hukou (1=yes; 0=no)	1,857	0.963	0.189	0	1
HouseholdSize	Number of household members	1,936	3.977	1.697	1	13
Age_husband	Age of the husband	1,690	47.71	13.97	21	86
Age_wife	Age of the wife	1,629	45.93	13.16	21	82
Children Number	Number of children	1,847	1.324	0.842	0	6
Son Number	Number of sons	1,936	0.846	0.762	0	6
Parents' Education Years	Education year of the couple's parents	1,823	4.058	3.606	0	16

Appendix Table A-4: Real Income Growth of Government Official Households

	2008	2009	2010	2011	2012	2013	Average
Full Sample	13.15%	20.35%	20.21%	17.07%	13.00%	10.36%	13.79%
	(25.17%)	(28.98%)	(31.29%)	(27.79%)	(24.55%)	(21.52%)	(8.36%)
HHs with no one working in the	14.17%	21.28%	21.21%	16.69%	13.42%	10.73%	14.24%
government	(26.32%)	(30.43%)	(32.69%)	(28.92%)	(25.49%)	(22.53%)	(8.75%)
HHs with non-official civil servants	8.38%	16.25%	15.43%	20.70%	10.98%	8.82%	12.46%
	(16.89%)	(18.55%)	(20.44%)	(19.31%)	(17.69%)	(12.88%)	(5.82%)
HHs with government officials	6.13%	13.01%	11.66%	18.53%	8.75%	6.44%	10.56%
	(14.57%)	(14.54%)	(15.96%)	(15.45%)	(13.26%)	(10.26%)	(4.75%)
Fu Ke level (Level I)	7.43%	14.92%	12.75%	20.57%	8.81%	7.31% (9.66%)	11.42%
	(15.36%)	(17.57%)	(15.48%)	(17.86%)	(13.67%)		(4.90%)
Zheng Ke level (Level II)	5.74%	12.49%	11.25%	18.00%	8.78%	5.94% (9.78%)	10.31%
	(15.06%)	(13.24%)	(16.77%)	(14.29%)	(11.78%)		(4.67%)
Fu Chu level (Level III)	3.99%	10.65%	9.84%	17.12%	7.93%	5.59%	9.34% (4.18%)
	(10.86%)	(9.86%)	(14.23%)	(12.29%)	(11.24%)	(11.94%)	
Zheng Chu level (Level IV)	4.45%	9.86%	8.60%	15.57%	6.19%	6.06% (8.24%)	8.39% (3.24%)
	(13.70%)	(10.17%)	(10.77%)	(9.90%)	(10.23%)		
Fu Ju level (Level V)	2.25% (8.46%)	9.20%	10.32%	11.51%	13.90%	6.31% (7.80%)	7.61% (2.82%)
		(12.48%)	(24.42%)	(10.48%)	(45.64%)		
Zheng Ju level (Level VI)	4.65% (9.25%)	11.49%	5.64% (3.50%)	8.80%	8.38% (8.92%)	2.74% (6.52%)	7.39% (3.94%)
		(13.07%)		(16.72%)			
General Government Offices	6.96%	13.41%	12.69%	18.27%	8.82%	5.52%	10.75%
	(14.64%)	(13.72%)	(13.18%)	(14.31%)	(14.73%)	(11.44%)	(4.78%)
Police, Courts, and Procuratorate	5.13%	13.15%	10.77%	19.66%	9.03%	6.37% (9.19%)	10.42%

	(13.32%)	(14.50%)	(15.54%)	(16.01%)	(11.91%)		(4.37%)
Financial Regulatory/Supervisory	4.93%	9.86%	9.92%	17.08%	8.49%	4.78% (8.61%)	9.22% (4.11%)
Offices	(11.61%)	(13.33%)	(12.00%)	(13.10%)	(10.99%)		
Bureaus on Megaprojects	5.56%	8.86%	11.95%	21.47%	7.81%	7.85% (7.18%)	10.31%
	(10.76%)	(10.77%)	(15.18%)	(17.15%)	(10.56%)		(4.64%)
Bureaus on Economic Supervision	6.07%	12.22%	10.92%	18.24%	7.14%	9.35%	10.61%
	(17.86%)	(14.70%)	(16.55%)	(13.71%)	(12.53%)	(11.70%)	(5.26%)
Others	6.52%	12.91%	11.49%	19.27%	8.30%	6.69% (8.76%)	10.62%
	(14.78%)	(14.02%)	(18.43%)	(16.07%)	(13.85%)		(4.83%)

Note: Standard deviations in parentheses; all the monetary variables are in real terms (2010 yuan).

Appendix Table A-5: Official Non-wage Benefits of Officials

	Average Value of All Urban Households	Average Value of Households Ranked in the Top 20% of Income
Medical Care	3192	5853
Central Heating	453	953
Pension Fund Contribution	2646	4803
Health Insurance Contribution	843	1578
Unemployment Insurance Contribution	153	366
Annual Aggregated Value	7287	13553
Monthly Value	607	1129

Source: Authors' calculations based on the statistics released by the National Bureau of Statistics, China.

Appendix Table A-6: Two versus One Official in a Household

Dependent variable = Log home value	(1)	(2)
With Non-official Civil Servant(s)	0.034***	0.034***
	(0.007)	(0.007)
With Two Government Officials	0.125***	0.125***
	(0.018)	(0.018)
With One Government Official	0.081***	-
	(0.008)	-
With Husband as Government Official	-	0.081***
	-	(0.009)
With Wife as Government Official	-	0.082***
	-	(0.016)
log(Life Time Income)_1	0.102***	0.102***
	(0.015)	(0.015)
log(Life Time Income)_2	0.144***	0.144***
	(0.021)	(0.021)
log(Life Time Income)_3	0.121***	0.121***
	(0.032)	(0.032)
log(Life Time Income)_4	0.030**	0.030**
	(0.013)	(0.013)
log(Life Time Income)_5	0.003	0.003
	(0.003)	(0.003)
N	105836	105836
R^2	0.499	0.499

Note: (1) Both home-value and lifetime-income variables are winsorized at 1%; (2) standard errors two-way clustered at city and month are reported in parentheses; (3) * significant at the 90% level, ** significant at the 95% level, *** significant at the 99% level; (4) all other control variables in Table 2 are also included here but not reported to save space.

Appendix Table A-7: Difference in Mortgage Terms

	(1) Interest Rate	(2) Loan-to-Value Ratio	(3) log(Length to Maturity)
With Non-Official Civil Servant(s)	0.006**	0.020**	-0.011***
	(0.003)	(0.008)	(0.003)
Fu Ke Official (Level I)	0.002	0.027**	-0.005
	(0.006)	(0.013)	(0.006)
Zheng Ke Official (Level II)	0.003	0.047**	-0.000
	(0.006)	(0.018)	(0.007)
Fu Chu Official (Level III)	-0.003	0.018	0.005
	(0.006)	(0.019)	(0.008)
Zheng Chu Official (Level IV)	-0.010	-0.003	-0.022*
	(0.009)	(0.025)	(0.011)
Fu Ju Official (Level V)	-0.046	-0.030	0.008
	(0.029)	(0.060)	(0.018)
Zheng Ju Official (Level VI)	-0.035	-0.124	-0.051
	(0.067)	(0.096)	(0.040)
General Government Offices	-0.010	-0.052**	-0.010**
	(0.008)	(0.020)	(0.004)
Police, Courts, and Procuratorate	-0.001	-0.002	-0.006
	(0.006)	(0.019)	(0.006)
Financial Regulatory/Supervisory Offices	0.000	-0.005	-0.017*
	(0.010)	(0.024)	(0.009)
Bureaus on Megaprojects	-0.014	0.016	-0.027
	(0.020)	(0.039)	(0.020)
Bureaus on Economic Supervision	0.001	0.003	-0.007
	(0.007)	(0.021)	(0.010)
log(Lifetime Income)_1	-0.009**	-0.072***	0.001
	(0.004)	(0.016)	(0.006)
log(Lifetime Income)_2	0.012*	-0.035**	-0.009
	(0.006)	(0.016)	(0.008)
log(Lifetime Income)_3	0.007	-0.053*	-0.008
	(0.007)	(0.022)	(0.008)
log(Lifetime Income)_4	0.012*	0.000	-0.001
	(0.006)	(0.012)	(0.005)
log(Lifetime Income)_5	-0.009***	-0.001	0.009***
	(0.002)	(0.003)	(0.002)
N	105836	105836	105836
R^2	0.889	0.252	0.172

Note: (1) Standard errors two-way clustered at city and month are reported in parentheses; (2) * significant at the 90% level, ** significant at the 95% level, *** significant at the 99% level; (3) all other control variables in Table 2 are also included here but not reported to save space.

Appendix Table A-8: Results Based on Raw (Unwinsorized) Data

Dependent variable = Log home value	(1)	(2)	(3)	(4)
With Non-official Civil Servant(s)	0.035***	0.035***	0.035***	0.035***
	(0.007)	(0.007)	(0.007)	(0.007)
With Government Official(s)	0.090***	-	-	-
	(0.010)	-	-	-
Fu Ke Official (Level I)	-	0.053***	-	0.030*
	-	(0.013)	-	(0.017)
Zheng Ke Official (Level II)	-	0.088***	-	0.067***
	-	(0.009)	-	(0.011)
Fu Chu Official (Level III)	-	0.093***	-	0.077***
	-	(0.017)	-	(0.021)
Zheng Chu Official (Level IV)	-	0.148***	-	0.134***
	-	(0.030)	-	(0.031)
Fu Ju Official (Level V)	-	0.181***	-	0.162**
	-	(0.054)	-	(0.058)
Zheng Ju Official (Level VI)	-	0.334**	-	0.317*
	-	(0.155)	-	(0.159)
General Government Offices	-	-	0.064***	0.005
	-	-	(0.010)	(0.011)
Police, Courts, and Procuratorate	-	-	0.078***	0.027*
	-	-	(0.010)	(0.014)
Financial Regulatory/Supervisory	-	-	0.117***	0.069***
Offices	-	-	(0.019)	(0.020)
Bureaus on Megaprojects	-	-	0.121**	0.068
	-	-	(0.043)	(0.041)
Bureaus on Economic Supervision	-	-	0.074***	0.020
	-	-	(0.016)	(0.017)
Other Bureaus	-	-	0.049***	-
	-	-	(0.013)	-
log(Lifetime Income)_1	0.082***	0.081***	0.082***	0.081***
	(0.013)	(0.013)	(0.013)	(0.013)
log(Lifetime Income)_2	0.136***	0.135***	0.136***	0.136***
	(0.022)	(0.022)	(0.022)	(0.022)
log(Lifetime Income)_3	0.121***	0.121***	0.120***	0.120***
	(0.031)	(0.031)	(0.031)	(0.031)
log(Lifetime Income)_4	0.029**	0.029**	0.029**	0.029**
	(0.012)	(0.012)	(0.013)	(0.013)
log(Lifetime Income)_5	0.004	0.004	0.004	0.004
	(0.003)	(0.003)	(0.003)	(0.003)
N	105782	105782	105782	105782
R^2	0.496	0.496	0.496	0.496

Note: (1) Standard errors two-way clustered at city and month are reported in parentheses; (2) * significant at the 90% level, ** significant at the 95% level, *** significant at the 99% level; (3) all other control variables in Table 2 are also included here but not reported to save space.

Appendix Table A-9: Non-linear Income Terms and Propensity Score Matching

Dependent variable = Log home value	(1) Linear term of lifetime income	(2) Square term of lifetime income	(3) Square and cubic terms of lifetime income	(4) Interaction terms between husband's age cohort and lifetime income	(5) Interaction terms between wife's age cohort and lifetime income	(6) Propensity score matching
With Non-official Civil Servant(s)	0.034***	0.032***	0.031***	0.036***	0.036***	0.043**
	(0.008)	(0.007)	(0.008)	(0.005)	(0.005)	(0.019)
Fu Ke Official (Level I)	0.028*	0.027*	0.026	0.030***	0.032***	0.025**
	(0.015)	(0.015)	(0.016)	(0.011)	(0.011)	(0.011)
Zheng Ke Official (Level II)	0.063***	0.063***	0.062***	0.073***	0.077***	0.069***
	(0.011)	(0.010)	(0.011)	(0.011)	(0.011)	(0.013)
Fu Chu Official (Level III)	0.073***	0.070***	0.069***	0.086***	0.086***	0.106***
	(0.018)	(0.018)	(0.018)	(0.013)	(0.013)	(0.021)
Zheng Chu Official (Level IV)	0.133***	0.125***	0.124***	0.139***	0.139***	0.137***
	(0.029)	(0.028)	(0.028)	(0.030)	(0.031)	(0.029)
Fu Ju Official (Level V)	0.169***	0.160***	0.158**	0.169***	0.180***	0.209***
	(0.054)	(0.054)	(0.057)	(0.043)	(0.044)	(0.052)
Zheng Ju Official (Level VI)	0.226**	0.211**	0.208**	0.228***	0.230***	0.265**
	(0.101)	(0.098)	(0.098)	(0.081)	(0.081)	(0.123)
General Government Offices	0.005	0.004	0.004	0.006	0.004	-0.014
	(0.011)	(0.011)	(0.011)	(0.013)	(0.013)	(0.014)
Police, Courts, and Procuratorate	0.026**	0.026**	0.025*	0.029**	0.026**	0.014
	(0.012)	(0.012)	(0.013)	(0.012)	(0.012)	(0.010)
Financial Regulatory/ Supervisory Offices	0.067***	0.065***	0.065***	0.071***	0.067***	0.047*
	(0.017)	(0.018)	(0.018)	(0.017)	(0.017)	(0.024)
Bureaus on Megaprojects	0.069*	0.067	0.067	0.067*	0.063*	0.102*
	(0.037)	(0.039)	(0.039)	(0.036)	(0.036)	(0.046)
Bureaus on Economic Supervision	0.018	0.019	0.019	0.023	0.020	0.024
	(0.015)	(0.015)	(0.016)	(0.017)	(0.017)	(0.025)
log(Lifetime Income)	0.045***	0.309***	0.500***	-	-	-
	(0.004)	(0.029)	(0.086)	-	-	-
log(Lifetime Income)^2	-	-0.021***	-0.054***	-	-	-
	-	(0.002)	(0.013)	-	-	-
log(Lifetime Income)^3	-	-	0.002**	-	-	-
	-	-	(0.001)	-	-	-
log(Lifetime	-	-	-	0.046***	0.049***	0.122***

Income)_1						
	-	-	-	(0.007)	(0.007)	(0.024)
log(Lifetime Income)_2	-	-	-	0.130***	0.138***	0.082
	-	-	-	(0.024)	(0.022)	(0.065)
log(Lifetime Income)_3	-	-	-	0.068**	0.087***	0.020
	-	-	-	(0.027)	(0.025)	(0.079)
log(Lifetime Income)_4	-	-	-	0.012	0.004	0.091*
	-	-	-	(0.017)	(0.016)	(0.044)
log(Lifetime Income)_5	-	-	-	0.014***	0.010***	-0.052*
	-	-	-	(0.004)	(0.003)	(0.029)
Interaction terms between husband's age cohorts and lifetime income piecewise	No	No	No	Yes	No	No
Interaction terms between wife's age cohorts and lifetime income piecewise	No	No	No	No	Yes	No
N	105836	105836	105836	105836	105836	7962
R^2	0.494	0.498	0.498	0.497	0.496	0.603

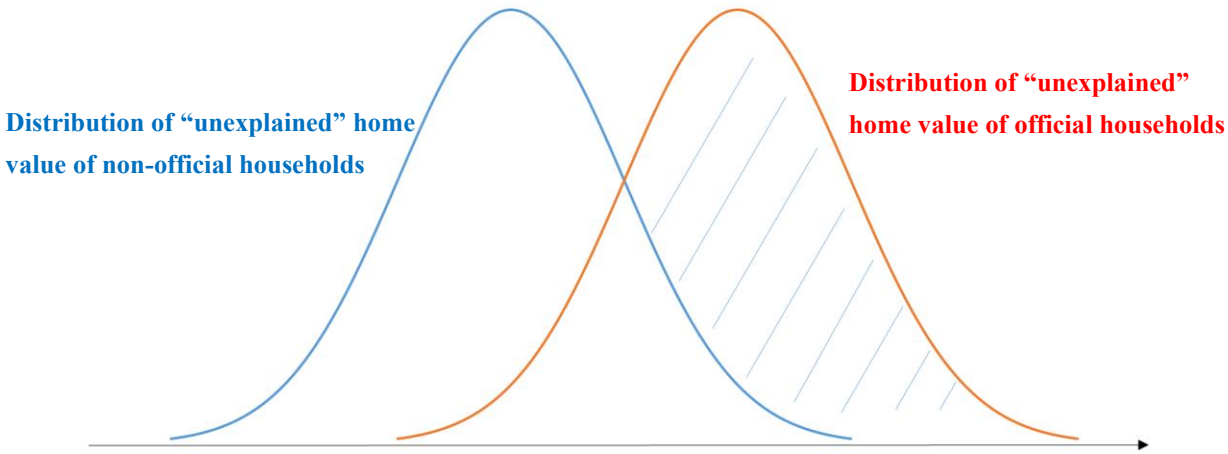
Note: (1) Both home-value and income variables are winsorized at 1%; (2) standard errors two-way clustered at city and month are reported in parentheses; (3) * significant at the 90% level, ** significant at the 95% level, *** significant at the 99% level; (4) all other control variables in Table 2 are also included here but not reported to save space.

Appendix Table A-10: Other Robustness Checks Based on CFPS Data

	(1)	(2)
	If_car	ln(FinancialInvestments)
With Government Official(s)	-0.019	-0.071
	(0.046)	(0.207)
log(HouseholdIncome)	0.049***	0.313***
	(0.007)	(0.071)
local *HUKOU*	-0.006	0.261
	(0.071)	(0.285)
HouseholdSize	0.009	-0.049
	(0.011)	(0.066)
Age between (30, 40] – Husband	0.041	0.296
	(0.034)	(0.311)
Age between (40, 50] – Husband	-0.053	0.302
	(0.044)	(0.223)
Age over 50 – Husband	0.023	0.197
	(0.049)	(0.188)
Age between (30, 40] – Wife	0.030	0.241
	(0.043)	(0.224)
Age between (40, 50] – Wife	0.087**	0.134
	(0.040)	(0.191)
Age over 50 – Wife	-0.014	0.386*
	(0.034)	(0.185)
Children Number	0.007	-0.142*
	(0.016)	(0.070)
Son Number	0.007	0.099
	(0.013)	(0.075)
Parents' Education Years	0.009**	0.078***
	(0.004)	(0.021)
City FE	YES	YES
Year FE	YES	YES
N	1,484	1,756
R^2	0.264	0.208

Note: (1) Both the financial investment and household income variables are winsorized at 1%; (2) the default group for age is (21, 30]; (3) standard errors two-way clustered at city and year are reported in parentheses; (4) * significant at the 90% level; ** significant at the 95% level; *** significant at the 99% level.

Appendix Figure A-1: Illustrative Graph on the Method for Imputing Portion of Official Households with Unofficial Incomes



Appendix B: Alternative Measures of Permanent Income

In the baseline estimation in Table 2, we compute the permanent income of a household based on a number of assumptions: (a) future real annual income growth to retirement that is half of the realized real annual income growth in the period between 2006 and 2013, (b) a discount rate of 5%, (c) a retirement age of 60 for men and 55 (or 50) for educated (or less educated) women, and (d) a (uniform) life expectancy of 80 years for men and 84 years for women at the time of home purchase. Finally, we incorporate self-reported gross financial assets, gross debt, and the market value of the houses already owned at the time of home purchase when computing a household's lifetime income. The average and median household lifetime incomes in the baseline case are reported in panel A of Appendix Table B-1. We now check the sensitivity of the main conclusions to variations in each of these assumptions.

We first vary the assumption of future income growth. In panel B of Appendix Table B-1, we assume the future annual income growth is only a third of the growth realized between 2006 and 2013 (i.e., slower than the baseline case). Unsurprisingly, as a result, household lifetime incomes (and therefore their annuity, permanent household incomes) are smaller than in the baseline. In panel C of Appendix Table B-1, future income is assumed to grow at the same pace as during 2006–2013 (i.e., faster than the baseline case). As a result, household lifetime income is higher than in the baseline case.

We redo the regressions in Table 2 with the new measures of permanent household income and report the results in Appendix Table B-2. Although the point estimates change from those in Table 2, some crucial features do not. In particular, the coefficients on the dummies for households with non-official civil servants and households with officials of different ranks are all positive and statistically significant. Moreover, the coefficients increase monotonically as the official rank increases. Therefore, the evidence of unofficial income is still statistically significant, and unofficial incomes still tend to increase with rank. We can easily verify that the proportion of official households with an unofficial income estimated under the two methods also increases with the bureaucratic rank of the officials. In this sense, the main conclusions are

robust to alternative assumptions about future income growth.

In panels D and E of Appendix Table B-1, we experiment with two different discount rates, 3% and 10%, respectively, which are below and above the assumed rate in the baseline case, respectively. The corresponding regression results are reported in panel B of Appendix Table B-2. Again, the main conclusion from the baseline case survives with the alternative assumptions of the discount rate.

The baseline calculation of lifetime resources takes into account both the net financial assets reported by the household and the imputed market values of apartment units already owned, in addition to lifetime labor income. As indicated in Appendix Table A-2, on average, households report gross financial assets in the order of 233,890 yuan (in the 2010 price) and almost no financial debt (other than the mortgage for which it is applying), and 17% of households own other dwelling units before the current home purchase. Unlike the labor income in the database, which is verified by the government pension scheme, self-reported gross financial assets, debt, and homeownership are not verified by a third party. Measurement errors could be an issue for these variables. To check the sensitivity of the results, we recompute lifetime income based solely on current and future labor income and ignore self-reported financial assets, debt, and homeownership. Some summary statistics of the recomputed lifetime incomes are reported in panel F of Appendix Table B-1; the regression results are reported in the first two columns of Appendix Table B-2, panel C. We find the main conclusions regarding the existence of unofficial incomes and the gradient of unofficial income as a function of official rank are not sensitive to the omission of assets and debt.

In computing lifetime income, we can also subtract consumption expenditure from income in each year. The summary statistics for the new measure of lifetime income are reported in panel G of Appendix Table B-1, whereas the new regression results are reported in columns 3 and 4 of Appendix Table B-2, panel C. Again, the main conclusions are unchanged.

In panel H of Appendix Table B-1, we vary the assumption on retirement age. Senior

officials at the *minister* level or above (for both men and women) retire at 65. The assumption that all officials can expect to rise to such a level and retire at 65 would boost the lifetime legal income of official households.[1] Keeping the retirement age for non-official households constant tends to increase the lifetime income of official households relative to other households and rationalizes the purchase of a somewhat more expensive home for the former group of households. These assumptions are not realistic and may exaggerate the differences in legal lifetime income between the two types of households. In panel H, we adopt these extreme assumptions. Not surprisingly, the permanent incomes for the official households become larger. Nonetheless, this new assumption on retirement age is not quantitatively big enough to change the main conclusions (see the results in columns 1 and 2 of Appendix Table B-2, panel D).

Finally, based on the *Life Insurance Mortality Table* issued by the China Insurance Regulatory Commission, we allow life expectancy to vary with the age of home purchasers in panel G of Appendix Table B-1. This modification affects household permanent-income measures relatively modestly and does not affect the main results either (columns 3 and 4 of Appendix Table B-2, panel D). As a sensitivity check, we also use the average life expectancy for home purchasers (80 for men and 84 for women). Again, the results are basically the same.

[1] This scenario also applies to the assumption that government officials expect, based on their social networks, to be rehired after retirement by some public institutions or even private firms. Such social networks typically disappear quickly after officials' retirement, and the People Daily (May 25, 2015) describes such a phenomenon as "the tea cools down as soon as the person is gone," or "*ren zou cha liang*." We can reasonably expect such rehiring, if it existed, would not last for more than five years.

Appendix Table B-1: Alternative Measures of Lifetime Income (in thousand RMBs)

	Average	Std. Dev.	Median
A. Basic assumptions: Half of realized income growth rate between 2008 and2013; discount rate of 5%; including current net wealth; men retiring at 60 and women at 55 or 50; life expectancy is 80 for men and 84 for women; not considering consumption expenditures			
HHs with no one working in the government	559.97	1056.41	227.60
HHs with non-official civil servants	265.53	484.79	158.32
HHs with government officials	185.18	235.24	144.82
B. 1/3 of realized income growth rate			
HHs with no one working in the government	320.86	544.05	179.81
HHs with no-official civil servants	172.00	217.91	130.02
HHs with government officials	151.57	139.15	128.44
C. Following the realized income growth rate			
HHs with no one working in the government	1374.95	2043.72	469.68
HHs with non-official civil servants	783.70	1347.04	289.46
HHs with government officials	377.71	667.83	207.90
D. Discount rate of 3%			
HHs with no one working in the government	584.78	1201.08	206.31
HHs with non-official civil servants	260.93	544.57	141.39
HHs with government officials	165.73	252.91	124.64
E. Discount rate of 10%			
HHs with no one working in the government	455.53	652.72	253.13
HHs with non-official civil servants	255.32	313.12	181.73
HHs with government officials	222.42	184.23	182.28
F. Not considering current net wealth			
HHs with no one working in the government	534.30	1057.40	196.65
HHs with non-official civil servants	240.17	484.53	130.07
HHs with government officials	144.26	231.39	105.57
G. Considering consumption expenditures			
HHs with no one working in the government	298.16	880.18	164.86
HHs with non-official civil servants	164.00	405.33	118.63
HHs with government officials	140.36	195.65	116.15

H. Later retirement for officials			
HHs with no one working in the government	560.03	1056.73	227.60
HHs with non-official civil servants	265.53	484.85	158.32
HHs with government officials	212.00	300.63	161.68
I. Changing life expectancy over age			
HHs with no one working in the government	558.83	1054.94	226.95
HHs with non-official civil servants	264.84	484.19	157.77
HHs with government officials	184.86	234.85	143.95

Appendix Table B-2: Unofficial Incomes under Alternative Measures of Permanent Incomes

A. With different assumptions about income growth rate

Dependent variable = Log home value	1/3 of realized income growth rate		100% of realized income growth rate	
	(1)	(2)	(3)	(4)
With Non-official Civil Servant(s)	0.036***	0.037***	0.026***	0.026***
	(0.006)	(0.007)	(0.008)	(0.008)
Fu Ke Official (Level I)	0.052***	0.030*	0.043***	0.021
	(0.011)	(0.015)	(0.013)	(0.016)
Zheng Ke Official (Level II)	0.082***	0.063***	0.082***	0.062***
	(0.009)	(0.011)	(0.010)	(0.011)
Fu Chu Official (Level III)	0.085***	0.070***	0.091***	0.076***
	(0.016)	(0.019)	(0.015)	(0.019)
Zheng Chu Official (Level IV)	0.137***	0.125***	0.144***	0.132***
	(0.027)	(0.028)	(0.027)	(0.029)
Fu Ju Official (Level V)	0.183***	0.165***	0.182***	0.163***
	(0.053)	(0.055)	(0.053)	(0.055)
Zheng Ju Official (Level VI)	0.228**	0.212*	0.239**	0.222**
	(0.104)	(0.106)	(0.100)	(0.101)
General Government Offices	-	0.003	-	0.004
	-	(0.011)	-	(0.012)
Police, Courts, and Procuratorate	-	0.027**	-	0.024*
	-	(0.012)	-	(0.012)
Financial Regulatory/Supervisory	-	0.064***	-	0.069***
Offices	-	(0.020)	-	(0.017)
Bureaus on Megaprojects	-	0.065	-	0.068*
	-	(0.039)	-	(0.037)
Bureaus on Economic Supervision	-	0.019	-	0.020
	-	(0.015)	-	(0.016)
log(Lifetime Income)_1	0.112***	0.112***	0.080***	0.080***
	(0.016)	(0.016)	(0.012)	(0.012)
log(Lifetime Income)_2	0.161***	0.161***	0.082***	0.082***
	(0.029)	(0.029)	(0.016)	(0.016)
log(Lifetime Income)_3	0.168***	0.168***	-0.018	-0.018
	(0.031)	(0.031)	(0.015)	(0.015)
log(Lifetime Income)_4	0.140***	0.140***	-0.014	-0.014
	(0.029)	(0.030)	(0.010)	(0.010)
log(Lifetime Income)_5	-0.015***	-0.015***	0.049***	0.048***
	(0.004)	(0.004)	(0.005)	(0.005)
N	105836	105836	105836	105836
R^2	0.504	0.504	0.493	0.493

Note: (1) Both home-value and lifetime-income variables are winsorized at 1%; (2) standard errors two-way clustered at city and month are reported in parentheses; (3) * significant at the 90% level, ** significant at the 95% level, *** significant at the 99% level; (4) all other control variables in Table 2 are also included here but not reported to save space.

B. With different discount rates

Dependent variable =	Discount rate = 3%		Discount rate = 10%	
Log home value	(1)	(2)	(3)	(4)
With Non-official Civil Servant(s)	0.032***	0.032***	0.035***	0.035***
	(0.007)	(0.007)	(0.007)	(0.007)
Fu Ke Official (Level I)	0.050***	0.028*	0.051***	0.029*
	(0.012)	(0.016)	(0.011)	(0.015)
Zheng Ke Official (Level II)	0.086***	0.065***	0.082***	0.063***
	(0.010)	(0.011)	(0.009)	(0.011)
Fu Chu Official (Level III)	0.090***	0.075***	0.085***	0.070***
	(0.015)	(0.019)	(0.015)	(0.019)
Zheng Chu Official (Level IV)	0.142***	0.129***	0.138***	0.126***
	(0.029)	(0.031)	(0.027)	(0.029)
Fu Ju Official (Level V)	0.184***	0.165***	0.183***	0.165***
	(0.051)	(0.054)	(0.053)	(0.054)
Zheng Ju Official (Level VI)	0.232**	0.215*	0.231**	0.215*
	(0.102)	(0.104)	(0.105)	(0.106)
General Government Offices	-	0.004	-	0.003
	-	(0.011)	-	(0.011)
Police, Courts, and Procuratorate	-	0.026**	-	0.027**
	-	(0.012)	-	(0.012)
Financial Regulatory/Supervisory	-	0.067***	-	0.065***
Offices	-	(0.019)	-	(0.020)
Bureaus on Megaprojects	-	0.066	-	0.068*
	-	(0.041)	-	(0.039)
Bureaus on Economic Supervision	-	0.020	-	0.018
	-	(0.015)	-	(0.015)
log(Life Time Income)_1	0.099***	0.098***	0.098***	0.098***
	(0.015)	(0.015)	(0.017)	(0.017)
log(Life Time Income)_2	0.132***	0.133***	0.142***	0.142***
	(0.025)	(0.025)	(0.017)	(0.017)
log(Life Time Income)_3	0.123***	0.123***	0.159***	0.159***
	(0.023)	(0.024)	(0.024)	(0.024)
log(Life Time Income)_4	0.006	0.006	0.077***	0.077***
	(0.013)	(0.013)	(0.025)	(0.025)
log(Life Time Income)_5	0.007**	0.007**	-0.012**	-0.012**
	(0.003)	(0.003)	(0.005)	(0.005)
N	105836	105836	105836	105836
R^2	0.498	0.498	0.501	0.501

Note: (1) Both home-value and lifetime-income variables are winsorized at 1%; (2) standard errors two-way clustered at city and month are reported in parentheses; (3) * significant at the 90% level, ** significant at the 95% level, *** significant at the 99% level; (4) all other control variables in Table 2 are also included here but not reported to save space.

C. Alternative assumptions on net worth and consumption expenditure

Dependent variable = Log home value	Not considering current net wealth		Considering consumption expenditures	
	(1)	(2)	(3)	(4)
With Non-official Civil Servant(s)	0.031***	0.031***	0.034***	0.034***
	(0.007)	(0.007)	(0.006)	(0.007)
Fu Ke Official (Level I)	0.050***	0.029*	0.050***	0.029*
	(0.012)	(0.015)	(0.012)	(0.016)
Zheng Ke Official (Level II)	0.085***	0.066***	0.080***	0.061***
	(0.009)	(0.010)	(0.009)	(0.010)
Fu Chu Official (Level III)	0.089***	0.075***	0.085***	0.071***
	(0.015)	(0.019)	(0.015)	(0.019)
Zheng Chu Official (Level IV)	0.141***	0.129***	0.138***	0.126***
	(0.026)	(0.028)	(0.026)	(0.028)
Fu Ju Official (Level V)	0.177***	0.159***	0.181***	0.164**
	(0.051)	(0.053)	(0.056)	(0.058)
Zheng Ju Official (Level VI)	0.239**	0.223**	0.227**	0.212*
	(0.099)	(0.101)	(0.103)	(0.104)
General Government Offices	-	0.005	-	0.002
	-	(0.012)	-	(0.012)
Police, Courts, and Procuratorate	-	0.023*	-	0.025*
	-	(0.013)	-	(0.013)
Financial Regulatory/Supervisory	-	0.068***	-	0.063***
Offices	-	(0.018)	-	(0.021)
Bureaus on Megaprojects	-	0.058	-	0.062
	-	(0.038)	-	(0.042)
Bureaus on Economic Supervision	-	0.019	-	0.019
	-	(0.016)	-	(0.015)
log(Lifetime Income)_1	0.132***	0.131***	0.032***	0.032***
	(0.015)	(0.015)	(0.004)	(0.004)
log(Lifetime Income)_2	0.144***	0.144***	0.137***	0.137***
	(0.019)	(0.019)	(0.017)	(0.017)
log(Lifetime Income)_3	0.103***	0.103***	0.106***	0.106***
	(0.015)	(0.015)	(0.012)	(0.012)
log(Lifetime Income)_4	0.004	0.004	0.112***	0.112***
	(0.023)	(0.023)	(0.018)	(0.018)
log(Lifetime Income)_5	0.011***	0.011***	-0.007	-0.007
	(0.003)	(0.003)	(0.005)	(0.005)
N	106191	106191	99426	99426
R^2	0.499	0.500	0.502	0.502

Note: (1) Both home-value and lifetime-income variables are winsorized at 1%; (2) standard errors two-way clustered at city and month are reported in parentheses; (3) * significant at the 90% level, ** significant at the 95% level, *** significant at the 99% level; (4) all other control variables in Table 2 are also included here but not reported to save space.

D. Unofficial incomes under different assumptions on retirement age or life expectancy

Dependent variable = Log home value	Later retirement for officials		Changing life expectancy with age	
	(1)	(2)	(3)	(4)
With Non-official Civil Servant(s)	0.034***	0.034***	0.033***	0.033***
	(0.007)	(0.007)	(0.007)	(0.007)
Fu Ke Official (Level I)	0.040***	0.018	0.051***	0.028
	(0.012)	(0.017)	(0.013)	(0.017)
Zheng Ke Official (Level II)	0.073***	0.053***	0.085***	0.065***
	(0.009)	(0.011)	(0.009)	(0.011)
Fu Chu Official (Level III)	0.076***	0.062***	0.089***	0.073***
	(0.016)	(0.020)	(0.016)	(0.019)
Zheng Chu Official (Level IV)	0.130***	0.118***	0.141***	0.128***
	(0.028)	(0.030)	(0.028)	(0.030)
Fu Ju Official (Level V)	0.174***	0.156**	0.184***	0.165***
	(0.055)	(0.057)	(0.054)	(0.057)
Zheng Ju Official (Level VI)	0.220**	0.204*	0.231**	0.215*
	(0.109)	(0.110)	(0.105)	(0.108)
General Government Offices	-	0.003	-	0.004
	-	(0.011)	-	(0.012)
Police, Courts, and Procuratorate	-	0.026*	-	0.026*
	-	(0.013)	-	(0.013)
Financial Regulatory/Supervisory	-	0.067***	-	0.067***
Offices	-	(0.018)	-	(0.019)
Bureaus on Megaprojects	-	0.066	-	0.066*
	-	(0.038)	-	(0.038)
Bureaus on Economic Supervision	-	0.019	-	0.020
	-	(0.016)	-	(0.015)
log(Lifetime Income)_1	0.099***	0.099***	0.102***	0.101***
	(0.015)	(0.015)	(0.015)	(0.015)
log(Lifetime Income)_2	0.134***	0.134***	0.144***	0.145***
	(0.019)	(0.020)	(0.021)	(0.021)
log(Lifetime Income)_3	0.110***	0.109***	0.121***	0.121***
	(0.029)	(0.029)	(0.032)	(0.032)
log(Lifetime Income)_4	0.028**	0.028**	0.029**	0.029**
	(0.014)	(0.014)	(0.013)	(0.013)
log(Lifetime Income)_5	0.003	0.003	0.003	0.003
	(0.003)	(0.003)	(0.003)	(0.003)
N	105836	105836	105836	105836
R^2	0.499	0.499	0.499	0.499

Note: (1) Both home-value and lifetime-income variables are winsorized at 1%; (2) standard errors two-way clustered at city and month are reported in parentheses; (3) * significant at the 90% level, ** significant at the 95% level, *** significant at the 99% level; (4) all other control variables in Table 2 are also included here but not reported to save space.