

Institution: Royal Holloway, University of London
Unit of Assessment: 16 Economics and Econometrics
<p>1. Unit context and structure, research and impact strategy</p> <p>1a. Overview of the unit - context</p> <p>The Department of Economics at Royal Holloway celebrated its first 20 years in 2016 and has in that time established a research environment with a strong international outlook. A founding principle was to combine strong Economic Theory with Applied Economics and Policy and this continues to guide our work. Our network of collaborations stretches the globe, with staff working with academics in some of the world's leading universities, including Harvard and Columbia in the US, the Paris School of Economics and Zurich in Europe, and the Universities of Tel Aviv, Tokyo and Melbourne. The Department's early focus on the application of our research to important economic and social challenges has built a solid foundation for what is now recognised as "impact", and, through our continued commitment to this agenda, our research has helped shape policies and regulations, and has influenced the work of NGOs, both nationally and abroad.</p> <p>Having made seven outstanding new appointments in the current REF period, we have grown to 27 full-time permanent staff (up from 24.4 in REF2014), and our research has continued to flourish. Our presence in leading academic journals has grown across all our key areas of strength, with 15% of our submitted outputs published in the "top five" journals. The Department's research income has seen a sustained increase, exactly doubling over the current assessment period relative to REF2014 (see Section 3 for details). The funding and organization of our PhD programme has been enhanced and more than twice the number of PhD students have graduated in this REF period compared to the previous (36, up from 17 in REF2014). Many have been successfully recruited to leading academic departments and other research organisations in the UK and internationally.</p> <p>Between 2012-2019, the Department was part of the Faculty of Management & Economics, where it remained largely self-contained and retained its strong identity. In 2019, the College was restructured from three Faculties into six Schools, including a new School of Law & Social Sciences (LSS) where our established research culture supports the development of the new Department of Law and the expanded Department of Politics and International Relations. We also continue to grow our interdisciplinary work with the College's outstanding research groups in the Departments of Psychology, Computer Science, and Mathematics.</p> <p>Our staff, brought in from top universities in the UK and throughout the world, have further developed their international collaborations. In 2014 we made a conscious decision that – while retaining these networks – we also wanted to see more collaborative work occurring at home. As a first step, in 2015, we set up specialized seminars in three core areas of strength: <i>economic theory</i>, <i>macroeconomics & labour</i>, and <i>applied economics</i>. These seminars, which all members of staff are encouraged to attend, have brought in a set of high-profile seminar speakers, including <i>inter alia</i> Matthias Doepke (Northwestern), Larry Samuelson (Yale), Luigi Pistaferri (Stanford), Ariel Rubenstein (Tel Aviv), David Levine (EUI), Stephanie Schmitt-Grohe (Columbia), Gianluca Violante (Princeton), Stefania Albanesi (Pittsburgh), Gordon Dahl (UCSD) and Costas Arkolakis (Yale). We further committed to developing our research on <i>digital economies</i>, deepening our collaborations with the Department of Computer Science in particular. As a result, we have had the confidence to configure these specialisms into four Centres. Established between 2017 and 2020, the Centres have already enriched our portfolio of research</p>

activities, including hosting events, fostering collaboration, mentoring junior staff, and generating research income.

An impediment to collaborative work on campus had been the splitting of the Department across three adjacent buildings thereby limiting interactions. In 2018, the College invested in renovating a further wing of the 1930s Horton Building to house all our academic staff and PhD students.

1b. Research objectives

The Department's long-standing research aims, since its inception, have been to *produce high quality theoretical and empirical economic research*, with an (intensified) ambition to *inform policy and provide insights that can help address the world's urgent economic and social problems*, and to *train new generations of high-quality researchers*. The long-run strategy for attaining these aims has three core components: **Staffing** – Recruiting, promoting and retaining outstanding researchers who contribute research of international excellent quality and with strong policy-relevance; **Environment** – Supporting innovative thinking, intellectual challenge and discourse, and building national and international collaborations and strategic partnerships; **PhD Training** – Working closely with young researchers to nurture them into future leaders for academic and public service throughout the world.

Research objectives 2014-2020 - review. We formulated three key strategic plans in REF2014: to (i) recruit promising researchers, including a strengthening our research in macroeconomics and finance; (ii) develop at least one research centre in a core area of strength; (iii) stabilize the size of our postgraduate programme, shift to more external PhD funding, and to enhance training. All three plans have been vigorously pursued and our targets met:

(i) We have followed a vigorous recruitment strategy, making seven new appointments over the REF period. The Department appointed Ritzberger as professor, Bhattacharya, Richter, Hirano and Roys at senior lecturer/reader level, and Piermont and Lee at lecturer level. This has strengthened not only our capacity in macroeconomics and finance, but also in theory and econometrics.

(ii) We have established four research centres: (a) the *Centre for Robust Inference in a Digital Economy* (RIDE), (b) the *Centre for the Economics of the Household* (EcHo), (c) the *Centre for Macroeconomic and Labour Economics* (MaLEc), and (d) the *Centre for Mathematical and Theoretical Economics* (MATE). The Centres were strategically designed along the lines of the Department's existing research groupings, but given them more formal responsibilities and greater visibility. All members of staff and PhD students are members of one or more Centre. All Centres have members from other departments and/or from the international research community, fostering interdisciplinary and cross-institutional collaborations.

(iii) We have increased our external PhD funding from a range of sources, including the ESRC (seven students), Leverhulme (two students), Commonwealth scholarship (one student), and via external collaborations (two students). This has enabled us to achieve a stable high-quality intake of, on average, 6 PhD students/year over the REF period. The Department is, since 2017, part of the SeNSS ESRC Doctoral Training Partnership and since 2018 we offer core PhD courses at high international standard in microeconomics, macroeconomics and econometrics through a collaboration with Birkbeck and City University, exploiting economies of scale. This collaboration builds upon the University of London framework and became possible when City became a college of the University.

The success of our strategy is reflected in the depth and breadth of our research outputs: over the current assessment period, staff from each of our centres have published in leading journals, including three papers in the *American Economic Review* (Bagger, Galenianos, Richter), four in

the *Review of Economic Studies* (Bagger, Bordalo, Hirano, Ritzberger), one in *Econometrica* (Feri), one in the *Journal of Political Economy* (Chevalier), eight papers in the *Economic Journal* (Anderberg/Wadsworth, Bagger, Galenianos, Mandler, Rud, Hamermesh, Rud/Trapeznikova), five in the *International Economic Review* (Feri, Gemici, Mandler, Sauer, Trapeznikova), four in the *Journal of Econometrics* (Lee), two in the *Journal of the European Economic Association* (Lührmann, Mandler), and eight in the *Journal of Economic Theory* (Bade, Galenianos, Mandler, Naef, Richter). Staff have published interdisciplinary research in leading journals, including *Current Biology* (Naef), *Research and Politics* (Spagat) and the *Journal of Cybersecurity* (Seltzer).

Research objectives 2021-2026. We aim to increase our capacity in core areas of strength, by the following measures:

(i) *Continue to recruit creative and talented researchers.* Our staffing strategy, agreed with College, will focus upon recruiting early career researchers who will be mentored by senior staff. As our researchers now cover all major areas of economics, and our emphasis will be upon identifying outstanding candidates in any area.

(ii) *Seek new collaborative lines of enquiry* with a focus on growing academic collaborations on digital economies and challenges in the post-covid world. In order to open up new and exciting research initiatives we will build collaborations with non-academic partners: using the Centres as hubs, we will work with partners both internationally, for instance with the World Bank, and locally with, amongst others, the Surrey Office of Data Analytics.

(iii) *Further develop the Centres.* The recently created centres will serve to develop our portfolio of collaborative research with both internal and external collaborations. Cross-centre collaborations, specifically across macro-, development- and family-economics, will innovate by exploiting overlapping interests and expertise. The centres will further lead on organizing departmental seminars and delivering high-profile events, and on raising external funds both in terms of project-based grants and large-scale funding opportunities.

We will seek to consistently implement our impact strategy and to further strengthen the system of career incentives to stress the importance of research quality and sustainable impact.

At college level we are well-placed to be leading contributors to the College “2020-2030 Future Directions” research strategy through its investments in four research “Catalysts” (see REF5a). The “Living Sustainably” catalyst – with key themes that include equality, healthy lives, work and ecological sustainability – is directly aligned with the research strengths of our EcHo centre, whilst the expertise of our RIDE centre aligns with the “Transformative Digital Technologies, Security and Society” catalyst.

1c. Research structure

The recently created Centres operate independently under the overall direction provided by the Research Committee. The Research Committee brings together the Director of Research, the Head of Department, the Director of Impact, the PhD Director, and the Centre Directors. The committee is responsible for setting strategic priorities, including monitoring the activities of the Centres. In parallel, the School's Director of Research and Knowledge Exchange (Lührmann) coordinates cross-departmental collaborations for larger joint challenge-led research bids and has put in place school-level incentives to support researchers in the School, including seed-corn funding and incentives to PIs (via overhead grant returns) to obtain external funding.

The four new Centres, while built around our existing strengths, bring new dynamism to our ambitions for delivering high-quality, high-impact, collaborative and fundable research. The Centres created are:

Centre for Robust Inference in Digital Economy (RIDE): (Sancetta, Director, Feri, Lee, Naef, Spagat) this Centre originated with big data research on financial trading, in collaboration with financial computing experts in the Department of Computer Science. The Centre has organized workshops on *Advances in Factor Models for Finance* (2018, with co-organizers from the Bank of England, UBS, and Macquarie) and *Machine Learning in Finance* (Nov 2019, with co-organizers from Goldman-Sachs, UBS, and BlackRock). In this group Spagat is an internationally leading researcher on conflict, and his work with various NGOs (see below) is an example of big data use for policy importance. Sancetta continues his influential work on statistical learning and financial econometrics. Feri works is pursuing a high-profile research agenda on social networks, including new network dynamics through social media.

Centre for Mathematical and Theoretical Economics (MATE): (Ritzberger, Director, Bade, Goldmanis, Mandler, Neary, Piermont, Richter) builds upon the Department's traditional strength in economic theory. There is a focus on decision theory (Mandler, Piermont, Richter), but also well-recognized competence in game theory, both in its cooperative variant (Bade) and its non-cooperative version (Ritzberger), as well as a strength in applications, like industrial organization (Goldmanis), financial economics (Ritzberger), or models of evolution (Neary). MATE is intensifying its collaboration with the University of Zurich, and expects a particular fruitful collaboration with the Zurich Centre for Decision and Neuroeconomic Theory (NOMIS). A first joint conference was planned for 2020, but will now take place in 2021.

Centre for Macroeconomic and Labour Economics (MaLEc): (Galenianos, Director, Bagger, Hirano, Mountford, Roys, Trapeznikova). The Department has a concentration of research on general equilibrium search models. Bagger, Galenianos, and Trapeznikova are pursuing a joint research agenda focusing on heterogeneity among firms, tackling key challenges in relation to measuring productivity dispersion, understanding the role of shocks as drivers of employment adjustments. An international collaboration is being built with the University of Aarhus and with Statistics Denmark. A regular seminar is organized with the University of Essex and Bristol University on search models in macroeconomics, and a workshop on *Search and Matching* (joint with Essex) was held in 2019.

Centre for the Economics of the Household (EcHo): (Anderberg, Director, Chevalier, Frank, Gemici, Lührmann, Rud, Sauer, Seltzer, Wadsworth) reflects the Department's traditional strengths in the areas of labour economics and family economics. EcHo workshops have been held on *Domestic Violence* (2017, funded by the Royal Economic Society), *Expectations in Education* (2018, funded by the Nuffield Foundation), *Social Care for Children* (2020, funded by UKRI). Chevalier and Frank continue their work on education, while Sauer is a leading figure in developing the economics volunteering. Wadsworth's research has focused the economic impacts of migration on the host country. Wadsworth and Frank have expertise in the area of sexual orientation economics, with Frank being the project lead for "families and communities" of a new COST network based at York.

1d. Approaches for enabling impact

Going forward, and in keeping with national priorities, the Department will to emphasize research based upon rigorous economic analysis with major policy implications. A Department impact strategy sets out how we *identify and nurture* impactful research projects, *engage in*

interdisciplinary activities with high impact potential, *foster collaborations* with research users and the co-creation of research, and *disseminate* our research to wide audiences.

To ensure that the impact-potential of our research is realized the Department established, in 2015, a new Director of Impact role. The Director (Rud) works with colleagues from across the department to identify – at an early stage – projects with strong impact potential, to target potential stakeholders, and developed tailored strategies for raising their visibility. The Director of Impact is a permanent member of the Department’s research committee and the role is recognized in the workload model.

We are engaged in continuous investment in people and infrastructure to enhance our impact capacity and efficiency. Staff are routinely encouraged to take impact-related training and a dedicated “Impact in Economics” webpage disseminates non-technical summaries of published and ongoing research, complemented by social media including Facebook, Twitter, and specialized blogs, and we monitor impact using, *inter alia*, Altmetrics. Our impact ambition is further supported at College level by a dedicated Knowledge Exchange and Enterprise team within the Research and Innovation department, and through engagement with the new College “catalyst” research structure for developing ambitious and impactful large-scale inter-disciplinary funding bids.

Using the Centres, we will increase our research user engagement and several staff are working on grant applications with input from NGOs and charitable organisations. For instance, Seltzer and Lührmann are developing a research agenda on the origins of female employment in professional occupations with the National Archives. Lührmann and Rud are working with WaterAid in Nigeria while Spagat’s extensive links with NGOs (Iraq Body Count, Action on Armed Violence, and Every Casualty) are providing a useful model for impact. Chevalier is collaborating with the OECD on the effect of automation on the skill distribution, and Anderberg is engaging with Action for Children on children’s social care. We organized a joint event with the Cabinet Office (Anderberg, Bagger, Lührmann and Rud) exploring overlaps of interest around labour markets and family. Wadsworth’s work with the ESCoE network has – through direct engagement with the ONS – identified discrepancies in the measurement of immigration.

Our multidimensional approach to impact is reflected in the fact that the three submitted ICSs have all achieved impact through different routes: one through *direct engagement and research co-creation* with an NGO (Spagat), one via an *advisory role* (Wadsworth), and one via *direct media attention* (Sancetta).

1e. Open research and reproducibility

In line with Royal Holloway’s institutional commitment to maximise the quantity of openly available research, the Department has developed strategies for open research that are in line with the best practices.

Pre-registration of research. Staff are encouraged, where applicable, to register pre-analysis plans and research protocols on relevant platforms. Examples from lab- and field-experimental projects include Piermont’s work on “unawareness and risk” (with de Aurejo, Pittsburgh) and Anderberg’s (with Morsink, Utrecht) work on domestic violence in Ethiopia – both registered on the AEA RCT Registry – and Naef’s project on basolateral amygdala (with Rosenberg, Vienna), registered on the Center for Open Science OSF platform

Open research data: Research data collected are made available when feasible. Examples include Spagat’s conflict data page where he has made available substantial amounts of data – some of which was obtained via FOI from the US State Department; historical data on the Union Bank of Australia collected by Seltzer and made available on Open ICPSR; Hamermesh and

Seltzer's compiled data on co-authorship also in Open ICPSR; data collected in economic experiments made available via journal websites (e.g. Lührmann et al. in *AEJ: Econ Policy* 2018, Richter, *JEBO*, 2015).

Public engagement with research: Economic staff lead on using blogs and MOOCs to disseminate research to, and interact with, non-academic audiences. Since 2015, Spagat's blog "War, Numbers and Human Losses" has reached a global audience with more than 50,000 views since 2016 while his "Accounting for Death in War" MOOC has had approx. 1,500 registered participants. Wadsworth's "State of Working Britain" blog has influenced the public debate on the UK labour market since 2017, and he has given invited talks to several non-academic audiences including e.g. keynote speeches at the HM Treasury Economists Conference in 2018 and the Westminster Employment Forum in 2017. Hamermesh (Emeritus Professor since 2017) is Editor-in-Chief for *IZA World of Labor* journal which summarizes state-of-the-art research in an accessible style.

1f. Research ethics and integrity

Economics follows Royal Holloway's code of research ethics. By College policy, all research projects undertaken by research staff and/or PhD students require ethical approval, either via full application to the College ethics committee or via self-assessment. Staff are supported by a Department Ethics Officer and supervisors monitor that ethics processes are followed in PhD students-led projects. Research ethics is a mandatory component within the College-provided "Advance" training programme for new research staff. The Director of Research and the PhD Director works with colleagues and research students to ensure that the UUK Concordat to Support Research Integrity is embedded in our research culture.

2. People

2a. Staffing strategy and staff development

Staffing and recruitment. The Department has followed its strategy of recruiting established professors, mid-career academics on an upwards trajectory, and highly promising early-career researchers, devoting extensive efforts to identifying outstanding candidates at every level. At senior level we appointed Klaus Ritzberger as full time professor in 2016. Ritzberger, who had been Director at the Institute for Advanced Studies in Vienna, provides senior leadership and mentoring in much the same way as was done by Dan Hamermesh until he became emeritus professor in 2017.

Recruitment below professorial level is overseen by a hiring committee – appointed by the HoD – who also organize initial interview at the annual meetings of the Allied Social Science Association (ASSA). The rigor of the process allowed us to further boost our already-strong theory group by the arrival of Richter (Pennsylvania), Bhattacharya (Pittsburgh), and Piermont (PhD, Pittsburgh). The appointments of Hirano (Tokyo) and Roys (Wisconsin-Madison) added strength in macro-economics, whilst the hiring of Lee (PhD, LSE) expanded our capacity in econometric theory. These latter colleagues expanded our academic research network, bringing collaborations with Ariel Rubinstein at Tel Aviv University (Richter), Joseph Stiglitz at Columbia University (Hirano), Chris Taber at Wisconsin-Madison (Roys), and Peter Robinson at the LSE (Lee).

Over the same period there were four departures: Pavan returned to the University of Rochester and Bhattacharya returned to his alma mater, the Indian Institute of Management, and we continue collaborations with both. Bordalo and Testa moved within the UK (to the Saïd Business School, Oxford, and the University of Nottingham, respectively). While we are disappointed at

these departures, our turnover rate remains reassuringly low. The College introduced market supplements in 2012 to ensure competitive salaries, but it is the extraordinarily collegial atmosphere and vibrant research environment that increases individual attachment. We also benefit from one of the most attractive university campuses in the UK, with the extraordinary Founder's Building as the highlight.

The arrival of new staff has continued to revitalize the Department and to bring in creativity and experience from the variation of backgrounds. The recruitment of staff below professorial level has allowed us to maintain a balanced seniority profile as a number of staff have been promoted. At the REF2014 census date, the Department had 14 professors, 7 SL/Readers, and 4 lecturers. At the current census date, we are 15 professors, 10 SL/Readers, 2 lecturers and 1 fixed-term postdoc researcher. The College Plan provides that we should expect a flow of new lecturers, noting that a number of lecturers have been promoted in the last few years.

Our approach to recruitment is underpinned by a commitment to equality, diversity and inclusivity, consistently ensuring gender-balanced and diverse long-lists of candidates. The proportion of female colleagues has increased since 2014 and now stands at 21.4 percent, slightly below the sector average (28.1 percent according to the 2016 Royal Economic Society Women's Committee Survey); women make up 13.3 percent of our professors, close to the sector average (16.6 percent). Three female colleagues hold leading research roles: within the Department Gemici serves as PhD Director, and at School-level Lührmann and Trapeznikova serve as Director of Research and Knowledge Exchange and PhD Director respectively, reflecting our commitment to offering a diverse range of role models to both our students and to the profession more generally. The Department is also highly internationally diverse. Our academic staff bring together 17 different nationalities.

Staff development. Our approach for supporting staff to reach their full research potential is to provide a fertile environment. Staff are free to set their own research agendas, and are encouraged to branch out across disciplinary boundaries and take appropriate risks to deliver projects of high originality and significance. Because our research has from the start been focused upon important policy issues and has a strong emphasis on collaborative work, our staff are well-placed to respond to calls for "challenge-led" research.

Mentoring and probation: The Department believes that doing top quality academic work is best supported by the model of apprenticeship and mentoring. Early career researchers are mentored by experienced staff who provide advice on career planning, research strategy, journal submissions, training and funding opportunities. All early career researchers are integrated into the activities of a Centre. This provides them with opportunities for collaborative work, delivers an environment where they are encouraged to apply for funding both individually and collectively, and enhances their visibility and opportunities for impact and engagement. Probation typically lasts three years and involve a lower administrative and teaching load. The probationer agrees a timetable of goals with their mentor, including for outputs, journal submissions, and grant applications. This approach is reflected in the achievements of our early career staff: out of the currently submitted outputs, three papers in the *Journal of Econometrics* (2016, 2019a, b) were completed in full or in part by Lee during probation, as was Bagger's paper in the *American Economic Review* (2014). Lee was further awarded an ESRC Research Grant during her probation.

Training and appraisals: The College offers and encourages training opportunities including (i) the college-provided "Advance" programme (and an earlier "On-Track" programme) which develops research skills for generating impact, developing grant proposals, and engaging with social media (four staff have taken some AP/On-Track training) (ii) teacher training for newly

appointed lecturers through the CAPITAL programme that qualifies participants for full fellowship of the Higher Education Academy (Lee, Piermont, Neary), (iii) research impact training in relation to evidencing impact, creating pathways, and informing policy (six staff have received impact-related training during the assessment period), (iv) courses to provide research leadership skills including the College Strategic Leadership Programme (Lührmann, Chevalier and Rud) and the Aurora leadership programme for women (Trapeznikova). The College will continue to develop its support and policies further as part of its commitment to the Concordat to Support the Career Development of Researchers. All our staff undergo an annual appraisal process which helps develop research and impact related plans through the support of an experienced member of staff.

Conference support: Key to staff's ability to deliver top-level research is the dissemination of and feedback at international conferences. To this end, each academic member of staff is provided with an equal annual research allowance, set on a year-by-year basis. The exposure of our staff to a variety of audiences further promotes collaborations and network building.

Sabbatical leave and exchanges with industry. Freedom from other duties is important for all academic staff to develop their research agendas, undertake more intensive and imaginative research, and for building impact. As a policy, our staff enjoy one sabbatical term for every six of service. Sabbaticals are tied to objectives in relation to publications, funding applications or impact activities. The benefits of the sabbatical scheme are reflected in several major outputs completed during such leave, e.g. Bagger's visit at Aarhus leading to his paper in the *Review of Economic Studies* (2019) and Seltzer's visit to the University of Melbourne, leading to a paper in the *Journal of Economic History* (2017).

Provision is also made for secondments. Sancetta spent 20 months (2017 to 2019) at UBS as Head of Algorithmic Execution Intelligence. This placement was directly related to his recent research (published in *Econometric Theory* 2015, 2018; and *Journal of Financial and Quantitative Analysis*, 2019; and *Journal of Financial Econometrics*, forthcoming) and has also fed into his future research plans. Sauer has spent two years at the Jerusalem Institute for Market Studies, developing his work in religion and economics and to establishing a new journal on the subject.

Recognition and reward – promotions. The College has adopted a policy where promotions are considered anonymously at School level, taking department recommendations into account. The disciplinary norms for Economics emphasize publications in the very top journals as well as impact. For supporting the promotion from Lecturer to SL/Reader, the Department sets a quality standard – the production of a single “top five” quality output – that is comparable to the requirement for tenure at leading US universities. For promotion to full Professor (and for professorial banding), the College has established – in consultation with each relevant department – a set of formal disciplinary-specific norms, defining the expected requirements for sustained performance in research, teaching, and engagement, and for the demonstration of academic leadership. We follow the Economics convention that research grants are inputs, not outputs. The College recognizes and rewards high-quality innovative research-led teaching and the Department views high quality teaching as supportive of research.

While we recognize that some turnover is efficient, we do not want our staff to feel that they need to go elsewhere in order to achieve promotion. The role of promotions for securing retentions of strong performing staff is reflected in the number of individuals who have been promoted during the REF window. These include Bagger (from Lecturer to Senior Lecturer in 2014 and to Reader in 2018), Lee (from Lecturer to Reader in 2018), Rud (from Senior Lecturer to Reader in 2017), Chevalier (from Reader to Professor in 2017), and Lührmann (from Lecturer to Senior Lecturer in

2016 and directly to Professor in 2019). In addition, Bordalo (now at Oxford) was promoted (from Senior Lecturer to Reader in 2015). These accomplishments reflect the commitment by the College to support and promote new entrants and the ability of the Department to nurture their development.

The College operates a professorial banding system to provide an objective basis for remuneration of professors, with a system in operation that is analogous to the promotions system across ranks. Our subject-criteria again emphasize publication in the very top journals, with strong policy and impact contributions.

2b. Research students

Our postgraduate research degree programme occupies a central place in the Department, and the size of our PhD community, along with their location within the Horton building, enables us to maintain an open door approach for frequent interactions between research students and staff. Our students are fully engaged with our every-day research activities – all being members of a Centre – and contribute by organizing events, including an international PhD Workshop (May, 2019) and, since the pandemic, a joint webinar series with Paris Dauphine University.

The programme's accomplishments are reflected in the placement of our students in research positions both in and outside of academia. Several of our graduates, since 2013, have taken up positions in leading universities including the LSE (Roth), University of Stirling (Wilson, now Glasgow), Bristol University (Johnson), and Kyoto (Kiguchi). At the same time, a number of graduates moved to positions in leading research organizations/consultancies including the IFS (Oteiza), NIESR (Aitken and Lissauskaite), the EBRD (Aksoy) and the Behavioural Insights Team (Farghly) and to government departments including the MoD (Wolley) and BEIS (Gunther).

The programme's aims of delivering skilled researchers is achieved not only through formal training and supervision but also through learning-by-doing with a strong encouragement for collaborative work. The benefits of this strategy are evidenced by the publication record of our students, with articles appearing in *inter alia* the *Journal of the European Economic Association* (Lluberas, joint with R. Griffith and M. Lührmann, 2016), the *Economic Journal* (Wilson, joint with D. Anderberg, H. Rainer and J. Wadsworth, 2016, awarded "Best Paper" in the *EJ*), the *European Economic Review* (Wilson, with R. Sauer, 2016), the *AEJ: Applied Economics* (Roth, joint with A. Ebenstein and V. Lavy, 2016) and the *AEJ: Economic Policy* (Oteiza, with F. Aragon and J.P. Rud, 2020).

Programme size and recruitment. The Department has over the past decade established a stable balanced-sized PhD programme, achieving a critical mass for core training and for delivering UG teaching, whilst at the same time ensuring quality of our intake and feasibility of our highly interactive approach to PhD supervision. Over the current REF period, the average annual intake of new students has been 6 per year. 36 PhD students have graduated, distributed across years as follows,

2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
2	7	5	4	4	9	4+1

where the final (+1) graduate was a US-based distance-learning student (not included in the HESA/REF4 data). In order to reach a wide range of prospective students, open advertisements for opportunities for funding are placed on the Department webpage, and via the SeNSS Doctoral Training Partnership.

Funding: Central to the stability and advancement of our PhD programme has been the securing of external funding to supplement College and Department resources. A total of seven PhD students have successfully gained ESRC funding, two of which have been CASE-studentships with private sector partners reflecting our collaborative agenda. Two students have benefitted from Leverhulme funding via the Royal Holloway Magna Carta Doctoral Centre. We use opportunities for teaching to provide additional support to PhD students, and to provide them with experience.

Training: Upon entry to our PhD programme, students take core courses in Microeconomics, Macroeconomics and Econometrics. These courses are joint with Birkbeck and City University. Students are also encouraged to pursue further training opportunities, e.g. one student has been invited to join the Swiss Leading House on Economics of Education, a fully funded year-long specialized PhD training. Nearly all our research students teach on our undergraduate programme and, for this, they receive training via a HEA accredited programme (inSTIL).

Supervision and support: Students are carefully matched to first- and second supervisors based on research interests. Supervisory teams are put together, when feasible, to allow junior staff to benefit from the supervisor experience of more senior staff. Each research student further benefits from financial support for conference participation – including at least one international conference during their studies as well as the US or European Job Market meetings – providing them with valuable exposure and experience. A total of 16 presentations by our PhD students at the annual conferences of the Royal Economic Society during the REF assessment period reflect this aim. They further benefit from dedicated office space in the Horton building and full access to computing facilities. For completing students the Department organizes mock job market presentations and interviews.

Monitoring: Each student benefits from an annual review with the PhD Director and the first- and second supervisor. In conjunction with the annual review process, a PhD conference is organized featuring high-profile invited speakers from various sub-disciplines and with a gender-mix (recent speakers include *inter alia* Jon Temple, Sarolta Laczo, Aniol Llorente-Saguer, Dov Samet, and Monica Costa-Dias). First-year students present posters, second-year students make “upgrade” presentations and fourth year students present their job market papers to the whole Department.

2c. Supporting equality and diversity

As Department we have collectively implemented a number of policies designed to foster inclusion of individuals with a variety of protected characteristics across our work. In recruitment, we ensure that our hiring committee members have completed College-provided unconscious bias training within the past two years. Our hiring committees have a rolling structure that promotes the building and sharing of experience, including the consistent implementation a new College-wide equitable system for scoring applications for shortlisting. Our panels are further composed of staff of different gender, levels, and fields in order help identify and promote candidates with diverse backgrounds who can help shape or decolonise our future research agenda. At present our staff represent 17 different nationalities.

In order to safeguard equality of access to promotion, all non-professorial staff are considered for promotion each year. In total 33.3% (2/6) of staff promoted in the current assessment period were women, thus exceeding the female share of the staff in the Department. In promoting the visibility of our staffs' research, for instance on social media, we pay particular attention to gender representation. Female and ethnic minority members of staff are able to benefit from the College-provided Aurora and Mandala leadership development programmes (see above). Gender balance characterizes our research student population: of the 36 PhD graduating over

the current assessment period, exactly half were women. Of the incoming students 42 percent were women and 37 percent were of non-UK/EU origin.

In order to improve the accessibility of our work to staff with different protected characteristics, the Department operates a family-friendly hours policy under which core activities, including seminars/meetings, take place between 10.00 and 16.30 (unless agreed by all participating parties). Under College policy, and supported by the Department, staff can request flexible working arrangements. Over the REF period, four members of staff have taken maternity or adoption leave. Since 2015 College sabbatical policy entitles staff returning from maternity leave to one term sabbatical leave in order to re-strengthen their research. The Department-provided annual research allowance is set to equal across all research staff. Our emphasis on supporting equality is also reflected in our submitted outputs: reviewed by the Department Research Committee – which has a balance representation of fields and gender – 24.6% of our submitted output portfolio is attributed to women, thus exceeding the female share of staff.

The Department Equality Champion (Frank) leads on Equality & Diversity initiatives. The role is supported by a new Equality Committee for the School, which has taken a dynamic approach in looking at issues from gender and ethnic equality, to the equality implications of working at home during the pandemic, both for staff and students. This Committee in turn is represented on the College's Equality, Diversity and Inclusivity committee, which is led by the Deputy Principal (Academic) and meets termly. Several members of staff are experts in the economics of equalities and diversity. Wadsworth has expertise in discrimination and sexual orientation; Frank has an active research agenda around gender, ethnicity and sexual orientation. Their work contributes to raising awareness and permeate equality values in the daily life of the department and at key moments such as hiring.

The College is proud of its history as an amalgam of two of the earliest women's colleges in the UK and is making a particular commitment to gender and race equality going forward. RHUL holds an Athena SWAN and Race Equality Charter Bronze awards and has developed an Athena SWAN toolkit that includes guidance and shares internal and extra-institutional good practice. The Department is committed to the American Economic Association Code of Professional Conduct, including the AEA Policy on Harassment and Discrimination.

3. Income, infrastructure and facilities

3a. Research income

The Department's research income has seen a sustained increase. In the last three years alone, we have secured two open call ESRC grants (Lee, Rud), one British Academy Mid-Career Fellowship (Lührmann), along with postdoc funding from the British Academy (Hassani-Nezhad) and the ESRC (Morando). Our research income has been widely spread across all our research areas, and has purposefully funded a broad array of productive research activities. Over the full census period, staff in the applied EcHo group have secured funding from the British Academy (Chevalier, Anderberg, Lührmann, Hassani-Nezhad, total £492k), the ESRC (Rud, Morando - both noted above - Wadsworth; total £420k), with further funding obtained from the Nuffield Foundation (Anderberg), HEFCE (Chevalier), the RES (Anderberg) and Nesta (Frank). The econometrics RIDE group benefited from funding from the ESRC (Lee, noted above; £233k), and further funding from the British Academy (Feri). Staff in the macro- and microeconomics groups, MaLEc and MATE, have obtained funding from *inter alia* the British Academy (Galenianos, Mandler) and the Minerva Stiftung (Bade). Overall, this means that our allocated research

income has doubled over the current assessment period relative to REF2014 (from £431k to £863k, see REF4).

Our research income in the current assessment period has further strongly supported career progression and the equality of research opportunities: 70 percent of all our research funding was gained by non-professorial staff and more than half was gained by women.

This breadth of external funding obtained has allowed the Department to engage in a range of research-enriching activities including boosting research intensity, building networks, enabling impact, and investing in future capacity. Funds have supported:

- *Providing staff with focused research time:* Lührmann's BA Mid-Career Fellowship enabled her to collect historical data from the National Archives and the Wellcome Library for her project on child health and nutrition (to be deposited with the UK Data Archive). Chevalier's Mid-Career Fellowship provided him with the opportunity to build up new collaborations through a visit to IZA (*Labour Economics*, forthcoming). Lee and Rud have enjoyed dedicated research time through their respective ESRC grants. Bade's Minerva ARCHES German-Israeli collaborative grant (joint with Ron Lavi, an expert in algorithmic game theory at Technion, Haifa) has enabled her to visit several Israeli universities.
- *Building collaborations and impact:* Lührmann and Rud are developing a collaboration with civil engineers and pediatricians in Nigeria on a GCRF-RAE award, Frank collaborated with a local theatre on a project on dynamic pricing sponsored by Nesta, and, related to one of our impact case studies, Wadsworth and Mountford received funding from the Migration Advisory Committee (Home Office) to investigate the impact of immigration on training and hiring of UK-born workers.
- *Delivering research events:* Externally funded workshops have been used for bringing together international researchers on up-and-coming research areas such as domestic violence, social care for children, and expectations in education.
- *Postdoctoral appointments and collaborative PhDs.* Postdoctoral researchers are an important addition to junior hiring and the Department has enjoyed postdoc funding from the British Academy and the ESRC (see above). ESRC-DTP-funded collaborative PhD awards have further allowed us to build links to non-academic partners whilst at the same time training new researchers.

3b. Strategies and support for generating research income

While we view grants as inputs, not outputs, we have throughout strongly encouraged all staff to apply for external research funds. We view this as an important gauge of the quality and impact potential of our work, and a further external evaluation of our proposed projects. We also encourage staff to put together (or join) teams of researchers, and to consider opportunities for interdisciplinary work. Even an unsuccessful application can lead a researcher to develop their projects on a longer-term and to make new and useful contacts. We do not encourage staff, however, to make applications for its own sake, and all applications are rigorously screened within the Department to ensure quality.

Our Centres play a strategic role as focal points and incubators for developing fundable projects. Via the Centres, staff (a) receive regular targeted information about funding opportunities identified jointly by the Research and Innovation team and the Director of Research and Knowledge Exchange for the School (Lührmann), (b) discuss plans for funding applications with the relevant Centre Director and the Director of Research, and (c) receive feedback on draft applications through peer-reviews. Additionally, via College, staff (d) benefit from workshop-based training focusing on grant-writing skills, planning for impact, and how to target particular

fundamental in the social sciences, (e) receive advice and support for creating impact from the RHUL Knowledge Exchange and Enterprise team, and (f) have the opportunity to apply for “seed corn funding” for both new research and for impact development via the College Research Strategy Fund (RSF). In order to ensure equal access to internal college funds, RSF applications are considered by a broadly composed committee at School-level. Over the current assessment period, the Department has benefitted from more than a half-dozen RSF grants (up to £5,000 each) that have been used for putting together hypotheses and methods ahead of applying for external funding.

Going forward, the Centres will also serve to encourage interdisciplinary work with strong funding and impact potential, not least by forging collaborations with the new College research catalysts on “Living Sustainably” and “Transformative Digital Technologies, Security and Society”, and by linking across the LSS School. In doing so, we will build on our existing collaborations with colleagues in cognate subjects within (i) the School of Engineering, Physical and Mathematical Sciences, including ongoing work both in relation to finance (Sancetta, with Computer Science) and to the pandemic (Hirano and Neary, also with Computer Science), and within (ii) the School of Life Sciences and the Environment, including ongoing (Naef, with Psychology) and planned collaborations (Rud, with Geography).

3c. Research infrastructure and facilities

The Department has, since its inception, benefited from outstanding facilities. We were allocated the 1930s Horton Building (originally the Physics laboratories) to house the Department, our PhD students and our experimental laboratory and interactive seminar and other spaces. A significant 2019 refurbishment of the Horton building created new offices to accommodate the expansion of the Department, along with the removal of Careers Services to another location. After the refurbishment, we are housing *all* of our academic and PhD students in one place, exclusively devoted to Economics. We have a dedicated seminar room, an experimental lab and work-areas for UG and PGT students. Bringing Economics together within a single building provides benefits by enhancing the Department's collective identity and ensuring equality of access to infrastructure and research facilities.

The in-house ExpRESS Lab (Experimental Research in Economics and Social Sciences) is a state-of-the-art laboratory for research on decision making, providing the Department with a strong profile in experimental economics. The lab is equipped with a full 32 PC stations running z-Tree. All facets of the ExpRESS Lab, including subject recruitment, treatment programming, and session management are organized by a dedicated lab manager. ExpRESS has enabled staff to engage in international collaborations in economics (e.g. Charness et al., *Journal of Economic Theory*, 2019) and interdisciplinary collaborations within RHUL (e.g. van der Leer et al., *Psychological Medicine*, 2017).

The Royal Holloway Strategic Plan 2013-2020 prioritised investments in the academic estate to provide improved facilities for research. A core investment was a new state-of-the-art library – the Emily Wilding Davison Building – opened in 2017, which provides dedicated PGR space for individual and group work and space for public engagement events. Also managed by the library, economics benefits strongly from extensive investment in digital resources in the social sciences, including e-journals and reference databases.

The Department uses RHUL's space in central London – at 11 Bedford Square – along with further meeting rooms at Senate House for enhancing the impact of and user engagement with our research, e.g. by hosting events at these locations.

4. Collaboration and contribution to the research base, economy and society**4a. Research collaborations, networks and partnerships**

Over the past 25 years the Department has recruited and brought together established academics and as well as early career researchers from top international departments. We have encouraged our staff to maintain and expand their external networks, whilst also forging collaborations with colleagues within the department and across College.

Examples of ongoing external collaboration that have already resulted in high-profile published outputs include: Richter's continued collaboration with Ariel Rubinstein (Tel Aviv University) exploring non-price institutions and when they may support harmony and efficient outcomes in both standard and nonstandard economic settings (*American Economic Review*, 2015); Feri's ongoing research agenda together with Gary Charness (UCSB), Matthias Sutter (Max Planck, Bonn) and Miguel Melendez (University of Malaga) studying network game experiments (*Econometrica*, 2014); Chevalier's continuing collaboration with Olivier Marie (Erasmus University Rotterdam and past RHUL PhD student) on selection into parenthood (*Journal of Political Economy*, 2017); Galenianos' ongoing collaboration with Alessandro Gavazza (LSE) on modelling inherent frictions in key commodity markets – e.g. for illicit drugs (*American Economic Review*, 2017) and, more recently, the credit card market. Current collaborations are expected to bear fruit over the coming years, including Hirano's work with Jose Scheinkman (Columbia University) on wealth concentration and asset bubbles.

Our interdisciplinary collaborations are also delivering a growing stream of high-level publications. Spagat has continued his collaboration with the physicist and work-leading researcher in "econophysics" Neil F. Johnson (George Washington University) on patterns of terrorism and insurgency (*Plos One*, 2018); Naef collaborates with the neuroscientist Trevor Robbins (CBE, Cambridge University) on cognitive function and economic decision-making (*Translational Psychiatry*, 2017). Seltzer has collaborated with researchers from Information Security, including Keith Martin (RHUL), on the behavioural irregularities among information security professionals (*Journal of Cybersecurity*, 2016). Goldmanis (submitted via the C17 UoA) has worked with psychologists, including Ryan McKay (RHUL) in delusion-proneness (*Psychological Medicine*, 2015). Similarly, a set of new collaborations are expected to bear fruit over the coming years, including Neary's work with computer scientist Gregory Gutin (RHUL) on networks and graphs, and Rud's work with biologist Jorge Tovar (RHUL) on climate change.

Academic collaborations are supported by the Department hosting a steady stream of academic visitors. The Centres serve as focal point for visitors and encourage researchers from anywhere in the world to seek collaborations with our staff by raising our visibility. Visitors since 2014 who have collaborated with our staff over the period include Gary Charness, UCSB, (Charness, Naef and Sontouso, *Journal of Economic Theory*, 2019) and Helmut Rainer, LMU (Anderberg, Rainer, Wadsworth and Wilson, 2016, *Economic Journal*). The department-provided research allowance in turn allow staff to go on academic visits, with recent examples including Lührmann visiting Joachim Winter at LMU (Lührmann, Serra-Garcia, Winter, *American Economic Journal: Economic Policy*, 2017), and Richter visiting Ariel Rubinstein at Tel Aviv (*Theoretical Economics*, 2019). The in-house ExpRESS lab plays a key role in facilitating collaboration specifically in experimental economics. Several colleagues further collaborate internationally through membership in leading economics research networks including IZA (Chevalier, Seltzer, Sauer, Wadsworth) and CESifo (Anderberg, Lührmann, Chevalier).

4b. Relationships with users, beneficiaries and audience

The Department's emphasis on the use of economic theory and econometric analysis to address major policy issues has led our researchers to engage directly with a range of partners for co-creation of research that serves their needs and challenges.

Many of our user relationships have been with non-governmental partners, for instance Spagat's ongoing collaboration with Action on Armed Violence (AOAV), which has led to numerous outputs, including a recent joint report on the effect of drone strikes on suicide attacks in Pakistan (cited in *The Times*, 29 March 2019). Other examples have directly contributed to enriching the research environment: a survey designed and ran at RHUL (Anderberg, Chevalier, Lührmann) led to a collaboration with the Centre for Longitudinal Studies and the development of a new module on young people's expectations in the Millennium Cohort Study; Frank's collaboration with the Firestation Centre for Arts & Culture, led to using the Centre as a "living laboratory" for dynamic event pricing.

We use broadcasts and other media to bring our research to the attention wider audiences. Examples of recent significant media attention include: Sauer's work in female entrepreneurship (*City AM*, *the Conversation*, *Biznews*); Sancetta's work on pre-announcement price movements (*Wall Street Journal*); Wadsworth's work on the impact of immigration in wages (*Independent*); Mandler's work on scientific isolation and progress (*Times Higher*); Hassani-Nezhad's work on paid maternity pay and women's earnings (*Economist*); Frank and Naef's work on UK universities in crisis (*the Conversation*). We use research news portals such as phys.org (Spagat) and arXiv (Neary, Rud) to promote our work to an interdisciplinary research audience. We have hosted two ESRC Festival of Social Science events, helping to engage the public with some of our research on crime and migration.

4c. Wider contributions to the economy and society

Drawing on the expertise gained through our research, our staff serve in key advisory roles. Wadsworth is member of the NHS Pay Review Body (NHSPRB) and on the advisory panel for the Cabinet Office Race Disparity Audit. Anderberg was external advisor on the Office for the Children's Commissioner's Stability Index project between 2017-2019. In 2020, Galenianos joined a special commission (together with *inter alia* Chris Pissarides and Costas Meghir), appointed by the Greek government, to draft a new "Growth Plan" for the Greek economy.

Contributing to the wider (and future) impact of our research, our staff have presented to a wide range of beneficiaries and policy-makers. Spagat presented his work on predictors of event-size distributions in modern wars at the Ministry of Defence (March, 2016); Galenianos presented his work on frictions in credit card markets to the Financial Conduct Authority (December, 2019) and his work on the Greek crisis to the Bank of Greece (April, 2019); Sancetta presented work on price-movements also at the Financial Conduct Authority (May, 2017); Rud presented research on climate change and agricultural productivity to the Inter-American Development Bank (December, 2017) and to the Ministry of Production in Argentina (July, 2016); Anderberg presented findings on intimate partner violence and children's development to Action for Children (January, 2019); Piermont presented research on awareness to the Atlanta-based marketing agency Moxie (April, 2018) and to the New York-based AI-start-up Cherrypick (June, 2019); Lührmann presented research on calorie intake to highly influential social purpose company the Behavioural Insights Team (Sept, 2015); Trapeznikova presented ongoing work on job creation and development at the CDC Group – the UK-government owned development finance institution (September, 2019)

4d. Wider influence, recognitions, and contributions to the research base

Journal editorship: Our staff hold editorship roles for leading journals, including the *European Economic Review* (Sauer editor-in-chief, Bagger), the *Australian Economic History Review* (Seltzer), *Journal of the Royal Statistical Society, Series A* (Chevalier), *Economics Bulletin* (Anderberg), *IZA World of Labor* (Chevalier), the *International Journal of Game Theory, Economic Theory* and *Mathematical Social Sciences* (Ritzberger). Sauer is also editor-in-chief for the newly launched Open Access spin-off *European Economic Review Plus*. Beyond the discipline, Sauer has been contracted by World Scientific Publishing to create a new interdisciplinary journal – the *Journal of Religion, Economics and Management* – and to be its founding editor-in-chief.

Learned societies, fellowships and panel memberships: We take a leading role in the committees for learned societies and research networks: Chevalier has served as member of the European Association of Labour Economists (EALE) Executive Committee; whilst at RHUL, Hamermesh was appointed Chief Coordinator for the IZA Research Network. Mountford serves on the ESRC Grants Assessment Panel and is also REF 2021 panel member. Chevalier further served as Panel Expert (Employability) for the HEFCE Teaching Excellence Framework. Chevalier was also awarded a Fellowship of the Royal Society of the Arts while Seltzer and Frank were elected Fellows of Academy of Social Sciences.

PhD examining: The Department contributes to the sustainability of the research base through our PhD training and staff regularly serve as PhD examiners: in total we have, over the assessment period, examined approx. 40 doctorates at UK universities – including Oxford, UCL, Cambridge and LSE – and a further 10 abroad, including the Ecole Polytechnique, Australian National University, Tel Aviv University, Tor Vergata University Rome, and Copenhagen University.

Keynotes and prizes: Our staff have given 12 plenary talks at international conferences and over 300 invited seminars over the current assessment period and have been awarded several prizes and awards including personal awards (Oskar Morgenstern Award, Ritzberger, 2015; the Bergmann Memorial Award, Richter, 2015; the Exeter Prize for Research in Experimental Economics, Feri, 2015) and “Best Paper” awards (*Economic Journal* 2016, Anderberg et al. 2016; *Econometric Theory*, Sancetta, 2015).