UNIVERSITY OF CAMBRIDGE

Cambridge Real Estate Research Centre

Annual Report
2019

Department of Land Economy
University of Cambridge

INTRODUCTION

The Cambridge Real Estate Research Centre (CRERC) co-ordinates and acts as a focus within the Department of Land Economy and across the University of Cambridge for applied research about real estate. It aims to ensure that real estate research in the University is "world class" and to raise the profile and impact of real estate research by members of the University in the wider academic, policy and business communities.   The Centre works with other academic organisations, professional bodies and industry to ensure research is of the highest quality, is relevant and has maximum impact.

The Centre is extremely grateful for the financial and broader support of its partners and other supporters including the Cambridge Land Economy Advisory Board (CLEAB) that have helped fund and enable its activities. This report aims to give an overview of all the activities of the Centre over the past year and highlight key initiatives and priorities for the future.

A copy of the Centre brochure is available on our website:
https://www.crerc.landecon.cam.ac.uk/about-us

The Centre continues to act as a hub for the various data sources available on real estate for staff and students, and engaged in discussion for new or improved data sources — if interested please email us via lemaster@hermes.cam.ac.uk

OUR RESEARCH
RESEARCH PROJECTS FOR INDUSTRY BODIES AND THE PUBLIC SECTOR

A full list of publications and working papers is contained in Appendices 1 and 2. The strength and quality of the research produced is consistent with our goal of being rated as "world class" in real estate research. Research has been produced and undertaken under a broad range of thematic areas that are priorities for the Centre.

Our work has examined topics ranging from key issues in real estate performance and the impact of size in real estate companies through to behavioural loss aversion studies and from projects looking at capital flows and to projects exploring the impact of migration and projects looking at issues around urbanisation and housing.   Publications since the last report include:

IPF—Managing Currency Risk in International Real Estate Investment
Colin Lizieri, Nick Mansley, Zilong Wang

This project commissioned by the Investment Property Forum was completed and published in 2018. Looking at how investment managers think about the impact of currency when investing internationally and if/how they attempt to manage/control currency risk arising from investing across currencies.

The research came up with some blunt conclusions, including that some real estate managers whilst referring to managing currency risk actually think about currency management more as a tool to selectively boost returns rather than really looking at how they are controlling the impact of currency risk.

The full report can be downloaded here: https://www.ipf.org.uk/resourceLibrary/managing-currency-risk-

Determinants of Energy Consumption and Exposure to Energy Price Risk: A UK Study
Franz Fuerst, Dimitra Kavarnou, Ramandeep Singh, Hassan Adan

Funded as part of the EU RentCal project (http://www.rentalcal.eu/british-partner), this study set out to investigate the drivers of energy consumption (focusing on gas consumption) for domestic space heating to establish which households are particularly exposed to risks associated with changes in energy prices and fuel poverty. https://www.repository.cam.ac.uk/handle/1810/294500

The main contribution of the study is to underline the relative importance of household socio-economic characteristics over dwelling characteristics in explaining per capita energy consumption. The reported findings challenge the prevailing policy practice, which focusses mostly on dwelling characteristics.

Tearing down the information barrier: the price impacts of energy efficiency ratings for buildings in the German rental market
Marcelo Cajias, Franz Fuerst, Sven Bienert

Also funded as part of the EU RentCal project, this study tests if tenants are willing to pay for energy efficiency and recognises that Rental markets are particularly prone to an energy efficiency gap and finds With some exceptions, energy-efficient dwellings command higher rents and rent out more quickly.
https://www.sciencedirect.com/science/article/pii/S2214629618309095

IPF—Long-term Value Methodologies in Real Estate Lending Colin Lizieri, Nick Mansley and Zilong Wang.

This major project for the Investment Property Forum in partnership with colleagues at the University of Reading, initially reviewed and tested earlier worked methodologies to estimate the long-term or sustainable value of real estate. The research team then expanded the analysis of the main models and developed new approaches as well as exploring other indicators that might help identify if market values are above long-term sustainable values.   The projects results were presented and supported by the Bank of England and further discussions are ongoing about regular updates that could be used by the Bank and the wider industry.
Published January 2020
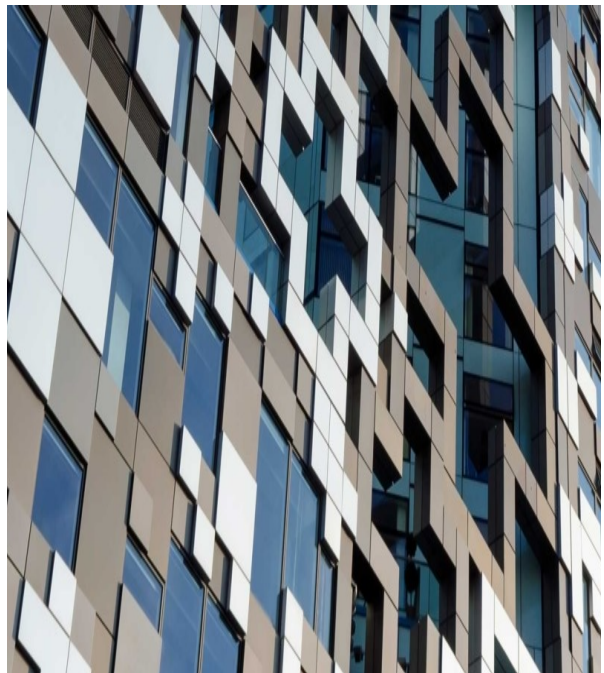
"This independent research, by a well-respected team, is one significant step in a larger process, which provides a rare opportunity for behavioural change in the property lending market, helping reduce the adverse impacts on the financial system from the inevitable cyclical movement in commercial property prices."

Size effects and economies of scale in European real estate companies
Brent Ambrose, Franz Fuerst, Nick Mansley, Zilong Wang

Published in *Global Finance Journal in* April 2019, as well as by EPRA, this study investigated scale economies in European real estate companies and was supported by an EPRA research grant. It examined the effects of size on revenue, expenses, profitability ratios and cost of capital using a panel regression approach. It found that larger real estate companies in Europe are able to generate higher revenue per unit of company size, incur lower costs and produce higher returns. Net Operating Income ratios and return ratios increase while Selling, General and Administrative expense ratios decrease with the size of a company. However, it did not find evidence that larger companies have lower cost of debt or lower weighted average cost of capital. From the analysis, it is evident that particularly small firms can reap substantial economies of scale as they grow. However, the benefits of further growth tend to be much more modest for larger companies. Given REITS (Real Estate Investment Trusts) are on average larger than comparable non-REITs this may explain why REITs have lower economies of scale in expenses and revenues than Non-REIT real estate companies.
https://www.sciencedirect.com/science/article/pii/S1044028317304349

Machine Learning, Architectural Styles and Property Values
Thies Lindenthal, Erik B Johnson

This research project first introduces an algorithm that collects pictures of individual buildings from Google Street View. Second, it trains a deep convolutional neural network (CNN) to classify residential buildings into architectural styles, taking into account spatial dependencies of these styles. Third, it investigates whether architectural styles influence house prices. For re-sales, the architectural style is a significant determinant of transaction prices while no such effect is found for new buildings. Additionally, we are able to provide guidance on how to detect and overcome some of the limitations of machine learning methods through a large-scale comparison of predictions and expert classifications.
https://github.com/thies/paper-uk-vintages/blob/master/text/manuscript_assa.pdf

500 Years of Housing Rents, Quality and Affordability
Thies Lindenthal, Piet Eichholtz, Matthijs Korevaar

How do housing rents, quality and affordability evolve when cities grow over time? This paper studies urban housing markets for half a millennium (1500–2017) for Amsterdam, Antwerp, Bruges, Brussels, Ghent, London, and Paris. Based on a dataset of 436,000 rent observations, we build new indices of housing rents, quality and inequality, and relate these to changes in wages and population. Long-term growth in real rent prices has been limited. Before 1900, markets were unregulated and rent prices and wages rose in tandem when cities grew, while housing quality and inequality increased. After 1900, housing affordability started improving substantially, and we show that short-term improvements in this period were partially attributable to rent controls. Most of the surge in housing expenditure that did occur over time is due to increasing housing quality rather than rising real rents.

Research Projects – Other Collaborations and International Research Projects

Helen Bao

"Nudging Towards a Better Financial Future: Applying Behavioural Insights in the Development of Financial Systems in Rural China". A two-year joint research project funded by ESRC and NSFC in partnership with Nantong Rural Commercial Bank. https://gtr.ukri.org/projects?ref=ES%2FP004296%2F1

"Formal Rules in the Rural Land Institutional Change in China: Development, Implementation and Evolution – Based on Behavioural Economics Theory and Empirical Study". Running from Jan 2017 – Dec 2020 this project is being conducted in association with National Natural Science Foundation of China, Renmin University of China. Publication and dissemination due 2020-2021.

Franz Fuerst

"Liveability at Height: Consumers' Willingness to Pay" was presented at the 25th Pacific Rim Real Estate Society Conference in Melbourne, Australia in January 2019. A collaboration with Matthew Palm and Georgia Warren-Myers from the University of Melbourne, the project provides insights into the main liveability elements consumers desire and are willing to pay for in the context of a city in transition to higher density living.
http://www.prres.net/index.htm?http://www.prres.net/Proceedings/2019proceedings.asp

"Estimating the Potential Risks of Sea Level Rise for Public and Private Property Ownership, Occupation and Management" is another collaboration with colleagues at the University of Melbourne.
The interim article is available here: https://www.mdpi.com/2227-9091/6/2/37

Nick Mansley and Zilong Wang

In 2018, in memory of the late Erwin Stouthamer, ANREV (Asian Association for Investors in Non-listed Real Estate Vehicles) fund a research project on currency risk. This Cambridge research "Currency Risk Management for Investors in Asia Pacific Non-Listed Real Estate Funds" explores how investors in Asia Pacific non-listed real estate vehicles approach these issues and the impact of different hedging strategies.
The full report can be found here: https://anrev.org/en/publications/details/121/653

Colin Lizieri

Working with Nestor Garza from Universidad del Norte, Colombia this study focused on the role and economic effect of land ownership and land monopoly in emerging urban environments. Land monopoly in conventional economics is a theoretical 'impossibility' which, nonetheless, allows for a spatial empirical approach. They designed a spatial land monopoly test of their own, understood as a pricing strategy where land prices could be 'over and above' those determined by city-wide location, urban regulation and externalities. They used the city of Barranquilla (Colombia) as a case study. This city offered ideal conditions for investigation of theories of land monopoly, given extreme land concentration in its highly regulated elite northern fringe. The study found no evidence of land monopoly pricing using different specifications of the spatial tests, which conformed to standard urban economic expectations: the pattern of development pointing to different, political channels influencing development. The full article can be found here: https://journals.sagepub.com/doi/full/10.1177/0042098018781306

OUR PEOPLE

The Centre is led by Prof Colin Lizieri (Centre Director) and Nick Mansley (Executive Director) who both have over 30-years of real estate research experience. The Centre also has a number of key Departmental staff with the expertise and proven capability of delivering the highest calibre of applied research and a breadth of research interests.

Colin Lizieri is Grosvenor Professor of Real Estate Finance and was Head of the Department (Jan 2016-Dec 2019). Over 30-years he has advised international bodies, governments, professional bodies and private organisations on real estate investment, and has published widely on real estate finance, investment risk management and office market dynamics.

Nick Mansley draws on extensive experience in investment management including as head of the global multi-manager business at Aviva Investors responsible for c.$20 billion of investments across all asset classes as well as a long track record of applied economics and real estate research.

Dr Helen Bao is University Senior Lecturer in Real Estate Finance, and Fellow in Land Economy at Newnham College. Helen is a real estate economist with a research focus on behavioural finance and real estate/housing markets, urbanization in China and has strong links with Chinese state and private organisations, research institutes and real estate investors.

Franz Fuerst is Professor of Real Estate and Urban Economics, and has an extensive portfolio of research on sustainable/green buildings and the impact on rent and value, on the drivers of property company and real estate market performance and on the relationships between knowledge industries and real estate values.

Dr Thies Lindenthal, University Lecturer in Real Estate Finance works on very long-run real estate performance and on the impact of technology on the analysis and behaviour of property markets.

Dr Zilong Wang is Senior Research Associate and his specialism is Finance and Risk. He also teaches quantitative methods on the MSt programme. Prior to his PhD, Zilong worked in investment banking as a financial analyst.

Natalie Bayfield is Senior Associate at the Centre and is a real estate financial analyst and urban economist. She is also CEO of Bayfield Training, and has taught and provided consultation worldwide. Natalie is also credited with inventing 'Real Estate Financial Modelling' as a subject in its own right over 20 years ago.

The Centre has also made some new appointments, increasing our research resources:

Dr Ozge Oner is University Lecturer in Real Estate and Spatial Economics and Fellow in Economics and Land Economy at Sidney Sussex College. Her research includes: Placemaking, Inclusivity and Town Centre/Retail in the Future. Ozge was also recently given the prestigious "Unga forskapriset" award for outstanding research in her home country, Sweden.

Dr Johan Larsson is University Lecturer in Economics and Public Policy and Fellow in Land Economy at Robinson College. His research interests are: Economic geography, regional science, urban economics and entrepreneurship

Dr Christina Li recently moved from her role as a Research Associate to being an Unestablished Lecturer in Real Estate Finance within the Department. Christina works closely with Helen Bao on her research project "Nudging Towards a Better Financial Future: Applying Behavioural Insights in the Development of Financial Systems in Rural China", and has a number of her own working papers in progress.
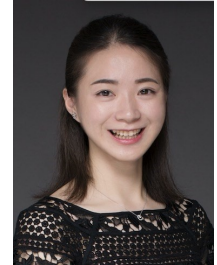
In 2019 Christina won a distinction award for her paper at the first China Behavioural and Experimental Economics Forum. Her other research interests are Behavioural Economics, Financial Inclusion, Real Estate Economics, Regional and Urban Economics and Public Policy.

There has also been a change in the administration staff at the Centre as we said thank you and goodbye to Centre and MSt Coordinator Gillian Barclay, who moved to the Institute of Continuing Education as Head of Academic Centre Administration for Professional Studies, and welcomed to the team Barbora Sajfrtova and Lynda Haines as Centre and MSt Coordinator and Centre and MSt Assistant respectively.

PHD SUCCESSES

In line with our aim to foster researchers, there are a number of PhD students currently associated with the Centre:

Yana Akhytrs'Ka: How can energy data analytics platforms affect small firms? A study of a reduction in energy use in the service sector and its spillover effects

Thuqan AlHindawi: Can BD/ML techniques enhance RE markets' transparency by providing a more efficient/robust way to examine the risk/return profile of real estate as an asset class?

Mark Burke: Emerging market GAP Housing: A comparative investigation of financing models for sustainable development in resource constrained environments

Marco Felici: Empirical questions in Housing Markets and Policy

Yiwen Qiu: Firm Locations, Industrial Structures, Regional Development Paths from a Dynamic

Perspective: A case study in China

Xinwei Wan: Property Market Sentiment, Government Land Sales and NAV Discount in REITS Valuation

Liangqi Wu: Urbanisation and Fiscal Risks in China

Max Exler: Asymmetric dependence and REIT performance

Saad Siddiqui (part-time): International asset pricing, housing and consumption

Anando Maitra (part-time): Corporate Bonds and Equities: the cross-section of flows

INDUSTRY AND PUBLIC BODIES

A number of members of the Centre continue to play leading roles in supporting industry and other bodies:

Colin Lizieri served on the European Public Real Esate Association (EPRA) Research Committee and as a member of the Investment Property Forum (IPF) Research Steering Group.

Nick Mansley is currently Chair of the Lord Chancellor's Strategic Investment Board (Ministry of Justice), an adviser to the Official Solicitor and Public Trustee and sits on the Urban Land Institute executive as well as undertaking a number of advisory/investment committee roles in the private sector.

The Centre also recognises the continued support of its sponsors and research grant providers, and is always grateful to members of the Research Committee of the Cambridge Land Economy Advisory Board (CLEAB) for their guidance. http://www.cleab.org/

CONFERENCES AND OUTREACH

Members of the Centre presented research papers or spoke at a range of conferences and meetings:

Colin Lizieri presented his paper (written with Bing Zhu from Reading University) "Connected Markets through Global Real Estate Investments" at the Real Estate Research Institute (RERI) Conference in Chicago in May 2018.

He was also an expert panellist and discussant at the European Real Estate Society (ERES) Annual Conference in Reading in June 2018, and the co-chair and closing speaker at the 6th International Real Estate Finance and Investment Conference in London in November 2018. The latter event was organised by the Department in association with the Cambridge Real Estate Finance Alumni Society and the Britain China Real Estate Association.

Nick Mansley was a speaker at the Association of Investors in Non-Listed Real Estate Vehicles (INREV) Erwin Stouthamer Research Grant Seminar in Amsterdam in February 2018. In March 2018, Nick was speaker and chair of the Association of Real Estate Fund (AREF) "Disruptors in the Industry" event in London. Also in 2018 Nick was a speaker at the European Conference of the Association of Foreign Investors in Real Estate (AFIRE) in Barcelona in May.

Helen Bao organised and chaired her first Cambridge Symposium on Behavioural Sciences and Urban Rural Development in China in January 2018, and in May 2019 organised and chaired the first Cambridge International Behavioural Sciences and Urban Studies Symposium.

Also in 2018 she presented at the American Real Estate Society (ARES) annual meeting in Florida; was a panel chair at the European Real Estate Society (ERES) Annual Conference in Reading and was a presenter, panellist and session chair at the Asian Real Estate Society (ARES) annual meeting in South Korea. In 2019 Helen was again a presenter and panellist at the American Real Estate Society (ARES) annual meeting, this time in Arizona, and a presenter, session chair and member of the programme committee for the Asian Real Estate Society (ARES) annual meeting in China.

Franz Fuerst presented/co-authored six papers at the European Real Estate Society (ERES) Annual Conference in Paris in July 2019. He was a presenter and panellist on the Sustainability Panel for 150-years of Built Environment Research at the University of Melbourne in April. Franz was also an invited speaker at the Ernst and Yound Australia, Green Building and Climate Change event in Melbourne in April.

Thies Lindenthal has presented his "Machine Learning, Architectural Style and Property Values" paper at three conferences: Urban Economics Association Annual Meeting in New York (October 2018), the American Economics Association (ASSA) Annual Meeting in Atlanta, USA (January 2019) and Weimer School Session at Homer Hoyt Institute in Florida (January 2019). The latter is invitation-only and he was honoured to be selected to participate.

His paper "The Odd One Out: Predicting Price Coarseness" has been accepted for presentation at the 2020 ASSA Annual Conference (it was previously presented at the Weimer School Session in 2019); and he will also chair a session on Real Estate and Machine Learning at the same event in San Diago in January 2020.

Christina Li presented papers in 2018 at both the AREUEA-ASSA conference doctoral session in Philadelphia and at the Asian Real Estate Society (ARES) annual meeting in South Korea. In 2019 Christina again presented at the AREUEA-ASSA conference this time in Atlanta, and was a discussant both at the Cambridge International Behavioural Sciences and Urban Studies Symposium and at the Real Estate Finance and Investment Symposium. In April Christina presented at the first China Behavioural and Experimental Economics Forum and in June she was a session chair and presenter at the International Conference on China's Urban Development in Beijing.

CENTRE INDUSTRY EVENTS
FUTURE CITIES

2018 was the third year of the Centre's Future Cities Conference

Held at Jesus College in July the conference brought together academic experts from Cambridge, elsewhere in the UK and internationally with investors, advisers and policy decision makers around a core theme of "**successful cities of the future**".

The conference looked at what makes cities successful and how technology can be used to improve how we design, develop, govern, travel and live in cities with a focus on transport, housing and wider property market issues.

Keynote speaker for Future Cities was Prof Chris Webster and his speech was entitled "'Successful future cities: what can we really expect from smart city data and tech?' To see his presentation and further details about the conference including a list of the successful winners of the PhD Future Cities Prize Fellowships sponsored by CapCo please go to the Future Cities webpages: https://www.crerc.landecon.cam.ac.uk/future-cities

WOMEN IN REAL ESTATE

May 2019 saw the Centre play host to a Women in Real Estate Seminar

Organised and chaired by Helen Bao, a packed audience filled the Principal's Lodge at Newnham College to hear Prof Sofia Dermisi from the University of Washington, and Cambridge's Prof Siqi Zheng talk about career opportunities in real estate in the university sector and what personally shaped their own careers.

CAMBRIDGE REAL ESTATE RESEARCH CLUB

This annual event continues to go from strength to strength. Hosted by the Centre and held at a local College, this invite-only one-day conference held each spring is a chance for Heads of Research/CIOs across the industry to share and discuss investment issues and research ideas in a relaxed environment .

In 2018 the sessions covered: Structural change and online impact in retail; Energy efficiency and barriers to investment; International capital flows, pricing etc.; Managing currency risk and Data analytics and research issues.

The 2019 sessions covered: Place-making, Inclusivity and Town Centre/Retail in the Future; New Data Sources and New Methods; Behavioural Insights; Policy Uncertainty and Real Estate Development; Wellness and Sustainability.

CENTRE ACADEMIC EVENTS
CAMBRIDGE INTERNATIONAL BEHAVIOURAL SCIENCES AND URBAN STUDIES SYMPOSIUM

The Symposium hosted by the Centre but led by Helen Bao took place at Newnham College in May 2019.

The Cambridge International Behavioural Sciences and Urban Studies Symposium provides a platform for discussions of **cutting-edge research at the intersection of behavioural sciences and urban studies**. Seventeen papers were presented and discussed extensively during the recent three-day symposium at Newnham College.

A wide range of behavioural topics were covered including: loss aversion, endowment effect, framing, mental accounting, herding, and social preferences. These behavioural tools are applied in land use policy, development and planning problems, urban regeneration, neighbourhood conservation and urban design, immigration and internal labour migration, liability and quality of life, greening, sustainable cities, among others.

Colin Lizieri gave the opening speech. The symposium also featured two keynote speeches by Prof Guy Robinson (Emeritus Editor of *Land Use Policy*) and Prof Pengjun Zhao (Edit-in-Chief of *Cities*).

In total 38 speakers, presenters and discussants attended from the UK, the USA, Australia, China, Singapore, and Hong Kong. The symposium is a true testimony that behavioural studies is an important research stream in urban studies, as researchers in top universities across the world are using behavioural tools to address key issues in urban studies.

CAMBRIDGE REAL ESTATE FINANCE AND INVESTMENT SYMPOSIUM

The third Real Estate Finance and Investment Symposium was held at St John's College, Cambridge in September 2019

The event was hosted by the Centre (led by Thies Lindenthal) but is organised in partnership with colleagues at the University of Florida and the National University of Singapore.

The Symposium featured longer, more in-depth paper presentations and ample time was given for discussion among presenters, assigned discussants, and other participants.

It was a relaxed yet focussed event aiming to inspire **a critical mass of leading academics in the field to create new thoughts and insights on general finance, real estate finance and investments topics**. With over 30 internationally renowned scholars from universities in the US, Germany, Spain, Switzerland, Macau and the UK, it really strengthens Cambridge's visibility in the real estate finance and investment research community.

Masters in Real Estate (MSt)

Now with it's fourth cohort, the Centre has led the development and delivery of this part-time Masters course since 2016. The inaugural cohort finished the course with a field trip to Copenhagen and celebrated their successful graduation in December 2018.

The second cohort (2017-19) have completed their residential sessions (including a trip to Madrid) and successfully submitted their dissertations and graduated at the end of 2019.

The third cohort (2018-20) have just started their second year and after their fourth residential block in December 2019, will be looking to complete their dissertations by July 2020.

The latest cohort (2019-21) completed their first Cambridge residential in September and are working on assignments before the next session in March 2020.

Students have a range of professional experience such as Analyst, CEO, CIO, Asset Manager, Development Manager, Building Surveyor, Student Housing Partner and Strategic Director. They are also internationally diverse, from countries as far as Hong Kong, Singapore, Australia, New Zealand, Japan and Taiwan, Canada and the US to Russia, Luxembourg, Switzerland and the UK.

We still want to make further progress in achieving balance between male and female applicants but are please that a third of the 2019 cohort are women in real estate, up on the previous year.

The MSt is delighted to be able to draw on leading industry experts to deliver lectures and host field trip visits alongside the core academic content.

The ultimate goal is to educate the up and coming leaders in the industry, to equip them with the very latest knowledge and skills to lead and innovate within their organisations, improving the performance, efficiency and sustainability of the Real Estate sector.

Looking Forward

The Centre intends to continue build on its strengths and successes as outlined in this report in order to enhance its position as a leading centre of rigorous and relevant research into real estate markets. We will seek further funding and partnerships to pursue work in the key research themes and priorities detailed below. We will bring together researchers and practitioners to explore emerging issues in the market that merit analysis and to share best practice in research and we will work to ensure that real estate research is central to our educational and executive programmes at Cambridge.

As a hub for international research, we will bring researchers (both academic and professional) to Cambridge as visitors and as associate members of the Centre and through meetings, seminars and symposia.

The Centre will continue to benefit from its new additional academic members of staff with research interests in Spatial Economics, Urban Economics and Behavioural Economics in relation to real estate.

We will actively seek doctoral students interested in undertaking research in our research priority areas: these are the next generation of professional and academic researchers and a key source of new ideas in the market. The critical constraint they face is funding and we will look to find ways of providing financial support – we would welcome partners in this effort.

The Centre's research agenda has a number of strands and some of the research activity planned for each theme is listed here:

Research Themes and Priorities for the Future

Risk Characteristics of Real Estate: It is increasingly recognised that the risk and return of real estate depends not only on the income and capital appreciation of the underlying assets, but also on the vehicle in which the properties are held: its institutional and capital structure. Meanwhile, investors increasingly are looking beyond traditional asset class boundaries to classify assets into groupings that reflect their sensitivity to particular types of risk factors. The Centre is continuing to extend its work on capital structure and real estate, and drivers of risk for real estate vehicles.

Real Assets and Non-Traditional Real Estate Investments: Linked to the previous theme and developing prior research work, we will continue to investigate the performance and risk characteristics of non-traditional real estate investment areas and to explore the relationship between real estate and other real assets.

Sustainability, Resilience and Performance: The Centre researches sustainability and real estate markets at different scales — energy performance and environmental sustainability at building level and its link to value and return, complemented by a broader perspective on sustainability and urban resilience, promoted by, for example, the Urban Land Institute and by the World Economic Forum's Agenda Council on the future of cities and real estate.

Ownership, Globalisation and Yield Structures: Prompted by the growing dominance of non-domestic purchasers in London (and other world gateway cities), the focus of this research includes attempting to understand the implications of global capital flows on market performance and values. For example, what is the basis of investment yields when, global investors with lower costs of capital are not tied into the local market, become significant in a particular city sub-market?

Technology, Risks and Opportunities: An emerging theme is the impact of technology on all real estate markets and the performance of real estate portfolios. This encompasses the risk to traditional real estate formats and cashflows from technology, for example, new working practices and new patterns of consumption, but also includes opportunities, such as the potential benefits of smart building technologies in driving greater efficiency of usage and more focused management to maximise returns, and the use of machine learning in assessing real estate.

Real Estate Risks in a Multi-Asset Class Portfolio Context: This work explores a number of approaches to identifying both known risk factors and uncertainties in investment and how to integrate real estate into multi-asset class frameworks.

Long Run Values, Capital Growth and Depreciation: This research theme explores very long run performance across property segments and examines the factors that have led to that performance. It aims to support decision making by investors, regulators and lenders.

Behavioural Economics, Perceptions and Preferences: This research seeks to explore issues around preferences, sentiment and the impact of nudges.

Placemaking and Regeneration: This theme looks at mixed-use developments both in terms of performance and impact relative to smaller single-use developments and their interaction with local economies, infrastructure and policy.

Appendix 1

PUBLISHED RESEARCH 2018/19

Yan, J and **Bao, H** (2018): A Prospect Theory-Based Analysis of Housing Satisfaction with Relocations: Field Evidence from China. *Cities: The International Journal of Policy and Planning,* 83: 193–202

Deng, Y, **Bao, H** and Gong, P (2018): Increased Tail Dependence in Global Public Real Estate Markets. *International Real Estate Review*. 21(2): 145 – 168

Xu, Y, Huang, X, **Bao, H** , Ju, X, Zhong, T, Chen, Z, Zhou, Y (2018): Rural Land Rights Reform and Agro-environmental Sustainability: Empirical Evidence from China. *Land Use Policy*, 74: 73 - 87

Wang, M and **Bao, H** (2018): Mega-event Effects on the Housing Market: Evidence from the Beijing 2008 Olympic Games. *Cities: The International Journal of Policy and Planning,* 72: 207 - 216

Bao, H (2020) Behavioural Science and Housing Decision Making: A Case Study Approach, London, *Routledge*, ISBN: 978-0-367-13576-8 (paperback) and 978-0-367-13575-1 (hardback)

Fuerst. F and Warren-Myers, G (2018): Does Voluntary Disclosure Create a Green Lemon Problem? Energy -Efficiency Ratings and House Prices. *Energy Economics*. doi:10.1016/j.eneco.2018.04.041

Fuerst, F and Singh, R (2018): How Present Bias Forestalls Energy Efficiency Upgrades: a Study of Household Appliance Purchases in India. *Journal of Cleaner Production*. https://doi.org/10.1016/j.jclepro.2018.03.100

Elhorst, P, Abreu, M, Amaral, P, **Fuerst, F** and Yu, J (2018): Raising the bar (8). *Spatial Economic Analysis*, *13*(1), 1-4. DOI: 10.1080/17421772.2018.1492823

Warren-Myers, G, Aschwanden, G, **Fuerst, F** and Krause, A (2018): Estimating the Real Implications of Sea Level Rise for Public and Private Property Ownership, Occupation and Management. *Risks*, 6(2), 37; doi:10.3390/risks6020037

Busic, A and **Fuerst, F** (2018): Does your Personality Shape your Reaction to Your Neighbours' Behaviour? A Spatial Study of the Diffusion of Solar Panels. *Energy and Buildings*. https://doi.org/doi:10.1016/j.enbuild.2017.11.009

Fuerst, F and Unbehaun, F (2018): Cap Rates and Risk: A Spatial Analysis of Commercial Real Estate, *Studies in Economics and Finance*, DOI:10.1108/SEF-11-2016-0267.

Costa, O, **Fuerst, F,** Mendes-Da-Silva, W, Robinson, S (2018): Green Label Signals in an Emerging Real Estate Market. A Case Study of Sao Paulo, Brazil. doi.org/10.1016/j.jclepro.2018.02.281: *Journal of Cleaner Production*.

Chuang, M and **Fuerst, F** (2018): Determinants of Cap Rates in US Office Markets, *Journal of Real Estate Literature*, 26/1, 267-282

Elhorst, P, Abreu, M, Amaral, P, **Fuerst, F**, Yu, J (2018): Raising the bar (7). *Spatial Economic Analysis*, *13*(1), 1-4. DOI: 10.1080/17421772.2018.1417680

Costa, O, **Fuerst, F**, Mendes-Da-Silva, W.; (2018): Are Corporate Office Buildings Priced Differently?, *Journal of Property Investment & Finance*; DOI(10.1108/JPIF-01-2018-0004

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Appendix 2

RESEARCH WORKING PAPERS

The centre has been active in publishing a significant number of working papers which can be downloaded from our website: **https://www.crerc.landecon.cam.ac.uk/working-papers**

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