



University of Macau

Faculty of Social Sciences and Humanities

Department of Economics

**Agricultural Productivity Growth in Chinese
Economy: A Provincial Panel Data Analysis
after 1980**

Zhuo Shuaihe (M-A-66802-1)

Supervisor: Dr. Kwan Fung

A thesis submitted in partial fulfillment of the requirements for the
degree of Master of Social Sciences at the University of Macau.

July 2008

Contents

Abstract	ii
Declaration	iii
Acknowledgements	iv
List of Tables	x
List of Figures	xi
Abbreviations	xii
1 Introduction	1
1.1 Backgrounds	
1.2 Significance of Research	2
1.3 Research Objectives.	4
1.4 Structure.	4
2 Literature Review	5
2.1 Neoclassical Growth Model.	5
2.1.1 The Model without Technological Progress	5
2.1.2 The Model with Technological Progress	9
2.2 Growth Accounting	10
2.3 Cobb-Douglas Production Function	10
2.4 Translog Production Function	11

2.5	Dynamic Production Function	II
2.6	Stochastic Frontier Model.	12
2.7	Data Envelopment Analysis.	14
2.8	Previous Empirical works on Chinese Agricultural Productivity.	15
3	Theoretical Framework	21
3.1	Cobb-Douglas Production Function Model.	21
3.2	Translog Production Function Model.	24
3.3	Dynamic Production Function Model	26
3.4	Stochastic Production Frontier Model	28
3.4.1	Time-invariant Technical Efficiency	28
3.4.2	Time-varying Technical Efficiency.	31
3.5	Comparison of the Four Theoretical Models	33
3.5.1	Interpretation of TFP	33
3.5.2	Residual	34
3.5.3	Elasticity of Factor Inputs	34
4	Empirical Analysis	36
4.1	Data Description	36
4.1.1	Data Measurement	36
4.1.2	Relationship Between Output and Input	41
4.2	Estimated Cobb-Douglas Production Function.	41
4.2.1	Aggregate Time Series Model	41
4.2.2	One-way Fixed Effects Model	43
4.2.3	Two-way Fixed Effects Model	46
4.2.4	Random Effects Model	48
4.2.5	Comparison of the Econometric Methods	50
4.3	Estimated Translog Production Function	51
4.4	Estimated Dynamic Production Function	53
4.5	TFP Growth Rates Analysis	56

4.5.1	Annual TFP Growth Rates . .	56
4.5.2	Provincial TFP Growth Rates	58
4.6	Estimated Stochastic Frontier Production Function	61
4.6.1	Maximum Likelihood Estimation	61
4.6.2	Estimated Time-invariant Model	62
4.6.3	Estimated Time-varying Model	64
4.7	Decomposition of the TFP Growth Rates	64
4.7.1	Decomposition of the Time-invariant Model.	64
4.7.2	Decomposition of the Time-varying Model	66
4.8	Efficiency Analysis . .	67
4.9	Model Selection for Chinese Agriculture.	69
4.10	Summary of the Empirical Analysis . . .	70
4.10.1	Summary of the Annual Analysis	71
4.10.2	Summary of the Provincial Analysis	73
5	Conclusions	75
5.1	Summary	75
5.2	Policy Implications	76
	Bibliography	85
	Data Sources	86
A	Appendix Estimated Dynamic Production Function	87
B	Appendix TFP Growth Rates and Technical Efficiency	89