
Index

- AERORRIEL, 157
 Alonso, W., 21, 22, 36–42, 46, 60, 114, 131
 Anas, A., 60, 108, 110
 Angel, S., 49
- Bacon, 4
 Barquisimeto, 160
 Barto, A. G., 61–2
 Batty, M., 3, 8, 12, 48, 49
 Baxter, R., 48, 49, 58
 Blunden, W. R., 114
 Botero, M. E., 143
 Broadbent, T. A., 102
 Buchanan, C., 114
 Bunge, M., 12, 13
- CAMETRO, 155
 capacity restriction, 119, 128–9, 133, 136, 150
 Campbell, D. T., 8
 Caracas, 154–63
 central place theory (*see* Christaller and Lösch)
 Centre for Configurational Studies, The Open University, 163
 Christaller, W., 20, 42–5, 46, 114
 Clark, C., 48
 Cochrane, R. A., 72
 cohort survival model, 111
 Converse, P., 48
 Crowther, D., 107
 Curaçao, 150–2
- Daganzo, C. F., 71
 Dale, H. M., 117
 de la Barra, T., 113, 114, 115, 116, 123, 124, 125, 139, 163
- demand functions
 commodities: demand for, 25–8; in central place theory, 42–3
 cross-elasticities, 29
 demand elasticities in the random utility model, 80
 diminishing returns, 27
 effective demand, 82
 final demand elasticities, 97–8
 floorspace demand, 105–6
- induced demand for transport, 130
 land, demand for, 29–32, 34
 repressed demand transport, 147
 substitutions, 29, 67
 travel demand, 130–1; along the Caracas-La Guaira motorway, 159; in the Central Railway, 161–2
- demonstration programs
 DIAL, 138, 168
 ECHE, 58, 168
 INPRO, 90, 169
 LOWRY, 58, 169
 REGINP, 95, 98, 169
 RIVER, 75–8, 169
 UTIL, 74, 169
 VONTH, 25, 29, 46, 169
 Dial, R. B., 136–9
 Dijkstra, E. W., 123
 discrete choice models (*see* random utility)
 Domencich, T., 68, 71–2
 DROV, 150
- Echenique, M., 12, 49, 58, 107, 114, 115, 116, 130, 168
- economic evaluation
 average utility, 72
 case studies, 156–60
 consumer's surplus, 72, 140–1
 dual model in the activity system, 102
 economic-energy evaluation, 163–7
 evaluation and simulation, 15, 66, 72
 evaluation procedure, 148, 150
 new bridge example, 75–8
 new more-expensive mode example, 73–5
 repressed demand, 147
 user benefits, 72, 148, 150
 value of time, 124
- Einstein, A., 3
- energy
 between place energy, 164
 energy constraint, in the entropy maximising model, 53
 energy evaluation study, 163–7
 TRANUS model, 148
 within place energy, 164
- entropy maximising models (*see also*

176 *Index*

- spatial interaction models)
- constrained models, forms of, 54–5
- constraints, 52, 65
- mathematical derivation of, 52–5
- micro-economic models, differences with, 59–64
- models of flows, 55
- models of the location of activities, 56–9
- random utility theory, comparison, 81
- states, initial and final, 51
- states, macro and micro, 51
- uncertainty, 51–2
- FERROCAR.**, 160
- floorspace**
 - activity system, in the, 103–10
 - age of buildings, 108–9
 - building types, 108
 - demand model, 105–6
 - demand/supply relationships, 100
 - demolitions, 109
 - Echenique's model, 58, 107
 - energy consumption in buildings, 164
 - Hansen's model, 107
 - informal housing, 110
 - overall supply of, 106–7
 - potential floorspace, 107
 - sub-markets, 108
 - supply model, 106–10
 - TRANUS model, 146
 - utility function, 107–8
 - vacancy condition of land, 109
- Garin, G. A., 49, 58, 102
- Geraldes, P., 130–1
- Goodall, B., 107
- Hansen, W. G., 48, 56, 107, 114
- Herbert, J., 46
- Hoyt, H., 48
- Huff, D. L., 49
- Hume, 5
- Hyman, G. M., 49
- input–output models**
 - demand, intermediate and final, 88
 - elasticities, 97–9
 - inputs, produced and primary, 88
 - monopoly rent, 96
 - multi-region model, 90–1
 - price accumulation, 94–7
 - production chains, 93–4
 - profits: abnormal, 95–7; normal, 94–5
 - random utility multi-region model, 92–9
 - scarcity rent, 96
 - sectors, producing and purchasing, 87
 - single-region model, 87–90
 - substitutions, 97–9
 - technical coefficients, 89, 92
- Interamerican Development Bank, 162
- Isard, W., 48, 87
- iterative processes**
 - activity system, solution of, 103–4
 - Alonso's model, solution of, 41–2
 - convergency, 28, 29
 - doubly constrained entropy maximizing model, solution of, 54
 - equilibrium assignment model, solution of, 135
 - informal housing model, solution of, 110
 - incremental assignment model, solution of, 134
 - integrated land use and transport model, solution of, 119
 - linked land use and transport model, solution of, 116
 - Lowry's model, solution of, 56–8
 - McLoughlin's search and assignment, solution of, 136
 - multi-region input–output model, solution of 96–7, 98
 - path search and assignment model, solution of, 139
 - planning process, 10–11
 - random utility model with variable costs and elasticities, 80
 - scientific process, 6–7
 - single-region input–output model, solution of, 89
 - TRANUS model structure, 146–8
 - Von Thünen's model with elasticities, solution of, 28–32
- Kanafani, A., 134
- Keynes, M., 82–5, 87
- Kirwan, R. M., 107
- Kuhn, T. S., 2
- La Guaira, 157–60
- La Victoria, 152–4
- Lakshmanan, T. R., 56
- land markets** (*see also land rent*)
 - activity system, in the 103–4
 - Alonso's model, 36–42
 - bid price, 22, 41–2
 - central place theory (*see Christaller and Lösch*)
 - Christaller and Lösch model, 42–5
 - complementarity between land and transport, 34, 36
 - equivalent land values, 146
 - indifference map, 37–8
 - locus of opportunity surface, 36–7
 - market areas, 20, 43–4
 - micro-economic theories of, 20–47
 - potential land, 106
 - Von Thünen's model, 21–32
 - Wingo's model, 32–6
- land rend** (*see also land markets*)
 - abnormal profits, 95–7
 - activity system, 103–10

Index

177

- Alonso's model, 36–42
 demand for land, 29–32, 34
 equivalent land values, 146
 micro-economic theories of, 20–47
 positive utility of land, 34
 Von Thünen's model, 21–32
 Wingo's model, 32–6
land use (see location of activities)
 Le Blanc, L. J., 135
 Leach, G., 164
 Lee, C., 48
 Leontief, W. W., 87, 90–1
 Lindsay, W., 107
location of activities
 activity analysis, 102
 activity system, 100–5
 Alonso's model, 36–42
 central place theory (*see Christaller and Lösch*)
 Christaller and Lösch model, 42–5
 Echenique's model, 58
 entropy maximising models, 56–9
 gravitational models, 49–50
 Hansen's residential model, 49, 56
 integrated land use and transport model, 117–19
 Lakshmanan and Hansen's retail location model, 56
 linked land use and transport model, 115–17
 Lowry's model, 56–8
 migration movements, 110–12
 new bridge example, 75–8
 spatial hierarchies, 112–13, 144, 152–4, 156–7, 160–2
 spatial interaction models, 48–64
 TRANUS model, 145–6, 149
 Von Thünen's model, 21–32
 Wilson's residential model, 58–9
 Wingo's model, 32–6
 Los Teques, 154–7
 Lösch, A., 20, 42–5, 46
 Lowry, I. S., 49, 56–8, 59, 60, 102, 107, 111, 114
 Luce, R. D., 78
- macro-economic models
 economic base model, 87
 Keynes' model, 82–5
 marginal propensity to save, 85
 marginal propensity to import, 86–7
 multi-region input–output model, 90–1
 multiplier effect, 84–5
 random utility multi-region input–output model, 92–9, 102–3
 regional income model, 85
 single-region input–output model, 87–90
 Malisz, B., 17
 March, L., 50
 Martin, D. B., 107
 Marx, C., 3, 8
 Masser, I., 111
 Mayberry, J. P., 132
- McFadden, D., 68, 71–2
 McGill, S. M., 102
 McLaughlin, W. A., 136, 139
micro-economic models
 Alonso's model, 36–42
 basic principles, 20–1, 59–60, 65, 73
 central place theory (*see Christaller and Lösch*)
 Christaller and Lösch model, 42–5
 spatial interaction models, differences with, 59–64
 Von Thünen's model, 21–32
 Wingo's model, 32–6
migration movements, 111–12
 Mills, E. S., 21, 107
 MINDUR, 152
modal split
 estimates, along the Caracas-La Guaira motorway, 159
 integrated land use and transport model, 118, 131–2
 linked land use and transport model, 116
 new more-expensive mode example, 73–5
 TRANUS model, 147, 150
 Wilson's trip distribution and modal split model, 55
mode choice (see modal split)
model dynamics
 continuous and discrete dynamics, 17
 dynamic equilibrium, 16
 exogenous and endogenous dynamics, 16–17
 response time, 16
 time lag, 16
 TRANUS system, 144–5
 urban–regional dynamics, 100–1
models, general
 analogies, 14
 black-box, 13–14
 continuous versus discrete models, 61–4
 definition of models, 10
 deterministic and probabilistic models, 14–15
 exogenous and endogenous variables, 14
 formalisation, 15
 goodness-of-fit, 12
 individuals' models, 7
 model dynamics, 15–18, 100–1
 model structure and planning system, 15
 real referents, 12
 representations, 13
 testability, 13
 theoretical content, 13
 Moore, E. F., 123
 Morais, A. L., 143
 Morlok, E. K., 135
 MTC, 158, 162
 Murchland, J. D., 123
 Muth, R. F., 21, 107

178 *Index*

- natural sciences
 - convergency with social sciences, 2–4
 - differences with social sciences, 1–2
- network analysis
 - back-node vector, 123
 - back-operator vector, 124
 - directed graph, 120
 - link capacity, 120
 - mean free speed, 120–1, 129
 - traffic density, 120
 - volume/capacity relationship, 121, 129
 - volume of flow, 120, 121
- network code
 - intersection-based representation, 125
 - link-based representation, 125–8
 - minimum path search, 123
 - multi-path search, 128
 - reverse graph representation, 125–8
 - transfers, in public transport, 124
 - TRANUS model, 147–8, 150
 - travel cost, 123–4, 128, 140, 147
 - travel time, 124, 128–9
 - turn prohibitions, 124–8
 - waiting time, 128–9
- Newton, I., 2
- Owens, S., 113
- Pellew, S., 164
- Penz, F., 164
- Pérez, B., 123, 124, 125, 139, 143
- Pick, G. W., 116–17
- Pierskalla, W. P., 135
- planning
 - land available through regulations, 106
 - model structure and planning system, 15
 - planners, 10–11
 - pre- and post-evaluation, 10–11
 - quantitative revolution, 3–4
 - regional planning applications, 157–63
 - simulation, 10
 - urban land use planning applications, 150–4
 - urban transportation planning applications, 154–7
- Popper, K. R., 4–8
- Puerto Cabello, 160–1
- Putman, S. H., 114
- random utility
 - aggregate utility, 67–73
 - attribute correlation, 71, 81, 139–40
 - average utility (*see* composite cost)
 - composite cost, 72, 79, 102, 140–1
 - consumer's surplus, 72
 - decision chains, 78–80
 - distribution of perceived utilities, 69–70
 - elasticities, 80
- entropy maximising models, comparison, 81
- hierarchies, 81, 112–13
- independence of irrelevant alternatives axiom, 78
- individual utility, 66–7
- logit models, 71–2, 93
- maximum entropy models, comparison, 81
- nested multinomial logit models (NML), 80
- new bridge example, 75–8
- new more-expensive mode example, 73–5
- parameter of the multinomial logit model, properties, 73–8
- probit models, 71
- sources of variability, 68–9
- spatial hierarchies, 112–13
- strict utility, 70, 79
- user benefits, 72, 148, 150
- variable costs, 80
- Weibull distribution, 71
- Reilly, W. J., 48
- Rickaby, P., 113, 143, 163
- Rogers, A., 49, 111
- route choice (*see* trip assignment)
- scientific method
 - criteria of demarcation, 5
 - Hume's problem, 5
 - induction, 2, 4–5, 6
 - Kuhn's theory, 2
 - logical asymmetry, 5
 - models, 11–18
 - objective knowledge, 6
 - paradigms, 2
 - Popper's interpretation, 4–6
 - principle of refutation, 5
 - simulation, 4
 - theory of three worlds, 5–6
- SELNEC, 114, 115, 117
- Senior, M. L., 117
- Shortreed, J. H., 123
- social processes
 - experimental society, 8
 - individual's model, 7
 - multiplicity and conflict, 8
 - open society, 8
 - planners, 10–11
 - social learning process, 8
 - social objective knowledge, 6–8
- social sciences
 - convergency with natural sciences, 2–4
 - differences with natural sciences, 1–2
 - individual's model, 7
 - quantitative revolution, 3–4
 - simulation in, 4, 9–10
 - social objective knowledge, 6–7
 - social scientists, 9–10
 - spatial hierarchies, 112–13, 144, 152–4, 156–7, 160–2

Index

179

- spatial interaction models (*see also* entropy maximising models)
 - entropy maximising derivation, 50–5
 - gravitational analogy, 48–50
 - micro-economic models, differences with, 47, 59–64
 - models of flows, 55
 - models of the location of activities, 56–9
 - origins of, 48–9
 - potential models, 50
- Stevens, B. H., 46
- Stewart, J., 48
- Stoneman, C. A., 123
- Strout, A., 90–1
- Supernak, J., 131
- supply models
 - activity system, supply sectors, 103–10
 - central place theory, 42–5
 - Echenique's floorspace supply model, 58, 107
 - floorspace supply model, 106–10
 - Hansen's floorspace supply model, 107
 - investment supply model, 97
 - TRANUS model of floorspace supply, 146
 - Von Thünen's model, 21–32
- TRANSPLAN, 160
- transportation system
 - capacity, 120
 - capacity restriction, 119, 128–9, 133, 136, 150
 - car availability, 131
 - car ownership, 55, 116, 131
 - generalised cost, 116–18, 147, 150
 - induced demand, 130
 - integrated land use and transport model, 117–19, 131–2
 - linked land use and transport model, 115–17
 - location of activities, relation to, 21–45, 48–64, 110–12
 - minimum path search, 123
 - modal split, 55, 118, 147, 150
 - multi-path search, 128
 - network analysis, 119–28
 - public transport, 124
 - repressed demand, 147
 - traffic density, 120
 - transport administrators, 120
 - transport operators, 120, 147
 - trip assignment, 116, 119, 132–40, 147–8, 150
 - trip distribution, 55, 116–7
 - trip generation, 116, 118, 129–31, 147, 150
 - value of time, 124
 - volume of flow, 120
 - Wardrop's principles, 132–3
- TRANUS, 143–67
- trip assignment
 - category analysis, 116–17
 - equilibrium assignment, 134–5
 - incremental assignment, 133–4
 - integrated land use and transport model, 132–40
 - linked land use and transport model, 116
 - optimised assignment, user and system, 132–3
 - path enumeration, 136
 - probabilistic route choice, 136–40
 - single-path assignment, 133
 - TRANUS model, 147–8, 150
 - travel time, average and marginal, 132
 - Wardrop's principles, 132–3
- trip distribution
 - linked land use and transport model, 116
 - Senior's critique, 117
 - Wilson's trip distribution and modal split model, 55
- trip generation
 - category analysis, 116–17
 - induced demand, 130
 - integrated land use and transport model, 118, 129–31
 - linked land use and transport model, 116
 - regression method, 116–17
 - repressed demand, 147
 - TRANUS model, 147, 150
- UMTA, 134, 135, 136
- utility functions
 - Alonso's model, general utility function, 39
 - consumer's surplus, 72
 - decision theory, 66–7
 - deterministic utility functions, 67
 - distribution of perceived utility, 69–70
 - probabilistic utility functions, 70
 - strict utility, 71
 - suppliers of built stock, utility function, 107
- Valencia, 160–1
- Van Valkenburg, M. E., 62
- Von Thünen, J. H., 20, 21–32, 34, 41, 45, 46, 60, 114, 169
- Wardrop, J. G., 132–3, 134
- Weber, A., 20
- Williams, H. C. W. L., 65–6, 68, 72, 79, 132
- Williams, I., 49, 58, 130–1
- Wilson, A. G., 46, 49, 50, 52–4, 58–9, 90–1, 111, 114
- Wilson, J., 123
- Wingo, L., 21, 32–6, 46, 47, 60, 114
- Wootton, H. J., 116–17
- Zipf, G. K., 48, 111