Contents

	List	of Figur	res p	age xiii
	List	of Table	es	xvi
	Fore	word by	y Luis F. López Calva and Robert Axtell	xvii
	Ack	Acknowledgements		
	List	of Abbı	reviations	xxv
	PAF	RTI A	COMPLEXITY APPROACH TO	
	SUS	STAINA	ABLE DEVELOPMENT	
1	Intr	oductio	on	3
	1.1		ation for This Book	3
	1.2	Cuttir	ng-Edge Methods for Challenging Goals	6
	1.3	The 'F	Policy Priority Inference' Research Programme	9
	1.4	Target	Audience	14
	1.5	Struct	ure of the Book	16
2	Poli	icy Pric	oritisation, Complexity, and Agent Computin	g 22
	2.1	Model	lling the Expenditure–Development Link	24
	2.2	Gener	ative Causation and Social Mechanisms	30
	2.3	On Ca	nusal Inference and Agent Computing	34
		2.3.1	The Identification of Counterfactuals	36
		2.3.2	The Workings of the Dependency and	
			Generative Accounts	38
		2.3.3	The Validity of Agent-Computing Counterfactua	ls 43
		2.3.4	The Benefits of Using Agent Computing for	
			Policy Evaluations	47
	2.4	Summ	nary and Conclusions	51

viii contents

3	Relevant Data and Empirical Challenges			53	
	3.1 A Worldwide Look at Sustainable Development throu				
		Data		54	
		3.1.1	SDGs and Indicators	54	
		3.1.2	Pre-processing Indicators and Descriptive		
			Statistics	62	
		3.1.3	Countries and Government Spending	68	
	3.2 Popular Modelling Frameworks and Their Limita			84	
		3.2.1	Benchmark Analysis	85	
		3.2.2	Regression Analysis	86	
		3.2.3	General Equilibrium Models	88	
		3.2.4	System Dynamics	91	
		3.2.5	Network Analysis	92	
	3.3 Empirical Challenges		ical Challenges	95	
		3.3.1	Adapting to Coarse-Grained Indicators	95	
		3.3.2	Moving beyond Associations	96	
		3.3.3	Handling Complex Expenditure Linkages	97	
		3.3.4	Embedding Vertical Mechanisms	99	
		3.3.5	Estimating Interdependency Networks	101	
	3.4	Summary and Conclusions			
4	A Computational Model			104	
	4.1	_		105	
	4.2	•		107	
	4.3	Public Servants		110	
	4.4	Central Authority		117	
	4.5	Development Outcomes		122	
	4.6	Summary and Conclusions		126	
5	Calibration and Validation			129	
	5.1	Calibration Strategy		130	
	5.2			132	
	5.3	-			
	5.4	On Statistical Confidence and Testing		139	

	5.4.1	Confidence Intervals	140
	5.4.2	Hypothesis Testing	142
5.5	Valida	ation	144
	5.5.1	External Validation	144
	5.5.2	Internal Validation	147
	5.5.3	Soft Validation	150
	5.5.4	Stakeholder Validation	151
5.6	Statist	tical Behaviour	152
	5.6.1	Testing for Synthetic Counterfactuals	153
	5.6.2	Parameter Recovery	154
	5.6.3	Overfitting	158
	5.6.4	Time Equivalence	160
5.7	On In	terdependency Networks	160
5.8	Summ	nary and Conclusions	163
	VELOP		
The	e Feasib	oility of the Sustainable Development Goals	167
6.1	On Qu	uantifying the Feasibility of the SDGs	167
6.2	Simul	ation Strategy	169
6.3	Expec	ted Gaps	171
	6.3.1	Gap Closures	176
6.4	Sensit	ivity to the Budget Size	181
	6.4.1	Proportional Changes in the Budget	184
6.5	Summ	nary and Conclusions	185
Gov	vernme	ent Spending and Structural Bottlenecks	188
7.1	On th	e Concept of a Structural Bottleneck	189
	7.1.1	A Formalisation: The Budgetary Frontier	190
7.2	Simul	ation Strategy	192
7.3	Result	ts	192
	7.3.1	Insensitivity on the Budgetary Frontier	192
	7.3.2	Poor Performance + Insensitivity = Bottleneck	195

6

7

X CONTENTS

		7.3.3	Not All Bottlenecks Are Created Equal: A	
			Flagging System	200
	7.4	Summ	nary and Conclusions	205
8	Pub	lic Gov	vernance and Sustainable Development	207
	8.1	On the	e Study of Corruption and the Rule of Law	209
		8.1.1	Two Conceptual Frameworks: Principal-Agent	
			versus Systems Thinking	209
		8.1.2	The Dominant Empirical Approach: Econometrics	210
	8.2	Data v	vith an Endogenous Rule of Law	214
	8.3	Simulation Strategy		216
	8.4	Results of Counterfactual Analyses		
		8.4.1	Non-linear Responses to Expenditure in the	
			Rule of Law	219
		8.4.2	Rugged Policy Landscapes	223
	8.5	Summ	ary and Conclusions	228
9	The Impact of International Aid			231
	9.1	Studies on Aid Effectiveness		233
	9.2	Data		236
		9.2.1	Countries and Indicators	236
		9.2.2	Government Expenditure	237
		9.2.3	Aid Flows	240
	9.3	Simul	ation Strategy	242
		9.3.1	Expenditure, Aid, and Counterfactuals	243
		9.3.2	Impact Metric	244
		9.3.3	Statistical Significance	248
	9.4	Results		250
	9.5	Beyond Conventional Methodologies		256
	9.6	Summary and Conclusions		258

PART III A FOCALISED VIEW OF SUSTAINABLE DEVELOPMENT

10	Subnational Development and Fiscal Federalism	265
	10.1 On Fiscal Federalism	267
	10.1.1 Fiscal Decentralisation in Mexico	268
	10.2 Data	271
	10.2.1 Development Indicators	271
	10.2.2 Development Clusters	271
	10.2.3 Expenditure Data	277
	10.3 Simulation Strategy	278
	10.4 Results	282
	10.4.1 The Impact of Contributions	282
	10.4.2 Optimising Contributions	282
	10.4.3 Policy Priorities and Contributions	285
	10.5 Summary and Conclusions	287
11	Accelerators and Systemic Bottlenecks	289
	11.1 Accelerators, Bottlenecks, and Their Empirical	
	Quantification	291
	11.2 Data	293
	11.2.1 Government Expenditure	293
	11.2.2 Development Indicators	294
	11.3 Simulation Strategy	295
	11.3.1 Counterfactual Budgets	310
	11.3.2 Detection of Bottlenecks and Accelerators	311
	11.4 Results	313
	11.4.1 Identification of Systemic Bottlenecks	
	and Accelerators	313
	11.4.2 Comparison against Naïve Approaches	315
	11.4.3 Disaggregation of Systemic Bottlenecks and	
	Accelerators	319
	11.5 Summary and Conclusions	321

xii contents

12	Deprivation, Income Shocks, and Remittances	323	
	12.1 Socioeconomic Deprivation in the Mexican Context	324	
	12.1.1 The Importance of Remittances and Research		
	Design	325	
	12.2 Data	327	
	12.2.1 Indicators	329	
	12.2.2 Social Expenditure	333	
	12.2.3 Household Spending and Remittances	335	
	12.2.4 The Complex Structure of Government		
	Spending and Development	336	
	12.3 Simulation Strategy	337	
	12.4 Results	340	
	12.4.1 Impact Evaluation by Expenditure Source	340	
	12.4.2 Shock Mitigation via Government Expenditure	346	
	12.5 Summary and Conclusions	348	
13	Lessons and Reflections		
	13.1 Lessons Learnt	350	
	13.2 From Analysis to Policy Guidelines	357	
	13.2.1 Workflow for Strategic Planning	359	
	13.3 A Call for Computational Social Scientists	362	
	13.3.1 Necessary Infrastructure	363	
	13.3.2 Upgrading Skills in Technical Teams	365	
	13.3.3 Updating Social Science Programmes	366	
	Bibliography		
	Index		