

Rainer Walz • Joachim Schleich

The Economics of Climate Change Policies

Macroeconomic Effects, Structural
Adjustments and Technological Change

Physica-Verlag

A Springer Company

Contents

1	Introduction	1
2	Effects of Climate Policy on the Economy:	
	A Theoretical Perspective	5
2.1	Macroeconomic Objectives	5
2.2	Price and Cost Effects.....	6
2.2.1	Effects of Changes in Prices and Costs	6
2.2.2	Existence of No-Regret Potentials	8
2.2.3	Existence of a Double Dividend	13
2.3	Innovation Effects.....	15
2.3.1	Policy-Induced Technical Change	15
2.3.2	Productivity Effect of Investments in Climate Protection	16
2.3.3	First Mover Advantage	18
2.4	Demand Effects	25
2.4.1	Structural Changes.....	25
2.4.2	Income Multiplier and Accelerator Effects	28
2.5	Combined Effects of the Impulses.....	29
3	Empirical Results of the Macroeconomic Impacts	33
3.1	Modelling Approaches.....	33
3.2	Macroeconomic Effects	39
3.2.1	Review of the Results from Top-Down Approaches	39
3.2.2	Results Using a Combined Bottom-Up/Top-Down Approach.....	43
3.2.3	Comparison and Interpretation	47
4	Structural Adjustments	53
4.1	Scope of Analysis	53
4.2	Sectoral Changes	54
4.3	Changes in Regional Employment	61
4.3.1	Scope of Analysis and Methodological Approach	61

4.3.2	Net Changes in Employment in the Labour Office District.....	62
4.3.3	Gross Changes in Number of Jobs	64
4.3.4	Comparison of East and West Germany	65
4.3.5	Effects on the Regional Concentration of Employment	67
4.4	Changes in Qualification and Working Conditions	67
5	Theoretical Approaches and the State-of-the-Art in Accounting for Technological Change	71
5.1	Definitions	71
5.2	Neoclassical Innovation and Environmental Economics.....	73
5.3	Evolutionary and Institutional Economics	75
5.4	Systems of Innovation Approach.....	77
5.5	Regulatory Economics.....	79
5.6	Policy Analysis	80
5.7	Review of Empirical Results	81
6	Technological Change and Energy Consumption in Energy Intensive Industry	87
6.1	Technological Change and Energy Consumption in the German Manufacturing Sector	87
6.1.1	Energy Consumption of the German Manufacturing Sector	87
6.1.2	Decomposition Analysis for Energy Consumption and Energy Intensity in the Manufacturing Sector	90
6.1.3	Estimations of Determinants for the Development of Fuel Intensity	92
6.2	Econometric Analyses for the Iron and Steel Sector.....	95
6.2.1	Technological Paradigms	95
6.2.2	Estimations of Aggregate Fuel Intensity in the Production of Pig Iron.....	98
6.2.3	Estimations for the Diffusion of the Electric Arc Furnace	99
6.2.4	Estimations for the Development of Energy Efficiency	101
6.3	Conclusions	106
7	Barriers to the Diffusion of Energy Efficiency in the German Commercial and Services Sectors.....	107
7.1	The Data	108
7.2	Barriers to the Diffusion of Energy Efficiency.....	109
7.2.1	Lack of Time	110
7.2.2	Lack of Information About Energy Consumption Patterns	111
7.2.3	Lack of Information About Measures	111

7.2.4	Investment Priorities.....	111
7.2.5	Uncertainty About Future Energy Costs	112
7.2.6	Landlord/Tenant Dilemma (Split Incentives).....	112
7.3	Determinants.....	113
7.3.1	Energy Consumption.....	113
7.3.2	Size	113
7.3.3	Energy Audits.....	113
7.3.4	Sub-Sector Dummies.....	114
7.4	Results	115
7.5	Conclusions	117
8	Innovation Effects of Regulation – Case Study for Wind Energy	119
8.1	Introduction and Methodology	119
8.2	Regulation in the Wind Energy Sector	122
8.2.1	Overview of Instruments	122
8.2.2	Regulation in Germany.....	124
8.2.3	Regulation in the US	126
8.3	Development and Diffusion of Wind Turbines.....	128
8.3.1	Development of Technology	128
8.3.2	Diffusion of Technology.....	131
8.4	Comparative Analysis of the Influence of Regulation on Innovation	133
8.4.1	Experimentation Phase in the 1980s	133
8.4.2	Rapid Market Growth in the 1990s	134
8.4.3	Future Outlook	138
8.5	Questions for Further Research	140
9	Summary and Conclusions.....	143
	Appendix: Model Description of ISIS	153
	Literature.....	155