

University of Wollongong - Research Online

Thesis Collection

Title: The multiple inter-relationships among health status, education, income and lifestyle factors: evidence from Australia

Author: Jae Hyung Lee

Year: 1997

Repository DOI:

Copyright Warning

You may print or download ONE copy of this document for the purpose of your own research or study. The University does not authorise you to copy, communicate or otherwise make available electronically to any other person any copyright material contained on this site.

You are reminded of the following: This work is copyright. Apart from any use permitted under the Copyright Act 1968, no part of this work may be reproduced by any process, nor may any other exclusive right be exercised, without the permission of the author. Copyright owners are entitled to take legal action against persons who infringe their copyright. A reproduction of material that is protected by copyright may be a copyright infringement. A court may impose penalties and award damages in relation to offences and infringements relating to copyright material.

Higher penalties may apply, and higher damages may be awarded, for offences and infringements involving the conversion of material into digital or electronic form.

Unless otherwise indicated, the views expressed in this thesis are those of the author and do not necessarily represent the views of the University of Wollongong.

Research Online is the open access repository for the University of Wollongong. For further information contact the UOW Library: research-pubs@uow.edu.au

1997

The multiple inter-relationships among health status, education, income and lifestyle factors: evidence from Australia

Jae Hyung Lee
University of Wollongong

Follow this and additional works at: <https://ro.uow.edu.au/theses>

University of Wollongong

Copyright Warning

You may print or download ONE copy of this document for the purpose of your own research or study. The University does not authorise you to copy, communicate or otherwise make available electronically to any other person any copyright material contained on this site.

You are reminded of the following: This work is copyright. Apart from any use permitted under the Copyright Act 1968, no part of this work may be reproduced by any process, nor may any other exclusive right be exercised, without the permission of the author. Copyright owners are entitled to take legal action against persons who infringe their copyright. A reproduction of material that is protected by copyright may be a copyright infringement. A court may impose penalties and award damages in relation to offences and infringements relating to copyright material.

Higher penalties may apply, and higher damages may be awarded, for offences and infringements involving the conversion of material into digital or electronic form.

Unless otherwise indicated, the views expressed in this thesis are those of the author and do not necessarily represent the views of the University of Wollongong.

Recommended Citation

Lee, Jae Hyung, The multiple inter-relationships among health status, education, income and lifestyle factors: evidence from Australia, Doctor of Philosophy thesis, Department of Economics, University of Wollongong, 1997. <https://ro.uow.edu.au/theses/1325>

NOTE

This online version of the thesis may have different page formatting and pagination from the paper copy held in the University of Wollongong Library.

UNIVERSITY OF WOLLONGONG

COPYRIGHT WARNING

You may print or download ONE copy of this document for the purpose of your own research or study. The University does not authorise you to copy, communicate or otherwise make available electronically to any other person any copyright material contained on this site. You are reminded of the following:

Copyright owners are entitled to take legal action against persons who infringe their copyright. A reproduction of material that is protected by copyright may be a copyright infringement. A court may impose penalties and award damages in relation to offences and infringements relating to copyright material. Higher penalties may apply, and higher damages may be awarded, for offences and infringements involving the conversion of material into digital or electronic form.



**THE MULTIPLE INTER-RELATIONSHIPS
AMONG HEALTH STATUS, EDUCATION,
INCOME, AND LIFESTYLE FACTORS:
EVIDENCE FROM AUSTRALIA**

By

JAE HYUNG LEE

**Ph.D Thesis submitted to the Department of Economics
The University of Wollongong,
Northfields Avenue, Wollongong,
New South Wales, 2522
Australia**

Telephone: 61 42 213666

Facsimile: 61 42 213725

ACKNOWLEDGEMENTS

I would like to thank Professor Don Lewis of the University of Wollongong for his encouragement and guidance throughout my study.

Insightful comments on the thesis were made by Professor Phil Lewis of Murdoch University, Associate Professor Rob Castle and Senior Lecturer Ed Wilson of the University of Wollongong.

Addressing the points raised by thesis examiners, Dr. Pat Wilson, Dr. Jim Butler of Australian National University, and Associate Professor John Mangan of Lancaster University and the University of Queensland, improved the thesis.

The Australian Bureau of Statistics was most helpful in supplying data and detailed information about the data used in this study.

Finally, I would like to thank Mr David McCoy and Mrs Rhonda McCoy for their careful typing of numerous drafts and the final version of this thesis.

TABLE OF CONTENTS

	Page
Acknowledgements	ii
Table of Contents	iii
List of Tables	v
List of Figures	xi
Abstract	xii
1.0 INTRODUCTION	1
2.0 REVIEW OF PREVIOUS STUDIES	9
2.1 THE INTER-RELATIONSHIPS AMONG HEALTH STATUS, EDUCATION, AND INCOME	9
2.1.1 Endogenous Health	9
2.1.2 Endogenous Education	14
2.1.3 Endogenous Income	16
2.2 LIFESTYLE FACTORS - SMOKING AND DRINKING BEHAVIOURS	24
3.0 ANALYTICAL FRAMEWORK	27
3.1 THE INTER-RELATIONSHIPS AMONG HEALTH STATUS, EDUCATION, AND INCOME	28
3.2 LIFESTYLE FACTORS - SMOKING AND DRINKING BEHAVIOURS	39
4.0 DATA	48
5.0 ESTIMATION RESULTS	54
5.1 THE INTER-RELATIONSHIPS AMONG HEALTH STATUS, EDUCATION, AND INCOME	54
5.1.1 Diagnostic Testing of the Hypothesis	54
5.1.2 Estimates of the Inter-relationships Among Health Status, Education, and Income	65
5.1.3 Impact of the Gender Distribution	81
5.1.4 Impact of the Skill Level	86
5.1.5 Impact of the Control Variables	90
5.2 LIFESTYLE FACTORS - SMOKING AND DRINKING BEHAVIOUR	104
5.2.1 Moderate Drinking	104
5.2.2 Smoking and Excessive Drinking	122
5.2.3 Impact of the Control Variables	133

TABLE OF CONTENTS - (Continued)

	Page
6.0 SUMMARY AND POLICY IMPLICATIONS	139
6.1 SUMMARY OF PRINCIPAL FINDINGS	139
6.1.1 The Multiple Inter-relationships Among Health Status, Education and Income	140
6.1.2 Lifestyle Factors - Smoking and Drinking Behaviours	149
6.2 POLICY IMPLICATIONS	155
7.0 REFERENCES	162
8.0 APPENDICES	171

LIST OF TABLES

	Page
Table 3.1	Definition of Selected Variables 30
Table 4.1	Source of Selected Variables 48
Table 5.1	Non-Nested Test of Double Logarithmic Versus Linear Models of Each of Three Indicators of Health (No Recent Illness, No Chronic Condition, and Self-assessed Good Health), Education, and Income 57
Table 5.2	Tests of Independence Among Three Indicators of Health (No Recent Illness, No Chronic Condition, and Self-assessed Good Health), Education, and Income 59
Table 5.3	Diagnostic Evaluation of Each Equation for Three Indicators of Health (No Recent Illness, No Chronic Condition, and Self- assessed Good Health), Education, and Income: The OLS Estimates 62
Table 5.4	Estimates of the Inter-relationships among Three Indicators of Health (No Recent Illness, No Chronic Condition, and Self-assessed Good Health), Education, and Income 68
Table 5.5	Estimates of Total (Indirect) Effect of University on Three Indicators of Health (No Recent Illness, No Chronic Condition, and Self-assessed Good Health) through Education and Income 73
Table 5.6	Summary Statistics for Changes in Intercept and Slope of Three Indicators of Health (No Recent Illness, No Chronic Condition, and Self-assessed Good Health) in Education and Income Functions due to the University Dummy: Two-Stage Least Squares (TSLS) Estimates 78
Table 5.7	Estimates of the Impact of Gender on Three Indicators of Health (No Recent Illness, No Chronic Condition, and Self-assessed Good Health) 82
Table 5.8	Estimates of Total (Indirect) Effect of Gender on Education and Income through Three Indicators of Health (No Recent Illness, No Chronic Condition, and Self-assessed Good Health) 85
Table 5.9	Estimates of the Impact of Skill Level on Education and Income 88
Table 5.10	Estimates of Total (Indirect) Effect of Three Indicators of Health (No Recent Illness, No Chronic Condition, and Self-assessed Good Health) on Skill Level through Education and Income 89

LIST OF TABLES - (Continued)

		Page
Table 5.11	Estimates of the Control Variables on Three Indicators of Health (No Recent Illness, No Chronic Condition, and Self-assessed Good Health)	94
Table 5.12	Estimates of the Control Variables on Education and Income	97
Table 5.13	Non-Nested Test of Double Logarithmic versus Linear Models of Each of No Recent Illness, Self-assessed Good Health, and Moderate Drinking	106
Table 5.14	Tests of Independence Between Each of No Recent Illness and Self-assessed Good Health, and Moderate Drinking	109
Table 5.15	Diagnostic Evaluation for Each Equation for No Recent Illness, Self-assessed Good Health, and Moderate Drinking: The OLS Estimates	112
Table 5.16	Estimates of Each Function for No Recent Illness, Self-assessed Good Health, and Moderate Drinking	116
Table 5.17	Estimates of Direct, Indirect, and Total Effects of Education and Income on Moderate Drinking	119
Table 5.18	Estimates of Direct, Indirect, and Total Effects of Smoking and Excessive Drinking on No Recent Illness and Self-assessed Good Health	120
Table 5.19	Non-Nested Test of Double Logarithmic versus Linear Models of Each of Smoking and Excessive Drinking	124
Table 5.20	Diagnostic Evaluation of Each of the Smoking and Excessive Drinking Equations: The OLS Estimates	126
Table 5.21	Estimates of the Smoking and Excessive Drinking Equations	131
Table 5.22	Estimates of Other Explanatory Variables in the No Recent Illness, Self-assessed Good Health, and Moderate Drinking Equations	134
Table 5.23	Estimates of Other Explanatory Variables in the Smoking and Excessive Drinking Equations	137

LIST OF TABLES - (Continued)

		Page
Table 6.1	The Ceteris Paribus Direct, Indirect, and Total Proportionate Rates of Changes of Three Indicators of Health (No Recent Illness, No Chronic Condition, and Self-assessed Good Health) with respect to Education and Income	156
Table 6.2	The Ceteris Paribus Direct, Indirect, and Total Proportionate Rates of Changes of Education and Income with respect to Three Indicators of Health, Education, and Income	156
Table 6.3	The Ceteris Paribus Total Proportionate Rates of Changes of Three Indicators of Health, Education, and Income with respect to Lifestyle Factors	157
Appendices		
Table A-1	Statistical Regional Structure in Australia	172
Table A-2	Rank Criterion Matrix of the Structural Equations for Three Indicators of Health (No Recent Illness, No Chronic Condition, and Self-assessed Good Health), Education, and Income	173
Table A-3	Rank Criterion Matrix of the Structural Equations for No Recent Illness, Self-assessed Good Health, and Moderate Drinking	175
Table A-4	Rank Criterion Matrix of the Structural Equations for Smoking and Excessive Drinking	176
Table A-5	Simple Bivariate Correlation Coefficients Between Each Pair of the State Dummies	177
Table A-6	Simple Bivariate Correlation Coefficients Between Each Pair of the State Variables Interacted with Public Health Expenditure per Person (age 15 Years or Over)	178
Table A-7	List of Australian Universities by Statistical Regions in Parentheses	179
Table A-8	Simple Bivariate Correlation Coefficients Among Selected Variables	184
Table A-9	Contingency Table: Cross-Classification Between No Recent Illness and Education	194

LIST OF TABLES - (Continued)

	Page
Table A-10 Contingency Table: Cross-Classification Between No Recent Illness and Income	195
Table A-11 Contingency Table: Cross-Classification Between No Chronic Condition and Education	196
Table A-12 Contingency Table: Cross-Classification Between No Chronic Condition and Income	197
Table A-13 Contingency Table: Cross-Classification Between Self-assessed Good Health and Education	198
Table A-14 Contingency Table: Cross-Classification Between Self-assessed Good Health and Income	199
Table A-15 Contingency Table: Cross-Classification Between Education and Income	200
Table A-16 Reduced-form Estimates of the Pairs of Structural Equations for Three Indicators of Health (No Recent Illness, No Chronic Condition, and Self-assessed Good Health), Education, and Income	201
Table A-17 Estimates of the No Recent Illness Equation: Specifications I and II	203
Table A-18 Estimates of the No Chronic Condition Equation: Specifications I and II	205
Table A-19 Estimates of the Self-assessed Good Health Equation: Specifications I and II	207
Table A-20 The Ceteris Paribus Estimates of the Education Equation: Specifications I, II, III, and IV	209
Table A-21 The Ceteris Paribus Estimates of the Income Equation: Specifications I, II, III, IV, V, and VI	210
Table A-22 Estimates of the Education Equation: Specifications I and II	211
Table A-23 Estimates of the Income Equation: Specifications I and II	213

LIST OF TABLES - (Continued)

	Page
Table A-24 Reduced-form Estimates of the Pairs of Structural Equations for Three Indicators of Health (No Recent Illness, No Chronic Condition, and Self-assessed Good Health) and Education	215
Table A-25 Reduced-form Estimates of the Pairs of Structural Equations for Three Indicators of Health (No Recent Illness, No Chronic Condition, and Self-assessed Good Health) and Income	217
Table A-26 Reduced-form Estimates of the Pairs of Structural Equations for Education and Income	219
Table A-27 The Ceteris Paribus Estimates When Omitting H ₁ from the Education Equation, and H ₂ and H ₃ from the Income Equation: Specifications I and II	220
Table A-28 Estimates of the Control Variables on Education and Income: Specifications I and II	221
Table A-29 Contingency Table: Cross-Classification Between No Recent Illness and Gender	224
Table A-30 Contingency Table: Cross-Classification Between No Chronic Condition and Gender	225
Table A-31 Contingency Table: Cross-Classification Between Self-assessed Good Health and Gender	226
Table A-32 Reduced-form Estimates on Three Indicators of Health (No Recent Illness, No Chronic Condition, and Self-assessed Good Health) and Gender	227
Table A-33 Contingency Table: Cross-Classification Between Education and Skill Level	229
Table A-34 Contingency Table: Cross-Classification Between Income and Skill Level	230
Table A-35 Reduced-form Estimates on Education, Income, and Skill Level	231
Table A-36 Contingency Table: Cross-Classification Between Moderate Drinking and No Recent Illness	233

LIST OF TABLES - (Continued)

		Page
Table A-37	Contingency Table: Cross-Classification Between Moderate Drinking and Self-assessed Good Health	234
Table A-38	Contingency Table: Cross-Classification Between Moderate Drinking and No Chronic Condition	235
Table A-39	Contingency Table: Cross-Classification Between Smoking and Excessive Drinking	236
Table A-40	Contingency Table: Cross-Classification Between Moderate Drinking and Smoking	237
Table A-41	Contingency Table: Cross-Classification Between No Recent Illness and Smoking	238
Table A-42	Contingency Table: Cross-Classification Between No Chronic Condition and Smoking	239
Table A-43	Contingency Table: Cross-Classification Between Self-assessed Good Health and Smoking	240
Table A-44	Reduced-form Estimates of the Pairs of Structural Equations for No Recent Illness, Self-assessed Good Health, and Moderate Drinking	241
Table A-45	Reduced-form Estimates of the Pairs of Structural Equations for Smoking and Excessive Drinking	242

LIST OF FIGURES

		Page
Figure 1.1	Inter-relationships Among Health, Education, and Income	3
Figure 3.1	Inter-relationships Among Three Indicators of Health (No Recent Illness, No Chronic Condition, and Self-assessed Good Health), Education, and Income: Effect of Gender	34
Figure 3.2	Inter-relationships Among No Recent Illness, Self-assessed Good Health, and Moderate Drinking: Effects of Education, Income, No Chronic Condition, Smoking, No Drinking, and Excessive Drinking	44
Figure 3.3	Inter-relationships Between Smoking and Excessive Drinking: Effects of Education, Income, and Moderate Drinking	47

ABSTRACT

This dissertation examines the inter-relationships among health, education, income, and health-related behaviour as measured by alcohol consumption and smoking. The cross-section models are estimated using data from Australia's sixty-one statistical regions to analyse multiple causal relationships among factors taken as endogenous. Classifying health indicators as 'no recent illness', 'no chronic condition', and 'self-assessed good or excellent health', ten models are presented and econometrically evaluated. The first, second, third, fourth, and fifth models take the proportions of persons with no recent illness and no chronic conditions, the proportion of persons aged 18 years or over with self-assessed good or excellent health, the proportion of persons aged 15 years or over with post-school qualifications, and nominal gross annual median income of persons aged 15 years or over, respectively, as endogenous. The inter-relationships among the proportion of persons with no recent illness, the proportion of persons aged 18 years or over with self-assessed good or excellent health, and the proportion of persons aged 18 years or over with moderate alcohol consumption are specified in the sixth, seventh, and eighth models. The proportions of persons aged 18 years or over with cigarettes consumption and with excessive alcohol consumption are taken as endogenous in the ninth and tenth models.

Diagnostic checks are conducted to evaluate all the models. The tests include the non-nested tests, the tests of independence, the tests for endogeneity and exogeneity, the RESET tests for functional form misspecification, and the tests for heteroskedasticity. The parameter stability of the models is also tested and then (if any instability is apparent) parameter instability analysis is carried out. In addition, the direct, indirect, and total effects of variables exogenously determined in the individual models are manifested, since all the models are identified.

The empirical evidence is consistent with the hypotheses that there are multiple inter-relationships (a) among the proportion of persons with each of no recent illness and no chronic conditions, the proportion of persons aged 18 years or over with self-assessed good or excellent health, the proportion of persons aged 15 years or over with post-school

qualifications and nominal gross annual median income of persons aged 15 years or over, (b) among the proportion of persons with no recent illness, the proportion of persons aged 18 years or over with self-assessed good or excellent health and the proportion of persons aged 18 years or over with moderate alcohol consumption, and (c) between the proportions of persons aged 18 years or over with cigarettes consumption and with excessive alcohol consumption.