China and International Housing Price Growth

Yuk Ying Chang[a1], Hamish Anderson[a] and Song Shi[a,b]

This version: 23 Nov 2016

Abstract

We document Chinese effects on international residential property price growth. We show the prices rise following falls in China's GDP or when China's savings rate increases. This is consistent with the notion of Chinese investing in overseas property markets when faced with less promising investment opportunities at home and when they have the means to invest offshore. The Chinese effects are stronger when risks are higher in China and for countries; where English is the primary spoken language, with better tertiary education quality, with lower correlations between local property market price growth and China's interest rate returns.

Key words:

JEL Codes: G11, R20, F21

[a] School of Economics and Finance, Massey University. New Zealand.
[b] Faculty of Design, Architecture and Building, University of Technology Sydney, Australia.
[1] Corresponding Author: Yuk Ying Chang. School of Economics and Finance, Massey University (Manawatu Campus), Private Bag 11-222, Palmerston North 4442, New Zealand, Tel: +64-6-3569099 ext. 84073; Email: Y.Chang@massey.ac.nz.

China and International Housing Price Growth

1.   Introduction

Chinese investment in overseas property markets is widely covered in media, including The Economist (18 June 2016), Forbes (16 May 2016), Wall Street Journal (25 May 2016), Reuters (18 August 2016), Financial Times (16 May 2016) and Bloomberg (14 April 2016), and draws attention of governments (e.g. Canada, Australia and Singapore governments have imposed restrictions on overseas property buyers). Anecdotal evidence suggests Chinese investment is significant[2] and affects other countries' real estate markets, economies and societies. The global residential real estate value is approximately double world GDP at US$163 trillion and comprises roughly 45% of mainstream global assets in 2015 (Savills 2016). As such, even a small Chinese impact on other countries' real estate could represent a very large change on global asset values. However, there is no systematic study, particularly in a global setting examining the Chinese impact. This motives us to conduct such a study. In particular, we investigate (a) whether China affects international housing markets, (b) for which countries the Chinese effects are stronger, (c) and what conditions influence the effects.

Real estate studies typically focus on a single country (e.g. Mian et al. 2015; Lai et al. 2010), while multi-country studies primarily examine country specific factors (e.g. Hott and Monnin 2008; Burnside et al. 2016), although general developments or global factors are

---

[2] According to Juwai, a leading international real estate broker specialising in Chinese investors, Chinese spent US$52 billion on foreign property in 2015, up from US$10 billion three years ago. It is predicted to hit US$220 billion by 2020. (source: https://list.juwai.com)

also examined (e.g. Favilukis et al. 2013). However, how one country affects the global housing market or housing markets of various countries, like this study, is rarely examined.

Primarily based on quarterly data from 1993-2015 of 23 countries, we find the real residential housing price indices growth is significantly negatively associated with the average growth of China's real GDP in the past four quarters. In addition, it is significantly positively associated with the contemporaneous change in China's saving rate (surplus funds) in the same year, after controlling for common real estate explanatory variables. On average a 0.23% increase in housing prices follows a 1% decrease in the China's GDP growth or when China's saving rate increases 2.3%. Given the global value of residential real estate (Savills 2016), a 0.23% increase represents a very large economic impact. Further, it is economically significant because the local economy generally has to grow by 0.89% more to have the same impact on the housing price.[3] We obtain similar results when we replace China's GDP growth with interest rate or consumer confidence expectations and when we replace China's saving rate by its wealth growth. These results are consistent with the notion of Chinese investing in overseas property markets when China has less promising investment opportunities and they have means (savings and wealth) to do so[4]. The significant relationships still exist when recent economic downturns are excluded or by separating the differential effect of the post-2007 period. The relationship with China's GDP is prevalent and relatively stronger for the residential property markets in the United States, the United Kingdom, Ireland, Australia, Netherlands, France, Sweden, Luxembourg, South Korea and South Africa.

---

[3] In this paper, "local" refers to that of the 23 countries we look at.
[4] One plausible reason for this phenomenon is that Chinese have relatively less exposure to foreign assets in 1990s in comparison to households in the USA and the UK. Hence, they are more likely to build up foreign asset holdings over our sample period than American and British.

Concerning the conditions under which these relationships are stronger, we have the following findings. First, it is more pronounced when economic risk is higher in China or when there are more Chinese risk/uncertainty stories in the media. Second, the surplus funds effect is more pronounced in local property markets with lower correlation with China's interest rate. Third, it is stronger for housing markets located in English speaking countries. Finally, it is more apparent in countries with quality higher education and local country real estate prices grow faster for China's top destinations for tertiary student migration when China is politically riskier.

Our work is related to two strands of research. First, studies considering the effects of external forces or factors on local property markets, including immigration (e.g. Saiz 2003), exchange rates (e.g. Rodríguez and Bustillo 2010), foreign capital flows (e.g. Aizenman and Jinjarak 2009), foreign direct investment (e.g. Farrell 1997) and tourists (e.g. Rodríguez and Bustillo 2010). However, we study the impacts of investment opportunities and risks of a single country, China, on international housing markets.

Second, we follow mainstream finance literature in examining factors affecting Chinese overseas property investment. In Markowitz portfolio selection model (1952), risk, returns and correlations[5] (for diversification) are the major determinants of an optimal portfolio. Numerous studies consider these determinants: risk (e.g. Yao and Zhang 2005 examine portfolio choices with risky housing), return (e.g. Meyer and Wieand 1996 study housing returns in an asset pricing context), and diversification (e.g. Cotter et al. 2015 investigate whether housing risk can be diversified using US data). More recently, literature

---

[5] While people may not actually make complex calculations related to theories (i.e. portfolio theory), they act as if they do (McEachern 2011). Harry Markowtiz (1999) argues that investment diversification was well-established in practice long before his seminal work in 1952, and highlights this by quoting from Act 1, Scene 1 in the *Merchant of Venice* as evidence that Shakespeare was not only conversant with diversification, but also intuitively understood covariance.

suggests investors also prefer politically stable environments (e.g. La Porta et al. 1997). Besides, studies find people are inclined to invest in assets they have more information for and are more familiar with (e.g. Coval and Moskowitz 1999; Grinblatt and Keloharju 2001; Huberman 2001; Ivković an Weisbenner 2005; Massa and Simonov 2006). Economists have also long recognised the importance of information about products on consumer behaviour (Nelson 1970).[6] In this study, we examine the above factors. In addition, we study whether attractive attributes of countries matter, including quality higher education. Real estate studies find premiums are paid for houses in areas with quality education institutions such as schools (e.g. Figlio and Lucas 2004).

The rest of this paper is organized as follows. Section 2 describes data. Section 3 lays out methodology and states hypotheses. Section 4 presents and discusses empirical results. Section 5 concludes.

2. Data

Our dependent variable is growth of housing price indices. The real seasonally adjusted quarterly housing price indices of 23 countries and the aggregate of these countries, for the period 1975 Q1 – 2015 Q4, come from Mack and Martínez-García (2011). The 23 countries are Australia, Belgium, Canada, Croatia, Denmark, Finland, France, Germany, Ireland, Israel, Italy, Japan, Luxembourg, Netherland, New Zealand, Norway, South Africa, South Korea, Spain, Sweden, Switzerland, the UK and the US. The indices are selected to be consistent with the US FHFA quarterly nationwide house price index for existing single-family houses (formerly called OFHEO house price index). The same source

---

[6] Properties are also consumption products. Environments associated with properties are also the attributes property buyers are concerned with.

also provides us with corresponding real seasonally adjusted quarterly personal disposable income series.

The sources of key variables of interest are as follows: Datastream (China's quarterly real GDP growth since 1992, prime lending rate, consumer expectation), the World Bank (China's saving rate and annual GDP before 1992), Credit Suisse (2015) (China's total wealth and wealth per adult), the PRS Group (China's political, economic and financial risk ratings), Bloomberg (China's numbers of risk stories and all stories), Solt (2014) (China's gini), Wikipedia website (Classification of English countries), Quacquarelli Symonds Limited (QS higher education country-level ranking), United Nations (top 5 tertiary student migration destinations of China).

Concerning raw data of other control variables, we obtain them from the Economic Cycle Research Institute, Datastream, the PRS Group, Bloomberg and the OECD. We get international business cycle chronologies from the Economic Cycle Research Institute. Local and world GDP, unemployment rates, exchange rates, and consumer confidence indices come from Datastream. We have political, economic and financial risk ratings of other countries from the PRS Group, and local and global numbers of risk stories and all stories from Bloomberg. Finally, the OECD provides us with country-level household debt, short-term interest rates, rental price indices, production indices in construction, and permits issued for dwellings or residential buildings. Where necessary, we convert all series into real seasonally adjusted quarterly series using the seasonality dummy approach. For daily or monthly series we take the average of all days or months in a quarter. The variable definition is given in Appendix 1.

Table 1 shows the main variable summary statistics. Over the sample period 1993 Q1 – 2015 Q4, China's real GDP growth is more than 10 times higher than both local country and world real GDP growth. On the other hand, China's political risk is higher than that of the 23 other countries, but comparable to overall world political risk (where lower rating indicates greater risk). China's economic risk is similar to our 23 local country economic risk average, while overall world economic risk is slightly higher. China's financial risk is also lower than its economic risk, local and world financial risk.

Table 2 reports correlation coefficients of major variables. The relatively stronger correlation coefficients are mainly associated with certain risk variables. The world's risk story number is relatively strongly correlated with world financial risk rating (0.557), China's political and financial risk ratings (-0.647 and 0.634), and China's and local proportions of stories about risk (0.581 and 0.617). China's financial risk rating is relatively strongly correlated with its economic risk rating (0.633), world financial risk rating (0.726), and local risk story number (0.567). Lastly, world financial risk rating is relatively strongly correlated with world economic risk rating (0.512) and local risk story number (0.502). Nevertheless, all VIFs (variance inflation factors) are well below 10. Hence, multicollinearity is not a concern.

3. Hypotheses and methodology

This section states the hypotheses and lays out the methodology. First, we have a divergent hypothesis. Home bias literature suggests that Chinese should invest mainly in China. However, in a spirit similar to the notion of "push" and "pull" factors in the capital flows literature (e.g. Fratzscher 2012; Calvo et al. 1993 and 1996; Fernandez-Arias 1996; Chuhan et al. 1998), when the expected growth opportunities are poorer in China, Chinese may offshore investment opportunities including residential property. As motivation for

overseas property investments, Newell and Worzala (1995) reports investors, in a survey, state "lack of opportunities in domestic market" and "higher returns than domestic markets" as key factors. Therefore, we predict that Chinese will buy more overseas properties when expected growth opportunities in China are lower whereby real housing price growth (hpg) of the overseas real estate markets will be higher. To test this prediction, we empirically estimate the following model:

$$hpg_{j,t} = a0 + \textbf{a1*China's expected growth opportunities}_t + Controls_{j,t} + e_{j,t} \qquad (1)$$

Subscripts j and t index country and quarter, respectively. We expect a1 to be negative. Lemmon and Portniaguina (2006) show that GDP is fairly strongly associated with consumer confidence of expected macroeconomic conditions, a major determinant of growth opportunities. This motives us to use the average of the real GDP growth of the past 4 quarters as a proxy for the expected growth opportunities. In place of the real GDP growth, we also use the interest rate and consumer expectations as alternative proxies for robustness checks.

The controls of the baseline model include lagged real housing price growth, real personal disposable income growth, past real GDP growth of local economy and the world, and country fixed effects.[7] We estimate robust standard errors based on country and time clustering. The additional controls of an augmented model are growth of the construction production index, growth of the rental index, growth of the unemployment rate, growth of the consumer confidence index, growth of the exchange rate, growth of the household debt

---

[7] The controls is based on the demand fundamentals in the housing market such as employment and income (Campbell et al. 2009-; Wheaton and Nechayve 2008). We include a lag housing price growth to control for the return persistence found in the housing market (Case and Shiller 1989). Based on DiPasquale and Wheaton's model (1992), GDP growth should be significantly correlated to the housing market demand. We add the world GDP growth to control for a general globalisation effect on local housing markets.

and growth of the interest rate.[8] To minimise the influence of outliers, variables of all regressions are winsorized at 1% and 99%.

We estimate the baseline model for each individual country to study the prevalence of the Chinese effects. To examine whether the divergent effects also exist elsewhere, we replicate the individual country analysis using real GDP growth of the US, the UK or the world in place of that of China.

Second, we have a surplus fund hypothesis. Economics (e.g. Krugman and Wells 2015) posits that when people have more funds, they will consume and invest more. Hence, we predict that an increase in Chinese funds will increase their overseas property investments, which in turn will increase the housing price growth of these markets. To test this hypothesis, we expand eq (1) to

$$hpg_{j,t} = a0 + a1*China's\ expected\ growth\ opportunities_t$$

$$+\ \textbf{a2*growth of China's available funds}_t + Controls_{j,t} + e_{j,t} \tag{2}$$

We predict a positive a2. As Chinese participants in overseas property markets are likely to be in the upper-middle class or higher because of a relatively high minimum investment outlay, the ideal proxy should capture the available funds of these Chinese. To capture this we use the growth of the product of an existing available funds measure and the Gini index. Larger Gini measures imply greater income inequality within a nation,

---

[8] Adding the interest rate and rent in the model will control for the housing market investment opportunities. Shiller (2006) argued that house prices should be equal to the present value of future rents. Glaeser et al. (2005) found that new construction is a key variable in explaining why US housing prices have gone up. Meanwhile, credit market terms is used to analyse the cause of subprime mortgage crisis (e.g. Khandani et al. 2009; Wheaton and Nechayer 2008; Glaeser et al. 2010). Exchange rate may be relevant for international investors as the change of exchange rate will have a material impact on foreign investment. Thus it may have predicative power in our analysis (Chen et al. 2010). Finally consumer confidence index is based on the exuberance theory proposed by Akerlof and Shiller (2009) to counter for the recent bubble period.

thereby capturing those in or above the upper-middle classes' ability to accumulate savings and wealth. We consider three alternative existing fund measures, the saving rate, the aggregate wealth and the wealth per adult. Subsequently, we focus on the saving rate because we only have data of the latter two from year 2000.

Third, we have a risk divergent hypothesis. Risk is a primary consideration of any investment (Markowitz 1952) including property. Miles (2009) reports a 1% increase in uncertainty lowers changes in housing starts by almost 1%. However, analogous to the first (divergent) hypothesis above, when risk in China is higher, Chinese invest less in China and turn to overseas investment. "Seeking a safe investment" has been given as a very important reason for Chinese overseas property purchases (Gu and Talyor 2015; Rubina 2016). Consequently, we expect an increase in risk in China will increase Chinese's oversea property investment, whereby accelerating the growth of foreign housing prices. We thus augment eq (2) as follows.

$$hpg_{j,t} = a0 + a1*\text{China's expected growth opportunities}_t$$

$$+ a2*\text{growth of China's available funds}_t + \mathbf{a3*\text{China's risk}_t}$$

$$+ \text{Controls}_{j,t} + \text{Risk Controls}_{j,t} + \text{Global Risk Control}_t + e_{j,t} \qquad (3)$$

The prediction is that a3 is positive. We have four China's risk measures: political, economic and financial risk ratings and proportion of stories in risk or uncertainty, estimated as the ratio of the number of risk and uncertainty stories to the number of all stories. As the ratings are inverse risk measures, their coefficients are expected to be negative. We simultaneously incorporate these different risk measures. The local risk

counterparts are new controls. We also include global risk controls because the foreign housing markets are integral parts of the world.

Finally, the Chinese effects predicted by the above three hypotheses are likely to vary across countries. The variation conceivably depends on how familiar Chinese are with these countries (e.g. Coval and Moskowitz 1999; Grinblatt and Keloharju 2001; Huberman 2001; Ivković an Weisbenner 2005; Massa and Simonov 2006) and how attractive these markets are to Chinese, such as English being the primary language and education quality (e.g. Figlio and Lucas 2004). In other words, familiarity and attractiveness are expected to moderate the Chinese effects on the growth of foreign housing prices. As a result, we modify eq (3) accordingly.

$$hpg_{j,t} = a0 + a1*China's\ expected\ growth\ opportunities_t$$

$$+ a2*growth\ of\ China's\ available\ funds_t\ + a3*China's\ risk_t$$

$$+ Controls_{j,t} + Risk\ Controls_{j,t} + Global\ Risk\ Control_t$$

$$\mathbf{+ a1m*Familiarity_{j(,t)}/Attractiveness_{j(,t)}*China's\ expected\ growth\ opportunities_t}$$

$$\mathbf{+ a2m*Familiarity_{j(,t)}/Attractiveness_{j(,t)}*growth\ of\ China's\ available\ funds_t}$$

$$\mathbf{+ a3m*Familiarity_{j(,t)}/Attractiveness_{j(,t)}*China's\ risk} + e_{j,t} \qquad (4)$$

If a familiarity/attractiveness attribute strengthens (weakens) the Chinese effects, a1m will be negative (positive) and a2m and a3m positive (negative). The main effects of the familiarity/attractiveness attributes are not incorporated for a more parsimonious model because either there is no main standalone effect, or the main standalone effect cannot be estimated with country fixed effects.

The attributes we consider sequentially and cumulatively are correlation between China's interest rate and growth of overseas housing prices (reflecting diversification benefits), English and higher education. Modern portfolio theory (Markowitz 1952) states that whether we add an asset into an existing portfolio depends on the incremental risk effect of this asset on the portfolio. If the asset is strongly positively (weakly) correlated with the portfolio, there is little (more) room for risk reduction. Therefore, an investor is more likely to invest in an asset if its correlation with his existing portfolio is lower. The return series of the Chinese portfolio is not readily available. However, as home bias literature suggests, Chinese likely mainly hold assets in China. It is thus plausible to use a series that reasonably tracks changes of returns of Chinese assets over time as a proxy for the return series of the Chinese portfolio. In particular, we use the prime lending rate.[9] We have two correlation measures: correlation based on all non-contemporaneous observations and correlation for odd (even) quarters based on even (odd) quarter observations.

As English is a principal international language, we expect that Chinese are more familiar with countries where English is the primary language (English countries). We also predict that the benefits associated with English also make these countries more attractive to Chinese. Hence, the real estate in English countries will be more appealing to Chinese. The Chinese effects on housing price growth will thus be stronger among these countries. We also have two English measures: a dummy for countries where English is the primary language (Australia, Canada, Ireland, New Zealand, the UK and the US) and a dummy for

---

[9] Several Chinese interest rate series (short-term, medium-term and long-term major loan rates, a discount rate and the prime lending rate) are highly correlated with coefficients above 0.99

countries where English is the de facto official and primary language (Australia, New Zealand, the UK and the US).

A primary reason for Chinese overseas property purchases is for their children's education and migration (e.g. Bradsher and Searcey 2015; Juwai 2016). Therefore, we predict that the Chinese effects are more prevalent for countries with better quality education. Our two measures of higher education quality are the 2016 QS higher education country-level ranking and a dummy for the 2013 top 5 tertiary student migration destinations of China. These five countries are the US, Japan, Australia, the UK and South Korea.

We also look at bilateral trade, Chinese outward foreign direct investment, the numbers of Chinese migration, overseas Chinese population and Chinese outbound tourists, geographical distance and long-term growth forecast of the foreign economies.[10] However, they have neither explanatory power, nor moderating effect. There are three possible explanations. First, these variables are not good proxies of the relevant familiarity/attractiveness. Second, the data quality is poor. Third, there is in fact no relationship along these dimensions.

4.   Empirical results

4.1   Graphs of main relationships

We first show graphically the relationships between housing price growth in international markets and growth in Chinese GDP and wealth. Graph 1A plots China's GDP growth and the housing price growth of the North America, Japan and Aggregate over the

---

[10] The data sources are UN Comtrade Database (bilateral trade), UNCTAD (FDI), the World Bank (migration), OECD (Chinese population and long-term forecasts), www.travelchinaguide.com (tourist numbers) and www.distancecaculator.net (distance)

sample period, where Aggregate is the composite of the 23 countries. The series are 4-quarter moving averages. It is evident that China's GDP growth is negatively correlated with the Aggregate and North American housing price growth, but not with Japanese housing price growth. In Graph 1B, we replace China's GDP growth in Graph 1A by its wealth growth, where wealth is the product of the total wealth and Gini. It is clear that China's wealth growth is fairly strongly positively correlated with the Aggregate and North American housing price growth, but not with Japan's.

The remaining graphs show strong corresponding relationships for English countries and countries with the top ⅓ QS rankings. The English countries are Australia, Canada, Ireland, New Zealand, the UK and the US. The countries with the top QS rankings are Australia, Canada, France, Germany, the UK and the US. Graph 2A and Graph 2C show China's GDP growth whereas Graph 2B and Graph 2D display China's wealth growth.

4.2   Effects of China's GDP growth

Table 3 reports the regression results of the relationship between China's rolling average real quarterly GDP growth over the past 4 quarters (past GDP growth) and housing price growth of the other markets around the world. The coefficient of China's past GDP growth is significantly negative. This is consistent with the divergent hypothesis that when China's growth opportunities are poorer, Chinese buy more overseas properties, whereby increasing the growth of housing prices of these markets.

The result is robust with respect to inclusion of various controls, as shown in Columns (1) – (3). The coefficients of the controls are generally consistent with expectations.

Moreover, the negative relationship also exists for an extended sample period[11], over which we convert pre-1992 China's annual GDP growth into quarterly GDP growth and take the average of pre-1992 quarterly variables of all quarters in the corresponding year, although the relationship is weaker in the earlier period. Besides, literature (e.g. Deng et al., 2011; Dokko et al., 2011; Kapetanios et al., 2012; Krishnamurthy and Vissing-Jorgensen, 2011; Wu et al., 2012; Xu and Chen, 2012) suggests that relationships may be different after the recent global financial crisis. However, we find that the significantly negative relationship persists when separating the differential effect of the post-2007 period.

We perform several other robustness checks.[12] First, instead of using past 4 quarters, we look at China's GDP growth based on past 1, 2, and 12 quarter intervals. All alternative intervals of past GDP growth have significantly negative relationships with the overseas housing price growth. The longer the past GDP growth interval the larger the estimated coefficients become. The magnitude of the coefficient for 12-quarter GDP growth is approximately double the 1-quarter coefficient (-0.115 and -0.056). Second, in place of past China's GDP growth, we consider China's consumer expectation based on past 1, 2, 3 and 4 quarters. All also have significantly negative relationships with the foreign housing price growth. Lastly, we replace past China's GDP growth by past China's prime lending rate. We obtain strongly statistically significant and qualitatively the same results. Interestingly, the magnitude of the estimated coefficient of the China's prime lending rate (-0.086) is very close to that of China's GDP growth.

Table 4 summaries the baseline results of 23 individual countries and the aggregate of these countries. The negative effects of China's past GDP growth on housing price growth

---

[11] The starting date varies across countries, depending on data availability.
[12] These results are not tabulated, but available from the corresponding author upon request.

appear in 82.6% of the countries. Among these countries, 52.6% has a statistically significant relationship, at 10% or stronger. For the US, the UK and the aggregate, the significance level is 1% or stronger. The table also shows past US and UK GDP growth do not have the same pervasive relationships with other markets housing price growth that we see for China's GDP growth.

4.3 Effects of China's saving change or wealth growth

Table 5 tests and supports the surplus fund hypothesis. The estimated coefficients of all three measures of the growth of China's available surplus funds are strongly significantly positive, at the 1% level. These are consistent with the notion that when Chinese have more surplus funds, they generally increase overseas housing purchases, whereby increasing the growth of foreign housing prices. Like the GDP growth results, these surplus fund effects are unlikely to be replicable by US wealth growth because the correlation between China's and the US's wealth growth is only 0.2. Meanwhile, China's past GDP growth remains significantly negative, with a slightly larger magnitude (changing from –0.08 to a range from –0.09 to –0.11).

4.4 Effects of China's risk

Table 6 shows relationships between the different risk measures and the housing price growth, based on an international panel data. In support of the risk divergent hypothesis, the estimated coefficient of the China's economic risk rating is significantly negative. This suggests that when China's economic risk is higher (represented by a lower rating index value), Chinese will invest more in foreign property markets, whereby

accelerating foreign housing price growth.[13] In addition, China's proportion of stories concerning risk or uncertainty has a significantly positive estimated coefficient. It is thus likely that when there are more Chinese risk stories, Chinese increase overseas housing investment, which in turn increases the corresponding housing price growth. The other Chinese risk measures are insignificant, except for the political risk rating which is significantly positive when the risk story variables are excluded.[14]

As for the local country risk measures, the coefficient of the economic risk rating is positive and strongly significant at the 1% level, suggesting higher housing price growth when the local economy is more stable. With regard to the world risk measures, the financial rating has a significantly positive coefficient whereas the proportion of risk stories has a strongly significantly negative coefficient. Hence, when the world faces lower risk, neither in political nor economic dimension, the housing prices around the world generally grow faster.

Importantly, past China's GDP growth is still negative and strongly significant at the 1% level. The estimated coefficient is −0.229. Hence, on average, a 1% decrease in past China's GDP precedes overseas housing price increases of approximately 0.23%. This represents an economically significant impact given the approximate 2015 global residential real estate value of US$163 trillion which is double world GDP and represents roughly 45% of mainstream global assets (Savills 2016). Furthermore, the change in China's saving rate also remains significantly positive. The estimated coefficient of 0.104 indicates a 1%

---

[13] Since the China's and the world's financial risk rating is highly correlated (0.726), we drop the China's financial risk rating and re-run the regressions. The results remain.
[14] We also separately consider change in China's original and relative corruption perception index, and change in China's corruption controls. There is no significant relationship.

increase in the China's saving rate is associated with a 0.1% increase in the international housing prices.

4.5   Moderating effects of correlation with China's interest rate

Table 7 reveals how Chinese effects vary with the correlation between China's interest rate and the local housing price growth. The interaction between the correlation and the change in China's saving rate is significantly negative. Consistent with modern portfolio theory, Chinese surplus fund effects are thus generally stronger when the correlation is lower.[15] However, the interaction between the correlation and China's economic risk rating is also significantly negative. This suggests the Chinese effects are stronger when China experiences better economic stability and the correlation between China's interest rate and local housing price growth is lower. This probably reflects that China's economic stability is a precursor to generating the surplus funds required to invest in offshore property markets. The remaining correlation interactions are not robustly significant.

4.6   Differential Chinese effects for English countries

The second attribute we consider is English. As shown in Table 8, consistent with the expectations, we find that the dummies for English countries interacted with China's past GDP growth and with the change in China's saving rate are significantly stronger, and have the same signs as these Chinese variables before. These show more pronounced corresponding Chinese divergent and surplus fund effects for English than non-English countries. There is no significant incremental Chinese risk effect on housing price growth of English over non-English countries.

---

[15] The effect of the growth of China's surplus funds becomes the coefficient of the surplus fund growth plus the product of the coefficient of its interaction with correlation and the correlation.

4.7   Education matters

Table 9 reports the moderation of the Chinese effects by education quality in the overseas market. The interaction between education and China's political risk rating is negative. This suggests that when China is more politically unstable, overseas housing markets of countries with quality higher education are more attractive to Chinese, whereby Chinese probably purchase more in these markets and the housing prices grow faster. Hence, education magnifies the China's political risk divergent effects on the housing price growth. On the other hand, the interaction between education and China's economic risk rating is significantly positive. Hence, education strengthens the Chinese effects on overseas housing price growth when China is more economically stable thereby enabling Chinese to generate surplus funds. The remaining educational interaction terms are insignificant at the standard level.

Plausibly, English countries and countries with better education have non-English and non-educational characteristics attractive to Chinese buyers. One obvious candidate is those attributes associated with the level of the development of the economy. Therefore, we examine whether measures of economic development replicate the English and education results. In particular, we look at two such measures, a dummy for the G7 and real GDP per capita. We find that they do not produce the English and education results. Hence, the latter are unlikely to be driven by the attributes associated with developed economies.

5.   Conclusions

Mainly based on data over 1993-2015 of 23 countries, we document Chinese effects on the price growth of the residential real estate markets around the world. On average, an approximately 0.23% increase in the housing prices follows a 1% decrease in the China's

GDP growth or for a 2.3% increase in the China's saving rate. These are consistent with the notion of an increase in Chinese overseas property purchases following deterioration of China's growth opportunities or associating with an increase in Chinese's surplus funds. These Chinese effects are stronger for English countries. The property markets of lower correlation with China's interest rate also have more pronounced surplus fund effects.

In addition, when China's economic risk is higher or China has more risk/uncertainty stories, the foreign housing prices also grow faster. This suggests that higher risk in China drives Chinese to invest more in the overseas housing markets, whereby accelerating the corresponding price growth. Besides, when China is economically more stable, the real estate prices grow faster for countries with better education and the housing markets with lower Chinese correlation. Finally, when China is politically riskier, the real estate prices grow faster for China's top tertiary student migration destinations.

References

Aizenman, J., Jinjarak, Y., 2009, Current account patterns and national real estate markets, Journal of Urban Economics, 66, 75 – 89.

Akerlof, G.A., Shiller, R.J., 2009, Animal spirits: how human psychology drives the economy, and why it matters for global capitalism, Princeton University Press, New Jersey.

Bradsher, K., Searcey, D., 2015, Chinese cash floods U.S. real estate market, New York Times, 28 November 2015, retrieved on 11 November 2016 from http://www.nytimes.com/2015/11/29/business/international/chinese-cash-floods-us-real-estate-market.html?_r=0.

Burnside, C., Eichenbaum, M., Rebelo, S., 2016, Understanding booms and busts in housing markets, Journal of Political Economy, 124(4), 1088 – 1147.

Calvo, G. A., Leiderman, L., Reinhart, C. M., 1993, Capital inflows and real exchange rate appreciation in Latin America, IMF Staff Papers, 40 (1), 108-51.

Calvo, G. A., Leiderman, L., Reinhart, C. M., 1996, Inflows of capital to developing countries in the 1990s, Journal of Economic Perspectives, 10 (Spring), 123-39.

Campbell, S.D., Davis, M.A., Gallin, J., Martin, R.F., 2009, What moves housing markets: A variance decomposition of the rent–price ratio, Journal of Urban Economics, 66, 90-102.

Case, K.E., Shiller, R.J., 1989, The efficiency of the market for single-family homes, American Economic Review, 79 (1), 125-137.

Chen, Y., Rogoff, K., Rossi, B., 2010, Can exchange rates forecast commodity prices, Quarterly Journal of Economics, 125(3), 1145-1194.

Chuhan, P., Claessens, S., Mamingi, N., 1998, Equity and bond flows to Latin America and Asia: The role of global and country factors, Journal of Development Economics, 55 (April), 439-63.

Cotter, J., Gabriel, S., Roll, R., 2015, Can housing risk be diversified? A cautionary tale from the housing boom and bust, Review of Financial Studies, 28(3), 913 – 936.

Coval, J., Moskowitz, T., 1999, Home bias at home: Local equity preference in domestic portfolios, Journal of Finance, 54, 1697 – 1704.

Credit Suisse, 2015, Global Wealth Databook 2015.

Cutts, R. L., 1990, Power from the ground up: Japan's land bubble, Harvard Business Review, May – June 1990, 164 – 172.

Deng, Y., Morck, R., Wu, J., Yeung, B., 2011, Monetary and fiscal stimuli, ownership structure, and China's housing market, NBER working paper 16871. National

Bureau of Economic Research, Cambridge, MA.

DiPasquale, D., Wheaton, W.C., 1992, The markets for real estate assets and space: a conceptual framework, Journal of the American Real Estate and Urban Economics Association, 20(1), 181-197.

Dmitrieva, K., 2016, Chinese buyers hungry for Canadian homes with inquiries up 134%, Bloomberg, 14 April 2016, retrieved on 16 September 2016 from http://www.bloomberg.com/news/articles/2016-04-13/chinese-buyers-hungry-for-canadian-homes-with-inquiries-up-134.

Dokko, J., Doyle, B.M., Kiley, M.T., Kim, J., Sherlund, S., Sim, J., Heuvel, S.V.D., 2011, Monetary policy and the global housing bubble, Economic Policy, 26(66), 233-283.

Economist, 2016, A roaring trade, 18 Jun 2016, retrieved on 1 Dec 2016 from

http://www.economist.com/news/united-states/21700660-chinese-tiger-mums-start-college-town-housing-boom-roaring-trade.

Farrell, R., 1997, Japanese foreign direct investment in real estate 1985 – 1994, Pacific Economic Papers, No. 272., Australia – Japan Research Centre.

Favilukis, J., Kohn, D. Ludvigson, S. C., Nieuwerburgh, S. V., 2013, International capital flows and house prices: Theory and evidence, in Housing and the Financial Crisis, edited by Glaeser, E. L. and Sinai, T., University of Chicago Press, pp. 235 – 299.

Fernandez-Arias, E., 1996, The new wave of private capital inflows: Push or pull?, Journal of Development Economics, 48 (March), 389-418.

Figlio, D. N., Lucas, M. E., 2004, What's in a Grade? School report cards and the housing market, American Economic Review, 94(3), 591 – 604.

Fratzscher, M. 2012, Capital flows, push versus pull factors and the global financial crisis, Journal of International Economics, 88(2), 341-356.

Glaeser, E.L., Gyourko, J., Saks, R.E., 2005, Urban growth and housing supply, Journal of Economic Geography, 6(1), 71-89.

Glaeser, E., Gottlieb, J., Gyourko, J., 2010, Can cheap credit explain the housing boom?, NBER Working Paper No. 16230. National Bureau of Economics Research, Cambridge, MA.

Grant, P., 2016, Chinese investors pour money Into U.S. property, Wall Street Journal, 25 May 2016, retrieved on 16 September 2016 from http://www.wsj.com/articles/chinese-investors-pour-money-into-u-s-property-1464110682.

Grinblatt, M., Keloharju, M., 2001, How distance, language and culture influence

stockholdings and trades, Journal of Finance, 56, 1053 – 1073.

Gu, W., Talyor R., 2015, Market turmoil seen spurring China property purchases overseas, Wall Street Journal, 27 August 2015, retrieved on 11 November 2016 from http://www.wsj.com/articles/australia-worried-about-rise-in-chinese-property-buying-1440654099.

Hott, C., Monnin, P., 2008, Fundamental real estate prices: An empirical estimation with international data, Journal of Real Estate Finance and Economics, 36, 427 – 450.

Huberman, G., 2001, Familiarity breeds investment, Review of Financial Studies, 14, 659 – 680.

Ivkovíc, Z., Weisbenner, S., 2005, Local does as local is: Information content of the geography of individual investors' common stock investment, Journal of Finance, 60(1), 267 – 306.

Juwai, 2016, 6 reasons why education underpins Chinese overseas property investment, 5 July 2016, retrieved on 11 November 2016 from https://list.juwai.com/news/2016/07/6-reasons-why-education-underpins-chinese-overseas-property-investment.

Kapetanios, G., Mumtaz, H., Stevens, I., Theodoridis, K., 2012, Assessing the economy-wide effects of quantitative easing, The Economic Journal, 122, 316-347.

Khandani, A., Lo, A.W., Merton, R.C., 2009, Systemic risk and the refinancing ratchet effect, NBER Working Paper No. 15362. National Bureau of Economic Research, Cambridge, MA.

Krishnamurthy, A., Vissing-Jorgensen, A., 2011, The effects of quantitative easing on interest rates: channels and implications for policy, NBER working paper No. 17555. National Bureau of Economic Research, Cambridge, MA.

Krugman, P., & Wells, R., 2009, Macroeconomics, Worth Publishers.

La Porta, R., Lopez-De-Silanes, F., Shleifer, A., Vishny, R. W., 1997, Legal determinants of external finance, Journal of Finance, 52(3), 1131 – 1150.

Lai, R. N., Van Order, R. A., 2010, Momentum and house price growth in the United States: Anatomy of a bubble, Real Estate Economics, 38(4), 753 – 773.

Lemmon, M.,Portniaguina, E., 2006, Consumer confidence and asset prices: Some empirical evidence, Review of Financial Studies, 19(4), 1499-1529.

Mack, A., Martínez-García, E., 2011, A cross-country quarterly database of real house prices: a methodological note, Globalization and Monetary Policy Institute Working Paper No. 99.

Markowitz, H., 1952, Portfolio selection, Journal of Finance, 7(1), 77 – 91.

Markowitz, H., 1999, The Early History of Portfolio Theory: 1600–1960, Financial Analysts Journal, 55(4), 5-16.

Massa, M., Simonov, A., 2006, Hedging, familiarity, and portfolio choice, Review of Financial Studies, 19, 633 – 685.

McEachern, W. A., 2011, Economics: A contemporary introduction. Cengage Learning.

Meyer, R., Wieand, K., 1996, Risk and return to housing, tenure choice and the value of housing in an asset pricing context, Real Estate Economics, 24(1), 113 – 131.

Mian, A., Sufi, A., Trebbi, F., 2015, Foreclosures, house prices, and the real economy, Journal of Finance, 70(6), 2587 – 2634.

Miles, W., 2009, Irreversibility, uncertainty and housing investment, Journal of Real Estate Finance and Economics, 38(2), 173-182.

Nelson, P., 1970, Information and consumer behaviour, Journal of Political Economy, 78(2), 311 – 329.

Newell, G., & Worzala, E., 1995, The role of international property in investment portfolios. Journal of Property Finance, 6(1), 55-63.

NZ Herald, 2016, Chinese buyers coming back to Auckland property market, 6 March 2016, retrieved on 16 September 2016 from http://www.nzherald.co.nz/business/news/article.cfm?c_id=3&objectid=11600974.

Rapoza, K., 2016, The flipside of China's love for American real estate, Forbes, 16 May 2016, retrieved on 16 September 2016 from http://www.forbes.com/sites/kenrapoza/2016/05/16/the-flipside-of-chinas-love-for-american-real-estate/#4bec60c240e8.

Reuters, 2016, Why Chinese investment in overseas real estate has more than doubled, 18 August 2016, retrieved on 16 September 2016 from http://fortune.com/2016/08/18/china-overseas-property-investment/.

Rodríguez, C., Bustillo, R., 2010, Modelling foreign real estate investment: The Spanish case, Journal of Real Estate Finance and Economics, 41, 354 – 367.

Rubina Real Estate, 2016, Chinese International Property Investment Trends in 2016, retrieved on 11 November 2016 from http://www.rubinarealestate.com/en/china/china-2016-international-property-investment-overview/.

Saiz, A., 2003, Room in the kitchen for the melting pot: Immigration and rental

prices, Review of Economics and Statistics, 85(3), 502 – 521.

Savills, 2016, World real estate accounts for 60% of all mainstream assets, 25 January 2016, retrieved on 18 September 2016 from http://www.savills.co.uk/_news/article/72418/198559-0/1/2016/world-real-estate-accounts-for-60--of-all-mainstream-assets.

Shiller, R.J., 2006, Long-term perspective on the current boom in home prices, The Economist's Voice 3.

Wheaton, W.C., Nechayev, G., 2008, The 1998-2005 housing "bubble" and the current "correction": What's different this time? Journal of Real Estate Research, 30, 1-26.

Wu, J., Gyourko, J., Deng, Y., 2012, Evaluating conditions in major Chinese housing markets, Regional Science and Urban Economics, 42, 531-543.

Xu, X.E., Chen, T., 2012, The effect of monetary policy on real estate price growth in China, Pacific-Basin Finance Journal, 20, 62-77.

Yang, Y., 2016, Beijing clampdown slows China spending spree on US property, Financial Times, 16 May 2016, retrieved on 16 September 2016 from https://www.ft.com/content/e1c2aa44-1b37-11e6-8fa5-44094f6d9c46.

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

Appendix 1: Variables – Definition, Frequency, Calculation and Exceptions.

Variable	Definition
C	takes a value of 1 for observations since 2008 Q1, 0 otherwise
ccg	growth in the seasonally adjusted consumer confidence indicator
cn_EconomicRiskRating	economic risk rating of China's economy; a larger value represents lower risk
cn_FinancialRiskRating	financial risk rating of China's economy; a larger value represents lower risk
cn_pastGDPgrowth after 1992	the average of quarterly growth in China's real GDP over the past 4 quarters
cn_pastGDPgrowth before or in 1992	quarterly growth from annual grow in China's real GDP
cn_PoliticalRiskRating	political risk rating of China's economy; a larger value represents lower risk
cn_RiskStoryNum/TotalStoryNum	the ratio of the number of risk stories to the number of all stories for China
cnSaving	China's gross domestic savings are calculated as GDP less final consumption expenditure (total consumption), % of GDP.
cnWealth	China's total wealth, denominated in US dollars
cnWealth per aduit	China's wealth per adult, denominated in US dollars
constrg	growth in the seasonally adjusted index of production in construction
corr (measure 1)	correlation between China's interest rate (the prime lending rate, cnint) and growth of housing price of the local property market (hpg)
corr (measure 2)	correlation between China's interest rate (the prime lending rate, cnint) and growth of housing price of the local property market (hpg)
d_cnSaving*gini	change in a China's saving rate
debtg	growth in annual household debt. Houshold debt is defined as all liabilities that require payment or payments of interest or principal by household to the creditor at a date or dates in the future. Consequently, all debt instruments are liabilities, but some liabilities such as shares, equity and financial derivatives are not considered as debt. According to the 1993 System of National Accounts, debt is thus obtained as the sum of the following liability categories, whenever available/applicable in the financial balance sheet of the households and non-profit institutions serving households sector, such as: currency and deposits; securities other than shares, except financial derivatives; loans; insurance technical reserves; and other accounts payable. For households, liabilities predominantly consist of loans, in particular mortgage loans for the purchase of houses. This indicator is measured as a percentage of net disposable income.

Variable	Definition
DisposableIncomeGrowth	growth in the real personal disposable income
DisposableIncomeGrowth(t-1)	DisposableIncomeGrowth of the previous quarter
Edu (measure 1)	country-level ranking of the 2016 QS world university ranking
Edu (measure 2)	takes a value of 1 for the 2013 top 5 tertiary student destinations of China, 0 otherwise
Eng (measure 1)	takes a value of 1 where English is the primary language, 0 otherwise
Eng (measure 2)	takes a value of 1 where English is a de facto official and the primary language, 0 otherwise
exg	growth in the exchange rate
g_cnWealth*gini	growth in China's wealth
g_cnWealth per adult*gini	growth in China's wealth per adult
gini	China's gini
HousingPriceGrowth (hpg)	growth in the real housing price index
HousingPriceGrowth(t-1)	hpg of the previous quarter
interestg	growth in the short-term interest rate. Short-term interest rates are the rates at which short-term borrowings are effected between financial institutions or the rate at which short-term government paper is issued or traded in the market. Short-term interest rates are generally averages of daily rates, measured as a percentage. Short-term interest rates are based on three-month money market rates where available. Typical standardised names are "money market rate" and "treasury bill rate".
loc_EconomicRiskRating	economic risk rating of the local economy; a larger value represents lower risk
loc_FinancialRiskRating	financial risk rating of the local economy; a larger value represents lower risk
loc_pastGDPgrowth	the average of quarterly growth in the real GDP of the local economy over the past 4 quarters
loc_PoliticalRiskRating	political risk rating of the local economy; a larger value represents lower risk
loc_RiskStoryNum/TotalStoryNum	the ratio of the number of risk stories to the number of all stories for the country
permitg	growth in the seasonally adjusted permits issued for dwellings / residential buildings.
rentg	growth in the seasonally adjusted rental price index
urateg	growth in seasonally adjusted unemployment rate
wd_EconomicRiskRating	average economic risk rating of all countries ; a larger value represents lower risk
wd_FinancialRiskRating	average financial risk rating of all countries; a larger value represents lower risk
wd_pastGDPgrowth	the average of quarterly growth in the real world GDP over the past 4 quarters

Variable	Definition
wd_PoliticalRiskRating	average political risk rating of all countries; a larger value represents lower risk
wd_RiskStoryNum/TotalStoryNum	the ratio of the number of risk stories to the number of all stories for the world

Variable	Frequency	Calculation
C	Monthly	
ccg	Monthly	First, calculate the monthly average in a quarter, then calculate the growth of the monthly average as the quarterly growth by taking the difference in natural log of values of the two consecutive quarters.
cn_EconomicRiskRating	Monthly	The average of the monthly ratings in a quarter
cn_FinancialRiskRating	Monthly	The average of the monthly ratings in a quarter
cn_pastGDPgrowth after 1992	Quarterly	
cn_pastGDPgrowth before or in 1992	Annual	quarterly growth = $(1 + \text{annual growth})^{0.25} - 1$
cn_PoliticalRiskRating	Monthly	The average of the monthly ratings in a quarter
cn_RiskStoryNum/TotalStoryNum	Daily	The average of the daily ratio in a quarter
cnSaving	Annual	
cnWealth	Annual	
cnWealth per aduit	Annual	
constrg	Quarterly	The difference in natural log of values of the two consecutive quarters.
corr (measure 1)	Quarterly	For quarter t, the correlation calculation is based on all data, but excluding quarter t data point
corr (measure 2)	Quarterly	For odd [even] quarter, the correlation calculation is based on all even [odd] quarter
d_cnSaving*gini	Annual	The first difference of the interaction of cnSaving and gini, divided by 10000
debtg	Annual	The difference in natural log of values of the two consecutive years.
DisposableIncomeGrowth	Quarterly	The difference in natural log of values of the two consecutive quarters.
DisposableIncomeGrowth(t-1)	Quarterly	
Edu (measure 1)	2016	
Edu (measure 2)	One data point	
Eng (measure 1)	One data point	
Eng (measure 2)	One data point	
exg	Monthly	First, calculate the monthly average in a quarter, then calculate the growth of the monthly average as the quarterly growth by taking the difference in natural log of values of the two consecutive quarters.

Variable	Frequency	Calculation
g_cnWealth*gini	Annual	The difference in natural log of values of the interaction between cnWealth and gini of the two consecutive years
g_cnWealth per adult*gini	Annual	The difference in natural log of values of the interaction between cnWealth and gini of the two consecutive years
gini	Annual	
HousingPriceGrowth (hpg)	Quarterly	The difference in natural log of values of the two consecutive quarters.
HousingPriceGrowth(t-1)	Quarterly	
interestg	Monthly	First, calculate the monthly average in a quarter, then calculate the growth of the monthly average as the quarterly growth by taking the difference in natural log of values of the two consecutive quarters.
loc_EconomicRiskRating	Monthly	The average of the monthly ratings in a quarter
loc_FinancialRiskRating	Monthly	The average of the monthly ratings in a quarter
loc_pastGDPgrowth	Quarterly	The quarterly growth is the difference in natural log of values of the two consecutive quarters.
loc_PoliticalRiskRating	Monthly	The average of the monthly ratings in a quarter
loc_RiskStoryNum/TotalStoryNum	Daily	The average of the daily ratio in a quarter
permitg	Quarterly	The difference in natural log of values of the two consecutive quarters.
rentg	Quarterly	The difference in natural log of values of the two consecutive quarters.
urateg	Monthly	First, calculate the monthly average in a quarter, then calculate the growth of the monthly average as the quarterly growth by taking the difference in natural log of values of the two consecutive quarters.
wd_EconomicRiskRating	Monthly	First, calculate the average rating of all countries in a month, then calculate the average of the monthly ratings in a quarter
wd_FinancialRiskRating	Monthly	First, calculate the average rating of all countries in a month, then calculate the average of the monthly ratings in a quarter
wd_pastGDPgrowth	Quarterly	The quarterly growth is the difference in natural log of values of the two consecutive quarters.
wd_PoliticalRiskRating	Monthly	First, calculate the average rating of all countries in a month, then calculate the average of the monthly ratings in a quarter
wd_RiskStoryNum/TotalStoryNum	Daily	The average of the daily ratio in a quarter

Variable	Exceptions
ccg	Norway: Quarterly
constrg	Croatia's Source: Datastream
debtg	Croatia, Israel, Luxembourg, New Zealand and South Africa do not have data
Edu (measure 1)	Croatia and Luxembourg do not have data
interestg	Japan: Interbank rate (Source: Datastream); Croatia: Credit rate before or in 2004 and T-bill rate after 2004 (Source: Datastream)
permitg	Japan and the US: Monthly (Source: Datastream); Croatia and Italy: Quarterly (Source: Datastream)
rentg	Croatia: Monthly (Source: Datastream)
urateg	Quarterly: France, Israel, Italy, Luxembourg, the Netherlands, New Zealand, Norway, South Africa, Sweden

Table 1. Summary Statistics

The definitions of the variables are given in Appendix 1.

Variable	Mean	Standard Deviation	25%	50%	75%
HousingPriceGrowth	0.54%	1.86%	-0.56%	0.50%	1.64%
DisposableIncomeGrowth	0.35%	0.85%	-0.09%	0.37%	0.84%
d_cnSaving*gini	0.54%	0.83%	-0.02%	0.40%	1.03%
g_cnWealth*gini	13.06%	12.77%	8.32%	11.40%	23.12%
g_cnWealth per adult*gini	11.57%	12.76%	6.84%	9.85%	21.42%
cn_pastGDPgrowth	10.14%	2.03%	8.38%	9.95%	11.28%
loc_pastGDPgrowth	0.58%	0.70%	0.26%	0.64%	0.97%
wd_pastGDPgrowth	0.71%	0.35%	0.60%	0.75%	0.95%
loc_PoliticalRiskRating	82	7	79	84	88
loc_FinancialRiskRating	40	5	37	40	44
loc_EconomicRiskRating	40	4	38	41	43
cn_PoliticalRiskRating	66	4	62	67	69
cn_FinancialRiskRating	45	3	45	46	48
cn_EconomicRiskRating	39	2	39	40	41
wd_PoliticalRiskRating	66	2	65	67	68
wd_FinancialRiskRating	37	2	35	37	38
wd_EconomicRiskRating	35	1	34	35	36
loc_RiskStoryNum/TotalStoryNum	12.15%	5.53%	7.78%	11.50%	15.31%
cn_RiskStoryNum/TotalStoryNum	11.84%	4.67%	9.11%	10.62%	14.91%
wd_RiskStoryNum/TotalStoryNum	14.59%	4.44%	10.84%	15.11%	17.16%
corr (measure 1)	-0.18	0.25	-0.38	-0.24	0.02

Table 2. Correlation

The definitions of the variables are given in Appendix 1. hpg is HousingPriceGrowth. The bold figures are significant at 5% or stronger.

|	hpg (t-1)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
DisposableIncomeGrowth (1)	**0.156**																					
d_cnSaving*gini (2)	**0.107**	-0.030																				
g_cnWealth*gini (3)	**0.241**	**0.088**	**0.336**																			
g_cnWealth per adult*gini (4)	**0.241**	**0.087**	**0.339**	**1.000**																		
cn_pastGDPgrowth (5)	**-0.115**	-0.017	0.006	**-0.175**	**-0.187**																	
loc_pastGDPgrowth (6)	**0.155**	0.071	**-0.275**	**-0.172**	**-0.172**	**0.268**																
wd_pastGDPgrowth(7)	**0.294**	**0.224**	**-0.137**	-0.028	-0.029	**0.197**	**0.579**															
loc_PoliticalRiskRating (8)	**0.207**	**0.079**	**0.089**	**0.067**	**0.066**	-0.074	0.040	0.010														
loc_FinancialRiskRating (9)	0.004	**0.054**	-0.012	0.017	0.016	**0.299**	0.032	**0.064**	0.103													
loc_EconomicRiskRating (10)	**0.291**	**0.166**	**0.084**	0.016	0.014	**0.102**	**0.323**	**0.353**	**0.520**	**0.367**												
cn_PoliticalRiskRating (11)	**0.091**	0.021	**0.191**	**0.128**	**0.117**	**0.560**	0.047	**0.062**	0.051	**0.286**	**0.131**											
cn_FinancialRiskRating (12)	-0.013	**-0.053**	0.085	**-0.180**	**-0.184**	**-0.250**	-0.079	**-0.215**	0.012	**-0.467**	-0.080	**-0.359**										
cn_EconomicRiskRating (13)	-0.017	-0.022	**-0.186**	**-0.101**	**-0.110**	**-0.279**	0.045	**-0.109**	0.039	**-0.334**	0.007	**-0.074**	**0.633**									
wd_PoliticalRiskRating (14)	**0.235**	**0.101**	-0.026	**0.199**	**0.189**	**-0.174**	**0.214**	**0.142**	**0.214**	**-0.154**	**0.210**	**0.244**	**0.132**	**0.328**								
wd_FinancialRiskRating (15)	**-0.090**	**-0.088**	**-0.140**	**-0.353**	**-0.354**	0.014	0.032	**-0.217**	-0.058	**-0.232**	**-0.188**	**-0.196**	**0.726**	**0.524**	-0.036							
wd_EconomicRiskRating (16)	**0.106**	0.029	0.001	**-0.149**	**-0.154**	**0.240**	**0.572**	**0.247**	0.076	**-0.185**	**0.303**	**0.142**	**0.435**	**0.491**	**0.392**	**0.512**						
loc_RiskStoryN/TotalStoryN (17)	**-0.100**	**-0.062**	**-0.058**	**-0.168**	**-0.166**	**-0.193**	-0.010	**-0.144**	0.048	**-0.255**	-0.098	**-0.415**	**0.567**	**0.335**	-0.035	**0.502**	**0.262**					
cn_RiskStoryN/TotalStoryN (18)	**0.196**	0.061	**0.360**	-0.046	-0.041	**-0.367**	**0.123**	0.034	**0.148**	**-0.248**	**0.158**	**-0.214**	**0.372**	0.088	**0.320**	**0.111**	**0.336**	**0.321**				
wd_RiskStoryN/TotalStoryN (19)	**-0.094**	**-0.062**	0.050	**-0.339**	**-0.328**	**-0.443**	-0.069	**-0.189**	-0.002	**-0.359**	**-0.106**	**-0.647**	**0.634**	**0.281**	**-0.119**	**0.557**	**0.254**	**0.617**	**0.581**			
corr (measure 1) (20)	0.020	0.013	0.001	0.001	0.001	-0.039	0.005	-0.011	-0.033	-0.024	0.006	-0.022	**0.059**	**0.057**	0.033	0.037	0.035	**-0.081**	0.035	0.038		
Eng (measure 1) (21)	**0.078**	**0.085**	0.010	0.002	0.002	0.022	-0.005	**0.116**	**0.203**	**-0.289**	**-0.208**	0.012	-0.037	-0.041	-0.030	-0.036	-0.028	**0.059**	-0.015	-0.026	0.015	
Edu (measure 2) (22)	**-0.099**	0.041	0.003	0.002	0.002	0.043	-0.005	**0.080**	-0.049	0.008	**-0.152**	0.029	**-0.074**	**-0.066**	-0.043	**-0.057**	**-0.048**	0.079	-0.042	**-0.053**	**-0.107**	**0.407**

Graph 1A. China's GDP growth and overseas housing price growth
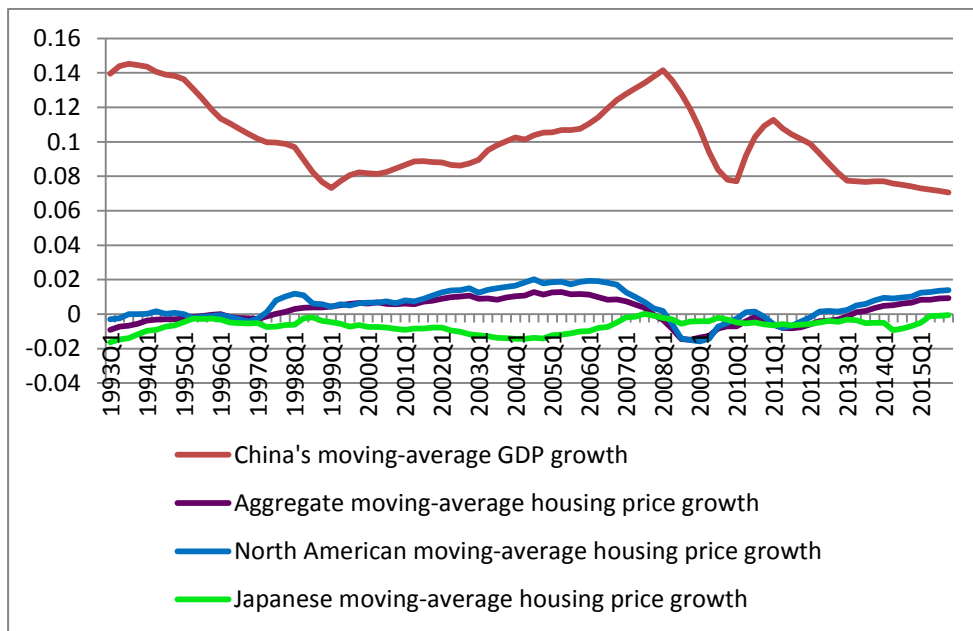
Graph 1B. China's wealth growth and overseas housing price growth
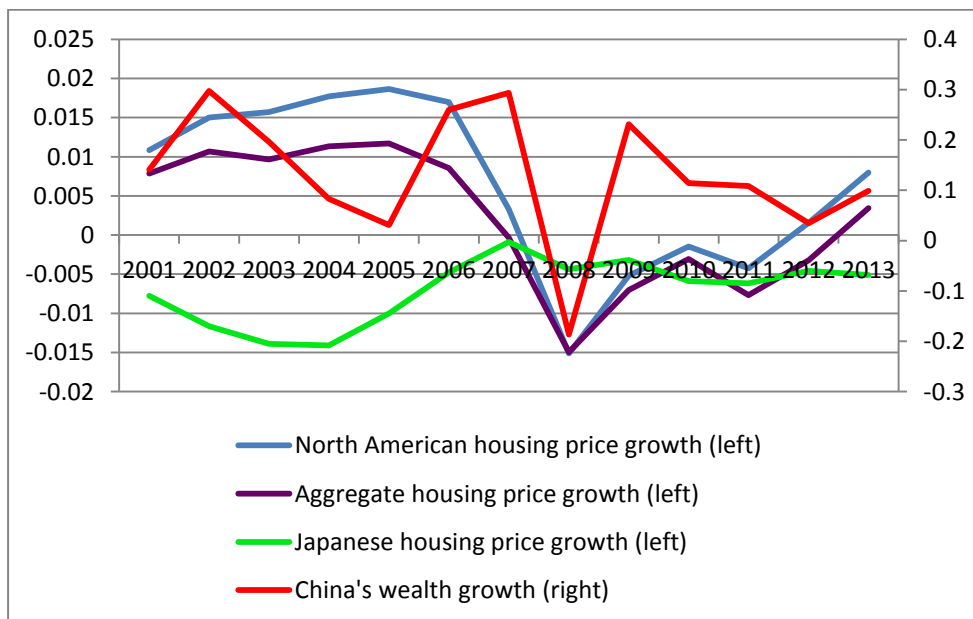
In Graph 1A, the China's GDP growth is the average of that of the past 4 quarters; the housing price growth is the average of that of contemporaneous and the past 3 quarters. North America consists of Canada and the US, weighted by PPP GDP per capita. In Graph 1B, China's wealth is the product of the total wealth and Gini; the housing price growth is the average quarterly growth of the 4 quarters in a year.

Graph 2A. China's GDP growth and English countries' housing price growth
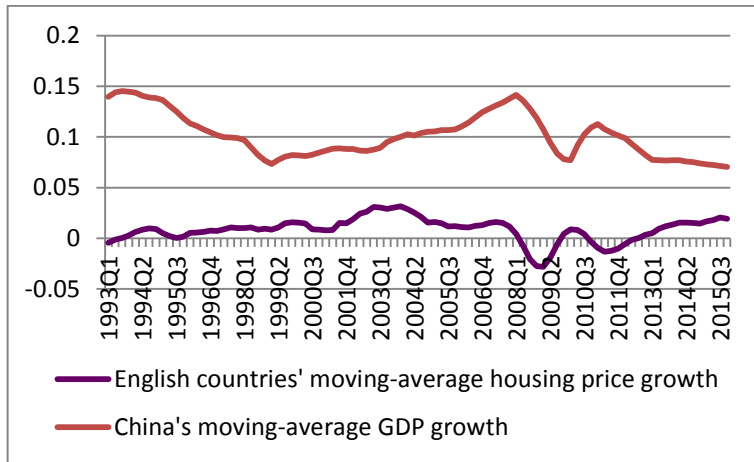
Graph 2B. China's wealth growth and English countries' housing price growth
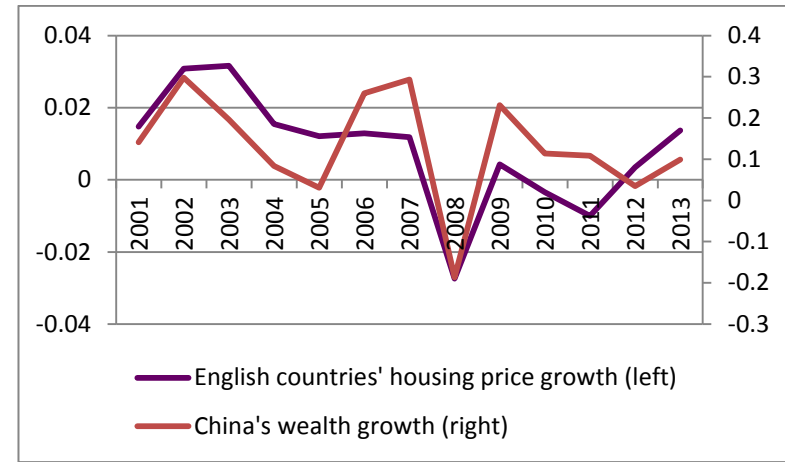
Graph 2C. China's GDP growth and high QS countries' housing price growth
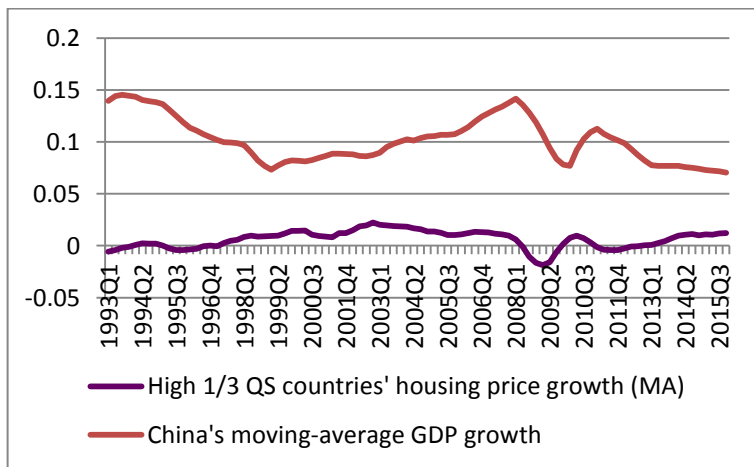
Graph 2D. China's wealth growth and high QS countries' housing price growth

Table 3. China's Past GDP Growth and Housing Price Growth of Other Markets Around the World

The dependent variable is housing price growth. Appendix 1 defines the variables. Country fixed effects are included. Robust standard errors are based on country and time clustering. ***, ** & * indicate 1%, 5% & 10% significance.

| Sample	93Q1-15Q4	93Q1-15Q4	96Q1-15Q4	81Q1-15Q4	93Q1-15Q4
	(1)	(2)	(3)	(4)	(5)
cn_pastGDPgrowth	**-0.074***	**-0.077***	**-0.080**	**-0.028***	**-0.076**
	(0.021)	**(0.023)**	**(0.029)**	**(0.015)**	**(0.030)**
loc_pastGDPgrowth		0.326***	0.436***	0.248**	0.108
		(0.091)	(0.119)	(0.093)	(0.119)
wd_pastGDPgrowth		-0.440**	-0.376**	-0.405**	-0.299
		(0.158)	(0.167)	(0.160)	(0.271)
HousingPriceGrowth(t-1)	0.546***	0.556***	0.499***	0.609***	0.516***
	(0.054)	(0.046)	(0.070)	(0.042)	(0.060)
DisposableIncomeGrowth	0.338***	0.315***	0.241**	0.322***	0.238***
	(0.064)	(0.069)	(0.091)	(0.061)	(0.081)
DisposableIncomeGrowth(t-1)	-0.077				
	(0.061)				
interestg			-0.001		
			(0.002)		
rentg			-0.060*		
			(0.032)		
urateg			-0.006		
			(0.010)		
permitg			0.016**		
			(0.006)		
constrg			0.014		
			(0.008)		
ccg			0.115***		
			(0.030)		
exg			-0.020**		
			(0.009)		
debtg			0.076***		
			(0.020)		
C*L.chrhpi					0.004
					(0.054)
C*chrpdi					0.179
					(0.118)
C*cn_past					-0.084*
					(0.046)
C*loc_past					0.341*
					(0.176)
C*wd_past					-0.383
					(0.307)
C					0.004
					(0.005)
Observations	2,116	1,919	1,133	2,089	1,919
Adjusted R-squared	0.400	0.456	0.563	0.494	0.473

Table 4. Chinese, American and British Past GDP growth and Housing Price Growth Around the World

This table reports the sign of the estimated coefficient of the past GDP growth of the baseline regressions of housing price growth of individual countries. ***, **, * and # indicate 1%, 5%, 10% and one-sided 10% significance.

pastGDPgrowth:	China	US	UK
Aggregate	-***	+	+
Australia	-*	-	-
Belgium	+	-	-
Canada	-#	-	+
Croatia	-	-	-#
Denmark	+	+**	+#
Finland	-	-	-
France	-*	+	+
Germany	-	-	-
Ireland	-*	+	+
Israel	+	-***	-***
Italy	-	+	+
Japan	+	+	+
Luxembourg	-***	+*	+**
Netherlands	-**	+	+*
New Zealand	-	-#	-#
Norway	-	+#	+
South Africa	-**	-**	+
South Korea	-*	-	+
Spain	-	-	+
Sweden	-*	+#	+
Switzerland	-	-#	-#
United Kingdom	-***	-	
United States	-***		+
Negative proportion	19/23	13/22	8/22
Significantly negative proportion (1%, 5% or 10%)	10/23	2/22	1/22

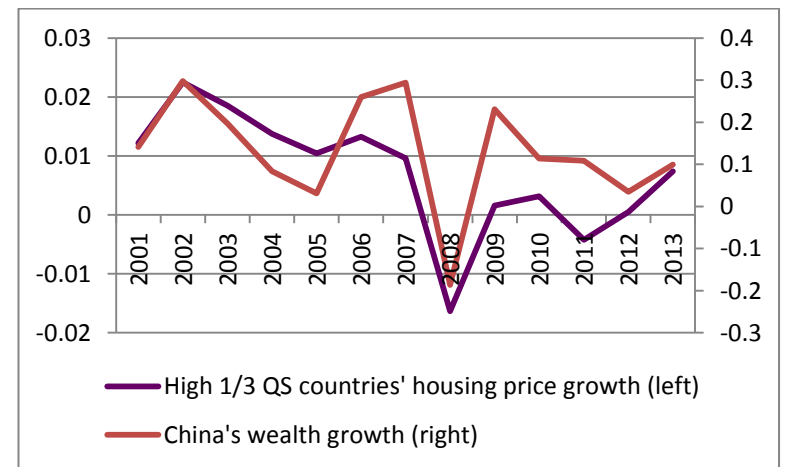Table 5. China's Saving Change/Wealth Growth and Housing Price Growth of Other Markets Around the World

The dependent variable is housing price growth. Appendix 1 defines the variables. Country fixed effects are included. Robust standard errors are based on country and time clustering. ***, **, * and # indicate 1%, 5%, 10% and one-sided 10% significance.

	(1)	(2)	(3)
d_cnSaving*gini	0.213***		
	(0.049)		
g_cnWealth*gini		0.016***	
		(0.006)	
g_cnWealth per adult*gini			0.016***
			(0.006)
cn_pastGDPgrowth	-0.092***	-0.109***	-0.107***
	(0.026)	(0.037)	(0.037)
loc_pastGDPgrowth	0.321***	0.352***	0.352***
	(0.092)	(0.070)	(0.070)
wd_pastGDPgrowth	-0.272#	-0.244#	-0.249*
	(0.176)	(0.145)	(0.144)
HousingPriceGrowth(t-1)	0.548***	0.574***	0.574***
	(0.046)	(0.050)	(0.050)
DisposableIncomeGrowth	0.310***	0.305***	0.305***
	(0.076)	(0.072)	(0.072)
Observations	1,743	1,170	1,170
Adjusted R-squared	0.471	0.512	0.512

Table 6. China's Risk and Housing Price Growth Around the World

The dependent variable is housing price growth. Appendix 1 defines the variables. Country fixed effects are included. Robust standard errors are based on country and time clustering. ***, **, * and # indicate 1%, 5%, 10% and one-sided 10% significance.

	(1)	(2)
cn_PoliticalRiskRating	0.061**	0.024
	(0.022)	(0.025)
cn_FinancialRiskRating	0.010	0.008
	(0.023)	(0.025)
cn_EconomicRiskRating	**-0.056****	**-0.070*****
	(0.021)	**(0.021)**
loc_PoliticalRiskRating	0.006	0.011
	(0.014)	(0.015)
loc_FinancialRiskRating	0.030*	0.028*
	(0.015)	(0.016)
loc_EconomicRiskRating	0.069***	0.071***
	(0.022)	(0.022)
wd_PoliticalRiskRating	0.020	-0.036
	(0.032)	(0.034)
wd_FinancialRiskRating	0.068#	0.141**
	(0.051)	(0.056)
wd_EconomicRiskRating	0.001	0.060
	(0.056)	(0.053)
cn_RiskStoryNum/TotalStoryNum		**0.038****
		(0.017)
loc_RiskStoryNum/TotalStoryNum		0.013
		(0.013)
wd_RiskStoryNum/TotalStoryNum		-0.096***
		(0.027)
d_cnSaving*gini	0.128**	0.104**
	(0.052)	(0.046)
cn_pastGDPgrowth	-0.193***	-0.229***
	(0.042)	(0.050)
loc_pastGDPgrowth	0.260***	0.258**
	(0.089)	(0.094)
wd_pastGDPgrowth	-0.341#	-0.505**
	(0.212)	(0.196)
HousingPriceGrowth(t-1)	0.495***	0.474***
	(0.047)	(0.047)
DispoableIncomeGrowth	0.282***	0.273***
	(0.073)	(0.072)
Observations	1,743	1,743
Adjusted R-squared	0.485	0.492

Table 7. Moderating Effects of Correlation with China's Interest Rate on Housing Price Growth Around the World

The dependent variable is housing price growth. Appendix 1 defines the variables. Country fixed effects are included. Robust standard errors are based on country and time clustering. ***, **, * and # indicate 1%, 5%, 10% and one-sided 10% significance.

corr used	measure 1	measure 2
	(1)	(2)
corr*d_cnSaving*gini	**-0.384****	**-0.245***
	(0.172)	**(0.136)**
corr*cn_pastGDPgrowth	-0.057	0.012
	(0.120)	(0.115)
corr*cn_PoliticalRiskRating	0.170**	0.054
	(0.082)	(0.054)
corr*cn_FinancialRiskRating	0.105#	0.046
	(0.079)	(0.043)
corr*cn_EconomicRiskRating	**-0.170****	**-0.141****
	(0.068)	**(0.059)**
corr*cn_RiskStoryNum/TotalStoryNum	-0.029	-0.023
	(0.029)	(0.028)

(to be continued)

Table 7. (concluded)

corr used	measure 1	measure 2
	(1)	(2)
d_cnSaving*gini	0.022	0.053
	(0.064)	(0.061)
cn_pastGDPgrowth	-0.232***	-0.224***
	(0.055)	(0.054)
loc_pastGDPgrowth	0.253**	0.258***
	(0.092)	(0.090)
wd_pastGDPgrowth	-0.517**	-0.508**
	(0.199)	(0.199)
cn_PoliticalRiskRating	0.049*	0.032
	(0.028)	(0.025)
cn_FinancialRiskRating	0.029	0.018
	(0.031)	(0.026)
cn_EconomicRiskRating	-0.104***	-0.101***
	(0.021)	(0.020)
loc_PoliticalRiskRating	0.015	0.015
	(0.016)	(0.016)
loc_FinancialRiskRating	0.028#	0.028*
	(0.017)	(0.016)
loc_EconomicRiskRating	0.059**	0.065**
	(0.024)	(0.023)
wd_PoliticalRiskRating	-0.035	-0.039
	(0.036)	(0.036)
wd_FinancialRiskRating	0.130**	0.137**
	(0.056)	(0.057)
wd_EconomicRiskRating	0.076#	0.069
	(0.054)	(0.054)
loc_RiskStoryNum/TotalStoryNum	0.007	0.010
	(0.015)	(0.014)
cn_RiskStoryNum/TotalStoryNum	0.032*	0.034*
	(0.018)	(0.019)
wd_RiskStoryNum/TotalStoryNum	-0.093***	-0.096***
	(0.028)	(0.028)
HousingPriceGrowth(t-1)	0.464***	0.468***
	(0.047)	(0.047)
DisposableIncomeGrowth	0.268***	0.270***
	(0.071)	(0.072)
Observations	1,743	1,743
Adjusted R-squared	0.495	0.492

Table 8. Incremental Chinese Effects on Housing Price Growth for English Countries over Non-English Countries

The dependent variable is housing price growth. Appendix 1 defines the variables. Country fixed effects are included. Robust standard errors are based on country and time clustering. ***, **, * and # indicate 1%, 5%, 10% and one-sided 10% significance.

Eng measure	Primary language	De facto official and primary language
	(1)	(2)
Eng*d_cnSaving*gini	0.161**	0.196***
	(0.066)	(0.069)
Eng*cn_pastGDPgrowth	-0.126**	-0.116*
	(0.060)	(0.064)
Eng*cn_PoliticalRiskRating	0.022	-0.002
	(0.025)	(0.027)
Eng*cn_FinancialRiskRating	0.002	-0.019
	(0.035)	(0.032)
Eng*cn_EconomicRiskRating	-0.026	-0.012
	(0.042)	(0.042)
Eng*cn_RiskStoryNum/TotalStoryNum	-0.017	-0.012
	(0.021)	(0.024)
d_cnSaving*gini	-0.028	-0.018
	(0.077)	(0.075)
cn_pastGDPgrowth	-0.197***	-0.213***
	(0.053)	(0.057)
loc_pastGDPgrowth	0.222**	0.232**
	(0.093)	(0.093)
wd_pastGDPgrowth	-0.486**	-0.497**
	(0.199)	(0.196)

(to be continued)

Table 8. (concluded)

Eng measure	Primary language	De facto official and primary language
	(1)	(2)
cn_PoliticalRiskRating	0.042#	0.049#
	(0.031)	(0.030)
cn_FinancialRiskRating	0.032	0.036
	(0.034)	(0.033)
cn_EconomicRiskRating	-0.099***	-0.104***
	(0.026)	(0.024)
loc_PoliticalRiskRating	0.016	0.013
	(0.017)	(0.016)
loc_FinancialRiskRating	0.033*	0.033*
	(0.019)	(0.020)
loc_EconomicRiskRating	0.052**	0.055**
	(0.024)	(0.026)
wd_PoliticalRiskRating	-0.036	-0.033
	(0.036)	(0.036)
wd_FinancialRiskRating	0.118**	0.122**
	(0.058)	(0.059)
wd_EconomicRiskRating	0.090#	0.085#
	(0.058)	(0.058)
loc_RiskStoryNum/TotalStoryNum	0.005	0.006
	(0.015)	(0.016)
cn_RiskStoryNum/TotalStoryNum	0.036**	0.034*
	(0.018)	(0.019)
wd_RiskStoryNum/TotalStoryNum	-0.093***	-0.093***
	(0.029)	(0.028)
corr*d_cnSaving*gini	-0.400**	-0.396**
	(0.174)	(0.171)
corr*cn_pastGDPgrowth	-0.049	-0.057
	(0.108)	(0.118)
corr*cn_PoliticalRiskRating	0.169**	0.170**
	(0.081)	(0.082)
corr*cn_FinancialRiskRating	0.100	0.100
	(0.080)	(0.081)
corr*cn_EconomicRiskRating	-0.169***	-0.173**
	(0.066)	(0.068)
corr*cn_RiskStoryNum/TotalStoryNum	-0.029	-0.029
	(0.030)	(0.030)
HousingPriceGrowth(t-1)	0.461***	0.460***
	(0.047)	(0.048)
DisposableIncomeGrowth	0.276***	0.278***
	(0.072)	(0.070)
Observations	1,743	1,743
Adjusted R-squared	0.496	0.496

Table 9. Moderating Effects of Higher Education on Housing Price Growth Around the World

The dependent variable is housing price growth. Appendix 1 defines the variables. Country fixed effects are included. Robust standard errors are based on country and time clustering. ***, **, * and # indicate 1%, 5%, 10% and one-sided 10% significance.

Edu measure	QS score	Top student destinations
	(1)	(2)
Edu*d_cnSaving*gini	-0.328#	0.026
	(0.224)	(0.086)
Edu*cn_pastGDPgrowth	0.201	0.059
	(0.218)	(0.061)
Edu*cn_PoliticalRiskRating	**-0.065**	**-0.077****
	(0.130)	**(0.034)**
Edu*cn_FinancialRiskRating	0.038	-0.003
	(0.081)	(0.041)
Edu*cn_EconomicRiskRating	**0.160****	**0.095****
	(0.075)	**(0.047)**
Edu*cn_RiskStoryNum/TotalStoryNum	0.056	0.008
	(0.051)	(0.026)
d_cnSaving*gini	0.176	-0.033
	(0.202)	(0.085)
cn_pastGDPgrowth	-0.335*	-0.199***
	(0.180)	(0.055)
loc_pastGDPgrowth	0.200#	0.230***
	(0.123)	(0.084)
wd_pastGDPgrowth	-0.535**	-0.491**
	(0.212)	(0.200)
cn_PoliticalRiskRating	0.085	0.048#
	(0.096)	(0.031)
cn_FinancialRiskRating	0.008	0.033
	(0.056)	(0.037)
cn_EconomicRiskRating	-0.216***	-0.112***
	(0.060)	(0.030)
loc_PoliticalRiskRating	0.015	0.019
	(0.017)	(0.017)
loc_FinancialRiskRating	0.033#	0.032#
	(0.021)	(0.020)
loc_EconomicRiskRating	0.051*	0.054**
	(0.027)	(0.026)

(to be continued)

Table 9. (concluded)

Edu measure	QS score	Top student destinations
	(1)	(2)
wd_PoliticalRiskRating	-0.036	-0.040
	(0.037)	(0.037)
wd_FinancialRiskRating	0.109*	0.124**
	(0.063)	(0.059)
wd_EconomicRiskRating	0.101*	0.085#
	(0.061)	(0.060)
loc_RiskStoryNum/TotalStoryNum	0.003	0.003
	(0.016)	(0.014)
cn_RiskStoryNum/TotalStoryNum	-0.004	0.036*
	(0.041)	(0.020)
wd_RiskStoryNum/TotalStoryNum	-0.089***	-0.094***
	(0.029)	(0.029)
corr*d_cnSaving*gini	-0.435***	-0.400**
	(0.145)	(0.172)
corr*cn_pastGDPgrowth	-0.036	-0.029
	(0.105)	(0.108)
corr*cn_PoliticalRiskRating	0.143*	0.153**
	(0.086)	(0.077)
corr*cn_FinancialRiskRating	0.100	0.096
	(0.092)	(0.080)
corr*cn_EconomicRiskRating	-0.162**	-0.159***
	(0.072)	(0.051)
corr*cn_RiskStoryNum/TotalStoryNum	-0.028	-0.031
	(0.030)	(0.030)
Eng*d_cnSaving*gini	0.220***	0.151**
	(0.063)	(0.059)
Eng*cn_pastGDPgrowth	-0.147***	-0.149**
	(0.057)	(0.064)
Eng*cn_PoliticalRiskRating	0.027	0.052**
	(0.026)	(0.022)
Eng*cn_FinancialRiskRating	-0.010	0.002
	(0.039)	(0.033)
Eng*cn_EconomicRiskRating	-0.045	-0.063*
	(0.049)	(0.038)
Eng*cn_RiskStoryNum/TotalStoryNum	-0.026	-0.021
	(0.020)	(0.020)
HousingPriceGrowth(t-1)	0.481***	0.451***
	(0.047)	(0.047)
DisposableIncomeGrowth	0.251***	0.282***
	(0.071)	(0.075)
Observations	1,665	1,743
Adjusted R-squared	0.507	0.499