

CHEAP AND EASY: COMPACT CGES FOR DEVELOPMENT POLICY

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ILO STRENGTHEN: GLOBAL KNOWLEDGE SHARING WORKSHOP



14 MAY 2019

Focus on applications

- Guatemala
- Honduras
- Many other applications-
petroleum reform
in Mexico



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Advanced CGE Models now highly evolved

- GTAP
- Mirage-code not even available
- REMI-combines econometrics and CGE methods
- Has become a business—difficult to find and difficult to learn



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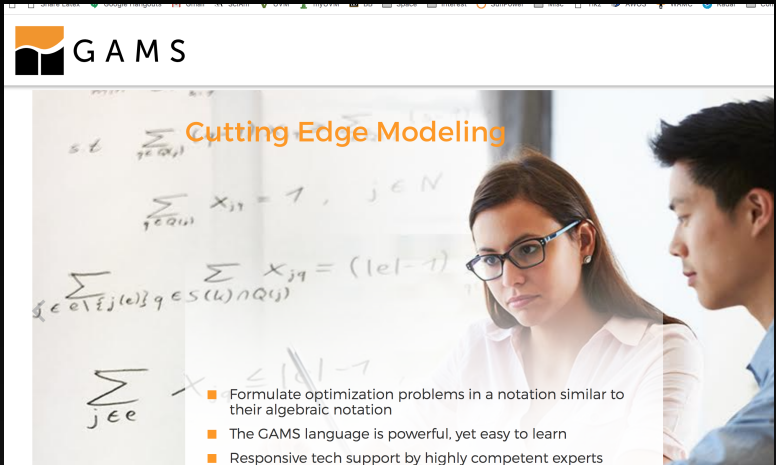


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Industry standard



The image is a screenshot of the GAMS (General Algebraic Modeling System) website. At the top, the GAMS logo is displayed, consisting of an orange square with a white stylized 'G' and the letters 'GAMS' in a bold, sans-serif font. Below the logo, the main heading 'Cutting Edge Modeling' is written in a large, orange, sans-serif font. The background of the website features a photograph of a woman with long brown hair and glasses, wearing a light pink shirt, looking intently at a whiteboard. A man with dark hair, wearing a blue shirt, is partially visible on the right side of the frame, also looking at the whiteboard. The whiteboard is covered with handwritten mathematical equations in black marker. The equations include a summation over a set Q, a summation over a set N, and a summation over a set E. The equations are as follows:

$$\sum_{j \in Q(i)} x_{ij} = 1, \quad j \in N$$
$$\sum_{j \in E \setminus \{j(e)\}} x_{jq} = (|e| - 1)$$
$$\sum_{j \in E} x_{ij} \leq |E| - 1$$

Below the equations, there is a list of three bullet points, each preceded by an orange square icon:

- Formulate optimization problems in a notation similar to their algebraic notation
- The GAMS language is powerful, yet easy to learn
- Responsive tech support by highly competent experts

A Compact CGE adequate for 95% of what standard model gives

- Standard models too complex with many buried assumptions closure specific
- Variable pattern of aggregation is key
- *Big data* becomes small, usable data.



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The Data: SAMs combine sources

- Input-output
- National income and product accounts
- Government budget
- Balance of payments

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Big Data!

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1		Social Accounting Matrix																
2		PEP standard model V2.0																
3		GTQ Millions Agriculture Industries-- Informal																
4						a-agsem	a-agfed	a-agstr	a-pstr	a-indfd	a-indtr	a-srvwat	a-srvstr				c-coff	c-bar
5	Agriculture	0	0	0	0	0	0	0	0	0	0	0	0	42191.1	123.472		347.225	1745.1
6	Industry--Services	0	0	0	0	0	0	0	0	0	0	0	0	348.335	473769		0.25969	
7	Informal	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
8	Agricultural industries for seed	a-agsem	0	0	0	0	0	0	0	0	0	0	0	24598.9	0		347.22502	1745.100
9	Agricultural industries for feed	a-agfed	0	0	0	0	0	0	0	0	0	0	0	10225	0		0	
10	Other agriculture	a-agstr	0	0	0	0	0	0	0	0	0	0	0	4771	303.545			
11	Other primary industries	a-pstr	0	0	0	0	0	0	0	0	0	0	0	2596.18	19.927		0	
12	Food industry	a-indfd	0	0	0	0	0	0	0	0	0	0	0	335.617	64125.5		0.2393588	
13	Other manufactures	a-indtr	0	0	0	0	0	0	0	0	0	0	0	1.18235	63678.5		0	
14	Water distribution	a-srvwat	0	0	0	0	0	0	0	0	0	0	0	0	2205.66			
15	Other services	a-srvstr	0	0	0	0	0	0	0	0	0	0	0	11.535	341759		0.02063052	
16	Agriculture	1553.82	25169.1			634.162	829.644	36.9351	53.0751	19469.3	3130.34	0.6543	2568.77	0	0		0	
17	Industry--Services	14198.6	205591			6613.98	3950.71	2141.99	1491.97	21241.4	54591.4	918.001	128840	0	0		0	
18	Informal	0	0											0	0			
19	Coffee	c-coff	0	433.533		0	0	0	0	433.53258	0	0	0	0	0		0	
20	Bananas	c-bana	0	23.8006		0	0	0	0	9.3478747	0	0	0	14.6527333	0		0	
21	Maize	c-maiz	151.924	2048		100.201409	51.7220476	0	0	2046.71484	0	0	0	1.28544357	0		0	
22	Beans	c-bean	0	244.706		0	0	0	0	186.317399	17.7711258	0	0	40.4172462	0		0	
23	Cereals and legumes	c-cere	7.4922	2072.45		7.49221992	0	0	0	2055.40421	0	0	0	32.9728228	0		0	
24	Roots and tubers	c-rtut	60.4832	163.58		60.4831684	0	0	0	9.78155479	0	0	0	153.788083	0		0	
25	Vegetables	c-vege	0	308.28		0	0	0	0	34.1100174	4.70039128	0	0	269.468773	0		0	
26	Fruits	c-frut	0.94187	528.617		0.94186879	0	0	0	386.677366	15.8815193	0	0	126.061915	0		0	
27	Other crops, live plants, flowers and their seeds	c-plan	564.336	5284.2		465.043501	99.2624227	0	0	4560.85434	701.505008	0	0	21.4403761	0		0	
28	Meat	c-meat	0	622.205		0	0	0	0	654.094749	0	0	0	7.5104461	0		0	
29	Eggs	c-eggs	0	216.591		0	0	0	0	154.102254	5.43025589	0	0	57.058408	0		0	
30	Other animal products including live animals	c-comp	0	1.00375		0	0	0	0	0	0	0	0	1.00374605	0		0	
31	Fuel wood	c-fuel	0	443.588		0	0	0	0	377.583231	51.4648721	0	0	14.5397554	0		0	
32	Other forestry products	c-offy	640.503	9368.65		0	640.503447	0	0	8332.23203	978.883516	0	0	55.3300092	0		0	
33	Fish and other fisheries products	c-fish	36.9954	289.96		0	36.9953226	36.9350568	0	156.829806	0.0311327	0	0	25.110468	0		0	
34	Minerals	c-minr	91.175	3119.9		0	38.0993835	0	53.0750627	87.0646182	1356.27291	0.65430102	1075.93115	0	0		0	
35	Meat products	c-meat	0	4563.39		0	0	0	0	273.046557	0	0	0	4290.3405	0		0	
36	Prepared or canned fish	c-fisp	0	75.9859		0	0	0	0	24.3400562	0	0	0	51.6457989	0		0	
37	Canned legumes	c-vege	0	615.362		0	0	0	0	363.765784	114.584329	0	0	136.613426	0		0	

Big Data!

	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL
1																			
2																			
3																			
4	c-maiz	c-bean	c-cert	c-rstu	c-vege	c-fna1	c-plan	c-milk	c-eggs	c-oarp	c-lena	c-otfr	c-fish	c-otml	c-meat	c-fisp	c-vegp	c-oilp	c-molp
5	4668.85	3061.6	330.36	2163.04	5308.56	1949.45	5024.63	914.932	2693.61	9.96199	1485.52	9353.54	538.474	2596.18	0	0	0	0	0
6	0.00085	0	0	0	0.00337	0.00689	7.31403	0.92333	0.22595	0.00128	0.02912	338.04	0.14027	1.39053	12525.3	313.849	986.591	2472.87	11743.2
7																			
8	4668.84542	3061.59703	330.369376	2163.0405	5308.56059	1949.4509	5024.62532	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	914.932252	2693.60673	9.96190477	0.10295967	6605.93598	0.40998326	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	1485.41883	2747.60813	537.974347	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	2596.17581	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	335.37812	0	0	12525.2363	313.848949	987.5641	2472.86664	11743.1523
13	0	0	0	0	0	0	0	0	0	0	0	0	0	1.18234652	0	0	29.028728	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0.00084968	0	0	0	0.00337084	0.00689186	7.31402993	0.923328	0.22554661	0.00128055	0.02912125	2.66152604	0.14027071	0.20818391	0.06456552	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18																			
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

[illegible]

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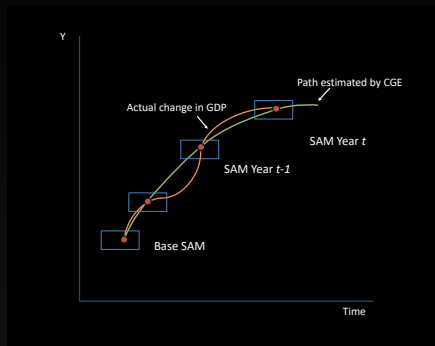
CU	CH	CI	CJ	CK	CL	CM	CN	CO	CP	CQ	CR	CS	CT	CU	CV	CW	CX	CY	CZ
x-daga	x-maca	x-lact	x-odi	x-bebi	x-inst	x-elwa	x-geot	Impuestas	t-act	s-act	t-com	s-com	t-imp	t-dir	t-fac	Inversion	inv	gstk	Totales
0	0	0	0	0	0	0	0	5,948,231,572	0	0	0	0	0	0	0	0	0	0	67353.4
4637.8	151.384	75.2924	1538.92	667.402	25639.2	173.519	15176.28914	0	0	0	0	0	0	0	0	0	0	0	526817
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37218.2
0	0	0	0	0	0	0	0	4,988,257,477	0	0	0	0	0	0	0	0	0	0	12050
0	0	0	0	0	0	0	0	0.0509724095	0	0	0	0	0	0	0	0	0	0	6025.94
4637.79554	151.38441	75.2923354	1511.94364	0	2.386336	0	56.31076387	0	0	0	0	0	0	0	0	0	0	0	12057.2
0	0	0	28.9766258	667.401775	25570.4803	0.25518773	113.8994586	0	0	0	0	0	0	0	0	0	0	0	77508.8
0	0	0	0	0	0	0	34.9034437	0.362222375	0	0	0	0	0	0	0	0	0	0	90082.8
0	0	0.000109931	0	0	66.3375209	136.310633	15005.8197	0	0	0	0	0	0	0	0	0	0	0	2242.87
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	356583
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	701.135	10.0345	691.1	79307.5
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	55801	54899.9	901.024	673402
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	33.2294	0	33.229394	552.494
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2568.66
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23.5064	0	23.5064012	12272.1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-4.13913	0	-4.1391316	6506.9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8.01462	0	8.01462131	2508.24
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4645.07
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30.1585	0	30.15853	14009.9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-20.6432	0	-20.643216	4090.63
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	269.756	0	269.75539	6621.12
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1206.17
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-2.5381	0	-2.5380995	3823.89
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-0.18262	0	-0.1826186	17.0036
0	0	0	0	0	0	0	0	0	0	0.00011	0	0	0	0	0	0.0001144	0	0.0001144	3267.3
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	74.7976	10.0345419	64.7630240	12444.3
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11.1494	0	11.1493669	1030.92
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	278.026	0	278.026088	3742.55
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-9.71699	0	-9.7169948	17261.7
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.45756	0	2.4575593	817.023
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28.7085	0	28.7085097	2710.67

Becomes...Small Data

SAM Guatemala													
	Activities			Commodities		Skilled	Unskilled	Capital/Emp	Poor	Rich	Invest	Gov	Exports
	Other	Construction	Informal	Other	Construction								
Other				446	0								
Construction				0	29								
Other	231	12	24.3						29	128	23	19	54
Construction	3	4	0.5						0	0	15	0	0
Informal									13	32	9	0	3
Skilled	52.64	1.81											
Unskilled	58.35	5.64											
Capital/Emp	98	5	32										
Poor						3	24	1					15
Rich						52	40	74					24
Savings								54					-41.7
Gov	3.772	0.403	0	17	0	0	0	3	1	8	0	0	3
Imports	0	0		57	-6	0	0	3	0	0	0	3	0
Total	446.71	29.42	56	521.36	23.23	54.45	64.00	135	43.21	188.62	47.65	36.77	57.21

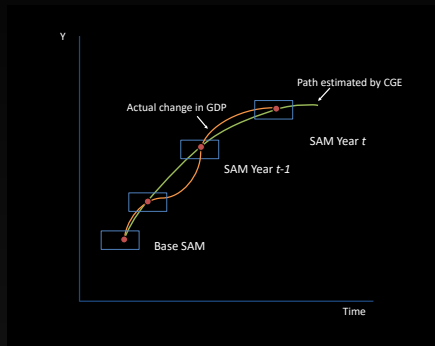
Dynamic SAMs

- Must have stock-flow relationship
- Updated at each sweep of the model
- Calibrated to time series
- Must account for capital dynamics



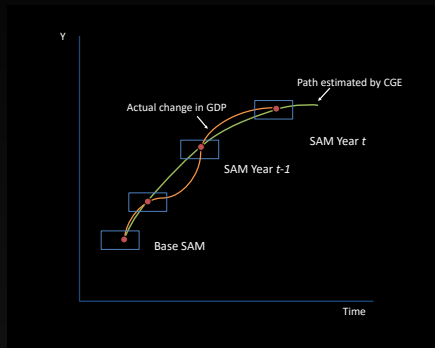
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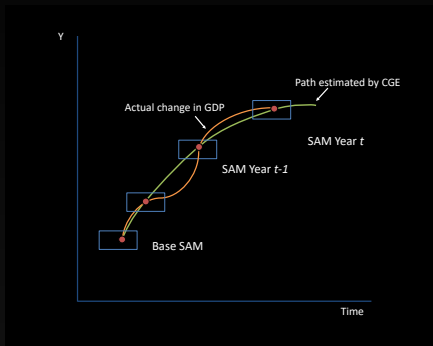
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Employment

- SAM/CGE only gives *wage bill*
- To get employment...need nominal wage series.
- For all skill categories
- This can be a problem!

Source: http://www.deloitte.com/au/assets/pdf/publications/australian_economic_projections_2010-2019.pdf

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- Same wage bill can correspond to many levels of employment

→ How can we get employment from a wage bill?

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- Same wage bill can correspond to many levels of employment
- Limitation typical of empirical models of employment

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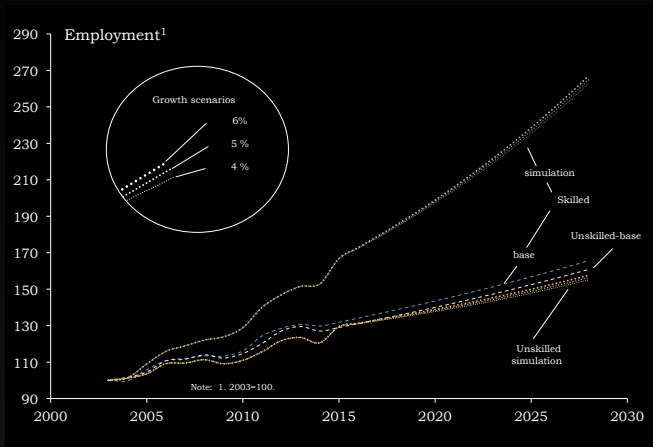
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Employment



Thanks...

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