2530001 (Advanced) 2580044 (Applied)

THE UNIVERSITY of York

Degree Examination 2004

ENVIRONMENT DEPARTMENT

BSc in Environment, Economics and Ecology, Part II
MSc in Environmental Economics and Environmental Management

APPLIED / ADVANCED ENVIRONMENTAL ECONOMICS

(2530001 (Adv.) 2580044 (Appl.))

Time allowed: **two hours**

Answer **TWO** questions out of **FOUR**
Each question is worth 50 marks
Answer all parts of each question selected, and show how you arrived at your answers.

University calculators will be provided.

Pay adequate attention to spelling, punctuation and grammar, so that your answers can be readily understood

1. Consider the following LimDep regression output that presents the coefficient estimates of a reduced-form relationship between catch per unit of effort (CPUE) and effort (TEFFORT) for the tiger prawn fishery.

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+-----------------------------------------------------------------------+
| Ordinary    least squares regression    Weighting variable = none     |
| Dep. var. = CPUE     Mean=   .1723784198    , S.D.=   .3488897312E-01 |
| Model size: Observations =       32, Parameters =   2, Deg.Fr.=    30 |
| Residuals:  Sum of squares= .2766192575E-01, Std.Dev.=         .03037 |
| Fit:        R-squared=  .266932, Adjusted R-squared =          .24250 |
| Model test: F[  1,     30] =    10.92,    Prob value =         .00247 |
| Diagnostic: Log-L =      67.4489, Restricted(b=0) Log-L =     62.4806 |
|             LogAmemiyaPrCrt.=   -6.928, Akaike Info. Crt.=     -4.091 |
| Autocorrel: Durbin-Watson Statistic =   1.73794,    Rho =      .13103 |
+---------+--------------+----------------+--------+---------+----------+
|Variable | Coefficient  | Standard Error |t-ratio |P[|T|>t] | Mean of X|
+---------+--------------+----------------+--------+---------+----------+
 Constant  .2083935994      .12147166E-01    17.156   .0000
 TEFFORT  -.1960936887E-05  .59330082E-06    -3.305   .0025   18366.313
```

The descriptive statistics for the variables employed are:

Descriptive Statistics
All results based on nonmissing observations.

Variable	Mean	Std.Dev.	Minimum	Maximum	Cases
CPUE	.172378420	.348889731E-01	.100566200	.248436563	32
TEFFORT	18366.3125	9192.31249	3439.00000	34551.0000	32

(a) Discuss the economic and statistical significance of the coefficient for TEFFORT.

(7 marks)

(b) Discuss the statistical significance of the regression.

(7 marks)

(c) Compute and interpret the elasticity of catch per unit of effort with respect to changes in effort.

(7 marks)

(d) Compute and interpret the maximum sustainable yield of the tiger prawn fishery.

(14 marks)

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(e) Given a logistic growth model

$$\frac{ds}{dt} = rs(K - s),$$

and a harvesting function

$$h(e, s) = aes,$$

where

- $s > 0$ is the *stock* of fish at time t,
- $e > 0$ is an index of effort at time t,
- $0 < r < 1$ is the *instantaneous growth rate* of the fish biomass,
- K represents the *carrying capacity*, and
- $a > 0$ is the *technological efficiency* of the harvest function,

derive a steady-state reduced-form relationship between between catch per unit of effort, $\frac{q}{e}$, and effort, e, that can be estimated by OLS.

(15 marks)

/please turn over ...

2. An incinerator was build in Massachusetts in 1981. Data on nearby house prices (expressed in 1978 dollars) and other house characteristics are available for two years, one before the construction, 1978, and one after, 1981. Consider the following model estimated using the 1981 year data in which *rprice*, the house price, is determined by the distance from the incinerator dummy *nearinc* defined as

$$nearinc = \begin{cases} 1, & \text{if } distance \leq 15840 \text{ feet;} \\ 0, & \text{otherwise.} \end{cases}$$

P-values are reported in parentheses below the coefficient estimates and after the test statistics.

$$\widehat{rprice} = \underset{(0.000)}{101307.5145} - \underset{(0.000)}{30688.27376}\, nearinc$$

$$n = 142, \quad F = 27.73 \quad (0.000), \quad R^2 = 0.165, \quad RSS = 0.1366141153 \cdot 10^{12}.$$

(a) Discuss the economic significance of the estimated coefficients.

(7 marks)

(b) Discuss the statistical significance of the regression.

(7 marks)

(c) The following model was estimated using the 1978 year,

$$\widehat{rprice} = \underset{(0.000)}{82517.22764} - \underset{(0.000)}{18824.37050}\, nearinc$$

$$n = 179, \quad F = 15.74 \quad (0.0001), \quad R^2 = 0.082, \quad RSS = 0.1533244717 \cdot 10^{12}.$$

Based on the results from the 1978 and 1981 years models, compute and interpret the impact of the incinerator on values of houses near the incinerator site.

(7 marks)

(d) Based on the results from the 1978 and 1981 years models and the following pooled model,

$$\widehat{rprice} = \underset{(0.0000)}{91035.49102} - \underset{(0.000)}{24456.64071}\, nearinc$$

$$n = 321, \quad F = 41.32 \quad (0.000), \quad R^2 = 0.115, \quad RSS = 0.3107454541 \cdot 10^{12}.$$

test whether the regression model differs across the two years.

(7 marks)

(e) Based on the results from the following estimated pooled model,

$$\widehat{rprice} = \underset{(0.326)}{10480.454} + \underset{(0.000)}{13502.286}\, y81 + \underset{(0.058)}{7493.655}\, nearinc - \underset{(0.003)}{15269.716}\, y81nrinc -$$
$$- \underset{(0.000)}{853.583}\, age + \underset{(0.000)}{4.065}\, agesq + \underset{(0.000)}{22.094}\, area + \underset{(0.006)}{4576.815}\, rooms$$

$$n = 321, \quad F = 74.35 \quad (0.000), \quad R^2 = 0.624, \quad RSS = 0.1318184386 \cdot 10^{12},$$

where *age* is the age of the house, *agesq* its square, *rooms* is the number of rooms in the house, *area* is the square footage of the house, *y81* is a dummy equal to 1 if the year is 1981, and *y81nrinc* is an interaction term equal to $y81 \times nearinc$. Test whether the impact of the construction of the incinerator is significantly different from zero.

(7 marks)

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(f) The model in (e) was re-estimated after dropping the *nearinc* variable resulting in the following estimated model,

$$\widehat{rprice} = \underset{(0.179)}{14194.193} + \underset{(0.000)}{11524.351}\, y81 - \underset{(0.024)}{9126.162}\; y81nrinc -$$

$$- \underset{(0.000)}{755.343}\, age + \underset{(0.000)}{3.522}\, agesq + \underset{(0.000)}{22.625}\, area + \underset{(0.015)}{4044.906}\, rooms,$$

$$n = 321, \quad F = 85.42 \quad (0.000), \quad R^2 = 0.620, \quad RSS = 0.1333478788 \cdot 10^{12}.$$

Compare the estimate on the interaction term *y81nrinc* with the one in (e). Explain why they are different.

(8 marks)

(g) The squared predicted value was added to the regression model in (d) and, after OLS estimation, the P-value for this variable was found to be 0.0588. How does this information affect the your interpretation of the regression results? How would you modify your model?

(7 marks)

3. Consider the panel regression results given in Table 1 of a reduced-form model. Individual- and time-specific effects are included in the regressions. The dependent variable is the log of sulfur emission measured in tonnes of sulfur per capita. The independent variables are the log of per capita GDP, its square, and the log of trade. GDP per capita is measured in **thousands** real 1990 international dollars (The mean of LGDP is equal to 12.4, the minimum to 3.73, and the maximum to 20.9). TRADE is a measure of openness computed as the ratio of imports plus exports to GDP. There are 95 countries in the panel and the time span is 1980–1990. Figures in parentheses are P-values for regression coefficients and the Hausman tests.

Table 1: Panel Regression Results

Region	World		OECD		Non-OECD	
Model	FE	RE	FE	RE	FE	RE
Constant	−5.526 (0.0044)	−5.129 (0.0043)	−72.452 (0)	−68.932 (0)	−3.850 (0.0613)	−3.967 (0.0380)
LGDP	3.158 (0.002)	2.972 (0.0020)	34.240 (0)	34.542 (0)	2.191 (0.0463)	2.347 (0.0231)
LGDP2	−0.349 (0.0099)	−0.310 (0.0163)	−3.833 (0)	−4.083 (0)	−0.227 (0.1214)	−0.243 (0.0831)
LTRADE	0.248 (0.0102)	0.078 (0.3559)	−0.638 (0.1573)	−1.011 (0.0068)	0.328 (0.0019)	0.147 (0.1097)
Hausman	13.32 (0.003994)		6.13 (0.105530)		12.24 (0.006616)	

(a) Discuss the economic and statistical significance of the coefficients for LTRADE in the OECD equation estimated by random effects (RE).

(7 marks)

(b) Compute and interpret the elasticity of *per capita* sulfur emissions with respect to changes in *per capita* income using the fixed effects (FE) estimates for the OECD sample.

(7 marks)

(c) Explain what kind of unobserved effects are accounted for by the inclusion of individual- and time-specific effects in the EKC panel models.

(7 marks)

(d) Based on the Hausman statistic decide for each sample (world, OECD, and non-OECD) which model, with fixed or random effects, is more appropriate.

(7 marks)

(e) Compute the relevant turning points of the estimated curves for the world, OECD and non-OECD samples.

(7 marks)

(f) What does *reduced-form* model mean (contrast it to a possible structural-form model of which the EKC equation is just one of the equations of a system)?

(15 marks)

4. Table 2 shows a three sector input-output table for the UK. The values are expressed in millions of pounds at 1993 basic prices. The table shows the value of domestically produced inputs going into the production of each commodity.

Table 2: Input-output table

	Primary	**Manufacturing**	**Services**	**Final demand**	**Total**
Primary	3969	15702	6211	12259	38141
Manufacturing	5742	75219	62070	148041	291071
Services	6294	55369	253490	502441	817593
Imports	2935	41100	31873	92366	168275
Sales by FD	3	453	1682	-2139	0
Net taxes	-2483	1440	29024	55155	83137
Value added	21680	101787	433245	0	556500
Total	38141	291071	817593	808122	1954717

(a) Compute the direct requirements matrix and use Newman's series to approximate Leontief's inverse using $k = 3$ (third order approximation).

(7 marks)

(b) Interpret the coefficient of the manufacturing column of the Leontief inverse.

(7 marks)

Using the following table on direct CO_2 emission intensities measured in tonnes of CO_2 emitted per million of pounds of spending on domestic 1993 production,

Table 3: Direct emmission intensities of CO_2 table

	Primary	**Manufacturing**	**Services**
CO_2	1634	404	5687

(c) Compute the direct and indirect emission intensity vector of CO_2 and interpret its values.

(7 marks)

(d) Compute the base run commodity supply (gross output) and the base run emissions of CO_2.

(7 marks)

(e) Compute a new final demand assuming a 10 per cent increase in spending in the services sector sector off–set by a decrease of the manufacturing sector such that the aggregate final demand is unchanged.

(7 marks)

(f) Compute the counterfactual supply and the counterfactual emissions of CO_2 implied by the new final demand, and, using the base run emissions of CO_2 as a benchmark equilibrium, compare the new counterfactual equilibrium with the benchmark one.

(7 marks)

(g) Discuss the assumptions about the production technology underlying input-output analysis.

(8 marks)

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