Economics Subject Board for Final Honour Schools
Report 2020

Part I

STATISTICS

A.

(1) Numbers and percentages in each class/category

Such statistics are included in the reports for the PPE, E&M and H&E Classification Boards. The table below gives the numbers of candidates taking Economics for the various FHS's.

FHS	2020	2019	2018
PPE	173	145	158
Economics & Management	78	84	86
History & Economics	17	12	14
History	0	0	1

(2) Vivas are not used.

(3) All scripts were double blind-marked. The submissions for *Behavioural & Experimental Economics* were also double blind-marked.

NEW EXAMINING METHODS AND PROCEDURES

B. For 2020 all exams were conducted as open-book exams.

Exam papers (which had been set as closed-book exams) were reviewed to determine whether or not they were suitable as open-book exams.

- Many were left unchanged: for some papers this seemed to make little difference to the quality of answers, but for others the quality increased significantly. For most of the latter, the assessors didn't move the bar higher, which led to higher marks in those papers than in previous years.
- In other papers, some parts of questions that required definitions or explanations that could be found in lecture handouts (or other readily available source material) were removed or down-weighted. In a few of these cases, this unsettled candidates because the paper felt too dissimilar from what they had expected.

C. For 2021, the plan is for open-book exams to again replace 3-hr closed-book exams.

The obvious recommendation is to tell those who set papers in the future whether or not their exam will be open-book, and to set a paper accordingly. This should be accompanied by issuing broad guidelines to setters (and assessors regarding book-work), and ensuring candidates are well-informed with plenty notice.

A number of assessors observed that the option to type answers, which led to the opportunity for candidates to review and revise their work, made for more concise and better structured answers. This option should be considered for future years, whether or not the exams revert to being closed-book.

D. The Economics Subject Board Exam Conventions were updated in relation to Covid-19 and circulated to students, as well as being published on the Economics WebLearn site, together with all further information circulated from the Chair:

ESB Conventions:
https://weblearn.ox.ac.uk/access/content/group/a64bf967-5670-4951-acd7-c4c64e416378/2020%20Exam%20Items/4.Economics%20Subject%20Board%20conventions%2019-20%20-%20COVID-19_Tracks%20removed.pdf

Chair's circulations:
https://weblearn.ox.ac.uk/portal/site/:socsci:econ:undergrad/tool/6dd6b946-97ed-44da-970b-f46ba79c03f7

Part II

A. GENERAL COMMENTS ON THE EXAMINATION

1. Background

This is the fourth year of the Economics Subject Board, and it is now established for all three joint honour schools that include Economics, namely PPE, Economics & Management, and History & Economics. There is also a Management Subject Board, and a de facto subject board for Philosophy and seemingly for Politics; History have no interest in having a subject board, it being a single honour school in its own right. The Chair of the Subject Board is a member of each Classification Board that has Economics subjects as part of its Final Honour School.

2. Procedure and timing

Candidates sat their exams on-line and assessors were provided with web-links to the scripts. This worked as well as could be expected (in fact rather smoothly) given the short amount of time that the university had to design and implement this new procedure. As in previous years, there is almost no slack in the system to cope with either late submission of marks or marks for many options coming in just before the deadline. Fortunately, most colleagues were prompt this year.

This year, assessors were told to add reconciliation notes when their initial marks were not simply averaged. (See the Exam Conventions.) Despite these notes often being rather terse, this was very helpful in resolving queries down the line.

3. Main meeting of the Subject Board

The chair & former deputy chair (Johannes Abeler) had an online meeting the day prior to the main meeting to analyse the marks and prepare for that meeting.

Summary statistics for each subject were presented, showing the percentage of marks in each class, the quartiles, the mean & standard deviation of the marks, and the mean mark of those candidates taking that subject relative to their marks in the core subjects.

There was no rescaling of marks in 2020.

The thorny issues of penalties for late submission of scripts and of Mitigating Circumstances Notices were handled by the Classification Boards, one major problem being ‘mixed messages’ from central admin, such as whether time-stamps where made when downloads & uploads were started or completed.

4. Summary and Recommendation

The Subject Board worked well. Responsibilities are clear, and there is consistency of treatment of Economics candidates across degree programmes. We now have marks across four years and this will enable us to perform some statistical analysis.

- We should incorporate an automatic check to flag cases were the agreed mark is out of range of the initial marks.
- We need a method of deciding whether or not ‘An optional paper was more or less difficult than other optional papers taken by students in a particular year’.

- Also, we need to tackle the problem arising from having a dozen or so assessors for the large core/prerequisite papers: some candidates simply “get lucky” owing to their scripts being assessed by generous markers.

B. EQUALITY AND DIVERSITY ISSUES AND BREAKDOWN OF THE RESULTS BY GENDER

Statistics on gender etc. are included in the reports for the Classification Boards (PPE, E&M and H&E).

C. DETAILED NUMBERS ON CANDIDATES' PERFORMANCE IN EACH PART OF THE EXAMINATION

Statistics by Subject

Subject & no. of candidates		>= 70	>= 60 < 70	>= 50 < 60	>= 40 < 50	>= 30 < 40	< 30	upper quartile	median	lower quartile	mean mark	st.dev.
QE	238	25%	51%	20%	4%	0%	0%	69.0	64.0	60.0	64.0	8.3
Macro	263	30%	58%	9%	2%	1%	0%	70.0	66.0	63.0	65.6	6.7
Micro	259	37%	48%	11%	3%	0%	0%	72.0	67.0	62.0	66.7	7.9
Behav'l & Exp't'l	17	18%	76%	6%	0%	0%	0%	68.0	65.0	62.0	65.0	4.0
Dev of World Econ	40	25%	75%	0%	0%	0%	0%	69.3	67.0	65.0	67.0	2.8
Dev Countries	29	34%	59%	7%	0%	0%	0%	70.0	67.0	64.0	67.3	5.3
E'metrics	53	34%	36%	28%	0%	2%	0%	72.0	66.0	57.0	65.2	9.8
Game Theory	32	34%	44%	22%	0%	0%	0%	71.3	66.0	61.5	66.1	7.6
Industry	31	39%	61%	0%	0%	0%	0%	70.0	68.0	66.0	67.8	3.5
Inter-national	5	40%	60%	0%	0%	0%	0%	75.0	69.0	68.0	71.0	3.7
Labour & Inequality	9	33%	44%	22%	0%	0%	0%	72.0	68.0	62.0	66.2	6.7
Micro Analysis	21	67%	14%	14%	5%	0%	0%	79.0	72.0	64.0	70.5	10.7
Money & Banking	40	20%	78%	3%	0%	0%	0%	69.0	66.0	64.0	66.2	4.0
Public	22	23%	73%	5%	0%	0%	0%	67.8	66.0	64.3	66.2	3.7
Sp.Subj.: Env.Econ &	15	40%	60%	0%	0%	0%	0%	70.0	68.0	67.0	68.0	3.2
Finance	15	40%	60%	0%	0%	0%	0%	70.5	68.0	66.5	68.5	4.2
Thesis	2											

D. COMMENTS ON PAPERS AND INDIVIDUAL QUESTIONS

Macroeconomics

The questions in section A were all compulsory. In section B candidates had to select two questions from a choice of six – all six questions attracted a reasonable number of responses and question 5 (choosing between a price path target and an inflation target) was the most popular.

The strengths and weaknesses of candidates' answers on a question by question basis are discussed in the remainder of this report.

Section A (short answer questions)

Question 1 (effects of an IS shock). The first part of this question was very close to analysis undertaken in the lecture slides. Most candidates correctly showed the adjustment of output, inflation and real interest rates following a permanent, unexpected positive shock to the IS curve. The second part asked for similar analysis but under the assumption that the policy-maker incorrectly believes the shock to be temporary. Many candidates realised that this would induce too small a rise in real interest rates, but showed the effects of this using a period t+1 Phillips Curve intersecting the VPC at the target inflation rate rather than the higher inflation rate that applied in period t as a result of the shock. For the third part on the inflation path, candidates correctly argued that a larger beta parameter in the loss function would lead to inflation returning to target more rapidly. The best candidates noted that for a sufficiently large beta the inflation rate could fall from t to t+1 despite policy-makers holding incorrect beliefs regarding the position of the IS curve. Some candidates mis-spelt 'Phillips' throughout their answers.

Question 2 (steady-state consumption in the Solow model). The first part of this question asked about the relationship between steady-state consumption and the savings rate. Most candidates could see that a rise in the savings rate would exert two competing effects on steady-state consumption, but only the best answers produced a comprehensive account of the golden rule for capital and savings and then noted that steady-state consumption rises with the savings rate up to the golden rule level but declines thereafter. Some weaker answers discussed the out of equilibrium effects of a change to the savings rate on consumption. For the second part candidates had to show the impact of improved technology on consumption. The best answers showed that consumption at each level of the savings rate would rise, due to the direct effect of improved production capabilities and the capital deepening from an increased quantity of saving. Weaker answers treated the one-off rise in the level of technology as a rise in the technology growth rate and showed the effects of a left rotation of the capital thinning line in the intensive form Solow diagram. For the final part, the best answers argued that a larger depreciation parameter would limit the size of consumption increase from a higher technology level, due to capital deepening being restricted.

Question 3 (inter-temporal consumption). For the first part of this question most candidates demonstrated impressive knowledge of how to derive the Hall random walk result for consumption from the general Euler equation for optimal consumption. The key assumptions requiring discussion in this question were equality of the discount rate and real interest rate, and quadratic utility. Candidates were aware of these requirements but very few provided an intuitive account of the roles played by each of these assumptions in delivering the random walk outcome (as opposed to just stating the assumptions and their roles in a mathematical derivation). For the second part of the question only the best candidates used the formula for the sum to infinity of a geometric series to derive an expression for permanent labour income in the budget constraint. The final part of the question asked for a first period consumption solution when the outturn for income in that period is known but all future income levels remain uncertain. Very few candidates were able to derive this result. Candidates who

provided some written account of the impact of a below/above average first period income outturn on consumption in that period were given some credit.

Section B (essay questions)

Question 4 (asymmetries in price stickiness). This question required a discussion of whether price stickiness is more plausible following positive demand shocks or negative demand shocks. A number of candidates chose to tackle this question by arguing that downward nominal wage rigidity implies that prices (set as a mark-up on costs) are more likely to be sticky in the aftermath of negative demand shocks. Some credit was given to such answers. An answer could be constructed by setting out the Ball, Mankiw and Romer explanation of sticky prices from the lectures. Whether or not there is asymmetry in price stickiness then depends on whether menu costs and real rigidities, the two key requirements for a sticky price outcome, are more relevant in one direction than the other.

Question 5 (price path targets and inflation targets). This was a popular question and candidates demonstrated good knowledge of the lecture material. Common arguments were that a price path target supported credible policy expansion at the zero lower bound, but presented problems in the face of stagflation shocks or in the event that the error with which central banks control inflation becomes quite large. On this basis, most candidates ended up agreeing with the statement in the question, namely that a price path target should be adopted at the lower bound but inflation targets pursued the rest of the time. Only the best candidates provided critical scrutiny of this suggested hybrid arrangement, for instance through asking whether the prospect of post-recovery excess inflation under a price path target is credible if there is the prospect of an automatic switch back to an inflation target. More generally, candidates assumed that the adoption of a price path target would address concerns over the credibility of optimal policy without questioning whether a proposal to adhere to a price path target was itself credible, i.e. the price path proposal may merely displace the credibility problem in the conduct of monetary policy.

Question 6 (monetary and fiscal policy in the open economy). For this question candidates explained that in the open economy monetary policy causes the economy to adjust along an RX locus that is flatter than the closed economy IS curve, meaning that monetary policy is more powerful in the open economy. Whilst this part of the analysis was well done there was relatively little critical analysis, for instance consideration of the plausibility of the assumption that net exports are sufficiently elastic with respect to the real exchange rate within one time period to generate the standard properties of the RX relation. For the fiscal policy part of the question there was good discussion of smaller open economy multipliers due to import leakages and exchange rate crowding out of fiscal policy. Very few candidates considered the possible endogeneity of aggregate supply to the real exchange rate captured in the ERU relationship, which opens up the possibility that fiscal policy may have *more* persistent effects on output in an open economy.

Question 7 (explaining the rising wage premium for skilled workers). For this question the best candidates provided a full account of the Acemoglu model of directed technical change and explained that a rising supply of skilled workers could create incentives for firms to invest in technologies suited to skilled workers, and that the demand effect on the wage premium could dominate for sufficiently high elasticity of substitution in the production function. Weaker candidates ignored the instruction to explain the wage premium in terms of the production technology and instead concentrated on the changing labour market power of trade unions as the reason for a shifting wage premium.

Question 8 (persistent technology shocks and the RBC model). Most candidates were able to give a sound account of the set-up of the RBC model, including first-order conditions for factor returns and the Euler equations for consumption and labour supply. The question

asked why it is necessary to assume a degree of persistence in the series for technology shocks in order for the RBC model to generate dynamic responses to technology shocks that match the empirical evidence on business cycle behaviour. The best answers commented on the fact that absent some technological persistence, the expansion of the capital stock when technology improves results in an adverse income effect on labour supply in subsequent periods. Without a persistent increase in labour supply the model cannot quantitatively match the output dynamics observed during a business cycle expansion. Assuming a degree of technology persistence is necessary to bridge this gap.

Question 9 (public debt determinants and public debt policy). This question was divided into three parts. For the first part most candidates correctly argued, correctly, that the government should save through running a surplus in advance of the downturn, run a deficit during the downturn and run a balanced budget thereafter. For the second part most candidates considered the common pool problem in financing public expenditure and the partisan theory of debt as explanations for debt trending away from the level predicted by tax-smoothing theories. For the final part candidates showed knowledge of a wide range of the criticisms levelled at the SGP rules, e.g. arbitrariness of the thresholds, failure to set debt in the context of state assets and so on.

Microeconomics

Two hundred and sixty candidates sat the paper: 167 PPE candidates, 76 E&M, and 17 H&E. Again, all questions in Part A were compulsory and there were four questions of equal weight. It transpired that two of the questions were on the easy side, with the other two being more challenging. Approximately 40% of the candidates were rewarded with a first-class mark on Part A (about half of them getting a 1st on this paper), although about 15% received less than half marks (and many of those candidates end up in the bottom decile with a 2.2 on this paper).

Approximate distribution of attempts at questions (Part B only):

Question	5	6	7	8	9	10
Attempts	10%	12%	62%	25%	42%	49%

Comments on Individual Questions

Part A

1] *General Equilibrium* (ave. 61%)
Most candidates found parts (a) to (c) quite manageable, but part (d) caused a few problems, quite possibly because this question was reminiscent of one from a few years ago but, unlike in that one, the utility functions of the consumers here were not identical.
There was wide variation in the quality of illustrative diagrams.

2] *Game Theory* (ave. 72%)
One of the easier of the Part A questions and most candidates provided good answers, although quite a few had small gaps.

3] *Risk & Expected Utility* (ave. 59%)
Most candidates managed part (a) (bookwork) and part (c) (the calculation) fairly well. A number struggled with part (b) and came to the wrong conclusion. (And far too many candidates thought that variance and spread are synonymous – they aren't!)

4] *Principal-Agent problem* (ave. 70%)
Similar to Q2, most candidates did not find this problem very challenging.
Again, this question was reminiscent of one from a few years ago – in fact some candidates discussed semi-separating equilibria *using exactly the wording and terminology from the outline answers to that problem*.

Part B

The answers tended to be concentrated on just a handful of questions, Q7 being most popular, followed by Q9 and Q10.
Note that the summary statistics for each question might exclude a small number of attempts that received very low marks because they were very short and almost verbatim from lecture notes.

5] *Inequality* (ave. 58%, low/medium st.dev.)
The least popular question. Most of the candidates answering it ended up with a low 2.1 or worse on this paper.

6] *Trade* (ave. 66%, low/medium st.dev.)
Not a very popular question, but with a mixed bag of answers. However, quite a few candidates simply relied on a basic trade model, not directly addressing the specific question about abolishing tariffs.

7] *IO (market power)* (ave. 62%, low st.dev.)
Very popular, and not especially well answered. Many essays resembled journalism, and very few included any sort of formal model.

8] *Insurance* (ave. 66%, very low st.dev.)
Not very popular, and nothing remarkable. Almost all answers were between 62% and 68%.

9] *Asymmetric Information (Principal-Agent problems)* (ave. 64%, high/medium st.dev.)
Fairly popular question which many candidates answered rather well. Having said that, a lot of answers relied rather heavily on bookwork.

10] *Duopoly, credible threat* (ave. 66%, high st.dev.)
Second most popular question, with quite a few very good answers. Maybe it was too easy – about a third of the answers were first class. A number had lapses when specifying strategies fully, and about a third of the attempts got the wrong answer to “is the announcement credible?”

Quantitative Economics

Part A

Q1 was generally done very well.

Q2 caused a surprising amount of difficulty. Many candidates failed entirely to recognise the relevance of the conditional expectation to this question, which made it difficult to award marks to their answers for either part.

Q3. Successfully answering part (a) required deriving the relationship between the three location dummy variables; relatively few candidates did this. Part (b) required the formulation of a model within interaction terms, which again only a few candidates provided.

Part B

Q4 and Q7 were the most frequently chosen questions in this part.

Q4 was generally done well, though many candidates missed subtleties in the relationships between the ATE, the TOT, and the difference in means. In particular, very few managed to answer part (e) correctly, and relatively few noted the relevance of the terms under which the programme was to be provided (whether voluntary or compulsory) for the answer in part (h).

Q5 was a technically demanding question: generally those who elected to attempt this question answered it well.

Q7. Marks on this question tended to be a little lower than for Q4. Some candidates appeared to be uncertain of the significance of the first stage regressions reported in the final three columns of the table. Some of the subtleties involved in answering part (d) were often missed.

Q6, Q7 and Q8 were answered by relatively fewer candidates: those who elected to attempt these questions generally did very well.

Behavioural and Experimental Economics

The overall quality of submitted essay was very good. The best essays combined an interesting and important research question with a well-thought out design that was able to answer the research question. The very best essays used a theoretical model to develop the experimental design and to derive testable implications. Variation of marks within group were mostly due to how well the question, design and results were explained, how well the study was linked to the existing literature and how well (if at all) a theoretical model was set up and explained.

Development of the World Economic since 1800

The paper was taken by 40 candidates. Candidates required to answer 3 questions from 8. The average mark overall was 67, reflecting the generally high standard of the answers. As the exam is essay format, the Covid-19 exam format seems to have made it easier for students to recall the relevant readings, compressing the distribution (i.e. there were fewer negative outliers).

Question 1 on the political Coase Theorem was answered by 9 candidates. Four candidates demonstrated an exceptional grasp of the issues.

Question 2 on the emergence of the state was only answered by 11 students. Three answers were outstanding.

Question 3 on culture and Europe's rise was answered by 32 students. As this was a popular question there was more variability in the quality of the answers.

Question 4 on Dell's mita paper was answered by 12 students. There were a few impressive answers which showed a deep understanding of this paper.

Question 5 on the impact of colonialism on Africa was answered by 34 candidates. Answers were roughly comparable to the average across all questions.

Question 6 on Engel's pause was answered by 4 candidates. One candidate provided a first-class answer.

Question 7 on the Gold Standard and the depression was answered by 8 students none of which provided an exceptional answer.

Question 8 on the Great Depression and protectionism was attempted by 10 candidates. Two candidates provided first-class answers.

Econometrics

A total of 53 students took the exam.

Mean 65.2, median 66, standard deviation 9.9.

Questions 2 and 4 in Part A and Questions 5 and 6 in Part B were the most popular choices.

Q1. 25 students answered this question. Answers varied in quality. Some students provided great detail in the necessary derivations, while others were less methodical. Although most students knew the concepts of unbiasedness, consistency and asymptotic distribution, some were unable to apply this knowledge to the estimator of the residual variance, required in parts (a), (b) and (d) of this question.

Q2. 36 students answered this question. Many students answered this question well. The main differences came in part (c), where some students went as far as showing the Gauss-Markov theorem, others only referred to the theorem in their answers, and a few did not see the connection.

Q3. Only 9 students answered this question. There was considerable heterogeneity in the quality of the answers. Part (d) was the most challenging part. Only a few students were able to derive the right expressions.

Q4. 36 students answered this question. This was one of the most systematic questions in Part A of the exam. Subquestion (a) was answered well by most students. In subquestion (b), some students summed over k instead of i, which lead to the wrong answer. While most students derived the right estimator for 9 in subquestion (c), some did not get the right answer for 3: The quality of answers for subquestion (d) was much more heterogenous; students who plotted the log likelihood function quickly saw the correct answer and provided the clearest explanation.

Q5. 32 students answered this question. Answers were generally good, although in part (c), most students did not take into account the presence of the absolute value in the stated condition.

Q6. 34 students answered this question. This is one of the questions with the most essay-like subquestions in the whole exam. It was chosen by many students. Most were aware of the relevant concepts, but the quality of the essay-like answers varied greatly. Some students provided an excellent balance between appropriate descriptions and technical derivations, while others offered minimal descriptions and no derivations.

Q7. 26 students answered this question. Some students provided excellent answers. Others did not approach it in a satisfactory manner. Specifically, the model in the question had a cubic trend, but some students tried to keep as close to the lecture material as possible, where just a linear trend had been considered, and others ignored the time series setting. These approaches were not successful.

Q8. Q8. Only 12 students answered this question. Parts (c) and (d) were also essay-like subquestions. The answers varied somewhat in quality, but most were well structured. Some students appeared to spend too much time on part (b) (15% of the total mark), and not enough time on parts (c) and (d) (together 80% of the total mark).

Economics of Developing Countries

29 candidates took the final exam. The majority of marks were in the 2.1 range, with the mean and median of about 67 also in line with previous years.

Due to the pandemic, the exam followed the online and open-book format that was adopted for other FHS exams. Overall, the process seems to have worked fairly smoothly, and the examiners certainly found the typed answers a lot easier to read than (some) candidates' handwriting. There were some other obvious improvements – e.g., fewer spelling mistakes. The time allowed (4 hours, instead of 3 hours) seems to have been quite adequate, judging by the fact that there were hardly any incomplete answers, where the student had obviously run out of time.

As in previous years, we are pleased to observe that all the questions on the exam were attempted by at least a few candidates – indeed, the spread was wider than usual, with no question attempted by fewer than 4 candidates. The overwhelming majority of candidates demonstrated a good knowledge of the material, as demonstrated by the quite high quality of their answers. We were also pleased to see that the distribution of marks across questions was quite similar, with no question being especially high-scoring or low-scoring. Starting from last year, the examination has asked candidates to answer three out of eight questions (rather than ten, as in previous years) and, as with last year, there does not seem to have been any apparent drop in the quality of the answers.

Brief comments on answers to specific questions.

Q1 – There were 5 responses to this relatively straightforward question, on (the limitations of) measures of inequality.

Q2 – There were 12 responses to this somewhat open-ended question. Good answers went beyond just an exposition of the Lewis model, to drawing out the implications for capital accumulation and labour employment in a dualistic economy.

Q3 – There were 14 responses to this question. Most answers were good, in contrasting the theoretical models with the empirical evidence on nutrition-based poverty traps, but there was some variance.

Q4 – There were 14 responses to this question, on public funding of education in developing countries. This was perhaps the one question where differences in open-book and (in an alternate universe) closed-book responses were most apparent. Most answers were strong on facts and arguments, but the best ones distinguished themselves in the way that they marshalled those facts and arguments to make a coherent assessment.

Q5 – This was the most popular question, perhaps because it was relatively straightforward, with 15 responses. Most answers did a good job of listing the arguments in favour of more open trade policies in developing countries, and perhaps as a consequence, the variance in marks was relatively low.

Q6 – There were 14 responses to this question. The better answers drew links between the two parts of the question, in describing how the mechanisms used by microfinance institutions (the second part of the question) helped to surmount the problems faced by lenders in poor countries (the first part of the question).

Q7 – There were 9 responses to this question. Most answers were good, in their discussion of Borjas's selection model, positive selection, and the brain drain.

Q8 – Only 4 candidates attempted this question. The answers were of high quality, with most responses recognising the problems of (reverse) causality, the distinction between short-run and long-run outcomes, and the importance (and difficulty) of distinguishing between institutions that were adopted by, versus imposed on, countries.

Economics of Industry

30 candidates sat the paper, of which 15 were EM students, 1 MHE and 14 PPE. The overall standard was good with 12 candidates awarded First Class overall marks on the paper and the remainder Upper Seconds. This year, as had been announced, the number of questions was reduced from eight to six and this does not seem to have disadvantaged candidates.

Comments on Individual Questions

Q1. (20 attempts)(Entry Deterrence) This was on the whole answered well. Better answers gave a careful treatment of the taxonomy of business strategies and discussed relevant empirical evidence.

Q2. (25 attempts) (Product Differentiation) Parts (a) to (c) asked candidates to go through the Salop model, which was straightforward as candidates had access to the lecture slides. To gain highest marks, however, candidates needed to give careful explanations and give a good answer to the more open-ended discussion in part (d). This was the most popular question and attracted the highest average mark.

Q3. (15 attempts) (Price Discrimination) Most candidates displayed a good understanding of price discrimination. Better answers gave a more careful discussion and covered a broader of range of material.

Q4. (Either)(6 attempts)(R&D) This question attracted solid answers. Better answers gave a good discussion of empirical evidence in (b) as well as a clear treatment of the theory in (a).

Q4. (Or)(6 attempts)(Advertising) This question also attracted solid answers. Candidates' discussion of informative advertising tended to be stronger than that of persuasive advertising.

Q5. (17 attempts)(Mergers) This question was on the whole answered well. Better answers gave a careful treatment of all three parts.

Q6. (4 attempts)(Exclusive Contracts) This was rather unpopular with the largest variance in outcomes.

Environmental Economics and Climate Change

Question 1 attracted no answers at all. Perhaps students thought the (deliberately) provocative nature of the question might be a bit risky to address?

Question 2, by contrast, was extremely popular, selected by 12/15 students. The quality of answers was rather mixed. Though most understood the theory of either travel costs or hedonic pricing, too many did not centre their discussion on the context given in the question. It also seems reasonable to expect students to know, by the end of a degree in Oxford, whether any of the city's tourist attractions have been significantly reduced by recent flooding events. In fact, the main direct impacts of this flooding were experienced by residents whose homes were flooded; flood risk should therefore influence house prices. Some students referred to Bakkensen and Barrage (2017), who observe underestimates in the welfare cost of future flood risk due to heterogeneity in beliefs regarding future flood risk. The best reflected that that the repeated floods would lead to updates in those beliefs.

Question 3 was addressed by 5 candidates, with moderate success. Some spent too long in explaining the formula for the Ramsey discount rate, or debating the best way to address discounting, without linking sufficiently to the key problems of irreversibility and uncertainty, as posed by the question. Better answers were able to explain quasi-option value or Krutilla-Fisher discounting. But there were no first-class answers giving deeper thoughts on this question.

There were three answers to question 4, all first-class. Students had undertaken their own experiments with this computer model as part of their tutorial work, and these three candidates showed both an excellent command of the literature and considerable original thought. In one case marks had to be discounted for the chaotic presentation of the work, but the ideas were well beyond what is usually presented in an undergraduate essay, so that a first class mark was still deserved.

Question 5 also attracted 3 answers, but there were much less successful. A tutorial question had addressed a simpler version - when there is a fixed "budget" of safe greenhouse emissions. We treat "environmental space for emissions" as the stock resource in a Hotelling model. For the exam question, because marginal damages are an increasing function of cumulative emissions, we should use the Hotelling model with extraction costs. Unfortunately, instead some candidates focused on the green paradox. In the setting of the question, a weak green paradox does not lead to a strong green paradox (since damages depend only on cumulative emissions) – that is, timing of emissions does not matter in welfare terms.

Question 6 attracted four responses, all good or very good. Students had understood well the double dividend model and the marginal interaction effect and marginal revenue effect. The best answers referred also to distributive impacts of a carbon tax and the empirical literature.

Question 7, like question 2, was addressed by 12 students. Reasonable answers successfully explained the model of Barrett 1994 and understood from the explanation given in lectures how side payments could improve on its disappointing conclusions. First class answers showed extensive further reading and reflected on further problems arising – for example in strategic bargaining over the level of side-payments.

Question 8 was addressed by 6 candidates, with most answers good or very good. Candidates referred to a wide variety of models and empirical work. Less successful answers over-interpreted a strategic incentive to cut regulation under free trade as providing a case that autarky would be effective for environmental preservation. Excellent answers showed extensive further reading and assessed, for example, the potential for border carbon

adjustments to allow both trade and environmental preservation, and that linking trade to international environmental agreements can facilitate better outcomes in these agreements.

The exam paper followed the same structure and general expectations as that set in 2019 (the first year in which this paper was offered). The paper was open-book and submitted online. The candidates' submissions were generally of a high standard; there was very close agreement on marks between the two assessors.

Timetable changes due to the pandemic meant that this exam took place very much later in time than almost all other exams in economics. This additional time for further reading, revision and reflection may have been as important as the open book format in the quality of the submissions.

Naturally, however, the open book format will have influenced what candidates were able to say. For example, impressive and extensive discussions of further reading were probably facilitated by access to notes. However, the effect is then more of a high quality tutorial essay, if the discussion of that reading is sensible and relevant. Question 2 had the greatest number of weak essays: a common problem was too close an adherence to the explanations in the lecture notes, instead of addressing the context at hand. (Of course, this problem also arises in closed book exams.) On the better side, one student went online and found the environment agency flood maps mentioned in Question 2, enabling them to make more specific and relevant points. This seems a rather sensible and positive use of the setting in which they found themself. The rather technical question 6 required explaining a model which had been discussed in detail in lectures. One might say that access to lecture notes was too much of an advantage, but that model is rather difficult to understand and so a convincing essay would only be possible for a candidate who had taken time to study it in advance.

On balance, therefore I would judge that combination of more time for revision and open book leads to a higher standard of submissions in substantive, positive ways.

Game Theory

Candidates were asked to answer four out of eight questions; at least one in each part of the exam corresponding to general solution techniques and applications, respectively. There were eleven candidates with a 1st-class mark, fourteen in the 2.i and seven in the 2.ii ranges, respectively.

The questions concerned mainly problem-solving like in previous years (explanations of concepts and interpretations of results being worth up to 10-20% of each question), therefore the open-book nature of the exam was not expected to make a great difference. The distribution of marks was similar to that in previous years.

Question 1: This was attempted only by 6 candidates, but most of those who attempted this question did well. The conceptual difficulty and novelty of the question was that there was a continuum of players in a coordination game. The calculations involving best responses in various parameter ranges was relatively straightforward. Some candidates did not address the final part of the question on the elimination of the “bad” equilibrium by altering the payoffs of only a small fraction of players.

Question 2: This question was attempted by 24 candidates; the distribution of marks was similar to that of the overall final marks (with an average nearly 67 and standard deviation around 11). This question involved a zero-sum game with payoffs given parametrically. Candidates were asked to work through various possibilities for pure and mixed equilibria. The key was to investigate cases methodically and to provide a short but precise proof for or against existence in each case. In the final two parts of the question candidates were also asked to compute mixing probabilities explicitly but parametrically, which was challenging as well.

Question 3: Only 4 candidates attempted this question. The main challenge was to set up a Bayesian coordination game by enumerating type-contingent strategies and identifying all outcomes and the players’ payoffs (in expectation conditional on each player’s type). Once the game was set up correctly (with four strategies for each player) it was not difficult to identify all pure-strategy equilibria under various parameter values.

Question 4: This question was attempted by 19 candidates and the marks produced a balanced distribution (average near 66, standard deviation around 9). This was dynamic game involving two firms contemplating to exit a declining market. Most candidates realised that when one firm exits the market the conditions facing the other change (improve). In order to find the subgame-perfect equilibrium candidates were expected to determine optimal play off the equilibrium path as well.

Question 5: This question was selected by 19 candidates; the results (with an average mark around 64 and a standard deviation of 11) were slightly worse than those on the exam overall. The initial two parts of the question were relatively easy to answer given open books, but computing the Nash bargaining solution in the specific problem (parts c-d) as well as the (unrelated) equilibrium of a particular bargaining protocol (part e) and comparing the two were more challenging.

Question 6: 25 candidates attempted this question for better-than-average results (the average mark was 71). The question tested whether candidates were familiar with evolutionary models (ESS, replicator dynamic, stochastic stability) without asking for a technically, mathematically challenging (“clever”) solution in a specific problem.

Question 7: Three candidates attempted it for less-than-stellar results (with an average in the low 2.i range). The question was to verify the equilibrium of an all-pay auction (formulated as

an R&D race) in a private-values environment, and then to derive a similar equilibrium (with less guidance) under common values. The second part of the problem was clearly more challenging than the first part.

Question 8: This was the most popular question with 28 attempts. The distribution of marks was similar to that of the overall final marks: the average was around 66 with a standard error of approximately 11 (final marks understandably have a smaller variance). This was a repeated-games question. The stage game was a Prisoner's Dilemma with the modification that one of the players could take an outside option (a third action) that is worse for both than any other outcome including mutual "defection". Such an action may be used as a credible (subgame-perfect) punishment only for finitely many periods. Candidates were asked to construct various subgame-perfect equilibria in the infinitely repeated game.

International Economics

The International Economics paper consisted of 8 questions, 4 on international trade (the first half of the course) and 4 on international finance (second half). All questions required essay style answers. Students were required to answer 3 questions in 4 hours.

The paper was generally well done, with approximately equal numbers of students obtaining 1st class and 2.1 marks, and no students below this. All students appeared to have coped well with the unusual circumstances. Most of them made advantageous use of the possibility to type their answers, inserting images of hand-drawn figures and illustrations where appropriate. It is possible that the ability to review and revise created by typing made for more concise and better structured answers than has been the case with hand-written examination scripts.

The examiners have retained no record of their marks on each question and are therefore unable to comment on performance on particular questions.

Labour Economics and Inequality

A total of 9 candidates took the exam. There were 8 questions altogether, 4 on each part of the course. The distribution of attempts at questions was:

Question	1	2	3	4	5	6	7	8
Attempts	5	3	1	6	2	3	2	5

Most students did well; there was no particular pattern discernible in terms of some questions being more difficult for them.

Nor, given the small number of students for each question, are there any patterns in terms of common omissions going beyond a single exam.

Microeconomic Analysis

Twenty-one candidates sat the paper: 12 PPE candidates, 8 E&M candidates and one H&E candidate. This paper is now well established (this was its fourth year) and generally attracts strong students. This year was no exception, and there were some really excellent candidates. Of the 14 candidates that got a first class mark on this paper, 11 of them got a 1st across their Economics papers as a whole.

Candidates had to answer any four out of six questions. The top 10 candidates (4 PPE, 6 E&M) got marks of 70+ for three or all four answers and averaged between 75 & 85, whereas the next 4 (all PPE) got marks of 70+ for two of the answers but one mark in the 50's and averaged very close to 70: all of them were rewarded with well-deserved firsts. Three candidates had marks ranging between 40 & 90 and were classed as 2.1's while three others had marks ranging between 40 & 65 and were classed as 2.2's. One candidate had an average of just under 50.

Distribution of attempts at questions:

Question	1	2	3	4	5	6
Attempts	57%	100%	62%	95%	10%	76%

Comments on Individual Questions

1] *Linear Algebra; Multivariate Calculus*
(a) A number of candidates got into a bit of a tangle numerically (or ran of time for the computations) but when they clearly (and correctly) described the method they would have used to complete their answer they were well rewarded.
(b) Reasonably well answered in general. Some candidates carelessly introduced typos – flipping +/–, getting simple derivatives wrong (but the assessors were generous).

Overall, the marks were dispersed between 40% and 95%, but with a high mean (over 70%) and a large spread.

2] *Constrained Optimisation*
Everyone attempted this question and as a rule they were well prepared.

The marks ranged from 55% to 90% with a high mean (over 75%) and a modest spread.

3] *Expected Utility Theory*
Only one or two outstanding answers and a handful at the bottom end with a big bulge in the middle. It seemed hard to get almost everything right, or most things wrong.

The marks had a middling spread and a mean of about 65%.

4] *Principal-Agent problems*
This was very popular – all bar one candidate attempted it – and very similar to a question from a few years back which might explain the swathe of high marks.

If we ignore the two lowest marks (40% & 35% for disorganised answers with very little, if anything, correct), the mean would be high (about 75%) and the spread modest.

5] *General Equilibrium (with certainty)*
Only two takers – lowish mean, low spread.

6] *General Equilibrium (with uncertainty)*
Rather popular and a fairly standard question on this topic. Many excellent answers but also a handful of third class marks with answers that were going nowhere &/or petering out.

The few low marks dragged the mean down (but only to just over 70%) and contributed to the high spread.

Money and Banking

This paper was taken by 40 candidates. The standard of the scripts was good and the open book format appeared to work well. All of the eight questions on the paper attracted at least one response. Questions one, three, four, five and six were the most popular. The reminder of this report provides comments on the answers to individual questions.

Question 1 (variations in the external finance premium and responses through quantitative easing). This was generally well answered. Most candidates cited increases in risk perceptions or risk aversion, and declines in asset prices, and hence collateral values, as possible drivers of the external finance premium. The best answers set these ideas in the context of a simple mathematical framework. Discussions of the role of quantitative easing in tackling rises in the external finance premium set out possible transmission channels for QE. The best answers were more nuanced and considered how the rise in the external finance premium might be more significant for small firms that are less obviously the beneficiaries of QE. The more complete answers also considered possible risks from QE, e.g. related to future inflation, central bank losses on asset purchases and so on.

Question 2 (money supply targets in Europe and the United States). Most answers set out the quantity theory as a basis for the predictive role of money growth in respect of price inflation, then argued that the growth of Eurodollars and bank lending to other financial institutions may have distorted this relationship to a greater extent in the United States than in Europe. Candidates considered other possible benefits of monitoring the money supply such as detecting macroeconomic imbalances not visible in consumer price inflation. Some candidates set out a distinction between broad money and credit in predicting financial crises but needed to be clearer in explaining this distinction and how it may matter in practice.

Question 3 (target ranges for the federal funds rate and the role of forward guidance). This question elicited relatively few answers, probably due to the first part of the question focussing on material outside the standard tutorial topic. Those that did answer the question focussed on the target range as a compromise between the price and quantity alternatives in the classic Poole analysis of the operating target choice. There was also some discussion of the ability of the Federal Reserve to tightly control the Federal Funds rate. Discussions of forward guidance largely addressed the likely credibility of such a strategy.

Question 4 (Taylor rule coefficients and inflation stability). Most candidates clearly explained the Taylor principle and presented the Clarida, Gali and Gertler account of how stronger monetary policy reactions to inflation account for lower and more stable inflation since the 1970s. Critiques of this view ranged from the Orphanides perspective on real time information to questioning of whether the short-term interest rate was an appropriate measure of policy in the 1970s. Some candidates considered other reasons for more stable macroeconomic performance such as less volatile shocks to the economy and stronger international competition containing inflation responses to shocks.

Question 5 (Central Bank Independence and the trade-off between inflation bias reduction and output volatility). Candidates were almost always clear that the Rogoff model supported the statement in the question. Some candidates discussed Lohmann's model in which the conservative central banker delivers inflation reduction at a smaller cost in terms of output variance. Some candidates considered the Walsh model as an exception to the hypothesis in the question but there was not much consideration of how this model may break down in practice and actually deliver greater volatility. There were very few detailed discussions of the empirical evidence in this area and its limitations.

Question 6 (explaining inflation persistence). This was a straightforward application of the lecture material. Candidates showed good knowledge of a range of models, including both models with some nominal inertia and models with flexible prices and some other constraint giving rise to inflation persistence.

Question 7 (arguments relating to the optimal inflation rate). Some candidates overlooked the instruction to look beyond arguments related to credibility and the zero lower bound. Otherwise, candidates handled the question well. Perspectives covered included Friedman's argument for negative inflation equal in magnitude to the real interest, the need to counter downward nominal wage rigidity and the role of seigniorage in public finance.

Question 8 (role of the state in the evolution of money). This question was answered by just one candidate.

Public Economics

The two part A questions are both compulsory. Candidates choose two questions from part B. There were 22 candidates in total. The table below reports the distribution of marks across the different questions.

	A1	A2	B3	B4	B5	B6	TOTAL
Mean	63.6	63.0	64.0	65.6	65.9	63.8	64.3
Median	65	62.5	65	65	65	65	65.0
75th	60	60	60	65	60	62.5	62.5
25th	75	75	70	70	75	70	71.7
N	22	22	20	9	11	4	22.0
Std Dev	6.4	6.5	5.3	4.6	6.6	6.3	3.6

The overall standard of answers was relatively high and a good comprehension of lecture material was demonstrated. On the other hand, few candidates ventured beyond the lecture material with the consequence that there were only a small number of outstanding answers.

The exam was prepared as a closed-book exam and then was open-book because of COVID restrictions. This perhaps made the questions more straightforward than we had anticipated.

E. COMMENTS ON THE PERFORMANCE OF IDENTIFIABLE INDIVIDUALS AND OTHER MATERIAL WHICH WOULD USUALLY BE TREATED AS RESERVED BUSINESS

MCs (Mitigating Circumstances Notices) are handled by the Classification Boards.

F. NAMES OF MEMBERS OF THE BOARD OF EXAMINERS

Internal Examiners
The examiners on the Subject Board were:

[redacted]

External Examiners

[redacted]

[redacted]