

Contents

List of tables and figures	xi
List of propositions	xiii
Preface	xv
Glossary of symbols	xvi
Introduction	xvii

0	A preliminary view of capital utilization	1
0.1	A simple model of capital utilization	2
0.2	The phenomenon of substitution	4
0.3	Economics effects of changes in capital utilization	6

Part I. Shift-work and the theory of the firm

1	Cost minimization	11
1.1	Assumptions underlying the model	12
1.2	The model and its operation: three propositions	16
1.3 *	Extensions	20
2	Specific functional forms: additional results	24
2.1	Capital intensity and ex-ante substitution possibilities	25
2.2	Wear-and-tear depreciation and ex-post substitution possibilities	28
2.3 *	The decision to work three shifts	33
2.4 *	Working capital and shift-work	36
Appendix 2.1	Proof of Proposition 5	41
Appendix 2.2	Sequentiality	42
3	Profit maximization	44
3.1	The issues	45
3.2 *	The constant- β technology	48
3.3 *	The semi-U technology	50
3.4	Dynamic considerations	58
3.5	Concluding remarks	63
Appendix 3.1	Perfect competition in the product market	64

Part II. Estimation

4	The estimation framework	67
4.1	A nontechnical overview of the estimation process	68
4.2 *	Specification of the dependent variable	70
4.3 *	Specification of the independent variables	75

* These starred sections may be omitted without loss of continuity.

4.4 *	Unobservable variables in the analysis of shift-work	77
4.5 *	The estimation technique	84
4.6 *	Measures of predictive performance for qualitative dependent variables	86
5	Econometric literature on capital utilization: an interpretation	90
5.1	Early empirical studies	91
5.2	Studies based on continuous dependent variables	92
5.3	Studies based on discrete dependent variables	99
6	Empirical implementation	104
6.1	The data based	105
6.2	Capital intensity	108
6.3	Elasticity of substitution	110
6.4	Economies of scale	118
6.5	Shift differentials	123
6.6 *	Working-capital hypotheses	125
6.7	Models implemented empirically	127

Part III. Results

7	Individual-country results	133
	Capital intensity, elasticity of substitution, and the unobservable-variable problem	134
7.1 *	Working-capital hypotheses	139
7.2 *	Methodological issues	144
7.3	Concluding remarks	150
8	International comparisons	153
8.1	Capital utilization and the level of economic development	153
8.2	An econometric analysis of shift-work differences among the UNIDO countries	157
8.3	Available evidence on the extent and main characteristics of shift-work in various countries	163
8.4	Concluding remarks	171

Part IV. Implications

9	Analysis of policy changes	175
9.1	The effects of shift-work: a theoretical formulation	176
9.2	Estimating the effects of policy changes on shift-work, employment, and capital requirements	180
9.3	Results of policy changes	182
9.4	General-equilibrium considerations	184
9.5	Concluding remarks	186
Appendix 9.1	Employment generated by maintenance and repair	186

Appendix 9.2	Derivation of $(L^2/X^2)/(L^1/X^1)$, etc.	189
10	Capital utilization and economic growth	191
10.1	Utilization in a static macroeconomic model	194
10.2	A simple neoclassical growth model	194
10.3	The effects of utilization on growth: a numerical illustration	197
10.4	* Extensions: endogenous savings rate and endogenous depreciation	198
10.5	Concluding remarks	202
Appendix 10.1	Derivation of equations	203
11	Shift-work and the dual economy	207
11.1	The static model	207
11.2	The growth model	209
11.3	Comparison of standard and dualistic models	210
Appendix 11.1	Derivation of equations	213
12	Conclusions and speculations	216
12.1	Summary of findings and conclusions	216
12.2	The human costs of shift-work	221
12.3	Reflections on public policy regarding shift-work	230
References		234
Index		241