

**Open Economy Macrodynamics:
Permanent and Temporary Policies in the
Case of Adjustment Costs**

Inaugural-Dissertation
zur Erlangung des Grades
Doctor oeconomiae publicae (Dr. oec. publ.)
an der Ludwig-Maximilians-Universität München

vorgelegt von
Stefan Franz Schubert

2001

Referent: Prof. Dr. Anton Konrad

Korreferent: Prof. Stephen J. Turnovsky, Ph.D.

Promotionsabschlussberatung: 6. Februar 2002

Contents

1	Introduction and Scope of the Thesis	1
1.1	The Main Theme	1
1.2	The Traditional Mundell-Fleming Model	2
1.3	The Representative Agent Model of an Open Economy	4
1.4	The One-Sector Small Open Economy Representative Agent Model	6
1.5	Outline of the Thesis	8
2	The One-Good Model	11
2.1	Introduction	11
2.2	The Framework	13
2.2.1	The Structure of the Economy	13
2.2.2	Macroeconomic Equilibrium	16
2.2.3	Equilibrium Dynamics	24
2.2.4	The Steady-State	27
2.3	Permanent Fiscal Expansion	28
2.3.1	Steady-State Effects of a Fiscal Expansion	29
2.3.2	Transitional Dynamics after a Fiscal Expansion	30
2.4	Temporary Increase in Government Spending — the Inconsistent Solution Method in the Literature	36
2.5	Temporary and Announced Future Policies — a Consistent Solution Method	42
2.5.1	The Approach to the Solution	42
2.5.2	The Steady-State Reconsidered	43
2.5.3	The System in Case of Temporary and Future Policy Changes	45
2.6	Temporary Increase in Government Expenditure	52
2.6.1	Notation	52
2.6.2	The Two Policy Regimes	53
2.6.3	A Short Look at the No-Arbitrage Conditions	55
2.6.4	Impact Effects	56

2.6.5	Dynamic Transition of the Economy	58
2.7	Announced Future Increase in Government Spending — another Application of the Consistent Solution Method	62
2.7.1	The Two Policy Regimes Again	62
2.7.2	Impact Effects	64
2.7.3	Dynamic Transition of the Economy	67
2.8	A Note on Announced, but Not Implemented Policy Changes	69
2.8.1	An Increase in Government Expenditure: Announced as Temporary, but Not Removed	69
2.8.2	An Increase in Government Expenditure: Announced for the Future, but Not Implemented	73
2.8.3	Implications	77
2.9	Results, Other Applications, and the Role of Adjustment Costs	77
2.9.1	Results	77
2.9.2	Other Applications	79
2.9.3	The Role of Adjustment Costs	79
3	Investment Tax Credit in a Small Open Economy Revisited	83
3.1	Introduction	83
3.2	The Macroeconomic Framework	84
3.2.1	The Structure of the Economy	84
3.2.2	Macroeconomic Equilibrium	87
3.2.3	Equilibrium Dynamics	88
3.2.4	The Steady-State	89
3.3	Permanent Investment Tax Credit	90
3.3.1	Steady-State Effects of a Permanent ITC	90
3.3.2	Transitional Dynamics after an Increase in the Rate of the ITC	92
3.4	A Temporary Investment Tax Credit	97
3.4.1	The Two Policy Regimes	98
3.4.2	Impact Effects	100
3.4.3	Dynamic Transition of the Economy	103
3.5	A Short Comparison with a Permanent ITC	107
3.6	Conclusions	109
3.6.1	Results	109
3.6.2	Suggestions for Further Research	110
4	The Two-Goods Model	113
4.1	Introduction	113
4.2	The Framework	115
4.2.1	The Structure of the Model	115

4.2.2	Macroeconomic Equilibrium	117
4.2.3	Equilibrium Dynamics	123
4.2.4	The Steady-State	127
4.3	An Increase in Government Expenditure on Domestic good	128
4.3.1	Steady-State Effects of a Permanent Increase in Government expenditure on the Domestic Good	128
4.3.2	Transitional Dynamics Upon a Permanent Increase in Government Spending on the Home Good	130
4.3.3	A Temporary Increase in Government Expenditure on the Domestic Good – the Inconsistency of the Model	130
4.4	An Increase in Government Imports	133
4.4.1	Steady-State Effects of a Permanent Increase in Government Expenditure on the Import Good	133
4.4.2	Transitional Dynamics After a Permanent Increase in Government Imports	134
4.4.3	A Temporary Increase in Government Expenditure on the Import Good — are there Inconsistencies?	134
4.5	Temporary disturbances and Inconsistencies – Causes and Consequences	135
4.6	Implications, Some Further Comments on the Literature, and the Role of Adjustment Costs	139
4.6.1	Implications	139
4.6.2	Some Further Comments on the Literature	140
4.6.3	Investment, Adjustment Costs, and the Role of the Real Exchange Rate	141
5	A Two-Goods Model with Inventories	145
5.1	Introduction	145
5.2	The Economic Framework	147
5.2.1	The Structure of the Economy with Inventories	147
5.2.2	Macroeconomic Equilibrium	152
5.2.3	Equilibrium Dynamics	158
5.2.4	The Steady-State	161
5.3	Permanent Increase in Government Expenditure on the Domestic Good	163
5.3.1	Steady-State Effects of an Increase in g_x	164
5.3.2	Transitional Dynamics after a Permanent Increase in Government Spending on Domestic Good	167
5.4	Permanent Increase in Government Expenditure on the Import Good	181
5.4.1	Steady-State Effects on an Increase in g_y	181

5.4.2	The Dynamic Evolution	184
5.4.3	Transitional Dynamics after a Permanent Increase in Government Expenditure on the Import Good, The Border Case $\Xi = 0$	185
5.4.4	Transitional Dynamics after a Permanent Increase in Government Expenditure on the Import Good, Case $\Xi > 0$	185
5.4.5	Transitional Dynamics after a Permanent Increase in Government Expenditure on the Import Good, Case $\Xi < 0$	192
5.4.6	A Short Comparison of the Cases	198
5.5	Temporary and Announced Future Disturbances	200
5.6	Conclusion	208
6	A Note on Closed-Economy Models	211
6.1	Introduction	211
6.2	The Closed Economy Model and the Problem of Goods Market Clearing	212
6.2.1	The Model	212
6.2.2	First Order Conditions	213
6.2.3	Macroeconomic Equilibrium	215
6.3	The Problem of Goods Market Clearing in Case of Temporary Disturbances	216
6.4	A Comparison with the Open Economy, Possible Solutions, and Conclusion	218
6.4.1	A Comparison with the One-Good Open Economy Model	218
6.4.2	Possible Solutions	219
6.4.3	Conclusion	220
7	A Minimalist Closed-Economy Model with Inventories	223
7.1	Introduction	223
7.2	The Economic Framework	224
7.2.1	The Structure of the Minimalist Economy	224
7.2.2	Macroeconomic Equilibrium	226
7.2.3	Steady-State Effects	229
7.2.4	Equilibrium Dynamics	229
7.3	Permanent Fiscal Expansion	231
7.3.1	Steady-State Changes	231
7.3.2	Initial Responses	232
7.3.3	The Dynamic Transition	235
7.4	Temporary Fiscal Expansion	237

7.4.1	Ultimate Steady-State Effects	237
7.4.2	The Dynamic System for a Temporary Increase in Government Expenditure	238
7.4.3	Initial Responses	238
7.4.4	The Dynamic Transition	241
7.5	Conclusion	242
8	Results, Further Applications, and Conclusion	245
8.1	Main Results	245
8.2	The One-Sector Model — Some Proposals for Future Research	247
8.3	A Short Note on Two- and Multi-Sector Models of a Small Open Economy	248
8.4	A Short Note on Two-Country Models	249
8.5	Concluding Remarks	250
A	Appendix to Chapters 2 and 3	253
A.1	Intertemporal Budget Constraint	253
A.2	Short-Run Static Solutions	254
A.3	Equilibrium Dynamics	255
A.3.1	Formal Solutions for k and q	255
A.3.2	A Digression on Phase Diagrams	258
A.3.3	Formal Solution for n	262
A.4	Steady-State Changes	265
A.5	Temporary Disturbances — the Inconsistent Solution Method in the Literature	272
A.6	The Steady-State Reconsidered	275
A.7	Temporary and Announced Future Disturbances — a Consistent Solution Method for the One-Good Model	279
A.8	Temporary and Announced Future Changes in Government Spending	286
A.8.1	Solutions for A_1, A_2, A'_1 , and $d\bar{\lambda}$	287
A.8.2	Temporary Increase in Government Spending ($dg > 0, \delta = 1$)	287
A.8.3	Announced Future Increase in Government Spending ($dg > 0, \delta = 0$)	293
A.9	Investment Tax Credit	297
A.9.1	Solutions for A_1, A_2, A'_1 , and $d\bar{\lambda}$	297
A.9.2	Temporary Investment Tax Credit ($dg > 0, \delta = 1$)	298
A.10	Initial Responses in Case of an ITC	309
A.10.1	Permanent Increase in the Rate of ITC	309
A.10.2	Temporary Increase in the Rate of ITC	312

A.11 Government Expenditure Increases and Fooling	315
B Appendix to Chapter 5	317
B.1 Short-Run Static Solutions	317
B.2 Equilibrium Dynamics	318
B.2.1 Formal Solutions for k , L , q , and σ	318
B.2.2 Formal Solution for n	323
B.3 The Steady-State	326
B.4 Steady-State Changes	328
B.5 Graphical Construction of Stable Manifolds	330
B.6 Impact Responses after Permanent Increase in g_x and g_y	336
C Appendix to Chapter 6	343
D Appendix to Chapter 7	347
D.1 The Agent's Intertemporal Budget Constraint	347
D.2 Short-Run Static Solutions	348
D.3 Equilibrium Dynamics	349
D.3.1 The Linearized Differential Equation System and its Solutions	349
D.4 Steady State Changes	350
D.5 Temporary Increase in Government Expenditure	352
D.5.1 Dynamics and Determination of the Arbitrary Constants	352
D.5.2 Calculation of Initial Responses	355
D.5.3 Investigation of $L(T)$ and $\lambda(T)$	356