Modelling

Regional Trade Agreements

by

Mark Melatos

A dissertation submitted in partial satisfaction of the requirements for the degree of
Doctor of Philosophy

Discipline of Econometrics and Business Statistics
School of Economics and Political Science
University of Sydney
Australia

June 2002
To Mum, Dad and Andrew

"Whate’er the senses take or may refuse, -
The Mind’s internal heaven shall shed her dews
Of inspiration on the humblest lay"
- William Wordsworth.
Declaration of Originality

This thesis contains no material which has been presented for a degree at this or any other university and, to the best of my knowledge and belief, contains no copy or paraphrase of work published by another person, except where duly acknowledged in the text.

Mark Melatos

"Nor heed the shaft too surely cast,
The foul and hissing bolt of scorn;
For with thy side shall dwell, at last,
The victory of endurance born."
- William Cullen Bryant.
Acknowledgments

The research which constitutes this dissertation was supported by an Australian Postgraduate Award from the Australian Government, as well as a Postgraduate Scholarship from the Ronald Henderson Research Foundation. The assistance of both organisations is gratefully acknowledged.

I would like to thank my supervisor, Professor Alan Woodland, for his patience and guidance throughout the writing of this thesis. In the process, I have gained an appreciation of both the art and science of conducting economic research, and for this I am especially grateful. Professor Woodland has also been extremely generous with his time; I learnt an enormous amount from our regular Friday afternoon meetings.

I also wish to thank faculty in the Disciplines of Economics and Econometrics for their part in creating a vibrant academic environment. This makes the task of a postgraduate student much easier and infinitely more enjoyable. I would particularly like to acknowledge Dr Don Wright from Economics for his help and patience during the early stages of my research. At a time when I was still ‘finding my feet’, Dr Wright provided guidance and support above and beyond the call of duty, and always with sympathy and good humour. Among faculty staff, special thanks must go to Sonnia Fuenteseca for sacrificing so much of her time to help me with computer problems as they arose.

Finally, and most importantly, I would like to thank my Mum, Dad, and brother, Andrew, for their unstinting support and love. The moods (and hours) of a PhD student are hardly "family-friendly". Yet, my family have been there every day to share my ups and downs with humour, sympathy and understanding. I would particularly like to thank my Mum and Dad for instilling in me their unshakable belief in the value of education. Special thanks too, to my brother, who never let me lose sight of the ultimate goal, and who was always willing to listen to, and comment on, my ideas. Mum, Dad, Andrew, this would have been impossible without you. Thank you for sharing this ‘adventure’ with me.
Abstract

In the last twenty years, regional trade agreements have proliferated. These have usually taken the form of customs unions (CUs) or free trade areas (FTAs). This thesis concentrates mostly on the formation and behaviour of CUs.

Union members levy a common external tariff (CET) on non-members. Existing theoretical models, however, do not agree on how the CET rate is chosen. Every model imposes a different choice rule exogenously. In this thesis, for the first time, plausible choice rules, based on the CU’s social welfare function, are derived endogenously. The strategic behaviour of members and non-members, reveals that responsibility for CET choice tends to be assumed by the member that can induce the rest of the world to levy those tariffs members prefer to face.

Relatively few general results exist describing the relationship between country characteristics and trade bloc formation. Here, new light is shed on this issue, by systematically analysing bloc formation in an asymmetric world, and investigating the role of preferences in coalition formation. It is found that global free trade is most likely to arise when all countries are similar. Customs unions tend to form between relatively well-endowed countries or those with similar preferences. It is also demonstrated that CUs will usually Pareto dominate FTAs, except where preferences differ significantly.

The role of transfers in CU formation has received relatively little attention in the regionalism literature. In this thesis, optimal intra-union transfers are introduced and their impact on CET choice is investigated. The impact of transfers on CU behaviour depends on the direction of the transfer. When the relatively inelastic member is the recipient, the CU responds less aggressively to non-member tariff choices than it does when transfers are not permitted. However, if the relatively elastic member is the transfer recipient, the union’s aggression increases. Moreover, when one union member exercises a similar degree of control over both CET and transfer choice, then the equilibrium CET tends to be lower than in the corresponding no-transfers situation.
Contents

List of Figures ix
List of Tables xii

1 Introduction 1
  1.1 Background ........................................ 1
  1.2 Objectives ......................................... 3
  1.3 Outline ............................................. 4

2 Preferential Trading Agreements: The Global Experience 6
  2.1 Introduction ....................................... 6
  2.2 Multilateralism and the GATT .......................... 6
  2.3 Observations on PTA Formation ........................ 7
    2.3.1 Types of PTAs ..................................... 8
    2.3.2 Membership Patterns and Overlapping PTAs ............. 11
  2.4 Why PTAs Form: An Historical Analysis ................. 12
    2.4.1 Latin American Integration .......................... 12
    2.4.2 ASEAN FTA ....................................... 18
    2.4.3 CEFTA ............................................. 20
  2.5 Why do Countries Join PTAs? ........................... 21
    2.5.1 Economic Objectives ................................ 22
    2.5.2 Political/Strategic Objectives ...................... 23
  2.6 Conclusion .......................................... 24

3 An Overview of the Regionalism Literature 25
  3.1 Introduction ........................................ 25
  3.2 Measurement Issues .................................... 26
  3.3 Modelling Issues ..................................... 29
    3.3.1 Issues of Dimensionality ........................... 29
    3.3.2 The Determination of Trade Taxes ................... 32
  3.4 The Welfare Effects of CUs ............................ 33
  3.5 Optimal Number and Size of Blocs ....................... 38
  3.6 Regionalism vs Multilateralism ........................ 41
    3.6.1 Static Incentives .................................. 42
    3.6.2 Dynamic Incentives ................................ 46
  3.7 Empirical Work ....................................... 46
3.8 Conclusion ........................................ 49

4 Modelling a CU’s Choice of CET ........................................ 50
4.1 Introduction ............................................... 50
4.2 Literature .................................................. 51
4.3 A Unilateral Tariff Setting Framework .............................. 54
    4.3.1 The Trading Equilibrium ............................ 54
    4.3.2 Trade Tax Determination ............................ 56
    4.3.3 Summary ............................................ 57
4.4 Customs Union Formation ...................................... 57
    4.4.1 The CU Contract ..................................... 57
    4.4.2 CU Model and Assumptions .......................... 59
    4.4.3 Tariff Setting ......................................... 61
    4.4.4 Contract Selection by Union Members ................. 62
4.5 Influences on CET Choice ....................................... 63
    4.5.1 Strategic Issues (Reaction Functions) ................. 64
    4.5.2 Welfare Issues (Iso-Welfare Contours) ............... 69
4.6 Plausible CU Contracts ......................................... 73
    4.6.1 Identifying a Range of Pareto Efficient SWFs ......... 73
    4.6.2 Plausibility and Delegation .......................... 77
    4.6.3 The Importance of Pre-Union Welfare .................. 78
    4.6.4 Some Conjectures .................................... 79
4.7 Conclusion ................................................... 79

5 Simulating CET Choice ............................................. 81
5.1 Introduction .................................................. 81
5.2 The Model .................................................... 82
    5.2.1 General Assumptions .................................. 82
    5.2.2 Assumptions About Consumer Behaviour ............... 82
    5.2.3 Calculating the Unilateral Tariff Equilibrium ........ 84
    5.2.4 Calculating the CU(1,2) Equilibrium .................. 85
    5.2.5 Specifying the Union’s SWF Weights .................. 86
5.3 Plausible CUs - An Example ..................................... 87
5.4 CET Choice in Two Dimensions (t^1_3 = t^2_3) ...................... 90
    5.4.1 Member Utility and ROW Tariffs ...................... 91
    5.4.2 Impact on CET Choice .................................. 91
    5.4.3 Impact on Strategic Behaviour ........................ 92
    5.4.4 Variation in the Range of Plausible SWFs ............. 94
    5.4.5 Plausibility and Pre-CU Welfare ....................... 96
    5.4.6 Explaining SWF Choice ................................ 97
    5.4.7 Testing for Plausible Contracts ....................... 99
5.5 CET Choice in Three Dimensions (t^1_3 ≠ t^2_3) ................... 103
    5.5.1 Impact on CET Choice .................................. 103
    5.5.2 Impact on Strategic Behaviour ......................... 103
    5.5.3 Plausible SWFs ........................................ 106
    5.5.4 Explaining UPF Shapes ................................ 108
5.6 Variations in Preferences ....................................... 109
5.6.1 Implications for the Plausibility of CU Contracts ..................110
5.6.2 Strategic Implications ........................................113
5.6.3 Implications for Equilibrium CET Choice ............................116

5.7 Variations in Endowments ...........................................118
5.7.1 Implications for the Plausibility of CU Contracts ..................119
5.7.2 Strategic Implications ...........................................119
5.7.3 Implications for CET Choice ......................................121

5.8 Conclusion ..........................................................124

6 Endogenous Trade Bloc Formation ....................................126
6.1 Introduction ..........................................................126

6.2 Modelling Trade Bloc Formation .....................................127
6.2.1 The Trading Environment .........................................127
6.2.2 Calculating the Unilateral Tariff Equilibrium .....................128
6.2.3 Calculating the Global Free Trade Equilibrium ....................129
6.2.4 Calculating the Customs Union Equilibrium .......................129
6.2.5 Calculating the Free Trade Area Equilibrium ......................130
6.2.6 Coalition Formation ...............................................132

6.3 Implementing the Core ...............................................135
6.3.1 Valuing Coalitions ................................................135
6.3.2 The Composition of the Core .....................................138
6.3.3 A Numerical Example .............................................139

6.4 Equilibrium Coalition Structures - Endowments ......................143
6.4.1 Varying the Endowment Distribution ...............................143
6.4.2 Endowments and Core Composition: Observations .................148
6.4.3 Coalition Blocking Behaviour .....................................151

6.5 Equilibrium Coalition Structures - Preferences .......................156
6.5.1 Variation in Country Preferences ................................156
6.5.2 Core Composition: Observations ................................157
6.5.3 Coalition Blocking Behaviour .....................................163

6.6 Conclusion ..........................................................165

7 Modelling CU S With Transfers .......................................167
7.1 Introduction ..........................................................167
7.2 Literature .............................................................168

7.3 Transfers In the European Union .....................................170
7.3.1 Financing Transfers ...............................................171
7.3.2 Allocating Transfers ..............................................174

7.4 A Model of CU S With Optimal Transfers .............................175
7.4.1 Introducing Transfers .............................................177
7.4.2 The CU Contract With Transfers ................................178
7.4.3 The Trading Equilibrium ..........................................178
7.4.4 Equilibrium Trade Taxes ..........................................180

7.5 Income Transfers and CET Choice ....................................181
7.5.1 The Nature and Feasibility of Transfers ..........................181
7.5.2 The Equilibrium Transfer-CET Relationship .......................183
7.5.3 Transfers and ROW Tariffs .........................................188
List of Figures

3.1 Trade diversion and the importance of consumption substitution. .................. 27
3.2 Two alternative trade patterns in a 3 × 2 model. Countries A and B form
a CU. .................................................. 30
3.3 Two potential trade patterns in a 3 × 3 framework. Countries 1 and 2 form
a CU. .................................................. 36
4.1 An example CU(1, 2) utility possibilities frontier. ............................... 62
4.2 Possible reaction function configurations when ROW chooses one tariff and
tariffs are strategic substitutes. .................................. 65
4.3 Possible reaction function configurations when ROW chooses one tariff and
tariffs are strategic complements. .................................. 66
4.4 Possible reaction planes showing the various strategic relationships between
tariffs. .................................................. 68
4.5 Example iso-welfare contours for (a) the customs union and (b) ROW. ......... 70
4.6 Curvature of union member iso-welfare contours. .................................. 72
4.7 Illustrating the set of plausible (i.e. Pareto efficient) CU contracts. The
reaction function diagrams, (a) and (b), are used to derive the utility pos-
sibility frontiers in figures (c) and (d) respectively. ............................... 74
4.8 Illustrating the set of plausible (i.e. Pareto efficient) CU contracts when
the CU(1, 2) UPF is monotonic. The frontiers in figures (c) and (d), are
derived from the reaction function diagrams, (a) and (b) respectively. ....... 76
5.1 Pattern of trade in a 3-country, 3-good world. ...................................... 82
5.2 Variation of SWF weights $d_1$ and $d_2$ along the unit circle. ...................... 87
5.3 Plotting (a) variation in equilibrium tariffs and (b) union member welfare,
for different CU(1, 2) SWFs, for the case $\sigma_1 = 1.5$ and $\sigma_2 = \sigma_3 = 0.99$, .. 89
5.4 How, in two dimensions, and given $\sigma_2 = \sigma_3 = 0.99$, the union’s CET varies
with $\theta$ for the cases $\sigma_1 = 0.6$, 0.99, 2 and 6.7. ............................... 91
5.5 Two-dimensional CU and ROW tariff reaction functions when (a) $\sigma_1 = 0.6,$
(b) $\sigma_1 = 2$, (c) $\sigma_1 = 6.7$, given $\sigma_2 = \sigma_3 = 0.99$. .......................... 93
5.6 The (two-dimensional) utility possibility frontier for CU(1, 2) when (a) $\sigma_1 = 0.6$, (b) $\sigma_1 = 2$, and (c) $\sigma_1 = 6.7$, given $\sigma_2 = \sigma_3 = 0.99$. .................. 95
5.7 Percentage changes in the CET and the real incomes of union members as
$\theta$ varies for the case $\sigma_1 = 0.6$, $\sigma_2 = \sigma_3 = 0.99$ with $\theta^3_1 = \theta^3_2$. ........... 102
5.8 How the union’s CET varies with $\theta$, in 2 and 3 dimensions, for the case
$\sigma_1 = 0.6$ and $\sigma_2 = \sigma_3 = 0.99$. ........................................ 104
5.9 Customs Union reaction planes, when $\sigma_1 = 0.6$ and $\sigma_2 = \sigma_3 = 0.99$, for SWFs characterised by $\theta = 0$ and $\theta = 90$. The points A and B label the extreme $CU(1,2)$ Nash equilibria which result. ........................................ 105
5.10 The two and three dimensional utility possibilities frontiers for $CU(1,2)$ when $\sigma_1 = 0.6$ and $\sigma_2 = \sigma_3 = 0.99$. ........................................ 107
5.11 Percentage changes in the CET and the real incomes of union members as $\theta$ varies, for the case $\sigma_1 = 0.6$ and $\sigma_2 = \sigma_3 = 0.99$ with $t_1^{\sigma} \neq t_2^{\sigma}$. ........................................ 109
5.12 Implications, for the set of plausible contracts, of changes in member preferences. Variation in $\sigma_1$ given $\sigma_2 = \sigma_3 = 0.99$. Note that when $\sigma_1 \approx 1$, all countries are identically symmetric and the $CU(1,2)$ UPF collapses to a point. ........................................ 111
5.13 Variation in member SWF preferences over $\sigma_1$. ........................................ 112
5.14 The CU’s reaction planes when $\sigma_1 = 0.98$ and $\sigma_2 = \sigma_3 = 0.99$. ........................................ 114
5.15 The CU’s reaction planes when $\sigma_1 = 0.99$ and $\sigma_2 = \sigma_3 = 0.99$. ........................................ 114
5.16 The CU’s reaction planes when $\sigma_1 = 1.01$ and $\sigma_2 = \sigma_3 = 0.99$. ........................................ 115
5.17 How, in three dimensions, and given $\sigma_2 = \sigma_3 = 0.99$, the union’s CET varies with $\theta$ for the cases $\sigma_1 = 0.7, 0.99$, and 1.4. ........................................ 116
5.18 Variation in the preferred CET of each union member and ROW tariffs as $\sigma_1$ alters. ........................................ 117
5.19 Implications, for the set of plausible contracts, of changes in member endowments. Variation in $\omega_i^3$ given $\omega_i^i = 1 \forall i$, and $\sigma_1 = \sigma_2 = \sigma_3 = 0.99$. Note that when $\omega_i^3 = 0.1$, all countries are identically symmetric and the $CU(1,2)$ UPF collapses to a point. ........................................ 120
5.20 Variation in member SWF preferences over $\omega_i^3$. ........................................ 121
5.21 Impact on the CU and ROW reaction functions as $\omega_i^3$ increases from (a) 0.09, to (b) 0.1 to (c) 0.11. ........................................ 122
5.22 Variation in the union’s CET with $\theta$ for three different values of $\omega_i^3$. ........................................ 123
5.23 Variation in the preferred CET of each union member and ROW tariffs as $\omega_i^3$ alters. ........................................ 124
6.1 Composition of the core as $\omega_1^1$ and $\omega_2^3$ vary, given $\omega_3^3 = 1$. ........................................ 144
6.2 Composition of the core when $\omega_1^1$ and $\omega_3^3$ vary, given $\omega_2^3 = 1$. ........................................ 145
6.3 Composition of the core when $\omega_2^1$ and $\omega_3^3$ vary, given $\omega_1^3 = 1$. ........................................ 146
6.4 Interesting directions of movement in the core composition matrices. The box identifies an individual cell, such as $(\omega_1^1, \omega_2^3) = (1, 1)$. ........................................ 149
6.5 Composition of the core when $\sigma_1$ and $\sigma_2$ vary, given $\sigma_3 = 0.9$. ........................................ 158
6.6 Composition of the core when $\sigma_1$ and $\sigma_3$ vary, given $\sigma_2 = 0.9$. ........................................ 159
6.7 Composition of the core when $\sigma_2$ and $\sigma_3$ vary, given $\sigma_1 = 0.9$. ........................................ 160
7.1 The composition of transfer funding in the European Union, 1988-1999. Transfers have been financed by a combination of levies on member GNP, the VAT base, and ‘traditional own resources’ (CET revenue). ........................................ 171
7.2 The effect of changes in the $CU(1,2)$ SWF on the size and direction of the intra-union transfer. ........................................ 182
7.3 Variation of the CET with $\theta$, for the case $\sigma_1 = 0.99$ ($\sigma_2 = \sigma_3 = 0.99$), when intra-union transfers are permitted and when they are not. ........................................ 184
7.4 Variation of the CET with $\theta$, when intra-union transfers are permitted and when they are not. The cases (a) $\sigma_1 = 0.6$ and (c) $\sigma_1 = 2$ are illustrated. Figures (b) and (d) focus on the region where the transfer and no-transfer curves intersect in each case. ................................................................. 186
7.5 Variation of the CET with the actual transfer to country 1, for the cases $\sigma_1 = 0.6, 0.99, 2$ and 6.3. ................................................................. 188
7.6 Variation in ROW tariffs with changes in the union’s SWF for the cases (a) $\sigma_1 = 0.6$ and (b) $\sigma_1 = 2$. In each case $\sigma_2 = \sigma_3 = 0.99$. ................................................................. 189
7.7 The impact of optimal transfers on the CU’s CET reaction function, assuming $\sigma_1 = 0.6$. For illustrative purposes, only the cases (a) $\theta = 35$ and (b) $\theta = 55$ are illustrated. ................................................................. 192
7.8 The impact of optimal transfers on the ROW’s tariff reaction function, assuming $\sigma_1 = 0.6$ and that the CU’s SWF is characterised by $\theta = 35, 45, 46$ and 55. ................................................................. 193
7.9 The $CU(1,2)$ UPF, for the case $\sigma_1 = 0.6$ when transfers are permitted and when they are not. ................................................................. 195
7.10 Variation in the CET and intra-union transfers with $\theta$ and $\psi$ for the cases (a)-(b) $\sigma_1 = 0.6$ and (c)-(d) $\sigma_1 = 2$. The single policymaker case, $\theta = \psi$, is also included for the purpose of comparison. ................................................................. 200
7.11 Union and ROW tariff reaction functions, given $\sigma_1 = 0.6$, when (a) transfers are not permitted, (b) $\psi = 46$, (c) $\psi = 45$, and (d) $\psi = 40$. The single-agency (i.e. $\theta = \psi$) CU reaction function is also included for comparison. ................................................................. 203
7.12 Variation in the curvature and position of $CU(1,2)$ UPFs with $\psi$ when $\sigma_1 = 0.6$. ................................................................. 206
7.13 Variation in the curvature and position of $CU(1,2)$ UPFs with $\psi$ when $\sigma_1 = 2$. ................................................................. 207
7.14 Comparing the welfare implications of $CU(1,2)$ with and without transfers for the cases: (a) $\sigma_1 = 0.5$ and (b) $\sigma_1 = 2$. ................................................................. 211
7.15 Comparing the welfare implications of $CU(1,2)$ with and without transfers for the case $\sigma_1 = 0.8$. ................................................................. 212
7.16 Variation in the grand transfer envelope and the $\theta = \psi$ locus for $\sigma_1 = (a) 0.5$, (b) 0.8, and (c) 2. ................................................................. 214

A.1 Determining optimal trade taxes ................................................................. 226
A.2 Non-existence of optimal trade taxes given horizontal offer curves. ............ 228
A.3 Impact of variations in $\sigma$ on trade indifference curves. ................................ 231
List of Tables

2.1 Significant customs unions and their characteristics .......................... 9
2.2 Significant free trade areas and their characteristics ....................... 10

5.1 Endowment distribution .................................................. 88
5.2 Strategic tariff relationships implied by CU’s reaction plane ............... 106
5.3 Strategic tariff relationships implied by ROW’s t31 reaction plane ........... 106
5.4 Strategic tariff relationships implied by ROW’s t32 reaction plane ........... 106
5.5 Endowment distribution .................................................. 119

6.1 Coalition Structures and Labels ........................................... 136
6.2 Coalition Structures Implied by Singleton Coalitions .......................... 138
6.3 Endowment Distribution - case (a) ....................................... 139
6.4 Endowment Distribution - case (b) ....................................... 139
6.5 Equilibrium utilities for two example parameter distributions ............... 140
6.6 Singleton Coalition Values ................................................ 141
6.7 Endowment Distribution .................................................. 143
6.8 Identically Symmetric Endowment Distribution .................................. 157

7.1 The welfare effects of CU(1,2) compared to the stand-alone equilibrium when preferences are varied .......................... 213