# AREUEA 2021 SINGAPORE VIRTUAL CONFERENCE

## Date: Monday, 19/July/2021

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|---|---|
| **9:00am - 11:00am (EDT)**<br>AREUEA | **AREUEA-Commercial Real Estate (7/19 Evening 1)**<br>Session Chair: **Jiro Yoshida**, The Pennsylvania State University, United States of America |
| **9:00am - 11:00am (EDT)**<br>AREUEA | **AREUEA-House Price (7/19 Evening 2)**<br>Session Chair: **Ruchi Singh**, University of Georgia, United States of America |
| **9:00am - 11:00am (EDT)**<br>AREUEA | **AREUEA-Household Behavior (7/19 Evening 3)**<br>Session Chair: **Daniel McMillen**, University of Illinois at Chicago, United States of America |
| **9:00am - 11:00am (EDT)**<br>AREUEA | **AREUEA-Public Finance (7/19 Evening 4)**<br>Session Chair: **Mike Langen**, University of Reading, United Kingdom |
| **9:00am - 11:00am (EDT)**<br>AREUEA | **AREUEA-Big Data (7/19 Evening 5)**<br>Session Chair: **Juan Palacios**, Massachusetts Institute of Technology, United States of America |

## Date: Tuesday, 20/July/2021

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|---|---|
| **9:00am - 11:00am (EDT)**<br>AREUEA | **AREUEA-Housing (7/20 Evening 1)**<br>Session Chair: **Moussa Diop**, USC, United States of America |
| **9:00am - 11:00am (EDT)**<br>AREUEA | **AREUEA-Monetary Policy (7/20 Evening 2)**<br>Session Chair: **Jing Li**, Singapore Management University, Singapore |
| **9:00am - 11:00am (EDT)**<br>AREUEA | **AREUEA-Supply (7/20 Evening 3)**<br>Session Chair: **Michael Eriksen**, University of Cincinnati, United States of America |
| **9:00am - 11:00am (EDT)**<br>AREUEA | **AREUEA-Household Mobility (7/20 Evening 4)**<br>Session Chair: **Siqi Zheng**, MIT, United States of America |
| **9:00am - 11:00am (EDT)**<br>AREUEA | **AREUEA-ESG (7/20 Evening 5)**<br>Session Chair: **Nils Kok**, University of Maastricht, Netherlands, The |

## Date: Wednesday, 21/July/2021

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|---|---|
| **9:00am - 11:00am (EDT)**<br>AREUEA | **AREUEA-Information (7/21 Evening 1)**<br>Session Chair: **Seung Hoon Lee**, Georgia Institute of Technology, United States of America |
| **9:00am - 11:00am (EDT)**<br>AREUEA | **AREUEA-Political Economy (7/21 Evening 2)**<br>Session Chair: **Liang Peng**, Pennsylvania State University, United States of America |
| **9:00am - 11:00am (EDT)**<br>AREUEA | **AREUEA-Equity Investment (7/21 Evening 3)**<br>Session Chair: **Eva Steiner**, Penn State University, United States of America |
| **9:00am - 11:00am (EDT)**<br>AREUEA | **AREUEA-Affordability (7/21 Evening 4)**<br>Session Chair: **Lingxiao Li**, California State University, Fullerton, United States of America |

# 19E1-commercial: AREUEA-Commercial Real Estate (7/19 Evening 1)

*Time:* Monday, 19/July/2021: 9:00am - 11:00am (EDT) · *Location:* AREUEA
*Session Chair:* Jiro Yoshida, The Pennsylvania State University, United States of America

**ID: 100 / 19E1-commercial: 1**
*Topics:* Commercial real estate: investors, Commercial real estate: other
*Keywords:* Commercial Real Estate, Face-to-Face Interactions, Tenant Resilience, Social Distancing, COVID-19 Pandemic

## Face-to-face Interactions, Tenant Resilience, and Commercial Real Estate Performance

**Wang, Chongyu**[1]; **Zhou, Tingyu**[2]
[1]The University of Hong Kong; [2]Florida State University; chw12010@hku.hk
*Discussant:* **Price, McKay** (Lehigh University)

The COVID-19 pandemic has induced an exogenous shock to the face-to-face (FTF) economy and the use of commercial real estate (CRE). By linking tenants, properties, and CRE firms, we construct three novel FTF measures that capture tenant remote working, internal communication between coworkers, and external contact with customers. We find that firms holding properties with tenants that are more resilient to social distancing perform better. These FTF effects weaken over the long term. As investors are capable of compiling valuable information regarding how tenants operate at granular levels, our findings support market efficiency and shed light on post-pandemic CRE performance.

**ID: 166 / 19E1-commercial: 2**
*Topics:* Commercial real estate: mortgages/CMBS, Risk and delinquency in mortgages
*Keywords:* Mortgage Termination, Default, Prepayment, Supply Elasticity, Installment Option

## Modelling Interactive Mortgage Termination Strategies: Installment Option Valuation Approach

**Tong, Lok Man Michelle**[1]; **Wojakowski, Rafal**[2]; **Marcato, Gianluca**[3]
[1]Independent; [2]University of Surrey; [3]University of Reading; r.wojakowski@surrey.ac.uk, g.marcato@henley.reading.ac.uk
*Discussant:* **Deng, Yongheng** (University of Wisconsin, Madison)

We build an installment option valuation model to price two types of early termination options written on commercial mortgages: default and prepayment. The key feature of our model is the introduction of supply constraints into the underlying real estate price process, which determines the value of early termination options. Our main contribution lies in the analogy between early mortgage termination and installment options with strangle-like payoff, so as to enable the modelling of the borrowers' ability to choose default (put) or prepayment (call) at a specific time. Our simulations find higher values of prepayment options relative to mortgage default. We also price the default option as an American continuous installment put option (if ignoring prepayment) and prepayment in cash as an American continuous installment call option (if ignoring default). Given execution costs, positive leverage effects on early termination are evidenced. Our numerical pricing results suggest that the value of early termination options rises with real estate supply elasticity. Less volatility enhances the certainties of real estate price movement that leads to a firm decision of early mortgage termination.

**ID: 130 / 19E1-commercial: 3**
*Topics:* Commercial real estate: mortgages/CMBS, Corporate finance and real estate
*Keywords:* Overconfidence, Disposition Effect, Restructuring, Default, Prepayment

## Walk a Tightrope: Could "Rational" Investors Well Manage Their "Irrational" Strategies?

**Tong, Lok Man Michelle**[1]; **Marcato, Gianluca**[2]
[1]Independent; [2]University of Reading; mictong@gmail.com
*Discussant:* **Corradin, Stefano** (European Central Bank)

The behaviour of debtors on restructuring, default and prepayment are underexplored. We present a framework of endogenous equilibrium effects of overconfidence and disposition on collateralised debt termination or modification. This is the first insight into the conceptual framework of debt termination which interacts with restructuring and partial prepayments. We document the first and foremost evidence. Analysing over 11,000 US office mortgages from 2001 to 2017, we apply the novel measure of office investors' behaviour driven by overconfidence and disposition effects, including the impacts of overall investor bias on supply responsiveness to rent in collateral markets, and strength proxies of overconfidence and attitudes towards disposition. We find that MSAs with greater investor bias show a more frequent exercise of denial but smaller prepayment probability. Biased investors tend to restructure rather than default. Overconfidence bias reduce likelihood of full prepayment. Comparing with non-behavioural factors in collateral markets, we evidence that behavioural effects are more significant on collateralised debt termination. We further investigate if institutional investors could control their irrational strategies and confirm that the irrational strategy driven by disposition effect is very likely to be well managed. These rational investors are alert, thus re-default rates are extremely low after restructuring.

**ID: 141 / 19E1-commercial: 4**
*Topics:* Real estate development, Corporate finance and real estate
*Keywords:* Asset-backed Securitization, Real Estate Development, Production Expansion, Entry, Strategic Alliances, Land Purchase

## Asset Securitization and Firm Expansion in Product Markets: Evidence from the Real Estate Development Industry

**Ma, Chao**
Xiamen University, China, People's Republic of; ma.271@buckeyemail.osu.edu
*Discussant:* **Zevelev, Albert** (Baruch College)

Asset-backed securities serve firms as an important financing source aside from loans, bonds, and stocks. Previous studies found that through facilitating "bankruptcy remoteness", asset-backed securitization can reduce issuing firms' borrowing costs and probabilities of facing credit constraints and increase their market values. However, little research has examined the real effect of securitization on firms' product-market activities. We examine the real estate development industry and find that after securitization, developers become more aggressive in purchasing land and entering new markets. With extra funding from securitization, developers conduct more strategic alliances with other developers in developing land parcels to utilize more production capacities.

# 19E2-houseprice: AREUEA-House Price (7/19 Evening 2)

*Time:* Monday, 19/July/2021: 9:00am - 11:00am (EDT) · *Location:* AREUEA
*Session Chair:* Ruchi Singh, University of Georgia, United States of America

**ID: 146 / 19E2-houseprice: 1**
*Topics:* Residential real estate: prices and indices, Residential real estate: investors
*Keywords:* top floor units, peer group effect on consumption, investment return, liquidity

## A view from the top: Are top floor units good for consumption but bad for investment?

**Tang, Chi Ho[1]; Leung, Ka Yui Chalres[2]**
[1]Hong Kong Shue Yan University, Hong Kong S.A.R. (China); [2]City University of Hong Kong, Hong Kong S.A.R. (China); chtang@hksyu.edu
*Discussant:* **Lin, Yatang** (Hong Kong University of Science and Technology)

"Top floor units" (TFU) refer to the units that are located at the top of condominium buildings, accompanied by an accessible roof, thus offering superior views. We first compute the premium from trading TFU. Second, we explore the co-movement between the TFU premia and the macroeconomy. We then compare TFU with other assets on the efficient frontier. We also investigate the profitability of this "high-end" market. Directions for future research are discussed at the end.

**ID: 206 / 19E2-houseprice: 2**
*Topics:* Residential real estate: mortgages/RMBS, Affordable housing
*Keywords:* Mortgage rates; Mortgage lending; House prices

## Cost of Credit and House Prices

**Akgündüz, Yusuf Emre[2]; Dursun-de Neef, Özlem[1]; Hacihasanoglu, Yavuz Selim[3]; Yilmaz, Fatih[3]**
[1]Goethe University Frankfurt, Germany; [2]Sabanci University; [3]Central Bank of the Republic of Turkey; dursundeneef@finance.uni-frankfurt.de
*Discussant:* **Begley, Jaclene** (Fannie Mae)

This paper studies the relationship between house prices and financing conditions by exploiting a sudden reduction in the mortgage rates of state-owned banks in Turkey during the summer of 2020 as an exogenous shock to provide causal estimates of the cost of credit on house prices. The effects are estimated using a detailed dataset on all house sales with mortgages. We find that a 1 percentage point decrease in annual interest rates raised house prices by 2.1%. The impact is driven by a corresponding increase in individual mortgage loans of 6.6%.

**ID: 163 / 19E2-houseprice: 3**
*Topics:* Agglomeration, Urban economics: other
*Keywords:* university expansion; knowledge spillovers; patents; new product

## Identifying Knowledge Spillovers from Universities: Quasi-experimental Evidence from Urban China

**Li, Jing[1]; Liu, Shimeng[2]; Wu, Yifan[1]**
[1]Singapore Management University, Singapore; [2]Jinan University, China; yifan.wu.2017@phdecons.smu.edu.sg
*Discussant:* **Whalley, Alex** (University of Calgary)

This paper studies the impact of universities on local innovation activity by exploiting a unique university expansion policy in China as a quasi-experiment. We take a geographic approach, empowered by geocoded data on patents and new products at the address level, to identify knowledge spillovers as an important channel. We obtain three main findings. First, university expansion significantly increases universities' own innovation capacity, which results in a dramatic boom of local patents not related to universities. Second, the impact of university expansion on local innovation activities attenuates sharply within 2 kilometers of the universities. Third, university expansion boosts nearby firms' new products and the number of nearby industrial patents that cite university patents but not those industrial patents that cite patents far away from universities.

**ID: 201 / 19E2-houseprice: 4**
*Topics:* Housing market segmentation, search, and sorting, Residential real estate: other
*Keywords:* Buyers' onsite viewing activities reveal important demand side information. Using unique visit level proprietary transaction data from the largest real estate agency in China, we provide evidence of the impact of buyers' onsite viewing activities on deal

## Seeing is Believing: The Impact of Buyers' Onsite Viewing Activities on Housing Transactions

**Hu, Maggie[1]; Kuang, Weida[2]; Li, Xiaoyang[3]; Shi, Yang[1]**
[1]The Chinese University of Hong Kong, Hong Kong S.A.R. (China); [2]Renmin University of China; [3]Jinan University; maggiehu@cuhk.edu.hk, xiaoyangli@link.cuhk.edu.hk, yang.shi@link.cuhk.edu.hk
*Discussant:* **Fu, Yuming** (National University of Singapore)

Buyers' onsite viewing activities reveal important demand side information. Using unique visit level proprietary transaction data from the largest real estate agency in China, we provide evidence of the impact of buyers' onsite viewing activities on deal likelihood and transaction prices. We find that buyers who are more active in onsite viewing in terms of number of visits are more likely to purchase a house, and also pay a higher transaction price. Compared with their initial budget and house plan, they also have a higher chance of making payment above their budget and buy houses with larger size and more rooms than they need. The finds are robust to the identification using of national basketball games as distractions that disrupt buyers' onsite house viewings. Further, the relationship between buyers' onsite house viewing and over budget payment is stronger (weaker) in a thin(thick) market.

# 19E3-household: AREUEA-Household Behavior (7/19 Evening 3)

*Time:* Monday, 19/July/2021: 9:00am - 11:00am (EDT) · *Location:* AREUEA
*Session Chair:* Daniel McMillen, University of Illinois at Chicago, United States of America

**ID: 127 / 19E3-household: 1**
*Topics:* Housing and the life cycle, Urban economics: other
*Keywords:* China, fertility, wealth, housing values, one child policy, quality-quantity tradeoff

## Housing Wealth, Fertility, and Child Quality

**Tang, Mingzhe[1]; Coulson, Edward[2]**
[1]Shandong University; [2]UC Irvine; sduecon.tang@hotmail.com
*Discussant:* **Ma, Sen** (Jinan University)

We use changes in wealth due to house price changes to test the effect of wealth on fertility and child quality in the context of Chinese fertility policies. We find, even in those situations where the one-child policy is not in effect, that wealth increases do not lead to increased fertility in urban areas, and have only a tiny effect in rural. However, a rise in housing wealth does lead to increased expenditure on a child's education for households in both rural and urban areas (although of different types of expenditure) and increased child's height in rural areas. In terms of Becker (1960), increased wealth tilts the tradeoff between child quality and quantity in favor of the former.

**ID: 117 / 19E3-household: 2**
*Topics:* Housing market segmentation, search, and sorting, Urban economics: other
*Keywords:* housing-related expenditure share, monocentric model of a city, spatial sorting

## Does Space Matter? The Case of a Cap on the Housing Expenditure Share

**Gong, Yifan[1]; Leung, Charles[2]**
[1]University of Western Ontario; [2]City University of Hong Kong; yfegong@gmail.com
*Discussant:* **Larson, William** (Federal Housing Finance Agency)

This paper argues that the introduction of space dramatically changes our evaluation of housing market-related policies. First, we document three stylized facts: the declining housing-related expenditure share with expenditure, the income-invariant working hours, and the spatial distribution of income-heterogeneous households. We then show that a spaceless model can match the first two facts only with heterogeneity in preference and income. In comparison, a canonical monocentric city model fits all three facts with heterogeneity in income only. Moreover, the housing price and welfare implications of imposing a cap on the housing expenditure ratio are very different in these two models.

**ID: 233 / 19E3-household: 3**
*Topics:* Home ownership and mortgage access, Policies and regulation in mortgage markets
*Keywords:* borrowing constraints; consumption; housing market; mortgage market

## The consumption response to borrowing constraints in the mortgage market

**van Horen, Neeltje[1,2,3]; Tracey, Belinda[1]**
[1]Bank of England; [2]University of Amsterdam; [3]CEPR; neeltje.vanhoren@bankofengland.co.uk
*Discussant:* **Carozzi, Filipe** (London School of Economics)

This paper shows that relaxing borrowing constraints positively affects household consumption in addition to stimulating housing market activity. We focus on the UK Help-to-Buy (HTB) program, which provided a sudden relaxation of the down payment constraint by facilitating home purchases with only a five percent down payment. Our research design exploits geographic variation in exposure to HTB and uses administrative data on mortgages and car sales in combination with household survey data. We estimate that the program increased total home purchases by 11 percent, and the increase was driven almost entirely by first-time and young buyers. Regions that were more exposed to the program experienced a rise in non-durable consumption unrelated to the home and in loan-financed car purchases, in addition to an increase in home-related expenditures. These results are independent of changes in regional house prices. Our findings point to a further link between the housing market and household consumption that does not operate through the home purchase and housing wealth channels.

**ID: 143 / 19E3-household: 4**
*Topics:* Machine Learning, Natural Language Processing, and AI in real estate, Urban economics: other
*Keywords:* COVID-19, Fear, Behavior Adaptation, Consumer City

## Fear And COVID-19: Micro-level analysis of determinants of Fear and implications for individual behavior

**Palacios, Juan[1]; Zheng, Siqi[1]; Fan, Yichun[1]; Bayham, Jude[3]; Fenichel, Eli[2]**
[1]Massachusetts Institute of Technology, United States of America; [2]Yale University, United States of America; [3]Colorado State University, United States of America; jpalacio@mit.edu
*Discussant:* **Sarmiento-Barbieri, Ignacio** (Universidad de Los Andes)

This paper examines the role of fear in shaping social-distancing behaviors during and after the COVID-19 pandemic using micro data from Sina-Weibo, the largest social network in China. We build a unique dataset including the universe of posts [N=18.55 Million] of a cohort of over 500,000 individuals located in China from January 1st 2019 to June 30th 2020. We use state-of-the-art Natural Language Processing (NLP) tools to compute the degree of ``expressed fear'' in each post by the subjects in our sample. We implemented a difference-in-difference design to link expressed fear on social to individuals' visits to Points of Interests (POIs) inferred by geotagged Weibo posts. The results show that fear escalates into actual behaviors. The effects are quantitatively significant and long-lasting: individuals with fear above their city median display a 3.8% reduction in all out-of-home activities higher than individuals with below median fear within the same city in the aftermath of COVID-19 city outbreaks. We observe significant heterogeneity across points of interest. High risk consumption places like restaurants and indoor entertainment showed 13.4% additional reduction of high fear people which remained stable for months, while low risk leisure contexts like parks showed no differences across fear groups.

## 19E4-pubfin: AREUEA-Public Finance (7/19 Evening 4)

*Time:* Monday, 19/July/2021: 9:00am - 11:00am (EDT) · *Location:* AREUEA
*Session Chair:* Mike Langen, University of Reading, United Kingdom

**ID: 174 / 19E4-pubfin: 1**
*Topics:* Local public finance, Urban economics: other
*Keywords:* Corporate Subsidies, Municipal Debt, Public Finance

### IMPACT OF CORPORATE SUBSIDIES ON BORROWING COSTS OF LOCAL GOVERNMENTS

**Chava, Sudheer; Malakar, Baridhi; Singh, Manpre**
Georgia Tech, United States of America; bmalakar3@gatech.edu
*Discussant:* **Zhan, Changwei** (National University of Singapore)

We analyze the impact of $38 billion of corporate subsidies given by U.S. local governments during 2005-2018 on their borrowing costs. We find that winning counties experience a $13.6$ bps increase in bond yield spreads as compared to the losing counties. The increase in bond yields is higher ($16$ -- $22$ bps) when the subsidy deal is associated with a lower jobs multiplier or when the winning county has a lower debt capacity. However, even a high jobs multiplier does not seem to alleviate the binding debt capacity constraints of some local governments. Our results highlight some potential costs of corporate subsidies for the local governments.

**ID: 173 / 19E4-pubfin: 2**
*Topics:* Local public finance, Urban economics: other
*Keywords:* Corporate Bankruptcy, Municipal Debt, Stakeholders

### Communities as Stakeholders: Impact of Corporate Bankruptcies on Local Governments

**Chava, Sudheer; Malakar, Baridhi; Singh, Manpreet**
Georgia Tech, United States of America; bmalakar3@gatech.edu
*Discussant:* **Yang, Zoe** (Chinese University of Hong Kong)

We find that the bankruptcy of a publicly listed manufacturing firm increases bond yields of the counties in which the firm has a significant presence. Affected counties that are subject to budgetary restrictions on debt, revenue, or expenditure, reduce their investment in education and other public services. This negative impact is amplified when the county is more dependent on the industry of the bankrupt firm and its upstream suppliers. However, counties located in pro-business states are less affected. Our results highlight how local communities are a major stakeholder in public firms and can be adversely affected by their financial distress, for example, during the Covid-19 pandemic.

**ID: 142 / 19E4-pubfin: 3**
*Topics:* Residential real estate: mortgages/RMBS, Policies and regulation in mortgage markets
*Keywords:* Capital requirements, mortgage rates, house prices

### Capital requirements, mortgage rates and house prices

**Damen, Sven[1]; Schildermans, Stef[2]**
[1]University of Antwerp, Belgium; [2]KU Leuven, Belgium; sven.damen@uantwerpen.be
*Discussant:* **Wang, Long** (ShanghaiTech University)

We study the effect of an increase in capital requirements for residential mortgages on mortgage rates and house prices. We exploit a unique quasi-experiment in which affected banks faced an increase in risk weights of five percentage points. Using a difference-in-difference estimator we find that treated banks increase their mortgage rates by 18 basis points. Houses near affected banks have a 2.34% lower sale price after the increase in capital requirements. Our results imply a semi-elasticity of house prices to changes in mortgage rates of 13, in line with predictions from a user cost model.

# 19E5-bigdata: AREUEA-Big Data (7/19 Evening 5)

*Time:* Monday, 19/July/2021: 9:00am - 11:00am (EDT) · *Location:* AREUEA
*Session Chair:* Juan Palacios, Massachusetts Institute of Technology, United States of America

**ID: 118 / 19E5-bigdata: 1**
*Topics:* Machine Learning, Natural Language Processing, and AI in real estate, Residential real estate: other
*Keywords:* Covid-19, Pandemic, Airbnb, short-term rental, machine learning, small business

## Cleanliness is Next to Income: The Impact of COVID-19 on Short-Term Rentals

**Wilkoff, Sean**[1]**; Shen, Lily**[2]
[1]University of Nevada Reno, United States of America; [2]Clemson University; swilkoff@unr.edu
*Discussant:* **Lee, Seunghoon** (University of Chicago)

The short-term rental market provides a close to real time signal of how events of regional and national importance can affect the demand for housing. We use Airbnb data from Austin, Texas to empirically investigate the impact of the onset of Corona Virus Disease 2019 (COVID-19) on the short-term rental market. Specifically, we employ a machine learning algorithm to create an extensive cleanliness dictionary to detect whether an Airbnb unit is clean. We use a difference-in-difference specification to value the change in income related to reviewer perceived cleanliness during the COVID-19 pandemic. We find the following results: first, available listings declined by 25% once the pandemic hit and those that remained lost 22% of their income and had occupancy decrease by 20%. Second, properties that were perceived to be clean increased their income by 17.5% and their occupancy by 16.5%, mitigating the negative shock due to COVID-19. Third, rental prices for clean Airbnb listings did not increase after COVID-19.

**ID: 120 / 19E5-bigdata: 2**
*Topics:* Machine Learning, Natural Language Processing, and AI in real estate
*Keywords:* Risk, Textual Analysis, Machine Learning, Structural Topic Model, 10-K

## Can Risks be Good News? Revealing Risk Perception of Real Estate Investors using Machine Learning

**Koelbl, Marina**[1]**; Laschinger, Ralf**[2]**; Steininger, Bertram**[3]**; Schäfers, Wolfgang**[1]
[1]University of Regensburg, IREBS International Real Estate Business School, Germany; [2]University of Regensburg, Department of Finance, Germany; [3]KTH Royal Institute of Technology, Sweden; bertram.steininger@abe.kth.se
*Discussant:* **Yonder, Erkan** (University of Concordiaca)

The SEC mandates firms to inform investors about their assessment of future contingencies in their 10-Ks. However lengthy and complex disclosures – mostly for dozens of firms in an investor's portfolio – can barely be processed by a human being. To cope with the flood of information, we exploit an unsupervised machine learning algorithm, the Structural Topic Model, to identify the risk factors discussed in 10-Ks. We apply this algorithm to a US REIT sample between 2005 and 2019 to assess whether the probability of appearance of the extracted risk factors helps to explain the perceived risk on the stock market. We find that the majority of risk factors is significantly associated with volatility indicating that our machine-assisted modeling presents a valid approach to quantify risk disclosures in textual form. Furthermore, we investigate in which direction individual topics affect investor risk perception. Even if all kinds of directions exist, uninformative topics with no impact, increasing risk-perception topics, and decreasing risk-perception topics, the latter is clearly predominant. The predominance of the risk-reducing effect indicates that risk disclosures can indeed be considered good news as long as they clarify the implications of already known risk.

**ID: 171 / 19E5-bigdata: 3**
*Topics:* Residential real estate: prices and indices, Machine Learning, Natural Language Processing, and AI in real estate
*Keywords:* Time on market, house price, 2SLS, chain-free, big data

## The Price--Time-on-Market Puzzle Revisited: Evidence from Big Data

**Huang, Yunlong; Milcheva, Stanimira**
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*Discussant:* **Buechler, Simon** (Massachussets Institute of Technology)

This paper provides new evidence on the relationship between time-on-market (TOM) and house prices. Using big data techniques, we construct a rich dataset on residential transaction prices in England between 2018 and 2020, their listing information, energy performance, and property taxes. We use two novel instrumental variables (IVs) -- the price revision duration and the council tax band for TOM and price respective. We show a positive and simultaneously determined relationship between price and TOM, in line with search theory. We also demonstrate that sellers not looking to use the proceeds from the sale as a down-payment for a new property, i.e. 'chain-free' sellers, list and transact at a lower price, all else equal.

**ID: 144 / 19E5-bigdata: 4**
*Topics:* Urban economics: other
*Keywords:* Urban growth, Machine Learning

## Identifying urban growth with machine learning

**B□uchler, Simon**[1]**; Niu, Dongxiao**[2]**; Thompson, Anne Kinsella**[1]
[1]MIT Center for Real Estate; [2]Hang Lung Center for Real Estate, Tsinghua University; dxniull@gmail.com
*Discussant:* **Calainho, Felipe Dutra** (University of Amsterdam)

Using machine learning (ML) models, we rank urban growth determinants by importance and predict the population growth for the next two,  ve, and ten years for American and Chinese urban areas. We  nd that real estate investment and human capital are the top determinants for the US. For China, being one of the 35 biggest cities and government expenditure matter the most. Amenities, transportation networks, and geographical location are strong future urban growth predictors for both countries. In the US, intercity transit is a stronger urban growth driver than intracity transit, whereas the opposite holds for China. Our ML models predict that coastal urban areas in the South Atlantic and the West South Central Division in the US, and southeastern coastal cities in China, will grow the most. Since China is in an earlier urbanization stage than the US, we show that housing affordability, human capital, amenities, and intercity transportation networks will become increasingly important to drive urban growth in developed and developing countries.

# 20E1-housing: AREUEA-Housing (7/20 Evening 1)

*Time:* Tuesday, 20/July/2021: 9:00am - 11:00am (EDT) · *Location:* AREUEA
*Session Chair:* Moussa Diop, USC, United States of America

**ID: 203 / 20E1-housing: 1**
*Topics:* Housing market segmentation, search, and sorting, Policies and regulation in mortgage markets
*Keywords:* Presale contract, Real estate option, Presale rescission rate, Housing market regulation

## Contract Rescission in the Real Estate Presale Market

**Gan, Quan**[1]; **HU, Maggie**[2]; **Wan, Wayne**[3]
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*Discussant:* **Hu, Mingzhi** (Jinan University)

This study documents that over 10% of the presale contracts in Hong Kong housing market between 1996 and 2014 were rescinded, resulting in a loss of HKD 436.67 million per year. We then investigate potential determinants of contracts rescission from a novel perspective of option theory. We find out-of-the-money presale contracts (with market price being lower than the outstanding payment at settlement) have a 12.2% higher rescission rate. Rescission rate is also higher when presale homebuyers bear more of the price risk as proxied by option delta and time-induced risk as proxied by time-to-maturity. Moreover, we find rescission rates drop significantly after Hong Kong government's housing market macroprudential measures. Our findings shed light on understanding the mechanism of presale contracts recession, homebuyers' strategic default behavior, and the role of housing market regulation in mitigating rescissions.

**ID: 204 / 20E1-housing: 2**
*Topics:* Housing market segmentation, search, and sorting, Residential real estate: other
*Keywords:* Corporate Headquarters Relocation; Housing Market; House Price Expectation; Spatial Spillover; Agglomeration Economies

## Corporate Relocation and Housing Market Spillovers

**Hu, Maggie**[1]; **Tsang, Desmond**[2]; **Wan, Wayne**[3]
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*Discussant:* **Wang, Chongyu** (Concordia University)

We investigate the impact of headquarters relocation on the local economy by examining its spillover effects on the housing market. Our baseline results show that headquarters moving into a district is significantly associated with 10% higher housing price growth in the district. Moreover, we document a temporal spillover effect as housing prices increase one year before the relocation and rise further until two years afterwards, and a spatial spillover effect of corporate relocation on nearby districts' housing markets of up to 15 miles. We further find agglomeration economies exacerbate the effect of corporate relocation on the housing market.

**ID: 195 / 20E1-housing: 3**
*Topics:* China's real estate markets, Residential real estate: other
*Keywords:* Housing price, wealth effects, collateral effects, online consumption

## Housing Shock and Online Consumer Behavior

**Fang, Hanming**[1]; **Wang, Long**[2]; **Yang, Yang**[3]
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*Discussant:* **Ikromov, Nuriddin** (California State University, Sacramento)

To establish the causal relationship between housing price appreciation and online consumer behavior, this study exploits a proprietary dataset assembled from October 1, 2016 to December 31, 2018 by the largest e-commerce company in China. In order to overcome the empirical challenges faced by existing literature due to the non-random nature of housing price changes, this study investigates a unique institutional setting in China, namely the announcement of the newest national-level special economic zone, Xiong'an New Area, on April 1, 2017, as an exogenous shock to the housing price. The study focuses on three areas of interest. First, we examine how exogenous and unanticipated housing wealth shocks impact households' online consumer behaviors. Second, we study the dynamic change of online consumer behaviors before and after the housing shock, and determine whether the behavioral responses persist in the long run. Third, we explore the underlying mechanisms through which the housing shock affects consumer behaviors. In particular, we attempt to disentangle the collateral effects from the housing wealth effects and the rent effects.

**ID: 129 / 20E1-housing: 4**
*Topics:* Residential real estate: mortgages/RMBS
*Keywords:* Appraisal Inflation, Securitization, Non-Agency Market, Adverse Selection, Information Asymmetry

## Appraisal Inflation and Private Mortgage Securitization

**Diop, Moussa**[1]; **Yavas, Abdullah**[2]; **Zhu, Shuang**[3]
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*Discussant:* **Li, Lingxiao** (California State University, Fullerton)

This paper examines adverse selection based on appraisal inflation in private securitization using jumbo refinance loans as a laboratory. Combining a nationwide mortgage data set with real estate transaction data, we find that mortgages with higher appraisal inflation have a higher probability of securitization. Ex post, securitized loans have more than 3\% higher appraisal inflation than similar portfolio loans. The effects are statistically and economically significant at key LTV notches. Inflated appraisals on sold notch loans are associated with higher defaults. However, the additional credit risk is not priced in mortgage rates. Lenders likely exploit their informational advantage about appraisal quality to benefit themselves or affiliated parties in the secondary market. The results are robust to various model specifications. These findings indicate the existence of adverse selection in private securitization based on property appraisal values.

# 20E2-monetary: AREUEA-Monetary Policy (7/20 Evening 2)

*Time:* Tuesday, 20/July/2021: 9:00am - 11:00am (EDT) · *Location:* AREUEA
*Session Chair:* Jing Li, Singapore Management University, Singapore

**ID: 135 / 20E2-monetary: 1**
*Topics:* Monetary policy and housing markets
*Keywords:* Unconventional Monetary Policy, Housing Portfolio Channel, EONIA, Quantitative Easing, Regional Business Cycles, Germany, Real Estate

## Real Effects of the ECB's Quantitative Easing: A Housing Portfolio Channel

**te Kaat, Daniel[2]; Ma, Chang[1]; Rebucci, Alessandro[3]**
[1]Fudan University; [2]University of Groningen; [3]Johns Hopkins University; changma@fudan.edu.cn
*Discussant:* **Zhang, Xirui (Sherry)** (Xiamen University)

We propose a new transmission channel through which a central bank's quantitative easing (QE) can affect local economic activity with segmented asset markets. In our model, a national financial intermediary responds to QE interventions by rebalancing its portfolio from bonds to housing. As a result, house prices increase and the total household portfolio return declines, boosting the economy by stimulating current consumption. The tighter the local housing supply, the stronger the consumption effects. We then investigate this channel empirically in German region-level data. Identi cation exploits the exogenous variation in land supply scarcity across regions to construct a measure of exposure to the housing portfolio channel. We nd that the QE impact on local GDP growth is more potent in regions with tighter land supply. We estimate that a one-standard-deviation increase in the size of the ECB's balance sheet raises GDP growth in the most exposed regions by 10-20 basis points more per year than in the least exposed ones. The housing return decline caused by a QE intervention can fully account for this regional growth differential.

**ID: 136 / 20E2-monetary: 2**
*Topics:* Residential real estate: investors, Monetary policy and housing markets
*Keywords:* External shock, small open economy, housing market, Bayesian variable

## External or Internal Causes? The Housing Markets of Two Asian Financial Centers

**Ng, Cho Yiu[1]; Leung, Ka Yui[1]; Yu, Jun[2]**
[1]City University of Hong Kong, Hong Kong S.A.R. (China); [2]Singapore Management University; cyngjoe@gmail.com
*Discussant:* **Shi, Wei** (Jinan University)

Housing markets in financial centers are subject to external and internal shocks, whose importance would also affect the best policy responses. We build Bayesian VAR models to characterize the housing market dynamics in two financial centers and distinguish the contributions of external and internal shocks. We find signs of flipping activities in Hong Kong's housing market but not in Singapore. An expansionary U.S. aggregate demand shock and monetary policy shock will lead to positive responses of the real housing price and the vacancy rate in Hong Kong. For Singapore, an expansionary U.S. aggregate demand shock has no significant effect on the real housing price and the vacancy rate. In contrast, an expansionary U.S. monetary policy shock leads to a decrease in the housing price and an increase in the vacancy rate. Our results survive several robustness checks.

**ID: 150 / 20E2-monetary: 3**
*Topics:* Residential real estate: prices and indices, Monetary policy and housing markets
*Keywords:* house price, housing boom, financing costs, financial institution, bank, wealth management products, shadow banking

## Can Housing Boom Elevate Financing Costs of Financial Institutions?

**Zhang, Shuoxun; Ma, Chao**
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*Discussant:* **Song, Changcheng** (Singapore Management University)

We provide evidence that house price appreciation elevates financial institutions' financing costs because it can make households invest more in houses and invest less or require higher returns on other assets. For identification, we employ the unique feature of wealth management products (WMPs, the largest component of China's shadow banking sector) that the issuing markets are local whereas the markets of some products' underlying assets are national. Stocks, bonds, and deposits do not possess this feature. We find that house price growth raises WMPs' expected returns offered by banks. Household-level analyses further confirm that house purchases reduce households' WMP-investment demands.

**ID: 138 / 20E2-monetary: 4**
*Topics:* Residential real estate: prices and indices, Monetary policy and housing markets
*Keywords:* Equilibrium housing prices; Macroeconomic variations; Dynamics long memory; Fractionally cointegrated VAR; Demand-supply identification

## Housing Price and Macroeconomic Interactions in Equilibrium: A Walk Down Memory Lane

**Duan, Kun[1]; Mishra, Tapas[2]; Parhi, Mamata[3]; Wolfe, Simon[2]**
[1]Huazhong University of Science and Technology, China; [2]University of Southampton, UK; [3]University of Roehampton, UK; piaoliudk128@163.com
*Discussant:* **Liang, Liang** (Fudan University)

We investigate how macroeconomic variations govern equilibrium housing prices by identifying effect-transmissions separately via demand and supply functions of housing within a memory-embedded interactive system. Using quarterly data for the US during 1975-2016 and a fractionally cointegrated vector-autoregressive model, we reveal dominant reactions of housing demand against relatively inelastic responses on the supply-side at equilibrium when facing the same macroeconomic variations. Long-memory featured error corrections make the housing market - macroeconomic system dynamically inefficient and asymptotically stable. This further explains why housing markets often respond slowly to macroeconomic interventions. Forecasting exercises and restrictions in parameter-space reassure robustness of our findings.

# 20E3-supply: AREUEA-Supply (7/20 Evening 3)

*Time:* Tuesday, 20/July/2021: 9:00am - 11:00am (EDT) · *Location:* AREUEA
*Session Chair:* Michael Eriksen, University of Cincinnati, United States of America

**ID: 186 / 20E3-supply: 1**
*Topics:* Housing cost and supply, Real estate development
*Keywords:* within-city heterogeneity, housing markets, supply elasticity, land title fragmentation

## A New Measurement of Neighborhood Supply Elasticity by Ownership Constraints

**Ren, Ren; Wong, Siu Kei; Chau, Kwong Wing**
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*Discussant:* **Orlando, Anthony** (Cal Poly - Pomona)

Supply elasticity measures how much supply will increase when the price rises. In the housing literature, it is well known that supply elasticity is determined by geographic constraints, zoning controls, and land-use status. Interestingly, we have found that all these measurements are not sufficient to capture the neighborhood supply elasticity in Hong Kong during 2003 and 2018 using the two well-established approaches in the literature. Instead, we find that the ownership constraints (the land title fragmentation) have significantly determined the supply elasticity at this very micro level. This finding can be explained by the tragedy of the anticommons, in which the title fragmentation leads to sub-optimal use of land and decreases supply elasticity. As a continuation of Baum-Snow and Han (2019), this paper contributes to the housing supply at the microgeographic level, paving the way for the growing literature of within-city heterogeneity, including the price movements and many others.

**ID: 185 / 20E3-supply: 2**
*Topics:* Agglomeration, Real estate development
*Keywords:* Transaction costs, Historical persistence, Skyscrapers, Lot fragmentation, Agglomeration economy

## From Samurai to Skyscrapers: How Historical Lot Fragmentation Shapes Tokyo

**Yamasaki, Junichi[1]; Nakajima, Kentaro[2]; Teshima, Kensuke[2]**
[1]Kobe University, Japan; [2]Hitotsubashi University, Japan; Kensuke-teshima@ier.hit-u.ac.jp
*Discussant:* **Kuang, Chun** (University of International Business and Economics)

Can transaction costs in the urban land market generate lot size persistence

and persistently hinder efficient land use? Using historical data in Tokyo, we study how initial lot fragmentation has affected urban development by exploiting the plausibly exogenous supply shock of large lots in 1868, the release of local lords' estates (daimyo yashiki) scattered throughout old Tokyo, now the central business district. We construct a 100 m*100 m-cell-level dataset spanning 150 years. Using ordinary least squares and a regression discontinuity design, we find that cells previously used as local lords' estates have larger lots today, implying that lot size persistence exists. We also find positive effects on land use and activities, that is, taller buildings, higher land prices, and higher firm productivity, implying lot size premia due to assembly frictions. We provide two pieces of evidence that these positive effects are explained by the growth of skyscrapers requiring large footprints. First, tall buildings explain the effect of local lords' estates on firm productivity today. Second, we find no positive impact on land prices before the skyscraper age. Instead, it was negative, suggesting that split frictions were dominant at that time and assembly frictions became relevant with the emergence of skyscrapers.

**ID: 220 / 20E3-supply: 3**
*Topics:* Housing cost and supply
*Keywords:* Local regulation, zoning, housing markets

## Quantifying Land Use Regulation and its Determinants - Ease of Residential Development across Swiss Municipalities

**Buechler, Simon Camilo[1]; von Ehrlich, Maximilian[2]**
[1]University of Bern; [2]University of Bern; buechler@mit.edu
*Discussant:* **Fu, Shihe** (Xiamen University)

We analyze land use regulation and the determinants thereof across the majority of Swiss municipalities. Based on a comprehensive survey, we construct several indices on the ease of local residential development, which capture various aspects of local regulation and land use coordination across jurisdictions. The indices provide harmonized information about what local regulation entails and the local regulatory environment across municipalities. Our analysis shows that, among others, historical building density, socio-demographic factors, local taxes, cultural aspects, and the quality of natural amenities are important drivers of local land-use regulation. We test the validity of the index with regard to information about the local refusal rates of development projects and show that the index captures a significant part of the variation in local housing supply elasticities.

**ID: 187 / 20E3-supply: 4**
*Topics:* Residential real estate: prices and indices, Housing market segmentation, search, and sorting
*Keywords:* Within-city, heterogeneity of price movements, supply elasticity, substitution, spatial models

## The Supply Elasticity, Substitution and Within-city Heterogeneity of Housing Price Movements

**Ren, Ren; Wong, Siu Kei; Chau, Kwong Wing**
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*Discussant:* **Ross, Amanda** (University of Alabama)

The within-city heterogeneity of the housing market is a growingly important but still understudied topic. While supply elasticity can explain the intercity heterogeneous price appreciation, the literature debates its intracity impact, which could be blurred by neighborhood substitution. This paper aims to revisit the question about the within-city housing price movements and contribute from three aspects. Firstly, we clarify that the conditional roles of supply elasticity under different substitution assumptions. Secondly, a recently developed measurement of the neighborhood supply elasticity is adopted to provide new evidence. Thirdly, we propose two novel ways of controlling the substitution effects using land availability spillovers and price comovements. Using data of 56 neighborhoods of Hong Kong from mid-2003 to mid-2018, we have identified the strong substitution effects, the direct and spillover effects of supply elasticity, and the spatially uneven impacts of supply elasticity on housing price appreciation. It is a clear rejection of perfect within-city substitution, under which the supply elasticity should affect housing prices equally across the city. This paper has delivered a clear answer to the debate that supply elasticity can shape the housing submarkets within a city after the substantial substitution effects have been thoroughly considered.

## 20E4-mobility: AREUEA-Household Mobility (7/20 Evening 4)

*Time:* Tuesday, 20/July/2021: 9:00am - 11:00am (EDT) · *Location:* AREUEA
*Session Chair:* Siqi Zheng, MIT, United States of America

**ID: 176 / 20E4-mobility: 1**
*Topics:* Urban economics: other
*Keywords:* housing consumption, intergenerational mobility, social engineering programs, human capital

### Like Father Like Son? Social Engineering and Intergenerational Housing Mobility

**Agarwal, Sumit; Fan, Yi; Qian, Wenlan; Sing, Tien Foo**
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*Discussant:* **Coulson, Edward** (University of California, Irvine)

We estimate the rate of intergenerational housing mobility in the context of large-scale social engineering programs in Singapore. Using a comprehensive set of data on residential demographics merged with the real housing transaction records covering 149,745 parents-child pairs from 1995 to 2018, we find upward mobility for children born to grass-roots parents, downward mobility for children of middle-class parents, and high persistence for children of upper-class parents. Affordable public housing and high-quality public education are evident to promote intergenerational housing mobility for children born to grass-root parents, as parents save from housing consumption and invest in children's human capital. One reason for the downward intergenerational mobility of children born to middle-class parents lies in resource drain in children's human capital investment squeezed from high housing consumption. Limited social engineering programs are designed to mitigate stagnation in the high end of the housing distribution, which is associated with the high persistence in intergenerational housing mobility for children born to upper-class parents. Our results shed light on the design of social engineering programs for other countries.

**ID: 221 / 20E4-mobility: 2**
*Topics:* Urban economics: other
*Keywords:* Household location choice, consumption amenities, household characteristics, distance to CBD

### Income and Household Location Choice in Switzerland

**Adams, Zeno[1]; Liebi, Luca[2]**
[1]University of St.Gallen, Switzerland; [2]University of St.Gallen, Switzerland; zeno.adams@unisg.ch
*Discussant:* **Tu, Yong** (National University of Singapore)

We examine household location choice for eight cities in Switzerland. Similar to other empirical studies for the U.K. and the U.S., income appears relevant only in simple regressions but is attenuated when household characteristics and amenities are controlled for. We show that municipality taxes, a variable that has particular spatial variation in Switzerland, plays a dominant role in explaining households' cross-sectional arrangements. This has significant implications for policymakers, their local tax rate decisions, and the maximization of the tax substrate. Finally, we study the interaction between household characteristics and amenities to reveal differences in household location preferences.

**ID: 182 / 20E4-mobility: 3**
*Topics:* Urban economics: other
*Keywords:* COVID-19; Location disclosure; Emergency relief payment; Spatial heterogeneity; Neighborhood spillover

### The Impact of COVID-19 Policy Responses on Mobility and Household Consumption

**Lee, Hyojung[1]; Lee, Jieun[2]; Lee, Kwan Ok[3]**
[1]Virginia Tech; [2]Seoul Institute; [3]National University of Singapore; hyojunglee@vt.edu
*Discussant:* **Fan, Yichun** (MIT)

During the COVID-19 pandemic, different countries have implemented different measures to reduce the spread of the coronavirus and mitigate the economic devastation brought on by the pandemic. In this paper, we study the impact of the COVID-19 policies implemented in Seoul, South Korea on mobility and household consumption using cell-phone based mobility and credit card transaction data. First, we examine how the public responded to the disclosed location information with COVID-19 cases in Seoul, South Korea. The results indicate that the disclosure of COVID-19 cases led to localized demand shock as both non-resident inflow and retail spending decreased significantly in neighborhoods with more cases. However, public responses to the disclosed information of cases do not appear to be homogenous across neighborhoods. Neighborhoods with higher employment density and land use diversity experienced a higher demand shock while mobility and retail performances of those with higher population density were less affected by COVID-19 incidences. Second, we examine the effects of emergency relief payment that the South Korean government provided on mobility and household consumption. The preliminary results suggest that the stimulus checks were spent locally, boosting revenues for restaurants, bars, medical centers, apparel retailers, among others.

**ID: 164 / 20E4-mobility: 4**
*Topics:* Transportation, Urban economics: other
*Keywords:* health, well-being, transportation, urban planning, travel behavior, China

### The Roads One Must Walk Down: Journey to Work and Depression for Beijing's Residents

**Wang, Xize[1]; Liu, Tao[2]**
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*Discussant:* **Wang, Binzhe** (MIT)

Mental health is an important aspect of well-being, and its connection to travel behaviors has yet to be widely examined. Using survey data from 1,528 residents in Beijing, China, we found that every 10 additional minutes of commute time was associated with a 1.1% higher likelihood of depression. Long commute time contributes to depression as a separate stressor rather than increasing work stress. Among different modes, time on motorcycles has the strongest association with depression. The commute-depression associations are stronger for older and blue-collar workers. Thus, policies for reducing commute time and increasing jobs-housing balance also have mental health benefits.

# 20E5-ESG: AREUEA-ESG (7/20 Evening 5)

*Time:* Tuesday, 20/July/2021: 9:00am - 11:00am (EDT) · *Location:* AREUEA
*Session Chair:* Nils Kok, University of Maastricht, Netherlands, The

**ID: 122 / 20E5-ESG: 1**
*Topics:* ESG and climate change, Local public finance
*Keywords:* Indoor Air Quality, School Infrastructure, Academic Performance, Human Capital, Education.

### Indoor Air Quality and Student Performance:

**Kok, Nils[2]; Palacios, Juan[1]; Eichholtz, Piet[2]; Duran, Nicolas[2]**
[1]Massachusetts Institute of Technology, United States of America; [2]Maastricht University; jpalacio@mit.edu
*Discussant:* **Aufhammer, Max** (UC Berkeley)

Governments devote a large share of public budgets to construct, repair and modernize school facilities. However, little is known about whether investments in the physical condition of schools translate into student achievements. In this study, we report the results of a large field study, providing quasi-experimental evidence on the implications for student performance of poor environmental conditions inside classrooms - key performance measure of school infrastructure, and a common indicator guiding investments in school facilities. We continuously monitor the environmental conditions (i.e. CO2, fine particles, temperature, humidity) in the classrooms of 3,000 children over two school years, and link them to their scores in over 14,000 nationally standardised tests. Using a fixed-effects strategy, relying on within-pupil changes in environmental conditions, we find that exposure to poor indoor air quality during the school term preceding the test is associated with significant performance drops. We document that one standard deviation increase in average CO2 during the school term leads to a 0.14 standard deviation drop in test scores. We document changes in teaching time as a potential mechanism of drops in performance.

**ID: 169 / 20E5-ESG: 2**
*Topics:* ESG and climate change, Real estate intermediaries
*Keywords:* Climate Risk; Homeowners' Insurance; Price Controls; Financial Regulation; Cross-Subsidization; Financial Institutions.

### Pricing of Climate Risk Insurance: Regulatory Frictions and Cross-Subsidies

**Sen, Ishita[1]; Tenekedjieva, Ana-Maria[2]**
[1]Harvard Business School; [2]Federal Reserve Board of Governors; ana-maria.k.tenekedjieva@frb.gov
*Discussant:* **Ouazad, Amine** (HEC Montreal)

Homeowners' insurance provides households financial protection from climate losses. To improve access and affordability, state regulators impose price controls on insurance companies. Using novel data, we construct a new measure of rate setting frictions for individual states and show that different states exercise varying degrees of price control, which positively correlates with how exposed a state is to climate events. In high friction states, insurers are more restricted in their ability to set rates and adjust rates less frequently and by a lower amount after experiencing climate losses. In part, insurers overcome pricing frictions by cross-subsidizing insurance across states. We show that in response to losses in high friction states, insurers increase rates in low friction states. Over time, rates get disjoint from underlying risk, and grow faster in states with low pricing frictions. Our findings have consequences for how climate risk is shared in the economy and for long-term access to insurance.

**ID: 179 / 20E5-ESG: 3**
*Topics:* Urban economics: other
*Keywords:* Air pollution, information policy, China, inequality

### Behavioral and Distributional Implications of Air Pollution Information on Urbanites' Outdoor Physical Exercise

**Fan, Yichun; Zheng, Siqi**
Massachusetts Institute of Technology, United States of America; ycfan@mit.edu
*Discussant:* **Duran, Nicolas** (UCL and Maastricht University)

Governments usually advise citizens to reduce outdoor activities when ambient air pollution is high through publicizing air quality index and advice. Despite the wide adoption of such information policy, there is limited causal evidence on how urbanites' engagement in outdoor activities changes in response to air pollution, and the distributional impacts across socio-economic groups. Here, we use a unique panel dataset of 22.4 million outdoor exercise records from smartphone App to track exercise activities of people all over China. Employing instrumental variable approach, we show that a 10 μg/m3 increase in ambient PM2.5 reduces people doing outdoor exercise by 1.31%. We find discontinuous response when ambient pollution surpasses the "heavy pollution" threshold, suggesting that people are reactive to public pollution guidance. Individuals in wealthier and well-educated neighborhoods reduce outdoor exercise more when ambient air pollution level is high than people in neighbourhoods of lower socio-economic status, which is driven by asymmetric awareness of pollution health impacts. These findings illustrate that differential behavioral response under homogeneous public information due to knowledge constraint can constitute an important channel of environmental inequality, which should be integrated into policy considerations when balancing between public mitigation and private avoidance efforts.

**ID: 111 / 20E5-ESG: 4**
*Topics:* Policies and regulation in mortgage markets, Risk and delinquency in mortgages
*Keywords:* Strategic Behavior, Forbearance, Machine Learning, NLP, Race, COVID-19, CARES Act

### Cost of Misaligned CARES Act: Overcrowding, Selective Verification and Unintended Racial Consequences

**Bandyopadhyay, Arka Prava**
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*Discussant:* **Lee, Keyoung** (Federal Reserve Bank of Philadelphia)

I utilize a novel data on proprietary servicer call transcripts to investigate strategic borrower responses to mortgage forbearance program (13% with only 1.5% unemployed) contained in the Coronavirus Aid, Relief, and Economic Security Act. I document selective verification of unemployment status (financial hardship) by the servicer. I also discern unintended consequences (disparate impact) of 2.4% for Inbound and 2% for Outbound communications for African American borrowers (without the servicer having race information) by the servicer to reduce ex-post risk. The soft information helps identify the incentives for these communications between the borrower and the servicer. My finding sheds light on the poor-targeting of Government programs (FHA, VA, USDA) during exacerbated income shocks from COVID-19 and estimates a \$5.76 Trillion exposure from plausible non-payment of residential mortgage debt obligations from forbearance.

## 21E1-Information: AREUEA-Information (7/21 Evening 1)

*Time:* Wednesday, 21/July/2021: 9:00am - 11:00am (EDT) · *Location:* AREUEA
*Session Chair:* Seung Hoon Lee, Georgia Institute of Technology, United States of America

**ID: 219 / 21E1-Information: 1**
*Topics:* Residential real estate: prices and indices, Real estate intermediaries
*Keywords:* Geographical concentration, Real estate agents' experience, Real estate agents' knowledge

### Real Estate Agents' Expertise, Spatial Specialization, and Search Costs

**Hayunga, Darren**[1]; **Buschbom, Stephen**[2]
[1]University of Georgia, United States of America; [2]Texas Tech University; hayunga@uga.edu
*Discussant:* **Lin, Desen** (University of Pennsylvania)

This study conducts a comprehensive investigation of whether real estate agents' expertise levels impact the market outcomes of transaction prices and marketing durations. Unlike prior papers, we find that number of prior transactions and the number of years agents hold a sales license have little consequence on outcomes. The important consideration for owners considering whom to employ is whether their home is located within or near an agent's spatial micromarket. The fact that proximity to an agent's geographical concentration improves prices and TOM suggests a reduction in search costs. This study also provides empirical support for the theory that sellers' agents provide more value during contractionary economic cycles.

**ID: 114 / 21E1-Information: 2**
*Topics:* Housing market segmentation, search, and sorting, Real estate intermediaries
*Keywords:* brokers, rent dispersion, time on market, housing search, New York City

### Housing Search and Rental Market Intermediation

**Lin, Desen**[1,2]
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*Discussant:* **Hayunga, Darren** (University of Georgia)

This paper uses a listing-agent matched data set to examine the heterogeneous impact of a broker's agent size on rent, listing time and tenant welfare in the residential rental housing market. Larger brokers are associated with lower rents and shorter listing time. The rent dispersion cannot be fully explained by the amenity difference and points to a sizable agent size premium. I develop a directed search model in which tenants meet landlords through brokers. The smaller rent premium reflects greater benefit of larger brokers who coordinate tenant search better in terms of higher matching probabilities. I evaluate the counterfactual effects of two policies. First, I examine whether expanding the brokerage sector due to lower barriers to entry will benefit tenants in the search process. Second, I examine the New York rental market reform from 2019 and quantify the general equilibrium impact of shifting the commission liability from tenants to landlords. My quantitative analysis shows that policy changes in the rental market lead to endogenous response of the brokerage sector and therefore augment the policy impacts on housing search and rental market outcomes.

**ID: 112 / 21E1-Information: 3**
*Topics:* Machine Learning, Natural Language Processing, and AI in real estate, Real estate intermediaries
*Keywords:* Soft information, Servicer, Machine learning, Natural Language Processing

### Quantifying Soft Information, Mortgage Market Efficiency & Asset Pricing Implications

**Bandyopadhyay, Arka Prava**
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*Discussant:* **Chen, Yifan** (The Pennsylvania State University)

In this paper, I provide a novel framework for machine learning models to ingest quantified soft information during the life of a loan, using cutting-edge natural language processing techniques on salient unstructured text, beyond positive/negative sentiments, from servicer call transcripts which provides efficiency and alleviates the information asymmetry between the lender (and/or issuer) and the borrower. Proprietary servicer comments are hardly accessible and offer the soft information for real-time delinquency status of the mortgages. I investigate whether the special servicer invoked by the investor can utilize the valuable comments from the master servicer. The time-varying soft information about the borrower's financial condition, health of the loan and the property condition from these master servicer comments renders the predictive power and has asset pricing implications. Given this valuable information, the special servicer may choose to use this information, as I anecdotally see with several private equity investors. The well-known unresolved conflict of interest between the master and special servicers (see \cite{Mayer2006AgencyCA}) can be resolved and this can have a significant reduction of moral hazard in the residential real estate market, thereby increasing efficiency and transparency.

**ID: 102 / 21E1-Information: 4**
*Topics:* Residential real estate: prices and indices
*Keywords:* market efficiency, private information, insiders, office locations, housing demand

### Amazon Is Coming to Town: Private Information and Housing Market Efficiency

**Chen, Yifan**[1]; **Wilkoff, Sean**[2]; **Yoshida, Jiro**[1]
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*Discussant:* **Bandyopadhyay, Arka Prava** (Baruch College)

This study provides evidence of strong-form efficiency in the housing market, where

prices fully incorporate private information. We use Amazon's progressive disclosure of its new headquarters locations in Virginia and New York to distinguish changes in the public's knowledge. Using a spatial difference-in-differences approach, we test whether housing prices increase before Amazon's public announcements. Housing prices near the Virginia headquarters exhibit 4:3% premia before Amazon's decision but no additional increase upon decision. Price premia for New York reach 17:5% before decision but disappear once Amazon cancels the headquarters. Other finalist cities exhibit no price premia, precluding the possibility of speculation.

## 21E2-political: AREUEA-Political Economy (7/21 Evening 2)

*Time:* Wednesday, 21/July/2021: 9:00am - 11:00am (EDT) · *Location:* AREUEA
*Session Chair:* Liang Peng, Pennsylvania State University, United States of America

**ID: 229 / 21E2-political: 1**
*Topics:* China's real estate markets
*Keywords:* Political connections; land price; starting price; listing auctions; anti-corruption

### Political Power and Land Prices: Evidence from Micro-level Land Data in China

**Yang, Chao[1]; Fan, Gang-Zhi[2]; Shan, Liwei[3]**
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*Discussant:* **Ma, Chao** (Xiamen University)

Using a unique sample consisting of 3,547 land transactions in China from 2008 to 2016, we find that politically connected firms can purchase land at lower prices than non-politically connected firms. Channel tests find that politically connected firms are more likely to have lower starting prices and acquire land through listing auctions, which help them to reduce their land prices. However, the recent anti-corruption action has weakened the effect of political connections on land prices. Further study shows that the negative effect of political connections is more significant for firms whose political relationships or headquarters are located in the same city as the purchased land, and that the effects of political connections are smaller in regions with more developed market environments, stronger legal systems, or less government intervention. We also find that the impact of political connection on land prices is smaller in cities with land resources constraints and cities with a greater dependence on land sales, i.e., greater fiscal pressure. Finally, a series of robustness tests confirm the main results.

**ID: 103 / 21E2-political: 2**
*Topics:* Transportation, China's real estate markets
*Keywords:* Subway, Land Auction, Asymmetric Information, Monopolistic Supplier, China

### How is Private Information Priced in a Monopolistic Market: Overall Evidence from Chinese Subway Land Auctions (2008 — 2018)

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*Discussant:* **Li, Jing** (Singapore Management University)

Economic theory suggests the monopolistic informed trader should extract all information rents. Using the comprehensive land auction data of all subway station built in China between 2008 and 2018, we find that the regional government charges a premium of $9.45 million per acre on average for the land parcels within 1 kilometer of a future subway station. When the location of the subway station is no longer private information, we further show that the ask price from the monopolistic supplier follows closer to the prediction of the real option model rather than the NPV model. Finally, our finding is consistent with the literature that the main incentive of the regional government officials is promotion and tenure, rather than personal benefits from the corruption.

**ID: 175 / 21E2-political: 3**
*Topics:* Residential real estate: prices and indices
*Keywords:* Hong Kong housing price, Chinese investors, safe haven effect, residential sorting, bargaining power

### A Tale of Two Cities: Mainland Chinese Buyers in Hong Kong Housing Market

**Fan, Yi[1]; Hu, Maggie Rong[2]; Wan, Wayne Xinwei[3]; Wang, Zhenping[4]**
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*Discussant:* **Fan, Gang-Zhi** (Guangzhou University)

This paper examines the effect of mainland Chinese buyers' housing purchase in Hong Kong. Contrary to media's allegation on mainland buyers causing huge bubbles in Hong Kong housing market, we find that mainland buyers only constitute less than 4% of housing transactions in Hong Kong from 2001 to 2017. Their price premium over locals is only 1.4% on average. However, the price premium is higher for properties attracting more interests from mainland buyers, such as luxury units larger in size (3.52%). We also find that the price premium varies with hedging demand for the currency risk over time (safe haven effect). Furthermore, the price premium is higher in buildings with more existing mainland homeowners (residential sorting). At last, the price premium is lower if the mainland buyer has stronger bargaining power such as more prior transaction experience or facing a mainland seller.

**ID: 116 / 21E2-political: 4**
*Topics:* Affordable housing, Urban economics: other
*Keywords:* Placed-Based Policies, Opportunity Zones, Tax Incentives.

### Job Growth from Opportunity Zones

**Arefeva, Alina[1]; Davis, Morris[2]; Ghent, Andra[3]; Park, Minseon[4]**
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*Discussant:* **Fuess, Roland** (University of St.Gallen)

The Tax Cuts and Jobs Act of 2017 established a new program called Oppor- tunity Zones (OZs) that created tax advantages for investing in businesses or real estate in a limited number of low-income Census tracts. We use a census of establishment-level data on employment to identify the effect of the program on job creation. We show that in metropolitan areas, the OZ designation increased employment growth relative to comparable tracts by between 3.0 and 4.5 per- centage points and new jobs were created across many different industries and education levels. The OZ designation did not create jobs in rural areas.

# 21E3-equity: AREUEA-Equity Investment (7/21 Evening 3)

*Time:* Wednesday, 21/July/2021: 9:00am - 11:00am (EDT) · *Location:* AREUEA
*Session Chair:* Eva Steiner, Penn State University, United States of America

**ID: 224 / 21E3-equity: 1**

*Topics:* Commercial real estate: prices and cycles, REITS

*Keywords:* Real Estate Price Indices, Commercial Real Estate, Structural Time Series Modelling, Bayesian Inference, Real estate operating statistics

## Estimating Market Fundamentals from REIT data

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*Discussant:* **Case, Brad** (None)

In this paper we propose a new methodology for the estimation of fundamental investment real estate time series using real estate investment trust (REIT) data. The methodology may be particularly useful to develop publicly accessible property-level operating statistics, such as income or expenses per square foot. Commercial property operating statistics are relatively under-studied from an investment perspective. To demonstrate the methodology and its usefulness, we estimate the time series of property values, net operating income, cap rates, operating expenses and capital expenditures, per square foot of building area, by property type (sector) at a quarterly frequency for multiple specific geographic markets from 2004 through 2018. The methodology enables easy derivation of important basic data that should be useful for academic and industry practitioner analysts based on high quality stock market based information compiled by the S&P Global SNL Real Estate Database. The methodological enhancements allow estimation of actual quantity levels rather than just longitudinal relative values (index numbers). They also avoid the need for any data source other than published REIT data. And we introduce a Bayesian framework that allows the estimation of reliable time series even in small markets.

**ID: 159 / 21E3-equity: 2**

*Topics:* Commercial real estate: investors, REITS

*Keywords:* REIT return; implied volatility change; informed trading; return predictability

## Option Price Implied Information and REIT Returns

**Cao, Jie[1]; Han, Bing[2]; Song, Linjia[1]; Zhan, Xintong[1]**

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*Discussant:* **Lu-Andrews, Ran** (California Lutheran University)

This paper investigates whether option-implied variables predict the cross-section of REIT returns. Among several measures we examine, the difference of changes in call and put implied volatilities (ΔCVOL-ΔPVOL) significantly predicts the REIT returns. A long-short strategy produces a return spread of 0.12% per week. ΔCVOL-ΔPVOL significantly predicts the stock market reaction to earnings conference calls. The return predictability is more pronounced among REITs with higher information asymmetry, such as noncore REITs and REITs with headquarter in less transparent MSA. Informed trading and related return predictability are also stronger for REITs operating in regions with higher land supply elasticity.

**ID: 124 / 21E3-equity: 3**

*Topics:* REITS

*Keywords:* REITs, Cross-sectional returns, Extreme returns, Short-term reversal, Institutional holdings

## Predicting REIT Returns: More Plausible than Expected

**Chen, Jiajin[1]; Lai, Rose Neng[2]**

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*Discussant:* **Letdin, Mariya** (Florida State University)

This study is about examining how firm level performance and risk can predict cross-sectional returns of REITs. The portfolio-level analyses indicate that past month maximum return and past month return capture cross-sectional variations in REIT expected returns during 1980 – 2017. In particular, high values of both lead to low expected REIT returns for non-January months, even after controlling for firm characteristics. While the short-term reversal is robust and more significant in January in general, that from the maximum return is actually positive in January due to the seasonal effect. A closer look reveals that after the recent subprime mortgage crisis, the predictive power of maximum return becomes weaker, while that of past month return seems to have disappeared. More interestingly, our results show that the predictive power of maximum return is weaker among REITs with more institutional holdings, which supports the argument of retail investors' preference for lottery-like stocks, which is more prevalent in mortgage REITs and less in equity REITs during the period of 1980-2010 but reversed after the crisis. Our findings provide valuable implications for practitioners including individual investors and institutional investors.

**ID: 214 / 21E3-equity: 4**

*Topics:* REITS

*Keywords:* COVID-19, listed real estate firms, stock return, neighborhood risk, spatial analysis

## Proximity to COVID-19 Cases and Real Estate Equity Returns

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*Discussant:* **Wang, Chongyu** (Concordia University)

This paper examines how stocks of listed real estate firms respond to new information on the risk associated with the firm's underlying assets. Using COVID-19 as a natural experiment, we employ a difference-in-differences (DID) approach to identify the effect of an asset's proximity to COVID-19 cases on returns of the real estate firm that owns the asset. We use a novel micro-level dataset which combines extensive data on the geographic footprint of COVID-19 patients, i.e., the locations they have resided in or visited, and the location of property holdings of real estate firms in Hong Kong. We find significantly negative effects of proximity to COVID-19 cases on stock returns. Having a property within 1 mile from a COVID-19 case results in a 0.04% lower return one day after the case disclosure. This effect is stronger for properties located closer. As we monotonically decrease the distance for the proximity proxy from 2 miles to 1 mile, 0.5 miles and 0.1 miles, the negative market reaction intensifies.

## 21E4-affordability: AREUEA-Affordability (7/21 Evening 4)

*Time:* Wednesday, 21/July/2021: 9:00am - 11:00am (EDT) · *Location:* AREUEA
*Session Chair:* Lingxiao Li, California State University, Fullerton, United States of America

**ID: 202 / 21E4-affordability: 1**
*Topics:* Affordable housing, Monetary policy and housing markets
*Keywords:* Housing assistance policy, real estate pricing, price bunching, price inflation, economic stimulus

### Who Gains from Housing Market Stimulus? Evidence from Housing Assistance Grants with Threshold Prices

**Agarwal, Sumit[1]; HU, Maggie[2]; Lee, Adrian[3]**
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*Discussant:* **Stacey, Derek** (University of Waterloo)

Governments use home ownership schemes for the dual purpose of improving housing affordability and stimulating house construction. This paper studies how the housing market responds to housing assistance policies by exploiting a natural experiment in Sydney, Australia, where buyers of new homes priced up to $600,000 were eligible for government subsidies between July 2010 and June 2012. We find this policy causes large distortions to sales volume and price level. We observe a large bunching just below the threshold price of $600,000, over 8 times the counterfactual density. The source of the bunching mass comes from both buyers moving down the price range as well as new entrants attracted to the market by the policy. We also examine price impact and find that policy affected new homes just below the threshold are associated with an overpricing of about $3,000, offsetting up to 56% of the received benefit. Further, homes are about 25% smaller in size than comparable homes in prior periods. Lastly, we document a wealth effect where neighborhoods receiving more subsidies experience an increase in new car purchases. Overall, this study sheds light on the effectiveness and externalities of housing subsidies to improve homeownership.

**ID: 183 / 21E4-affordability: 2**
*Topics:* Affordable housing, Local public finance
*Keywords:* property tax, assessments, inequality

### Measures of Vertical Inequality in Assessments

**McMillen, Daniel[1]; Singh, Ruchi[2]**
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*Discussant:* **Diop, Moussa** (USC)

Standard measures of vertical inequity suggest that assessments are regressive in the sense that high-priced properties are often assessed at lower rates than low-properties. Conventional measures of measuring vertical inequality include a simple descriptive statistic – the price-related differential – and measures based on regressions. We show that regression-based procedures are seriously flawed, with a bias that tends to imply regressivity even when it is not present. To supplement the price-related differential, we propose three approaches that focus on the entire distribution of assessments rather than attempting to provide a single measure to characterize the entire assessment process. The first is to compare Gini coefficients for sales prices and assessments. These statistics directly measure vertical inequality by determining whether the distribution of assessments is not as skewed toward low-value properties as are sales prices. Second, we show that the Suits Index, which has been used to analyze tax progressivity, can be used to analyze whether assessments are progressive or regressive. The third approach is to test formally whether the distribution of log sales prices is statistically different overall from the distribution of log assessed values.

**ID: 107 / 21E4-affordability: 3**
*Topics:* Housing and cyclical dynamics, Affordable housing
*Keywords:* housing affordability, output dynamics, endogenous house price, wage rigidity, monetary policy rule.

### The Dynamics of the House Price-to-Income Ratio: Theory and Evidence

**Leung, Charles[1]; Tang, Edward[2]**
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*Discussant:* **Malpezzi, Stephen** (University of Wisconsin-Madison)

The house price-to-income ratio (PIR) is widely used as an affordability indicator. This paper complements the cross-sectionally focused literature by proposing a tractable model for the PIR dynamics. Our model predicts that the PIR is very persistent and is correlated to the lagged aggregate output. Cross-country analysis confirms this prediction and provides evidence for a long-term, positive and significant relationship between PIR and aggregate production. Our results hint at the construction of an early warning system for housing market mispricing. Our tractable formulation of a stochastic money growth rule may carry independent research interest.

**ID: 207 / 21E4-affordability: 4**
*Topics:* Migration, Affordable housing
*Keywords:* Multigenerational; Millennials; Immigrants; Co-residence; Housing, Asian, Hispanic, Demographics

### U.S. Millennial Multicultural Multigenerational Household Preferences and Ownership

**Wu, Yi[1]; Tidwell, Alan[2]; Sah, Vivek[3]**
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*Discussant:* **Lin, Desen** (University of Pennsylvania)

In this study, we document household formation, mobility, and tenure among millennials with a particular focus on the effect of ethnic and cultural diversity. Using the American Housing Survey and employing contextual models, we find a proclivity for multigenerational adult family living arrangements among first- and second-generation Asian and Hispanic millennials compared to their White peers. This observed difference is only partially conditioned on income, housing affordability, and education. First-generation Asian, and first- and second-generation Hispanic millennials are less likely to own a house compared to White millennials. The effect of co-residence on ownership is significant and positive though suggesting this living arrangement contributes to homeownership across all generational and ethnic groups. And, millennials that moved are more likely to co-reside if their move was motivated by family/friends or housing cost, this is consistent across all ethnic groups.