China and International Housing Price Growth*

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Abstract

We document the Chinese effects on international residential property price growth. We show housing prices grow faster following decline in growth of China's gross domestic product, increases in China's savings rate, or rise in China's risks. These results are 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. These effects are stronger for countries where English is the primary spoken language, with better tertiary education quality, and that exhibit lower correlations between local property market price growth and China's interest rate.

Keywords: international housing prices, China, overseas opportunities, investible funds, risk, English, education

JEL Codes: G11; R20; F21

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1. Introduction

Chinese investment in overseas property markets is widely covered in the media[1] and draws attention from governments (e.g. the Australian, Canadian, and Singaporean 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. In 2015, the global residential real estate value of US$163 trillion, is approximately double the world's gross domestic product (GDP) and comprises roughly 45% of mainstream global assets (Savills 2016). Therefore, even a small Chinese impact on other countries' real estate could represent a very large change on global asset values. However, no systematic study has been undertaken, particularly in a global setting, examining the Chinese impact, which has motivated our study. In particular, we investigate (a) whether China affects international housing markets, (b) which countries are more strongly affected, (c) and what conditions influence the effects.

Real estate studies typically focus on a single country (e.g. Lai et al. 2010; Mian et al. 2015), while multicountry studies primarily examine country-specific factors (e.g. Hott and Monnin 2008; Burnside et al. 2016), although general developments or global factors are also examined (e.g. Favilukis et al. 2013). However, how one country affects the global

[1] For example, *The Economist* ("A roaring trade," 18 June 2016), *Forbes* ("The flipside of China's love for American real estate," 16 May 2016), *The Wall Street Journal* ("Chinese investors pour money Into U.S. property," 25 May 2016), *Reuters* ("Why Chinese investment in overseas real estate has more than doubled," 18 August 2016), *Financial Times* ("Beijing clampdown slows China spending spree on US property," 16 May 2016), and *Bloomberg* ("Chinese buyers hungry for Canadian homes with inquiries up 134%,"14 April 2016).

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

housing market or the housing markets of various countries, such as this study investigates, is rarely examined.

Primarily based on the quarterly data of 23 countries from 1993–2015, 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 contemporaneous changes in China's savings rate (investible funds) in the same year, after controlling for common real estate explanatory variables. On average, an approximately 0.23% increase in international housing prices follows a 1% decrease in China's GDP growth and an approximately 1% increase in international housing prices is associated with a 1% increase in China's savings rate. 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 must grow by 0.89% more to have the same impact on its own housing prices.[3]

The GDP growth of the United States, the United Kingdom, or the aggregate of France, Germany, and the United Kingdom does not have such pervasive effects as those of China's GDP growth. We obtain similar results when we replace China's GDP growth with interest rates or consumer confidence expectations and China's savings rate by wealth growth. These results are consistent with the notion of the Chinese investing in overseas property markets when China has less promising investment opportunities and they have the means (savings and wealth) to do so.[4] These significant relations still exist when recent economic downturns are excluded or when separating the differential effect of the post-

[3] In this paper, the term *local* refers to one of the 23 countries we examine.

[4] One plausible reason for this phenomenon is that the Chinese had relatively less exposure to foreign assets in 1990s in comparison to US and UK households. Hence, they were more likely to build up foreign asset holdings over our sample period than the Americans and the British.

2007 period. The relation with China's GDP is prevalent and relatively stronger for residential property markets in the United States, the United Kingdom, Ireland, Australia, the Netherlands, France, Sweden, Luxembourg, South Korea, and South Africa.

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

We search major policy changes for international property buyers or key rule changes that affect ease of Chinese capital outflows, but find only a few such changes in our sample period for exploitation as exogenous changes to the relations we study. There is very limited time-series cross-sectional variation. Therefore, we are strongly cautious and conservative about generalisation of the results. Nevertheless, we find that corresponding residential housing prices grow faster following a relaxation of capital outflows for Chinese resident from China in 2007 and a relaxation for foreigners to purchase properties in Australia in December 2008. We also find that related housing prices grow slower following an imposition of a capital gains tax for overseas investors buying UK residential property in April 2015 and a restriction for foreigners to buy properties in Australia in April 2010. Since the number of the major exogenous changes is small, these changes are estimated to be hardly useful for further formal and robust analyses.

Our work is related to two strands of research. First, we consider the effects of external 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 tourism (e.g. Rodríguez and Bustillo 2010). However, our study examines the impacts of investment opportunities and the risks of a single country, China, on international housing markets.

Second, we follow the mainstream finance literature in examining factors affecting Chinese overseas property investment. In the 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, such as 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). The literature also suggests investors prefer politically stable environments (e.g. La Porta et al. 1997). In addition, studies find people are inclined to invest in assets for which they have more information and with which they are more familiar (e.g. Coval and Moskowitz 1999; Grinblatt and Keloharju 2001; Huberman 2001; Ivkovíc and Weisbenner 2005; Massa and Simonov 2006). Economists have also long recognized the importance of information about products on consumer behaviour (Nelson 1970).[6] In this study, we examine the above-mentioned factors. In addition, we study whether the attractive attributes of countries

[5] While people may not actually make complex calculations related to theories (i.e. portfolio theory), they act as if they do (McEachern 2011). Markowitz (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 of the *Merchant of Venice* as evidence that Shakespeare was not only conversant with diversification but also intuitively understood covariance.

[6] Properties are also consumption products and property buyers are therefore concerned about the environments associated with properties as well.

matter, including quality tertiary education. Real estate studies find premiums are paid for houses in areas with quality educational institutions such as schools (e.g. Figlio and Lucas 2004).

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

2. Data

Our dependent variable is growth of housing price indices. The real seasonally adjusted quarterly housing price indices of 23 countries and their aggregate from 1975 Q1 to 2015 Q4 are obtained from Mack and Martínez-García (2011). The 23 countries are Australia, Belgium, Canada, Croatia, Denmark, Finland, France, Germany, Ireland, Israel, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, South Africa, South Korea, Spain, Sweden, Switzerland, the United Kingdom, and the United States. The indices are selected to be consistent with the US Federal Housing Finance Agency's quarterly nationwide house price index for single-family houses (formerly called the Office of Federal Housing Enterprise Oversight house price index). The same source also provides corresponding real seasonally adjusted quarterly personal disposable income series.

The sources of the key variables of interest are as follows: Datastream for China's quarterly real GDP growth since 1992, the prime lending rate, and consumer expectation; the World Bank for China's savings rate and annual GDP before 1992; Crédit Suisse (2015) for China's total wealth and wealth per adult; the PRS Group for China's political, economic, and financial risk ratings; Bloomberg for the numbers of China's risk stories and all stories; Solt (2016) for China's Gini coefficient; Wikipedia for the classification of English countries;

Quacquarelli Symonds Limited for the QS higher education country ranking and the United Nations for the top five tertiary student migration destinations of China.

We obtain the raw data for the other control variables from the Economic Cycle Research Institute, Datastream, the PRS Group, Bloomberg, and the Organisation for Economic Co-operation and Development (OECD). We obtain international business cycle chronologies from the Economic Cycle Research Institute. Local and world GDP, unemployment rates, exchange rates, and consumer confidence indices are from Datastream. We obtain the 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 country-level household debt, short-term interest rates, rental price indices, production indices in construction, and indices of 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 use the average of all days or months in a quarter. The variable definitions are given in the Appendix.

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

Table 2 reports the correlation coefficients of the 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 the world financial risk rating (0.557), China's political and financial risk ratings (-0.647 and 0.634, respectively), and China's and local proportions of stories about risk (0.581 and 0.617, respectively). 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, the world financial risk rating is relatively strongly correlated with the world economic risk rating (0.512) and the local risk story number (0.502). Nevertheless, all variance inflation factors are well below 10. Hence, multicollinearity is not a concern.

3. Hypotheses and methodology

The home bias literature shows that investors typically hold portfolios that are overweighted towards their home market, which suggests that the Chinese will invest mainly in Chinese-domiciled assets. However, certain factors may encourage the Chinese to invest offshore. In particular, in a spirit similar to the notion of 'push' and 'pull' factors in the capital flow literature (e.g. Calvo et al. 1993, 1996; Fernandez-Arias 1996; Chuhan et al. 1998; Fratzscher 2012), when there are fewer expected growth opportunities in China, the Chinese may seek offshore investment opportunities, including residential property. As motivation for overseas property investments, Newell and Worzala (1995) report that investors in a survey state 'lack of opportunities in domestic market' and 'higher returns than domestic markets' as key factors. Therefore, we predict that the Chinese will buy more overseas properties when expected growth opportunities in China are fewer, which would lead to faster real housing price growth *(hpg*) of overseas real estate markets. We call this

the overseas opportunity hypothesis. To test this prediction, we empirically estimate the following model:

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

where the subscripts j and t index the country and quarter, respectively. We expect a1 to be negative. Lemmon and Portniaguina (2006) show that the GDP is fairly strongly associated with consumer confidence in expected macroeconomic conditions, a major determinant of growth opportunities. Therefore, we use the average of the real GDP growth of the past four quarters as a proxy for expected growth opportunities. In place of 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, the past real GDP growth of the 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, of the rental index, of the unemployment rate, of the consumer confidence index, of the exchange rate, of household debt, and of the interest rate.[8] To minimize the influence of outliers, the variables of all the regressions are winsorized at 1% and 99%.

[7] The controls are based on demand fundamentals in the housing market such as employment and income (Wheaton and Nechayev 2008; Campbell et al. 2009). We include lagged housing price growth to control for 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 housing market demand. We add the world GDP growth to control for a general globalization effect on local housing markets.

[8] Adding the interest rate and rent in the model will control for housing market investment opportunities. Shiller (2006) argues that house prices should be equal to the present value of future rents. Glaeser et al. (2005) find that new construction is a key variable in explaining why US housing prices have gone up.

We estimate the baseline model for each individual country to study the prevalence of China's effects. To examine whether there are similar effects for other major economies, we replicate the individual country analysis using the real GDP growth of the United States, of the United Kingdom, and of the aggregate of France, Germany, and the United Kingdom in place of that of China.

Regarding our second hypothesis, economics posits that when people have more funds, they will consume and invest more (e.g. Krugman and Wells 2015). Specifically, when Chinese individuals have more funds to invest, some of it will flow into the property market, including markets outside China. Hence, we predict that an increase in investible funds of the Chinese will increase their overseas property investments, which, in turn, will increase the housing price growth of these markets. We call this the investible funds hypothesis. To test this hypothesis, we expand Eq. (1) to

$$hpg_{j,t} = a0 + a1*\textit{China's expected growth opportunities}_t + \mathbf{a2}*\boldsymbol{\textit{growth of China's investible funds}_t} + \textit{Controls}_{j,t} + e_{j,t} \quad (2)$$

We consider three alternative fund measures: the savings rate, aggregate wealth, and wealth per adult. We subsequently focus on the savings rate because we only have data on the latter two measures since year 2000. We predict a positive a2. Since Chinese participants in overseas property markets are likely to be in the upper-middle class or higher because of the relatively high minimum investment outlay, the ideal proxy should capture

Meanwhile, credit market terms is used to analyse the causes of the subprime mortgage crisis (e.g. Wheaton and Nechayev 2008; Khandani et al. 2009; Glaeser et al. 2010). The exchange rate may be relevant for international investors, since changes of the exchange rate will have a material impact on foreign investment. Thus, it could have predictive power in our analysis (Chen et al. 2010). Finally, the consumer confidence index is based on the exuberance theory proposed by Akerlof and Shiller (2009), to counter for the recent bubble period.

this group's investible funds. We therefore use the growth of the product of an existing investible funds measure and the Gini index. Larger Gini measures imply greater income inequality within a nation, thereby capturing the ability to accumulate savings and wealth of those in or above the upper-middle classes.

Concerning our third 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 overseas opportunity hypothesis, when risk in China is higher, the Chinese invest less in China and turn to overseas investment. 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 overseas property investments by the Chinese, thus accelerating the growth of foreign housing prices. We call this risk hypothesis. We thus augment Eq. (2) as follows:

$$hpg_{j,t} = a0 + a1*\textit{China's expected growth opportunities}_t + a2*\textit{growth of China's investible funds}_t + \mathbf{a3}*\boldsymbol{\textit{China's risk}_t} + \textit{Controls}_{j,t} + \textit{Risk Controls}_{j,t} + \textit{Global Risk Control}_t + e_{j,t} \quad (3)$$

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

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

As our final hypothesis, China's effects predicted by the three hypotheses above are likely to vary across countries. The variation conceivably depends on how familiar the Chinese are with the countries in question (e.g. Coval and Moskowitz 1999; Grinblatt and Keloharju 2001; Huberman 2001; Ivkovíc and Weisbenner 2005; Massa and Simonov 2006) and how attractive these markets are to the Chinese, including aspects such as English being the primary language and quality tertiary education (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. We therefore modify Eq. (3) accordingly:

$$
\begin{aligned}
hpg_{j,t} = {} & a0 + a1*\textit{China's expected growth opportunities}_t \\
& + a2*\textit{growth of China's investible funds}_t + a3*\textit{China's risk}_t \\
& + \textit{Controls}_{j,t} + \textit{Risk Controls}_{j,t} + \textit{Global Risk Control}_t \\
& + \mathbf{a1m}*\boldsymbol{Familiarity_{j(,t)}/Attractiveness_{j(,t)}*China's\ expected\ growth\ opportunities_t} \\
& + \mathbf{a2m}*\boldsymbol{Familiarity_{j(,t)}/Attractiveness_{j(,t)}*growth\ of\ China's\ investible\ funds_t} \\
& + \mathbf{a3m}*\boldsymbol{Familiarity_{j(,t)}/Attractiveness_{j(,t)}*China's\ risk} + e_{j,t} \qquad (4)
\end{aligned}
$$

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 the correlation between China's interest rate and the growth of overseas housing prices (reflecting diversification benefits), primary languages, and quality of higher education. Modern portfolio theory (Markowitz 1952) states that whether we add an asset to an existing portfolio depends on the asset's incremental risk effect 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 the investor's existing portfolio is lower. The return series of the Chinese portfolio is not readily available. However, as the home bias literature suggests, the Chinese likely mainly hold assets in China. It is thus plausible to use a series that reasonably tracks changes of the 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.

Since English is a principal international language, we expect the Chinese to be more familiar with countries where English is the primary language (English countries). We also predict that the benefits associated with English make these countries more attractive to the Chinese. Hence, real estate in English countries will be more appealing to the 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 United Kingdom, and the United

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

States) and a dummy for countries where English is the de facto official and primary language (Australia, New Zealand, the United Kingdom, and the United States).

A primary reason for overseas property purchases by the Chinese 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 education. Our two measures of higher education quality are the 2016 QS higher education country-level ranking and a dummy for the 2013 top five tertiary student migration destinations of China. These five countries are the United States, Japan, Australia, the United Kingdom, and South Korea.

We also look at bilateral trade, Chinese outward foreign direct investment, Chinese migration numbers, the overseas Chinese population and Chinese outbound tourists, geographical distance, and the long-term growth forecasts of the foreign economies.[10] However, these have neither explanatory power nor moderating effects. 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 no relation along these dimensions.

4. Empirical results

4.1 Main relations

We first graphically show the relations between housing price growth in international markets and growth in the Chinese GDP and wealth. Figure 1A plots China's

[10] The data sources are the United Nations Comtrade Database (bilateral trade), UNCTAD (foreign direct investment), the World Bank (migration), the OECD (Chinese population and long-term forecasts), www.travelchinaguide.com (tourist numbers), and www.distancecalculator.net (distance)

GDP growth and the housing price growth of North America, Japan, and the aggregate of the 23 countries. The series are four-quarter moving averages. It is evident that China's GDP growth is negatively correlated with aggregate and North American housing price growth, but not with Japanese housing price growth. In Figure 1B, we replace China's GDP growth in Figure 1A by its wealth growth, where wealth is the product of the total wealth and the Gini index. 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 relations for English countries and countries with the top third of QS rankings. The English countries are Australia, Canada, Ireland, New Zealand, the United Kingdom, and the United States. The countries with the top QS rankings are Australia, Canada, France, Germany, the United Kingdom, and the United States. Figures 2A and 2C show China's GDP growth and Figures 2B and 2D display China's wealth growth.

4.2 Effects of China's GDP growth

Table 3 reports the regression results of the relation between China's rolling average real quarterly GDP growth over the past four quarters (past GDP growth) and the housing price growth of the other markets around the world. The coefficient of China's past GDP growth is significantly negative. This result is consistent with the overseas opportunity hypothesis, that when China's growth opportunities are poorer, the Chinese buy more overseas properties, whereby increasing the growth of these markets' housing prices.[11]

[11] We regress China's real housing price index growth on China's contemporaneous or lagged real GDP growth. The coefficient of the GDP growth is significantly positive. When we replace the above GDP growth by the average of the GDP growth over the past four quarters, the coefficient is still positive but weaker. These results are consistent with the view that lower GDP growth in China reflects a lack of investment opportunities in

The result is robust with respect to the inclusion of various controls, as shown in columns (1) to (3) of Table 3. The coefficients of the controls are generally consistent with expectations. Moreover, the negative relation also exists for an extended sample period,[12] over which we convert pre-1992 China's annual GDP growth into quarterly GDP growth and use the average of the pre-1992 quarterly variables of all quarters in the corresponding year, although the relation is weaker in the earlier period. In addition, the literature (e.g. Deng et al. 2011; Dokko et al. 2011; Krishnamurthy and Vissing-Jorgensen 2011; Kapetanios et al. 2012; Wu et al. 2012; Xu and Chen 2012) suggests that relations may be different since the recent global financial crisis. However, we find that the significantly negative relation persists when separating the differential effect of the post-2007 period.

We perform several other robustness checks.[13] First, instead of using the past four quarters, we look at China's GDP growth based on past the one-, two-, and 12-quarter intervals. All alternative intervals of past GDP growth have significantly negative relations with overseas housing price growth. The longer the past GDP growth interval, the larger the estimated coefficients. The magnitude of the coefficient for 12-quarter GDP growth (-0.115) is approximately double the one-quarter coefficient (-0.056). Second, in place of past China's GDP growth, we consider China's consumer expectations based on the past one, two, three, and four quarters. In all cases, the relations with foreign housing price growth are significantly negative. Lastly, we replace China's past GDP growth by China's past prime lending rate. We obtain strongly statistically significant and qualitatively the same results.

China's domestic market, including the domestic property market, consistent with the overseas opportunity hypothesis. In addition, consistent with the investible funds hypothesis, we find that Chinese property market returns are significantly and positively correlated with our measures of wealth or investible funds with Chinese investors.

[12] The start date varies across countries, depending on data availability.

[13] These results are not tabulated but are available from the authors upon request.

Interestingly, the magnitude of the estimated coefficient of China's prime lending rate (-0.086) is very close to that of China's GDP growth.

Table 4 summarizes the baseline results of 23 individual countries and the aggregate of these countries. Negative effects of China's past GDP growth on housing price growth are observed in 82.6% of the countries. Among 52.6% of these countries, a statistically significant relation, at 10% or stronger, exists. For the United States, the United Kingdom, and the aggregate, the significance level is 1% or stronger. The table also shows that past US and UK GDP growth do not have the same pervasive relations with housing price growth in other markets that we see for China's GDP growth. To compare with the effects of a larger European economy, presumably with more significant influence elsewhere, we combine the French, German, and British GDPs. We find that the combined GDP growth also does not have comparable pervasive effects on international housing price growth.

4.3 Effects of China's changes in saving or wealth growth

Table 5 tests and supports the investible funds hypothesis. The estimated coefficients of all three measures of the growth of China's investible funds are strongly significantly positive at the 1% level.[14] These results are consistent with the notion that, when the Chinese have more investible funds, they generally increase overseas housing purchases, thereby increasing the growth of foreign housing prices. Like the GDP growth results, these investible funds effects are unlikely to be replicated for US wealth growth because the correlation between the wealth growth in China and in the United States is only

[14] Wealth and the savings rate without Gini interaction also have significant results. However, the saving results are stronger with Gini interaction, whereas wealth and wealth per adult have similar results whether we interact them with the Gini coefficient or not.

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 the relations between the different risk measures and housing price growth based on international panel data. In support of the risk hypothesis, the estimated coefficient of China's economic risk rating is significantly negative. This result suggests that, when China's economic risk is higher (represented by a lower rating index value), the Chinese will invest more in foreign property markets, thereby accelerating foreign housing price growth.[15] In addition, China's proportion of stories concerning risk or uncertainty has a significantly positive estimated coefficient. When there are more Chinese risk stories, therefore, the Chinese are likely to 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.[16,17]

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

[15] Since China's and the world's financial risk ratings are highly correlated (0.726), we drop China's financial risk rating and rerun the regressions. The results stand.

[16] China's political risk and the world's proportion of stories about risk/uncertainty are positively correlated. Therefore, it is possible for China's political risk rating to be significantly positive (insignificant) when the risk story variables are excluded (included) if the world's risk story variable subsumes China's political risk.

[17] We also separately consider changes in China's original and relative corruption perception indices and changes in China's corruption controls. We find no significant relationship.

has a strongly significantly negative coefficient. Hence, when the world faces lower financial risk or appears in fewer risk stories, housing prices around the world generally grow faster.

Importantly, China's past 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 China's past 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 the world GDP and represents roughly 45% of mainstream global assets (Savills 2016). Furthermore, the change in China's savings rate also remains significantly positive. The estimated coefficient of 0.104 indicates that a 1% increase in China's savings rate is associated with a 0.1% increase in international housing prices.

4.5 Modifying effects of correlation with China's interest rate

Table 7 reveals how Chinese effects vary with the correlation between China's interest rate and local housing price growth. The interaction between the correlation and changes in China's savings rate is significantly negative. Consistent with modern portfolio theory, Chinese investible funds effects are thus generally stronger when the correlation is lower.[18] However, the interaction between the correlation and China's economic risk rating is also significantly negative. This finding suggests housing prices grow faster when China experiences better economic stability and the correlation between China's interest rate and local housing price growth is lower. This can be understood as follows. When China is more economically stable, Chinese people will have stronger incentive to invest at home. Hence,

[18] The effect of the growth of China's investible funds becomes the coefficient of investible fund growth itself plus the coefficient of the interaction with the correlation and the investible fund growth.

during these times, only those foreign housing markets with higher diversification benefits will attract more Chinese purchases in relation to those markets with lower diversification benefits. The remaining correlation interactions are not robustly significant.

4.6 Differential Chinese effects for English countries

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

4.7 Education matters

Table 9 reports the moderation of the Chinese effects by the education quality in the overseas market. The interaction between education and China's political risk rating is negative. This finding suggests that, when China is more politically unstable, the overseas housing markets of countries with higher-quality education are more attractive to the Chinese, who then probably purchase more in these markets and housing prices grow faster. Hence, education magnifies China's political risk effects on 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 the Chinese buyers to generate more funds. The remaining educational interaction terms are insignificant at the standard levels.

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

5. Conclusions

Using mainly the data of 23 countries from 1993 to 2015, we document the Chinese effects on the price growth of residential real estate markets around the world. On average, an approximately 0.23% increase in housing prices follows a 1% decrease in China's GDP growth or a 2.3% increase in China's savings rate. These results are consistent with the notion of an increase in Chinese overseas property purchases following the deterioration of China's growth opportunities or an increase in Chinese's investible funds. These Chinese effects are stronger for English countries. Property markets that have a lower correlation with China's interest rate also exhibit more pronounced investible funds effects.

When China's economic risk is higher or China has more risk/uncertainty stories, foreign housing prices also grow faster. This result suggests that higher risk in China drives the Chinese to invest more in overseas housing markets, thereby accelerating corresponding price growth. In addition, when China is more economically stable, real estate prices grow faster for countries with two conditions, better education and lower correlation between

their housing markets and the China’s interest rate. Finally, when China is politically riskier, real estate prices grow faster for China's top tertiary student migration destinations.

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Appendix: Variables – Definition, Frequency, Calculations, 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	Average of quarterly growth in China's real GDP over the past 4 quarters
cn_pastGDPgrowth before or in 1992	Quarterly growth from annual growth in China's real GDP
cn_PoliticalRiskRating	Political risk rating of China's economy; a larger value represents lower risk
cn_RiskStoryNum/TotalStoryNum	Ratio of the number of risk stories to the number of all stories for China
cnSaving	China's gross domestic savings, calculated as GDP less final consumption expenditure (total consumption), % of GDP.
cnWealth	China's total wealth, in US dollars
cnWealth per adult	China's wealth per adult, in US dollars
constrg	Growth in the seasonally adjusted index of production in construction
corr (measure 1)	Correlation between China's interest rate (prime lending rate, cnint) and the growth of the housing price of the local property market (hpg)
corr (measure 2)	Correlation between China's interest rate (prime lending rate, cnint) and the growth of the housing price of the local property market (hpg)
*d_cnSaving*Gini*	Change in China's savings rate
debtg	Growth in annual household debt. Household debt is defined as all liabilities that require payment or payments of interest or principal by a household to a 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 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 households and non-profit institutions serving the household sector: 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, particularly mortgage loans for the purchase of houses. This indicator is measured as a percentage of net disposable income.

Variable	Definition
DisposableIncomeGrowth	Growth in 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 top five tertiary student destinations of China in 2013, 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 the de facto official and 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 coefficient
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 implemented 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 standardized terms 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	Average of the 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 seasonally adjusted permits index issued for dwellings/residential buildings.
rentg	Growth in the seasonally adjusted rental price index
urateg	Growth in the 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	Average of the 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	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 the natural log of the values of two consecutive quarters
cn_EconomicRiskRating	Monthly	Average of the monthly ratings in a quarter
cn_FinancialRiskRating	Monthly	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	Average of the monthly ratings in a quarter
cn_RiskStoryNum/TotalStoryNum	Daily	Average of the daily ratio in a quarter
cnSaving	Annual	
cnWealth	Annual	
cnWealth per adult	Annual	
constrg	Quarterly	Difference in the natural log of the values of two consecutive quarters
corr (measure 1)	Quarterly	For quarter t, the correlation calculation is based on all data, but excluding quarter t's data point
corr (measure 2)	Quarterly	For odd [even] quarters, the correlation calculation is based on all even [odd] quarters
*d_cnSaving*Gini*	Annual	The first difference of the interaction of cnSaving and Gini, divided by 10,000
debtg	Annual	Difference in the natural log of the values of two consecutive years
DisposableIncomeGrowth	Quarterly	Difference in the natural log of the values of 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 the natural log of the values of two consecutive quarters

Variable	Frequency	Calculation
*g_cnWealth*Gini*	Annual	Difference in the natural log of the values of the interaction between cnWealth and Gini of two consecutive years
*g_cnWealth per adult*Gini*	Annual	Difference in the natural log of the values of the interaction between cnWealth per adult and Gini of two consecutive years
Gini	Annual	
HousingPriceGrowth (hpg)	Quarterly	Difference in the natural log of the values of 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 the natural log of the values of two consecutive quarters
loc_EconomicRiskRating	Monthly	Average of the monthly ratings in a quarter
loc_FinancialRiskRating	Monthly	Average of the monthly ratings in a quarter
loc_pastGDPgrowth	Quarterly	Quarterly growth is the difference in the natural log of the values of two consecutive quarters
loc_PoliticalRiskRating	Monthly	Average of the monthly ratings in a quarter
loc_RiskStoryNum/TotalStoryNum	Daily	Average of the daily ratio in a quarter
permitg	Quarterly	Difference in the natural log of the values of two consecutive quarters
rentg	Quarterly	Difference in the natural log of the values of 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 the natural log of the values of 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	Quarterly growth is the difference in the natural log of the values of 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	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 the Appendix.

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. Correlations

The definitions of the variables are given in the Appendix. Here, *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**						
l*oc_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**

Figure 1A. China's GDP growth and overseas housing price growth

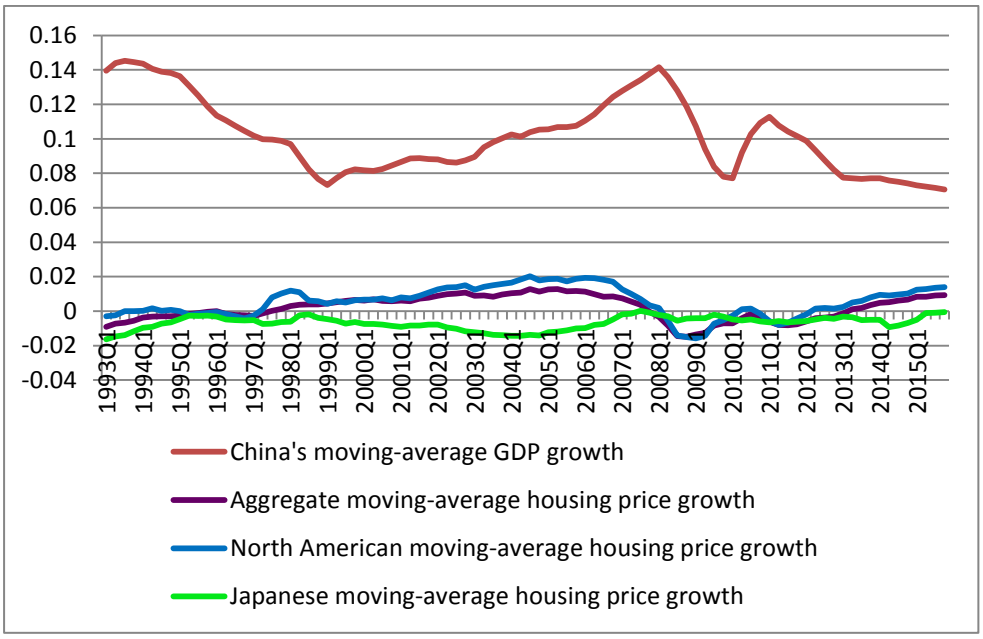
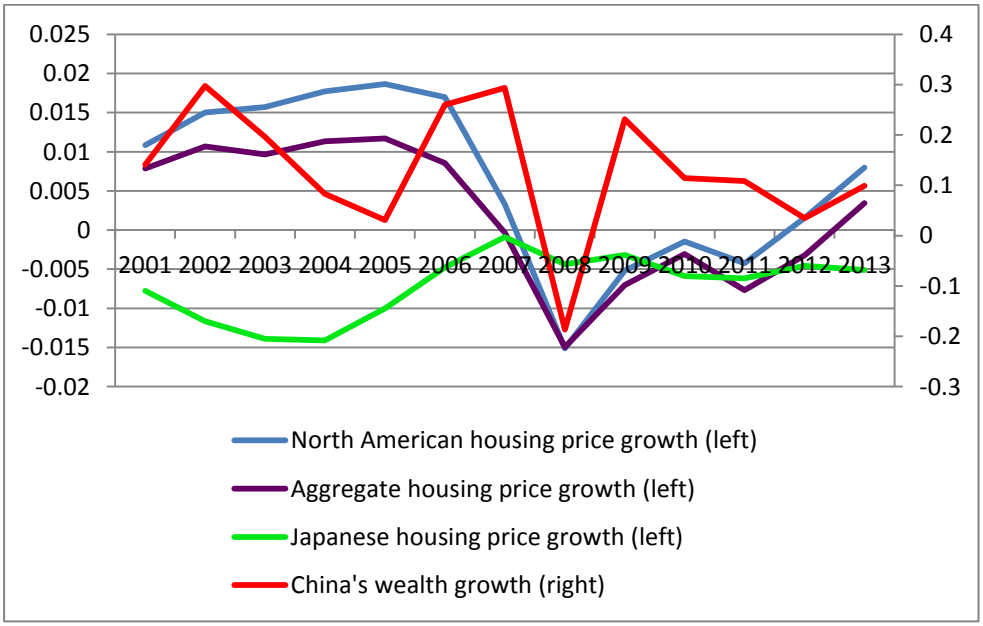


Figure 1B. China's wealth growth and overseas housing price growth



In Figure 1A, China's GDP growth is the average of that of the past four quarters; the housing price growth is the average of that of the contemporaneous and the past three quarters. North America consists of Canada and the United States, weighted by the GDP purchasing power parity per capita. In Figure 1B, China's wealth is the product of total wealth and the Gini coefficient; housing price growth is the average quarterly growth of the four quarters in a year.

Figure 2A. China's GDP growth and English countries' housing price growth

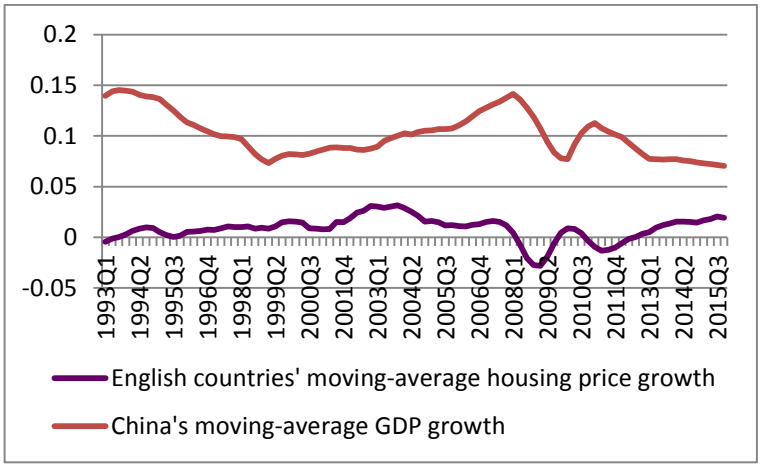


Figure 2B. China's wealth growth and English countries' housing price growth

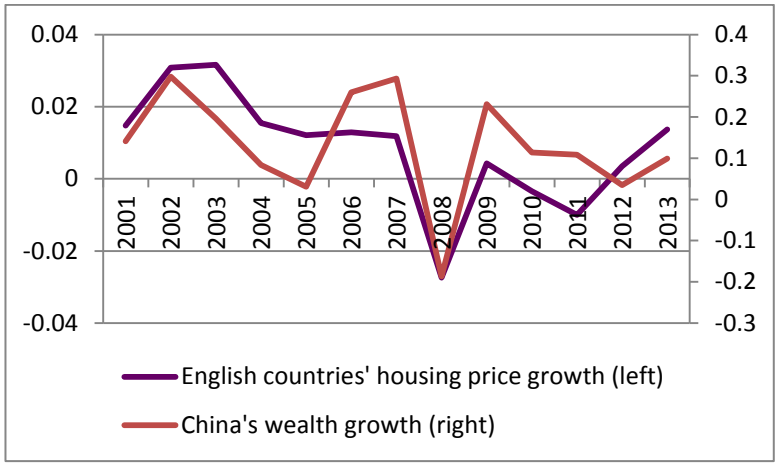


Figure 2C. China's GDP growth and high-QS countries' housing price growth

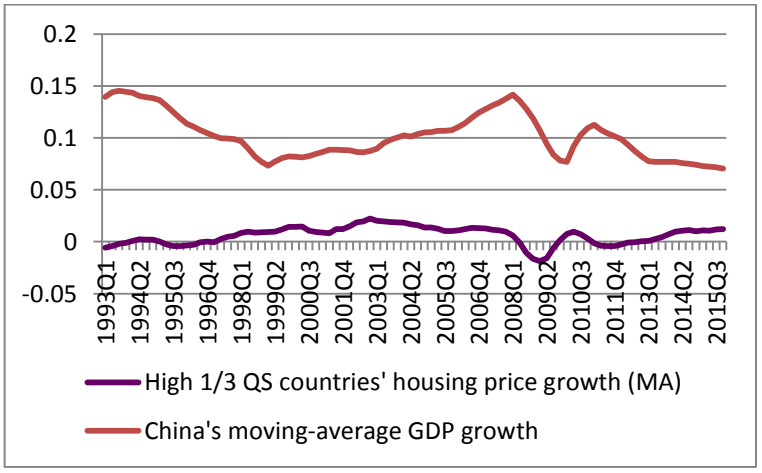


Figure 2D. China's wealth growth and high-QS countries' housing price growth

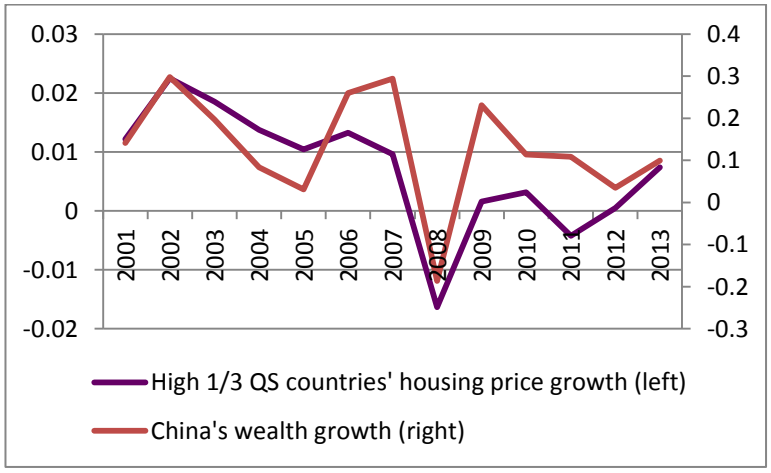


Table 3. China's Past GDP Growth and the Housing Price Growth of Other Markets around the World

The dependent variable is housing price growth. The variable *C* takes a value of one for observations since 2008 Q1 and zero otherwise. The Appendix defines the other variables. Country fixed effects are included. Robust standard errors in parentheses are based on country and time clustering. ***, **, and * indicate 1%, 5%, and 10% significance, respectively.

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 HousingPriceGrowth(t-1)*					0.004
					(0.054)
*C*DisposableIncomeGrowth*					0.179
					(0.118)
*C*cn_pastGDPgrowth*					-0.084*
					(0.046)
*C*loc_pastGDPgrowth*					0.341*
					(0.176)
*C*wd_pastGDPgrowth*					-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, British, and Combined Past GDP Growth and Housing Price Growth around the World

We run the following regressions at the individual country level:

$$hpg_t = \alpha + \boldsymbol{\beta}\textbf{*}\textbf{\textit{China/US/UK/Combined past GDP growth}}_{\mathbf{t}} + \lambda Controls_t + e_t$$

where *combined past GDP growth* is the growth of the sum of the GDP of France, Germany, and the United Kingdom, with weights based on GDP purchasing power parity. The Appendix defines the variables. This table reports the sign of β, the estimated coefficient of the *past GDP growth* in the baseline regressions of the housing price growth of individual countries. ***, **, *, and # indicate 1%, 5%, 10%, and one-sided 10% significance, respectively.

pastGDPgrowth:	China	US	UK	Combined
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	6/20
Significantly negative proportion (1%, 5%, or 10%)	10/23	2/22	1/22	2/20

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

The dependent variable is housing price growth. The variable *d_cnSaving*Gini* is the first difference of the interaction of *cnSaving* and *Gini*; *g_cnWealth*Gini* is the difference in the natural log of the values of the interaction between *cnWealth* and *Gini*; *g_cnWealth per adult*Gini* is the difference in the natural log of the values of the interaction between *cnWealth per adult* and *Gini*. The Appendix defines the other variables. Country fixed effects are included. Robust standard errors in parentheses are based on country and time clustering. ***, **, *, and # indicate 1%, 5%, 10%, and one-sided 10% significance, respectively.

	(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. The variable *d_cnSaving*Gini* is the first difference of the interaction of *cnSaving* and *Gini*. The Appendix defines the other variables. Country fixed effects are included. Robust standard errors in parentheses are based on country and time clustering. ***, **, *, and # indicate 1%, 5%, 10%, and one-sided 10% significance, respectively.

	(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. The variable *d_cnSaving*Gini* is the first difference of the interaction of *cnSaving* and *Gini*. The Appendix defines the other variables. Country fixed effects are included. Robust standard errors in parentheses are based on country and time clustering. ***, **, *, and # indicate 1%, 5%, 10%, and one-sided 10% significance, respectively.

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)

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. The variable *d_cnSaving*Gini* is the first difference of the interaction of *cnSaving* and *Gini*. The Appendix defines the other variables. Country fixed effects are included. Robust standard errors in parentheses are based on country and time clustering. ***, **, *, and # indicate 1%, 5%, 10%, and one-sided 10% significance, respectively.

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)

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. Modifying Effects of Higher Education on Housing Price Growth around the World

The dependent variable is housing price growth. The variable *d_cnSaving*Gini* is the first difference of the interaction of *cnSaving* and *Gini*. The Appendix defines the other variables. Country fixed effects are included. Robust standard errors in parentheses are based on country and time clustering. ***, **, *, and # indicate 1%, 5%, 10%, and one-sided 10% significance, respectively.

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)

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