DOCTORS AT WORK: DETERMINANTS OF SUPPLY AND DEMAND IN THE AUSTRALIAN GP MARKET

Ian Stewart McRae

A thesis submitted for the degree of Doctor of Philosophy of
The Australian National University

January 2008
Declaration

Except where it is otherwise indicated, the work in this thesis is my own.

Ian McRae

January 2008
Acknowledgements

Many people have contributed to the development of this thesis. My many colleagues from the Department of Finance and the Department of Health and Ageing assisted me when I first encountered the mysteries of Australian health financing. In particular my thanks to the staff in the Department of Health and Ageing who provided the data which formed the basis of this thesis.

I am extremely grateful for the friendship and support of my student colleagues, who have graciously tolerated a student older than most of their parents, and especially Vicky Ng-Brett and Terence Cheng who shared offices with me and helped me in many ways.

Professor Jim Butler, Professor Bruce Chapman, Dr Alexandra Sidorenko and Dr Prem Thapa who have formed my supervisory panel have provided much sage advice, encouragement, and assistance. My special thanks to Professor Butler, who as chair of my panel has made substantial contributions to the direction of my work.

Thanks to David Gardiner who proofread the thesis in accordance with the Australian Standard for Editing Practice.

Finally no-one can take on an enterprise like a PhD without their family. My love and thanks go to my children Ben, Sebastian and Adam for their support and to my mother-in-law Rosa for keeping me grounded whenever necessary. While my mother Mavis will sadly not see the completion of the process, she and my father Hugh have given me all the support possible through the last four years.

My deepest love and gratitude of course go to Roberta, who has provided support above and beyond the call of duty, and without whom not only this Ph D but anything else I have achieved in life would not have been possible.
Abstract

During the period 1996 to 2003, the annual number of general practitioner (GP) services per capita in Australia fell by 14 per cent and the proportion of services bulk billed (i.e. provided at no cost to the patient) fell by 12 percentage points. This substantial reduction in access to services was such that the government responded by increasing government medical insurance rebates, increasing the number of GPs in Australia and providing incentives for GPs to bulk bill.

There has been no comprehensive modelling of the market for GP services to assist in understanding the reasons for these declining trends. This thesis aims to fill that gap. It is the first Australian study of the GP market using panel data, and the first to explicitly examine the market as a whole, including the interaction between the supply and demand factors.

Previous Australian modelling of the GP market has been cross-sectional and mostly demand-focused. This thesis uses panel modelling techniques applied to data for the period from 1996 to 2003 to minimise the biases faced by the previous cross-sectional analyses. The study estimates explicit supply and demand equations, explores the relationship between these equations and the market outcomes, and establishes the impact of policy and other factors on the market for GP services.

It shows that, in the short term, the main determinant of demand for Australian general practice services is the real value of the Medicare rebate. Further, the supply curve, which is determined jointly by aggregate numbers of GPs and by the number of services they provide on average, is near vertical which implies demand changes have little impact on service volumes, but do impact on prices. GP age and gender partially determine the average number of services provided per GP, but a trend effect which is arguably due to attitudinal changes is a major determinant of GP activity levels.

The models estimated in this thesis show that supplier-induced demand may apply in Australian general practice but is not material. They also show that GPs who charge
patients with concession cards less than other patients are behaving economically rationally, and that when the government increases the Medicare rebate payment, about 85 per cent of the real value of the increase goes to the GP and 15 per cent to the patient. The analysis was unable to detect any effect of GP density or of the business cycle on mortality in Australia.

This thesis provides the first empirically based overview of the behaviour of the GP market around the end of the twentieth century. In doing so it shows how government policy initiatives and other trends interact to generate the market outcomes that are observed. If the government has targets for service levels or pricing patterns in general practice, these models can facilitate the design of the policy options appropriate to achieve those targets.
# Contents

Declaration......................................................................................................................... ii

Acknowledgements .......................................................................................................... iii

Abstract............................................................................................................................. iv

Contents ............................................................................................................................ iv

List of Tables .................................................................................................................. xiii

List of Figures and Charts ............................................................................................ xvi

Glossary of Acronyms................................................................................................... xvii

Chapter 1: Introduction ....................................................................................................1

1.1 The Australian Medicare System for General Practice........................................ 2
1.2 A Brief History of GP Services under Medicare ................................................ 3
1.3 Issues to be Addressed........................................................................................ 5
1.4 Previous Australian Analyses ............................................................................. 7
1.5 Approach to Analysis.......................................................................................... 8
1.6 Outline of the Thesis........................................................................................... 9

Chapter 2: Background and Literature Review ...........................................................11

2.1 Introduction....................................................................................................... 11
2.2 General Practice in the Australian Medicare System ......................................... 12
   2.2.1 General Structure of Medicare................................................................... 12
   2.2.2 The MBS Rebates Applicable to GPs........................................................ 13
   2.2.3 Vocationally Registered GPs (VR GPs) .................................................... 14
   2.2.4 Other Medical Practitioners (OMPs)........................................................ 15
   2.2.5 Enhanced Primary Care (EPC) and Service Incentive Payments (SIP)..... 16
   2.2.6 Other Services Provided by GPs................................................................. 16
   2.2.7 Length of Consultations............................................................................. 17
   2.2.8 Payment Arrangements.............................................................................. 18
   2.2.9 Indexation of Rebates ................................................................................ 18
2.3 Trends and Structures in the Australian GP Market ............................................. 19
Chapter 5: The Impact of Border Crossing ................................................................. 136
  5.1 Introduction ..................................................................................................... 136
  5.2 Border Crossing and Supplier-induced Demand ............................................ 137
    5.2.1 What is Border Crossing in General Practice? ........................................ 137
    5.2.2 Why Does Border Crossing Matter? ....................................................... 138
    5.2.3 How Has Border Crossing Been Accommodated? .................................. 139
  5.3 Border Crossing at Different levels of Aggregation ....................................... 139
    5.3.1 The Measure of Border Crossing ............................................................ 139
    5.3.2 The Impact of Aggregation on Border Crossing ...................................... 141
    5.3.3 The Impact of Border Crossing on Fees Charged .................................... 141
  5.4 Preliminary Models of GP Demand to Explore Border Crossing Effects ...... 144
    5.4.1 The Demand Models Estimated ............................................................... 144
    5.4.2 Results of the Modelling ........................................................................ 145
    5.4.3 Summary of Preliminary Modelling ....................................................... 146
  5.5 Conclusion ...................................................................................................... 149

Chapter 6: Supply and Demand Interaction: Structural Equation Estimates ........ 150
  6.1 Introduction ..................................................................................................... 150
  6.2 Model Structures and Processes ................................................................... 151
List of Tables

Table 2.1: Outcomes of the basic market forces during Medicare .........................21
Table 2.2: Bulk billing rates by RRMA region and concession cards: 2002 ..........34
Table 2.3: Richardson (2001) model .....................................................................46
Table 2.4: Connelly model IIA (FIML) – Elasticities .............................................54
Table 2.5: Actual and predicted outcomes: Richardson & Peacock (1999) demand
model .....................................................................................................................59

Table 3.1: Prices associated with GP services .......................................................71
Table 3.2: MBS rebates for standard GP consultations, 1996-2006 .......................83
Table 3.3: Summary data for 2001 ........................................................................87
Table 3.4: Annual data for variables used over time only .......................................90
Table 3.5: Selected annual totals ............................................................................90

Table A3.4.1: Raw data from RACGP Inter-Practice Costs Survey: Costs by practice
size .............................................................................................................................99
Table A3.4.2: Raw data from RACGP Inter-Practice Costs Survey: Costs by region99

Table 4.1: Model structure .....................................................................................114
Table 4.2: Doctors’ perception of patients who are bulk billed .............................124
Table 4.3: Demand coefficients in small and large SLAs (unweighted, 2001) .......129

Table A4.1.1: Skewness of major variables, 2001.................................................135

Table 5.1: Estimation of demand for GP services at SSD level, 2001 .....................148

Table 6.1: Linear panel model of demand .............................................................156
Table 6.2: Alternate panel demand model based on gross fee ...............................157
Table 6.3: Linear panel model of GP density .........................................................159
Table 6.4: Linear panel model of services per GP ..................................................160
Table 6.5: Linear panel models of mortality ...........................................................166
Table 6.6: Linear panel model of demand including bulk billing measure ..........168
Table 6.7: Linear panel models of bulk billing .......................................................170
Table 6.8: Cross-sectional demand equation ...........................................................174
Table 6.9: Cross-sectional GP density equation ....................................................175
Table 6.10: Cross-sectional services per GP equation ..........................................179
Table 6.11: Cross-sectional mortality equations ....................................................182

Table A6.1.1: Spatial correlation of residuals of base equations, 2001 .................185
Table A6.2.1: MCCV tests for overfitting base equations ....................................186
Table A6.3.1: Log-log panel demand equation ....................................................187
Table A6.3.2: Log-log panel GP density equation ...............................................188
Table A6.3.3: Log-log panel services per GP equation .......................................189
Table A6.3.4: Log-log panel mortality equations ................................................190

Table A6.4.1: Comparison of elasticities: Demand equations ..............................191
Table A6.4.2: Comparison of elasticities: GP density equations ...........................192
Table A6.4.3: Comparison of elasticities: Services per GP equations .................193
Table A6.4.4: Comparison of elasticities: Mortality equation: GP density ..........194
Table A6.4.5: Comparison of elasticities: Mortality equation: Services per capita 195

Table 7.1: Comparisons of modelling results for the demand for GP services ....201
Table 7.2: Impact of changing GP density through demand effects only .............227

Table A7.1.1: Structure of general practice: 1996 to 2003 ...............................244
Table A7.1.2: Average GP activity levels by category, 1996 and 2003 .................244

Table A7.3.1: Linear panel demand equation: concession card-net fee interaction 247

Table 8.1: Elasticities and the effect of changes in major policy parameters .......256
Table 8.2: Service utilisation: Reduced form equation ......................................257
Table 8.3: Average net fee charged: Reduced form equation .............................258
Table 8.4: Average gross fee charged: Reduced form equation .......................259
Table 8.5: Bulk billing rate: Reduced form equation ........................................260
Table 8.6: Estimated and actual outcomes in the GP market: 2006 ....................266
Table A8.2.1: Utilisation equations with and without time trend.........................277
Table A8.2.2: Bulk billing equation with and without time trend.........................279

Table A8.3.1: GP utilisation (services per capita) 2001: by SEIFA and region.......281
Table A8.3.2: Panel equation for GP utilisation with SEIFA–rural interaction……282

Table A8.4.1: Spatial correlation of residuals of reduced form equations ..........283
Table A8.5.1: MCCV tests for overfitting of reduced form equations...............284
Table A8.6.1: Estimated changes in exogenous variables 2003–2006.................285
List of Figures and Charts

Chart 1.1: GP services and bulk billing, 1984–85 to 2005–06 ........................................4
Chart 1.2: GP numbers and GP services, 1984-85 to 2005-06 .....................................5

Chart 2.1: Trends in real values of fees, 1984–85 to 2005–06 .....................................19
Chart 2.2: GP supply and demand with insurance......................................................20
Chart 2.3: GP ‘Demand’: Net fees and services per capita .......................................23
Chart 2.4: GP ‘Supply’: Gross fees and services per capita .......................................23
Chart 2.5: Supplier-induced demand ........................................................................25

Chart A3.3.1: Services per GP by region ....................................................................98
Chart A3.3.2: GP density by region ............................................................................98
Chart A3.3.3: GPs in training by region .....................................................................98

Figure 4.1: Outline of the GP model ........................................................................106

Chart 5.1: Average net fee charged 2001, by SLA BCR deciles (N=816) ...............143
Chart 5.2: Average net fee charged 2001, by SSD BCR deciles (N=196) ...............143
Chart 5.3: Average net fee charged 2001, by SD BCR deciles (N=56) ...................143

Chart 6.1: Relationship between mortality and services per capita .........................155
Chart 6.2: Annual supply curves with 1996 and 2003 demand curves ......................163
Chart 6.3: Relation between average GP revenue and average fee charged: 2001 Statistical Sub-divisions (195 observations) ...........................................................178

Chart 7.1: Relationship between GP activity and fees charged ..............................207
Chart 7.2: Projections of supply and demand with post-2003 policy changes ........213
Chart 7.3: Marginal prices and costs for rich and poor groups ..............................222
Chart 7.4: Major determinants of demand and supply ........................................242

Chart A7.2.1: Costs per FTE GP by practice size .....................................................245

Chart A8.1.1: Time trends of services and fees .......................................................275
# Glossary of Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABS</td>
<td>Australian Bureau of Statistics</td>
</tr>
<tr>
<td>AGSRC</td>
<td>Australian Government Schools Recurrent Costs</td>
</tr>
<tr>
<td>AIC</td>
<td>Akaike information criterion</td>
</tr>
<tr>
<td>AIDS</td>
<td>Almost ideal demand system</td>
</tr>
<tr>
<td>AIHW</td>
<td>Australian Institute of Health and Welfare</td>
</tr>
<tr>
<td>AMA</td>
<td>Australian Medical Association</td>
</tr>
<tr>
<td>ARIA</td>
<td>Accessibility/Remoteness Index of Australia</td>
</tr>
<tr>
<td>ASGC</td>
<td>Australian Standard Geographical Classification</td>
</tr>
<tr>
<td>AWE</td>
<td>Average weekly earnings</td>
</tr>
<tr>
<td>BIC</td>
<td>Bayesian information criterion</td>
</tr>
<tr>
<td>BCR</td>
<td>Border crossing ratio</td>
</tr>
<tr>
<td>BEACH</td>
<td>Bettering the Evaluation and Care of Health (annual survey of GPs)</td>
</tr>
<tr>
<td>CBD</td>
<td>Central business district</td>
</tr>
<tr>
<td>CPI</td>
<td>Consumer price index</td>
</tr>
<tr>
<td>DoHA</td>
<td>Department of Health and Ageing</td>
</tr>
<tr>
<td>ED</td>
<td>Emergency department</td>
</tr>
<tr>
<td>EPC</td>
<td>Enhanced primary care (items in the MBS Schedule)</td>
</tr>
<tr>
<td>FIML</td>
<td>Full information maximum likelihood</td>
</tr>
<tr>
<td>FRACGP</td>
<td>Fellow of the Royal Australian College of General Practitioners</td>
</tr>
<tr>
<td>FTE</td>
<td>Full-time equivalent</td>
</tr>
<tr>
<td>FWE</td>
<td>Full-time workload equivalent</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographic information system</td>
</tr>
<tr>
<td>GMM</td>
<td>Generalised method of moments</td>
</tr>
<tr>
<td>GMM-AIC</td>
<td>Generalised method of moments: Akaike information criterion</td>
</tr>
<tr>
<td>GMM-BIC</td>
<td>Generalised method of moments: Bayesian information criterion</td>
</tr>
<tr>
<td>GP</td>
<td>General practitioner</td>
</tr>
<tr>
<td>HIC</td>
<td>Health Insurance Commission (predecessor to Medicare Australia)</td>
</tr>
<tr>
<td>IOLS</td>
<td>Iterated ordinary least squares</td>
</tr>
<tr>
<td>LCM</td>
<td>Latent class model</td>
</tr>
<tr>
<td>MBS</td>
<td>Medicare Benefits Schedule</td>
</tr>
<tr>
<td>MCCV</td>
<td>Monte Carlo Cross Validation</td>
</tr>
</tbody>
</table>
NHS  National Health Survey  
OMP  Other medical practitioner  
OTD  Overseas trained doctor  
PIP  Practice Incentives Program  
RACGP  Royal Australian College of General Practitioners  
RRMA  Rural, remote and metropolitan areas classification  
SAH  Self-assessed health  
SEIFA  Socio-economic index for Australia  
SES  Socio-economic status  
SID  Supplier-induced demand  
SIP  Service incentive payments  
SMR  Standardised mortality rate  
SUR  Seemingly unrelated regression  
WPE  Whole patient equivalent  
VIF  Variance inflation factor  
VR GP  Vocationally Registered GP  
2SLS  Two-stage least squares estimation  

Regional Classifications  
CD  Census Collection District  
SLA  Statistical Local Area  
SSD  Statistical Sub-division  
SD  Statistical Division  

States of Australia  
NSW  New South Wales  
Vic  Victoria  
Qld  Queensland  
SA  South Australia  
WA  Western Australia  
Tas  Tasmania  
NT  Northern Territory  
ACT  Australian Capital Territory  

xviii