Economics Subject Board for Final Honour Schools
Report 2019

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	2019	2018	2017
PPE	145	158	154
Economics & Management	84	86	86
History & Economics	12	14	15
History	0	1	0

(2) Vivas are not used.

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

Microeconomics Analysis:
The agreed marks were low, being –5.9 relative to the core marks. It was the view that the paper was too long &/or hard, and that a number of candidates at the bottom end of the distribution had been particularly disadvantaged. The marks were **rescaled** with the effect that those in the 50s and 60s increased by 2, those below this would be increased by 3 and those above would be increased by 1; the mean relative to the core then stood at –4.1.

NEW EXAMINING METHODS AND PROCEDURES

B. No new methods or procedures operated for the first time in the current academic year.

C. No changes in examining methods, procedures and examination conventions are being considered for the forthcoming academic year.

D. The Economics Subject Board Exam Conventions are included in the letter to candidates by the Chair of the various FHS's that include Economics. The information is also published on the Economics WebLearn site:
https://weblearn.ox.ac.uk/access/content/group/a64bf967-5670-4951-acd7-c4c64e416378/Economics%20Subject%20Board%20Conventions/FHS%20Economics%20conventions%2018-19.pdf.

Part II

A. GENERAL COMMENTS ON THE EXAMINATION

1. Background

This is the third year of the Economics Subject Board, and it seems that it is now officially accepted 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 but not yet 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

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. (The exams spanned weeks 5 through 7 of Trinity term; the deadline for marking the three core subjects was the middle of Friday of week 8, and for the options it was the middle of Friday of week 9 – all the marks were processed by the middle of Monday of week 10, allowing time to prepare for the main meeting of the Subject Board the following day.) Fortunately, thing went quite smoothly.

3. Main meeting of the Subject Board

The chair & deputy chair ([redacted]) had met on the afternoon before 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.

The board accepted the recommendation to rescale the marks for *Microeconomics Analysis* (see Part I A (3) above). There was a lengthy discussion about rescaling the marks for Labour Economics, where it was felt that one of the assessors might have been too generous on the whole; it was decided that because of the small number of candidates (8), it would be unsafe to draw any firm conclusion from the data and that no rescaling of the marks was appropriate.

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 three years and perform some statistical analysis.

Rescaling
The University's 'Policy and Guidance for Examiners' contains:

> **11.4. Scaling of marks**
>
> Education Committee considers that it is appropriate to scale marks for a paper where it has been established that either:
>
> (a) …
>
> (b) *An optional paper was more or less difficult than other optional papers taken by students in a particular year*
>
> Again, a higher or lower median or mean mark for an optional paper relative to

other optional papers would not in itself constitute sufficient evidence for this. The differences in mean or median scores of students taking different optional papers could simply be the result of natural variation in ability within the cohort of students. If the number of students taking options is small, statistical analysis (say of performance of students in optional versus compulsory papers) can be an unreliable tool.

(c) …

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*'. It has been suggested that the following yardstick might be employed: for each (optional) paper, look at all the candidates taking that paper and calculate the average of all their marks across all the other papers those candidates sat.

⟶ **A small group of skilled data-analysts should be set up to consider this and other possibilities.**

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	226	31%	42%	21%	6%	0%	0%	71.0	65.0	58.0	64.6	9.3
Macro	238	26%	60%	14%	0%	0%	0%	70.0	65.0	62.0	65.3	5.2
Micro	237	27%	57%	15%	1%	0%	0%	70.0	65.0	60.0	65.2	7.1
Behav'l & Exp't'l	10	20%	70%	10%	0%	0%	0%	67.0	65.5	62.5	65.0	3.9
Dev of World Econ	32	38%	56%	6%	0%	0%	0%	70.0	66.0	64.0	66.3	4.1
Dev Countries	33	21%	76%	3%	0%	0%	0%	68.0	67.0	63.0	66.5	4.0
E'metrics	47	34%	38%	11%	11%	4%	2%	73.0	67.0	57.0	64.4	13.9
Game Theory	27	33%	48%	15%	4%	0%	0%	71.5	67.0	60.5	65.7	7.9
Industry	38	24%	61%	16%	0%	0%	0%	69.0	65.0	62.3	65.5	5.0
Inter-national	7	29%	71%	0%	0%	0%	0%	69.0	68.0	65.0	67.1	3.3
Labour	8	38%	38%	25%	0%	0%	0%	75.8	68.0	63.3	68.1	8.1
Micro Analysis	34	38%	38%	18%	3%	3%	0%	74.8	66.5	60.0	65.5	11.4
Money & Banking	50	26%	72%	2%	0%	0%	0%	69.5	67.5	65.3	67.0	3.3
Public	30	23%	77%	0%	0%	0%	0%	66.8	64.5	63.0	65.1	3.1
Sp.Subj.: Env.Econ and Climate Change	3											
Finance	10	0%	100%	0%	0%	0%	0%	68.0	67.0	64.5	66.2	2.6
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 4 (monetary policy response to a productivity shock) was by far the most popular.

Section A (short answer questions)

Question 1 (reduction in the inflation target). For the first part of this question almost all candidates correctly shifted the MR curve downwards and described the subsequent adjustment of real interest rates, output and inflation. A small number of candidates overlooked the lag in the IS curve relationship and asserted that real interest rate changes would adjust output and inflation contemporaneously. For the second part answers were more mixed. The best answers provided definitions of the relevant unemployment concepts, noted that the market is on the PS curve out of equilibrium and deduced that this means a temporary increase in involuntary unemployment and a temporary decrease in voluntary unemployment. Weaker answers started with poor definitions of the unemployment concepts and therefore made incorrect assertions regarding unemployment adjustment. Some candidates claimed that involuntary unemployment is constant if the WS and competitive labour supply lines are parallel, but this is only true in equilibrium and is not correct in the context of this question.

Question 2 (Solow growth model). The first part of the question was a standard exercise and almost all candidates illustrated capital deepening from a rise in the savings rate. For the second part candidates often gave comprehensive accounts of the consumption response to a higher savings rate, arguing that consumption could end up higher, lower or at the same level as it started depending on whether the new capital stock was closer to, further from or equal distance from the golden rule level. Weaker answers ignored the fact that consumption always decreases contemporaneously in this case. The third part was the discriminator. Most candidates set the change in capital to zero to find an expression for the savings rate, but only the best candidates used the numerical values on growth rates and the capital share to calculate a steady-state savings rate of 20%.

Question 3 (inter-temporal consumption model). For the first part many candidates used the example of the Hall model of inter-temporal consumption in which the consumption solution is the annuity value of lifetime wealth which can be expressed as the sum of financial and human wealth. The candidates awarded the highest marks for this part of the question were able to provide a full derivation of the Hall result, including all the relevant assumptions. For the second part a surprising number of candidates made errors in differentiating the utility function when formulating the Euler equation. However, most candidates were able to explain that precautionary saving would follow in this case. For the final part candidates were confident setting out the Ricardian Equivalence Hypothesis and arguing that it would fail when there is precautionary saving but only the best candidates illustrated their answer with an example, e.g. if fiscal changes increase uncertainty regarding future income flows then precautionary saving breaks the Ricardian Equivalence.

Section B (essay questions)

Question 4 (monetary policy response to a positive productivity shock). This question elicited a large number of answers and proved to be a good discriminator. Weaker candidates saw that the productivity shock must shift out the PS and VPC curves but failed to see that PC also shifts and consequently argued for a rise in inflation and subsequent tightening of monetary policy. Better answers noted that PC shifts and demonstrated a fall in inflation from the favourable supply shock followed by below equilibrium real interest rates to give adjustment along the MR line. Candidates did a good job explaining how basic model parameters influence the size of the initial interest rate cut, though hardly any candidates

spotted that there are three effects associated with the alpha parameter – in addition to steepening PC and flattening MR it leads to a larger initial drop in inflation. Candidates also discussed the nature of inflation expectations and the degree of central bank concern for future output and inflation as other determinants of the monetary policy reaction.

Question 5 (nominal GDP targeting). Candidates often failed to give a good account of what nominal GDP targeting actually entails. In support of its adoption candidates argued that the nominal GDP path target helps ensure credibility of the optimal monetary policy response to (a) a cost-push shock when there is a New Keynesian Phillips Curve; (b) the economy hitting the zero lower bound for monetary policy interest rates. The better answers cited various practical difficulties associated with the use of a nominal GDP target. Weaker answers based their discussion around price path targets rather than the nominal GDP targets mentioned in the question.

Question 6 (monetary policy in the open economy). This was a straightforward application of the open economy lecture material. Candidates were given credit for showing that open economies approach equilibrium along an RX locus that is flatter than the closed economy IS curve so that interest rate adjustment is dampened relative to the closed economy case. Relatively few candidates challenged the claim in the question, e.g. through assessing whether net exports and hence demand respond to the real exchange rate in the way presumed in the open economy IS equation in the lectures and the Carlin and Soskice textbook.

Question 7 (directed technical change and the relationship between economic growth and wage inequality). Candidates showed good knowledge of the Acemoglu model of directed technical change and focussed on the elasticity of substitution between skilled and unskilled labour as a determinant of whether or not technology suited to skilled workers will result in a rising wage premium for those who are skilled. Relatively few candidates addressed whether or not changes to wage inequality will impact the incentive to innovate in the future in a way that may affect the extent of directed technical change.

Question 8 (RBC model with positive tax rates on labour and capital income). This question attracted relatively few candidates, perhaps because of the structured nature of the question and the need to show quite specific knowledge. For the first part candidates gave good accounts of the RBC set-up and most candidates argued that positive tax rates dampen fluctuations because a positive technology shock raises returns to factors by less when there is a positive tax wedge. For the second part only the best answers saw that a balanced budget commitment means lowering tax rates in good states and vice versa, so that the volatility of macro variables after a given technology shock is increased. For the final part very few candidates realised that, since fluctuations in an RBC economy are fully efficient, there is no role for counter-cyclical tax policy.

Question 9 (causes and consequences of rising public debt and evaluation of the Maastricht criteria). Candidates produced good discussions of reasons for debt/GDP ratios having increased over time and what the costs of such indebtedness might be. The arguments followed the lectures quite closely. Only the best candidates included relevant technical details such as the equation for debt dynamics. For the final part some candidates were unclear on what the Maastricht criteria actually involved.

Microeconomics

Two hundred and thirty-seven candidates sat the paper: 142 PPE candidates, 83 E&M, and 12 H&E. Again, all questions in Part A were compulsory and there were four questions of unequal weights. This year the weighting on Part A increased from one third to 40%. Two of the questions were fairly easy, the other two were more challenging. It transpired that over 40% of the candidates were rewarded with a first-class mark on Part A (many of them getting a 1st on this paper), although about 15% received less than half marks (and many of those candidates got a 2.2 on this paper).

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

Question	5	6	7	8	9	10
Attempts	27%	17%	58%	17%	65%	17%

Comments on Individual Questions

Part A

1] *General Equilibrium* (ave. 67%)
A number of candidates were confused by the notation and also by it not being explicit which good was the numeraire.
Part (a) and (c) were generally OK, but in part (b) quite a few candidates forgot that for efficiency the endowment has to be exhausted.
There was wide variation in the quality of illustrative diagrams in part (d).

2] *Game Theory* (ave. 66%)
This was well within the capabilities of most candidates, but there wasn't a lot of scope to excel – else the average mark would probably have been higher.

3] *Risk & Expected Utility* (ave. 61%)
Most candidates managed part (a) (bookwork) and part (b) (the simpler calculation) fairly well. Many of those who didn't quite manage the algebra in part (c) got a lot of credit for reasoning their way non-technically to a very good approximation to the answer.
As in Q1, illustrating the results in a diagram proved beyond many candidates, and very few managed to explain the ranking of the prices.

4] *Principal-Agent problem* (ave. 68%)
Similar to Q2, most candidates did not find this problem very challenging.
However, comments on calculations were often sparse, and there was relatively little interpretation of "agency cost".

Part B

The answers tended to be concentrated on just a handful of questions, Q7 and Q9 being very popular. (As last year, the long problem, Q10, was not very popular.)

5] *Social Choice (voting)* (ave. 63%, low spread)
It proved difficult to excel or to blunder when answering this question (very few first class answers, very few third class answers), with approximately 3/4 of those attempting it getting

a mark between 62% and 68%.

6] *Externalities (tradeable permits)* (ave. 60%, lowish spread)
Not a very popular question, but some very good answers and a few poor ones; those in between hovered around the 2.1/2.2 boundary.
One or two candidates thought it was morally wrong not to be allowed to volunteer to join the army but to have to buy a permit to do so.

7] *IO (mergers)* (ave. 64%, low spread)
Very popular, largely bookwork, and not very exciting to mark.
About a fifth of the answers were first class, and very very few were third class.

8] *Expected Utility Theory* (ave. 58%, high spread)
Not very popular. Some excellent answers, but also some rather poor ones, with not much in between, i.e. very few between 52% and 68%.

9] *Asymmetric Information (signalling)* (ave. 66%, lowish spread)
The most popular question, largely bookwork. About a quarter of the answers were first class and over a half were 2.1's. The poorer answers were a bit muddled over the effect of removing the ability to signal.

10] *Competitive Equilibrium (exchange economy)* (ave. 60%, huge spread)
Another not very popular question. About a fifth of the answers were rated 85% or higher, but about the same fraction failed to reach 40%. Most of the rest were fairly evenly spread across the 2.1 & 2.2 bands.

Quantitative Economics

Part A

Q1 was generally done very well, though in part (b) the normality of Z was often merely asserted, without referring to the assumed independence of X and Y.

Q2 elicited responses of widely varying quality. Some entirely omitted giving an abstract definition of Granger causality; others argued that this was related to the 'predictability of Y by X' in a manner that was otherwise left unspecified.

Q3. In part (b), many were tripped up by correct calculation of the standard error for the effect of two additional years of experience. In part (e), few explored the full range of possibilities here, which was needed in order to produce a satisfactory answer; very few gave a cogent discussion of how/why the standard error might change.

Part B

Most of the candidates answered Q4 and Q6. Q4 was generally done well. Q6, on the other hand, proved surprisingly difficult; candidates struggled particularly with parts (b.iii) and (c). For (b.iii) the clear implications of the scenario described for random assignment were generally ignored. A typical response to (c) involved reproducing largely irrelevant material rote-learned from the lecture slides, e.g. making reference to 'SUTVA' or 'imperfect compliance' (not an issue since we have an instrument!). A satisfactory answer required using the information provided in the question to discuss internal validity, as distinct from discussing interval validity in the abstract.

Q7 was generally answered competently, though rarely outstandingly.

Q5, Q8 and Q9 were attempted by relatively few 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

In general, the quality of the scripts was pleasing. The candidates demonstrated a thorough knowledge of the subject matter and answered a wide range of questions although the candidates seemed to prefer the “great divergence” questions to those related to the great depression.

The candidates seem to have preferred Q4 and Q7: both of these were broader questions related to big picture issues. As this was the focus of the course, perhaps next year there could be more these questions. The range and average of the questions was roughly constant across questions.

Candidates were required to answer 3 questions from 10, and the average mark overall reflected the generally high standard of the answers.

Question 1 on the economic stagnation of the Islamic world was answered by 10 candidates. Two candidates demonstrated an exceptional grasp of the issues.

Question 2 on the historical rise of China was only answered by 4 candidates. None of the answers were particularly outstanding.

Question 3 on trust in Africa was answered by 10 candidates. Answers here were less convincing than those provided in question 1.

Question 4 on political fragmentation and Europe’s rise was the most popular question, being answered by 28 candidates. There were a few impressive answers which showed a deep understanding of how feudalism and both inter and intra state competition likely facilitated Europe’s rise.

Question 5 on warfare and the Malthusian regime was answered by 8 candidates. Answers were roughly comparable to the average across all questions.

Question 6 on human capital and income convergence by 10 candidates. Four candidates provided first-class answers.

Question 7 on the Gold Standard and the depression was answered by 15 candidates a few of which provided exceptional answers.

Question 8 on the Great Depression post-war unemployment was attempted by 5 candidates.

Question 9 on individualism and economic development in Italy was attempted by 5 candidates, none of which demonstrated an outstanding grasp of the economic and historical issues involved.

Question 10 on trade and war was attempted by just one candidate.

Econometrics

The candidates were required to answer four questions, with two about Microeconometrics and another two about Macroeconometrics. Questions 1 and 4 were the most popular ones. In contrast to previous years, we substituted the empirical question with an essay question, which only a handful of candidates attempted.

Brief remarks on individual questions

Q1. 39 candidates answered this question. Only a few candidates were able to derive the relationship between the simple linear regression and the sample correlation.

Q2. 31 candidates answered this question. The question had the highest average grade of all questions in Microeconometrics, with a mean grade of 64 points.

Q3. 15 candidates answered this question. The question had the lowest average grade of all questions in Microeconometrics, with a mean grade of 51 points.

Q4. 11 candidates answered this question. Candidates who were able to spell out a linear constant elasticity model performed well in this question.

Q5. 37 candidates answered this question. Only a few candidates were able to state for which coefficients the AR(2) process is stable.

Q6. 20 candidates answered this question. The question had the highest average grade of all questions in Macroeconometrics, with a mean grade of 71 points.

Q7. 36 candidates answered this question. Only a few candidates were able to derive the asymptotic distribution of the Dickey Fuller test.

Q8. Only 3 candidates answered this question. In general, this essay question was poorly answered, and it had the lowest average grade of all questions in Macroeconometrics, with a mean grade of 52 points.

Economics of Developing Countries

The vast majority of marks were in the 2.1 range. There were some truly excellent answers, the highest mark being over 80.

As in previous years, we are pleased to observe that all the questions on the exam were attempted by at least a few 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 similar, with no question being especially high-scoring or low-scoring. Starting this year, the examination has asked candidates to answer three out of eight questions (rather than ten, as previously) and we are especially pleased that there has been no apparent drop in the quality of the answers.

Comments on answers to specific questions.

Q1 – There were 12 responses to this question. Most answers did a good job of analysing various measures of poverty, and in distinguishing between (measures of) poverty and inequality. The better answers pointed out the often-perverse implications of using simple measures such as the Head Count Ratio, and discussed the advantages of using more distributionally sensitive measures.

Q2 – This was a popular question, with 16 responses. This question was particularly well-answered, with most answers being careful to note the credibility of the identification strategies used in the studies that they discussed. The best answers recognised the role of credit and other market failures, and suggested policy responses accordingly.

Q3 – There were 14 responses to this question. Most answers were good, in their coverage of efficiency vs equity arguments for government intervention, and in their discussion of externalities and communicable vs non-communicable diseases. The best answers were also careful to distinguish between government provision and government financing of health services, and in discussing the reasons for ‘government failure’.

Q4 – This was the most popular question, perhaps because it was relatively straightforward, with 24 responses. The weaker answers were too general, and in some cases had a very thin discussion of recent models of co-ordination failure. The better answers really addressed the question, and tried to distinguish between the policy implications of the respective models.

Q5 – Only 6 candidates attempted this question. The most basic answers discussed the distributional implications of reforms such as trade liberalization, and their effect on electoral politics. The better answers discussed the importance of the relative sizes of the affected populations, and considered the possibility that having a majority might not be enough. The best answers specifically considered the political implications of (models of) individual specific uncertainty, and also considered situations where the credibility of ex ante promises of ex post redistribution cannot be taken for granted.

Q6 – There were only 3 responses to this question. While the ‘micro-macro paradox’ had been discussed in the lectures, in the context of education, perhaps candidates were thrown off by the application of this idea to the context of foreign aid. The best answers recognised the obvious difference in context, but also in scale (where aid might form a small portion of the recipient’s economy) and the difficulty of establishing causality in (usually) cross-country regressions.

Q7 – There were 13 responses to this question. There were a few surprisingly weak answers, which were too generic, and did not really address the question. The better answers did a good job of summarising the various explanations that have been discussed in the literature.

Q8 – There were 11 responses to this question. Most answers to the mathematical portions were quite good. The best ones distinguished themselves by conveying the intuition behind the analytics, and with a thoughtful discussion of the (recent) literature on the determinants of migration.

Economics of Industry

There were 38 candidates (22 from E&M, 2 from H&E, and 14 PPE). In the following, n denotes the number of answers. There were 9 scripts with a mark of 70 or more, and 6 with a mark below 60. The questions discriminated well between candidates.

Question 1 (n = 28), on collusion, was the most popular question. Most demonstrated good understanding of the main theoretical factors affecting collusion, and of the models of fluctuating demand, but the discussion of the empirical evidence on the latter was less strong. On the whole, discussion of empirical evidence should mention the nature of the data, and econometric issues that arise, as well as the substantive conclusions of the study.

Question 2 (n = 8), on the effect of market size on margins and firm size under Bertrand and Cournot with free entry, was on material that was covered fully in the lectures. Good answers explained that in Bertrand (with entry costs) only one firm enters, while in Cournot a larger market size reduces the margin, increases the number of firms less than proportionally, and increases firm size. Evidence from Bresnahan and Reiss, and Campbell and Hopenhayn, was relevant for the empirical part of the question.

Question 3 (n = 19) had two parts. Part (a) was standard, and all those answering this question were able to solve for the equilibrium prices in a standard Hotelling model and to show that prices are strategic complements. Part (b) differentiated the candidates. All correctly stated that the socially efficient locations of the firms are at ¼ and ¾, but many failed to find the correct demand functions, which are, perhaps surprisingly, the same as those in the standard Hotelling model when the firms are at 0 and 1. The indifferent customer is defined by $p_A + t(x - 0.25) = p_B + t(0.75 - x)$, and the demand for the firm at ¼ equals x. Those who did not work this out tended to argue that it was as if the line was shortened and was now of length ½. This ignores the fact that the firm at, say ¼, has total demand equal to those customers in between the two firms who prefer that firm, plus those who are in its backyard (¼).

Question 4 (n = 19) on price discrimination and its effects on consumers, was generally well-done. For part (a) the best answers noted that when discrimination leaves total output unchanged total welfare falls and, because profits increase, it must be that aggregate consumer surplus falls as well. Part (b), on discrimination opening a new market, was well-done. Part (c) asked for the effects on consumer welfare of discrimination based on location in the Thisse and Vives model. The best answers explained fully why the equilibrium pricing schedules are what they are.

Question 5 (n = 13) was a general question on advertising and research and development (R&D). Many used this as an opportunity to write down everything they knew about the two topics, rather than choosing models that addressed the question directly. Persuasive advertising might increase output, but at the margin reduces social welfare in the Dixit-Norman model, while informative advertising raises welfare. The fixed costs of advertising and of research and development were mentioned by some. On research and development candidates mentioned that while often total output rises when R&D is done, but noted also that a non-drastic innovation can leave total output unchanged (for example if firms are price-setters).

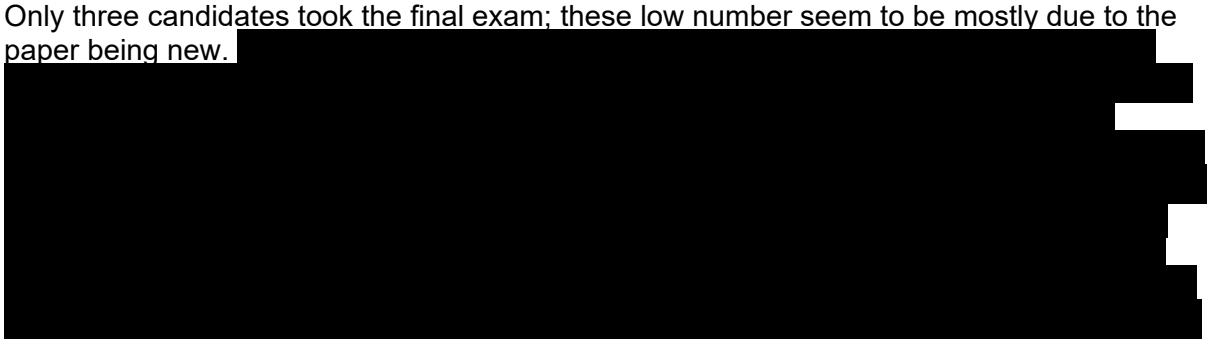
Question 6 (n = 15) had four statements about the effects of a merger in a Cournot framework and asked for conditions (if any) for these statements to hold. The best answers used the analyses of Farrell and Shapiro for parts (a) and (d), and noted that part (b) holds when the condition for part (a) does not hold. Part (c) proved difficult for many: in the standard framework it is not possible for the welfare of both consumers and outside firms to rise with a merger.

Question 7 (n = 3), on the effect of market structure on prices, was moderately done. The better answers discussed the empirical studies and methods in detail, including the econometric issue of endogenous market structure and its solutions.

Question 8 (n = 9) had four statements about vertical relations and candidates were asked to state whether they are true or false and to explain. This was very well answered. It required candidates to know about basic double marginalization, the Rey and Tirole model where demand or retail cost can be uncertain, the secret deals model of Hart and Tirole, and models of exclusive contracts (both the Chicago critique and the effect of externalities amongst buyers).

Environmental Economics and Climate Change

Only three candidates took the final exam; these low number seem to be mostly due to the paper being new.



Game Theory

All candidates attempted four questions, at least one from each part, as required, but a few scripts revealed time-management issues.

Question 1 (a coordination game with economic insights) was attempted by only one candidate under apparent time pressure, they did not make much progress on this question.

Question 2 was taken by all candidates but one; the average mark was near 65 with a standard deviation of 12. Overall this question went well and showed that candidates were generally familiar with fundamental concepts such as dominance, rationalizability and (mixed-strategy) Nash equilibria. In parts (a)-(b) some gave sloppy definitions, and in (c) a common mistake was not explaining why certain strategies were rationalizable. In parts (d)-(g) some failed to check all possible combinations of mixed strategies when checking for all Nash equilibria.

Question 3 (on a linear Cournot-Stackelberg game) was attempted by 10 candidates for an average score of 66; most did well on it, but one solution was seriously incomplete for apparent lack of time. Not-too-common mistakes included not proving (but rather assuming) symmetry and uniqueness in part (a), and not describing SPE strategies away from the equilibrium path in part (c).

Question 4 (on a dynamic protocol for allocating discrete goods) was taken by 12 candidates for an average mark of about 66. Apart from two solutions all were of high quality. Getting the right solution required the use of backward induction; a full description of equilibrium strategies and a careful examination of ties distinguished 1st-class solutions.

Question 5 (on bargaining games) was attempted by 7 candidates; the average mark was 66 with a large standard deviation (three solutions were excellent, the other four seriously flawed). In part b the key was to observe that effort costs are sunk at the bargaining stage; this is indeed the source of inefficiency in part c.

Question 6 (on evolutionary games) was popular with 22 attempts, but the results were mixed: the average mark was around 62 with a standard error over 10. Candidates lost marks for not checking ESS formally in part (a) and leaving their answers to parts (c) and (d) incomplete.

Question 7 (repeated games) was taken by 14 candidates; there were nearly flawless answers but also ones that answered parts (c) through (f) incorrectly. The average mark was around 65 but the standard deviation was over 18. Candidates were expected to construct various repeated-game equilibria such as stick-carrot punishment strategies (part d) and punishment phases involving reversion to Nash equilibria that are ranked differently by the players (part e).

Question 8 (a reputation game) was attempted by 16 candidates; the average mark was around 64 with a standard deviation of about 15. There were a couple of solutions that did not make much progress; others completed the analysis of the game correctly but did not develop a compelling application in the final part.

International Economics

The paper consisted of 8 questions of which candidates had to answer 3. All questions were essay type, which candidates were expected to answer by applying economic principles supported, if appropriate, by figures and/or equations. Four of the questions covered the international trade half of the course, and four international macro-economics.

Seven candidates took the paper. Performance was generally good, with most candidates demonstrating good grasp of the material.

Labour Economics and Industrial Relations

Overall

In general, there were several candidates who provided very strong answers to all the questions they selected. At the same time, there were candidates for whom some essays were strong, while their other essay answers were more mixed in terms of quality. Exceptional answers to any of the essay questions showed a clear understanding of the underlying theoretical concepts and linked those theories to existing empirical evidence. The examiners were particularly impressed by some candidates who tied in evidence from a broader set of papers that were not covered in the lectures. Weaker answers tended to explain some of the theory well but were limited in the discussion of the empirical papers and their relevance to the question asked.

Q1. One candidate answered this question. The candidate explained the underlying theory well and provided an excellent account of the existing literature. The examiners were particularly impressed by the fact that the candidate cited and explained related literature that was not covered in the lecture.

Q2. Several candidates answered this question. There were examples of poor and very good answers to this question. The very good answers explained the empirical study in detail and related it to different theories of discrimination. Poor answers provided little detail on the study and drew wrong conclusions from the empirical findings.

Q3. This question was popular among candidates. Overall, responses to this question were of high to very high quality and exhibited a very good understanding of the material covered. Many of the answers went beyond what had been covered in the lectures, citing additional papers that were relevant to the question asked.

Q4. No attempts

Q5. Several candidates selected this question which asked candidates to explain how one can empirically identify the labour demand curve. Responses to this question were good to very good and carefully explained different approaches by drawing on evidence from different empirical papers.

Q6. This question was very popular among candidates. The quality of the essays written were of mixed quality. While some essays were fantastic, other essays lacked a clear argument and did not display a deep level of understanding. Good answers explained the theory well and tied in the empirical evidence from different empirical papers.

Q7. Several candidates attempted this question. The responses were mixed in terms of quality. The question asked candidates to tie in evidence from different parts of the course, and high-quality answers displayed a good knowledge and understanding of how the different parts were connected.

Q8. Several candidates attempted this question and responses to this question were mixed in terms of quality. Some essays were too narrow in their scope and focused on only one specific aspect, without tying in evidence from different empirical papers.

Microeconomic Analysis

Thirty-four candidates sat the paper: 19 PPE candidates, 15 E&M candidates and no H&E candidate. This paper was in its third year, and it felt as if there was a slight drop-off in general outcomes; also the paper did not seem so good at discriminating between very able candidates and those less able – in the sense that, while those who did well in this paper tended to do well overall (the top 15 each got a 1st across their Economics papers), some others who did well overall fared less well in this paper.

Candidates had to answer any four out of six questions. The top thirteen candidates (6 PPE, 7 E&M) got high marks in at least two questions, almost no mark below 50, and were rewarded with well-deserved firsts; the bottom eight candidates (5 PPE, 3 E&M) got at least two marks at or below 40, no marks higher than 60, and their papers were assessed as 2.2's or worse; as last year, the remaining thirteen candidates (8 PPE, 5 E&M) were spread fairly evenly through the 2.1 band.

Distribution of attempts at questions:

Question	1	2	3	4	5	6
Attempts	74%	71%	74%	82%	35%	65%

Comments on Individual Questions

1] *Linear Algebra; Multivariate Calculus*
(a) Some candidates failed to realise that if an eigenvalue is repeated then one must choose linearly independent corresponding eigenvectors to ensure that the matrix *V* is invertible. Many ran of time for the computations.
(b) This was not well answered: many candidates had some idea how to approach the question but found it hard to produce a clear argument.
(c) This was fairly mechanical and reasonably well answered.

With hindsight, this question was too long.
Overall, the marks were dispersed between 20% and 90%, with a lowish mean.

2] *Constrained Optimisation*
(a, b) Reasonably well answered, though some candidates thought that if a function was not differentiable it could not be continuous.
(c, d) Some failed to notice that (c) was about minimization and (d) maximization, and some failed to read the question carefully and distinguish between global and local optima.

The marks ranged from 35% to 90% with a modest mean and low variance.

3] *General Equilibrium (with certainty)*
Many candidates failed to consider non-negativity constraints.
Part (d) was difficult – probably too tricky for many undergraduates, even very good ones.
The mean was low, and marks ranged from 15% to 95%.

4] *Expected Utility Theory*
This was the most popular question, possibly because it was close to bookwork, and it was answered very well by a number of candidates – half of the attempts received a mark of 75% or higher.
Nevertheless, since there were also a fair number of weak answers, the marks were widely spread out between 20% and 95%, with a mean in the mid 60's.

5] *Principal-Agent problems*
This was the least popular question although those that attempted it tended to do very well –

only two marks below 65%.
Consequently the mean was high (about 73%) and the spread was low.

6] *General Equilibrium (with uncertainty)*
A bit quirky since the conclusion that many/most jumped to was that with three possible states this was also the number of instruments that were required for efficiency – the better candidates backtracked as they developed their answers and some of the answers were outstanding … but there were also many weak ones.
As a result, the mean was modest (about 62%) and the variance was high.

Money and Banking

This paper was taken by 50 candidates. The standard of the scripts was good. All but one of the eleven questions on the paper attracted at least one response. Questions one, two and three were the most popular. The reminder of this report provides comments on the answers to individual questions.

Question 1 (explanations for the pro-cyclicality of credit supply). Candidates drew on knowledge of the narrow lending channel, the broad lending channel, the risk-taking channel and the bank capital channel to account for the pro-cyclicality of credit supply. Examples were based on output movements caused by changes to monetary policy and output movements independent of monetary policy. Most candidates argued that monetary policy should be varied counter-cyclically in order to offset market driven changes in financial conditions. Candidates also argued that policy changes may need to be of smaller magnitude if amplified by some lending channel. Some candidates noted that in downturns lower bound problems may take effect more quickly if policy needs to react to a widening external finance premium and that policy-makers may wish to react to downturns pre-emptively in order to reduce the chances of hitting the lower bound, or engage unconventional policy measures.

Question 2 (predictive power of money for inflation and financial crises). Candidates typically started out with a discussion of the Quantity Theory linking money growth and inflation and linked its declining importance to factors such as Eurodollar effects on the US money supply statistics. The argument that money may signal financial crises was typically illustrated with reference to high rates of money supply growth prior to the financial crisis when inflation was largely on target (though some candidates did not specify whether the examples they used were drawn from the US, the UK or some other country). The best candidates considered the implications of these relationships for monetary policy in light of the Lucas Critique.

Question 3 (unstable equilibria in the Cagan model). Almost all candidates did a good job describing the model and explaining why the high inflation equilibrium was unstable. A typical route through the question was to say that instability made hyperinflation more likely, but then challenge that position with other considerations, for instance a policy-maker may choose not to pursue higher inflation if it foresees hyperinflation will be the result. Very few candidates questioned how an economy might start at a high inflation equilibrium given it is unstable.

Question 4 (rationale for publishing central bank estimates of the neutral rate of interest). This question elicited a very small number of responses.

Question 5 (inversion of the yield curve as a predictor of downturns). Candidates used some version of the term structure equation to make the basic point that an inverted yield curve could reflect expectations of loose future monetary policy in response to a macroeconomic downturn. Candidates were generally good in discussing how quantitative easing may have undermined this relationship, for instance through creating a demand for safe assets of long maturity, but were less forthcoming on regulatory changes and how they may have caused an inversion of the yield curve independently of changed expectations over the future state of the economy.

Question 6 (lessons to be learned from quantitative easing and other unconventional monetary policy). This was a reasonably popular question but candidates tended to rely on tutorial work to give accounts of the transmission mechanisms for such policies without focussing on specific lessons for future use of such policies.

Question 7 EITHER (discount rates and inflation bias). The majority of candidates answering this question were able to explain that a higher discount rate means higher inflation bias under adaptive expectations but not under rational expectations. However, very few candidates were explicit about the rational expectations case and how the absence of any automatic link between current policy and future outcomes prevented any role for the discount rate in shaping inflation bias (a small number of excellent answers discussed

whether punishment strategies may be one way to re-establish a role for the discount rate in setting inflation outcomes).

Question 7 OR (explanations for the requirement on central banks to publish open letters). Most discussions focussed on the Bank of England. Candidates argued that the letter could be interpreted as the penalty for missing the inflation target in the Walsh model, but noted that letters published in the past do not seem to have been interpreted by the Bank as a penalty. Other perspectives were that the letter is primarily a communication device for central banks as they seek to anchor inflation expectations in the aftermath of shocks.

Question 8 (stabilization bias and the form of the Phillips curve). Some candidates produced very poor explanations of the basic stabilization bias. Better answers linked the bias to the existence of the current expectation of future inflation in the NKPC and argued that any down weighting of this term, e.g. in a hybrid Phillips curve, would negate the bias. Some candidates pointed out that sticky prices are not essential for a forwards term in the Phillips curve, for instance in the Christiano, Eichenbaum and Evans indexation model it arises under flexible prices, and that sticky prices are therefore not necessary for a stabilization bias.

Question 9 (optimal inflation rate). This question did not elicit any answers.

Question 10 (Bitcoin and theories of the origin of money). This question was generally well answered. Candidates argued that Bitcoin is an important challenge to state/credit theories given that taxes and the like cannot be settled via Bitcoin, and then went on to consider the extent to which Bitcoin has the characteristics of the form of money that emerges in models such as that proposed by Kiyotaki and Wright.

Public Economics

The answers were generally of satisfactory quality demonstrating a sound grasp of the relevant theory and awareness of empirical evidence. This was the second year the exam was in the new A/B format and candidates overall coped very well with it.

Q1: 30 attempts (compulsory). Good answers described Atkinson-Stiglitz (1976) and its key assumption of separability between consumption and leisure: all goods are equally complementary to leisure. An example of a good (given in IFS lectures) for which this seems most unlikely to be true is childcare, which is an important substitute for leisure.

Q2: 30 attempts (compulsory). A straightforward question, covered in the lectures. In neither the UK nor the US, we observe full platform convergence. However, platforms are more similar than without the push towards the median voter (though hard to establish causality). The central assumptions of the median voter theorem are violated for countries with proportional election systems so it is not surprising if behaviour there is not in line with the theorem.

Q3: 13 attempts. One route to answer this question was very theoretical, explaining how the optimal linear income tax rate is found by setting up a constrained optimisation problem for the government (and then applying Roy's identity and the Slutsky equation, for very good answers). An alternative route was to rely heavily on material from the IFS lecture on taxes, benefits and labour supply, explaining how to estimate the (compensated) elasticity in labour supply. Or, even better, do both.

Q4: 19 attempts. Good answers discussed externalities and internalities as well as different forms of taxation and regulation to affect behaviour. Few answers went into detail on how to estimate the value of a statistical life or QALYs. Very good answers noted that there is variation in the marginal externality: most disease and injury are associated with very high consumption levels. So there will still be deadweight loss from applying a second-best tax.

Q5: 12 attempts. A straightforward question that was close to the lecture but many candidates struggled with this question.

Q6: 16 attempts. Most answers were able to cover the costs and benefits of university education and link this to the probability of leaving the country. The private benefits depend on how transferable the obtained skills are. Law and medicine are harder to transfer than, say, engineering and economics.

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

MCNs (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] (Chair), [redacted]

External Examiners
for E&M: [redacted]
for PPE: [redacted]

[redacted]
Chair, 2019 Economics Subject Board