

Comparison of Local Economic Models, REMI,  
IMPLAN and Southern California's Inter-County  
Social Account Matrix (SCI-SAM): Impact Analysis on  
LA-LB Dual Ports Disruption

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# Introduction

- The regional economic commercial software such as IMPLAN and REMI are widely used in estimating economic impacts on local issues.
- Reputation vs. Robustness
- Do they provide similar results in the impact analysis and what are pros and cons in the results?
- Can we show if and how other local economic models, once constructed, e.g., Southern California's Inter-County Social Account Matrix (SCI-SAM) can provide consistent results to the commercial economic impact software in the impact study?

# Introduction *(Continued)*

- Recent study by Bonn and Harrington (2008)\* showed some interesting results by comparing among REMI, IMPLAN, and Capacity Utilization Model (CUM) based on 2005:

1. They compared estimated total output, income, and employment results of each model, the income results were most different.

-- The CUM estimated the 'payroll', REMI estimated the 'disposable personal income' and IMPLAN estimated the 'value added'.

2. Difference of between REMI and IMPLAN: REMI is working from a highly aggregated regional I/O table (23 sectors), IMPLAN is working from a highly specified county I/O table (509 sectors).

- \*Bonn, M. A., and Harrington, J., 2008, A comparison of three economic impact models for applied hospitality and tourism research, *Tourism Economics*. 14(4): 769-789.

# SCAG Region



Source: [http://www.scag.ca.gov/eMap/images/scag\\_region04.jpg](http://www.scag.ca.gov/eMap/images/scag_region04.jpg)

# **IMPLAN (Impact model for Planning, WWW.IMPLAN.COM)**

- o IMPLAN model is traditional input-out type model.
- o IMPLAN also includes Social Account Matrix and is used for economic impact assessment, and recently released version 3.
- o With IMPLAN V.3 it is constructed to possibly track the flow of all 440 IMPLAN Commodities from any county to every other county in the US, allowing to track and model how the effect of impact in one county disperses into other counties.

# REMI (Regional Economic Impact Model, [WWW.REMI.COM](http://WWW.REMI.COM))

- o The REMI model is a dynamic forecasting and policy analysis tool incorporates the complete inter-industry relationships found in input-output models.
- o REMI integrates input-output, computable general equilibrium, econometric, and economic geography methodologies.
- o The overall structure of the model can be summarized in five major blocks: (1) Output, (2) Labor and Capital Demand, (3) Population and Labor Supply, (4) Wages, Prices, and Costs, and (5) Market Shares.

# SCI-SAM (Southern California's Inter-County Social Account Matrix)

- o SCI-SAM is an Multiregional Input-Output (MRIO) of the 6 counties for 20 (2-digit) North American Industry Classification System (NAICS) industrial sectors. The major data sources are the Minnesota IMPLAN Group's IMPLAN model for each county.
- o Apply Park (2006)'s useful approach to estimating trade flows among regions based on Geographically Weighted Regression (GWR) model.

# SCI-SAM (Southern California's Inter-County Social Account Matrix)

- o The model estimates a large number of intra- and intercounty shipments as well as demographic characteristics
- o The matrix includes county-to-county trade flows for each industry and county-to-county commuting flows for each income category for 2004
- o Connecting each region's SAM requires three components of data sets;
  1. One region's SAM matrix,
  2. Trade flows of each commodity and service sector, and
  3. Migration or commuting flows matrix for each income class

# SCI-SAM

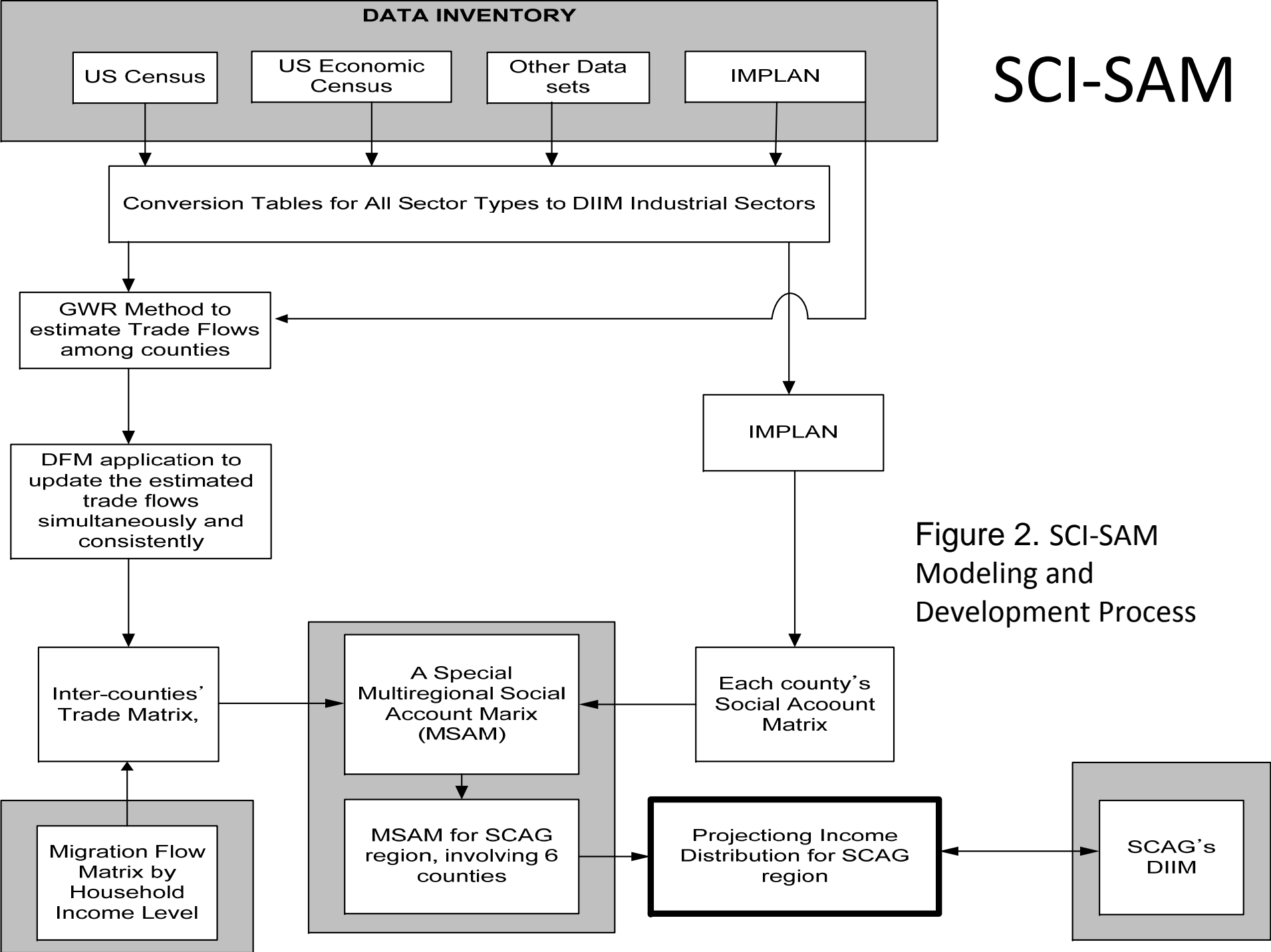


Figure 2. SCI-SAM Modeling and Development Process

# IMPLAN vs REMI (Foreign Imports)

		REMI						IMPLAN					
SCAG 20 sectors	Sector descriptions	Imperial	Los Angeles	Orange	Riverside	San Bernardino	Ventura	Imperial	Los Angeles	Orange	Riverside	San Bernardino	Ventura
11	Agriculture	4	221	78	67	52	18	18	911	225	95	138	40
21	Mining	23	5,257	767	218	315	188	41	14,742	1,408	396	2,271	167
22	Utilities	1	52	21	8	7	5	0	28	1	4	3	2
23	Construction	0	0	0	0	0	0	0	0	0	0	0	0
31	Manufacturing	389	45,244	19,448	7,610	6,925	4,639	443	40,109	15,923	6,216	5,994	4,105
42	Wholesale Trade	4	409	159	56	58	39	0	0	0	0	0	0
44	Retail Trade	1	72	29	12	11	7	0	0	0	0	0	0
48	Transportation and Warehousing	17	1,844	703	251	274	165	6	410	239	77	57	56
51	Information	1	238	74	29	24	15	1	117	43	18	18	11
52	Finance and Insurance	3	366	180	43	45	41	2	81	33	20	15	8

Year: 2004

Unit: REMI is in fixed (2000) \$million and IMPLAN is current (2004) \$million.

# IMPLAN vs REMI *(Continued)*

		REMI					IMPLAN						
SCAG 20 sectors	Sector descriptions	Imperial	Los Angeles	Orange	Riverside	San Bernardino	Ventura	Imperial	Los Angeles	Orange	Riverside	San Bernardino	Ventura
53	Real Estate and Rental and Leasing	0	7	2	1	1	1	0	1	0	0	0	0
54	Professional and Technical Services	2	255	104	35	35	22	1	47	22	9	9	8
55	Management of Companies and Enterprises	0	1	1	0	0	0	0	0	0	0	0	0
56	Administrative and Waste Services	0	28	11	4	4	2	0	0	0	0	0	0
61	Educational Services	0	6	2	1	1	1	0	5	3	2	1	1
62	Health Care and Social Assistance	0	1	0	0	0	0	0	0	0	0	0	0
71	Arts, Entertainment, and Recreation	0	29	6	2	2	1	0	6	1	1	1	1
72	Accommodation and Food Services	0	0	0	0	0	0	0	0	0	0	0	0
81	Other Services, except Public Administration	0	44	17	6	7	4	0	7	2	1	3	0
92	Government and government enterprises	0	0	0	0	0	0	0	0	0	0	0	0

Year: 2004

Unit: REMI is in fixed (2000) \$million and IMPLAN is current (2004) \$million.

# REMI vs IMPLAN (Employment)

		REMI						IMPLAN					
SCAG 20 Sectors	Sector descriptions	Imperial	Los Angeles	Orange	Riverside	San Bernardino	Ventura	Imperial	Los Angeles	Orange	Riverside	San Bernardino	Ventura
11	Agriculture	8,115	3,988	3,186	10,235	1,256	8,512	15,486	9,356	7,402	20,736	5,875	23,706
21	Mining	175	7,364	2,167	940	1,045	1,089	49	10,429	1,929	712	769	842
22	Utilities	451	13,108	3,782	1,592	3,675	1,008	311	13,982	4,507	1,521	3,534	907
23	Construction	2,267	215,095	117,487	89,123	55,846	24,565	2,447	228,387	152,832	100,312	61,388	25,125
31	Manufacturing	2,521	514,605	193,787	58,689	69,211	40,914	2,457	512,393	194,095	55,270	67,199	37,297
42	Wholesale Trade	1,987	257,625	98,356	21,476	32,427	14,767	2,064	258,151	96,612	20,359	30,619	13,576
44	Retail Trade	8,371	523,808	193,919	97,290	97,786	45,743	7,016	475,708	178,173	85,779	83,819	42,505
48	Transportation and Warehousing	2,058	186,996	31,986	17,602	45,465	6,043	2,982	262,924	47,279	21,633	57,198	10,396
51	Information	469	255,605	39,218	9,054	8,684	8,221	396	254,189	36,227	7,472	7,131	6,719
52	Finance and Insurance	1,240	238,383	137,976	24,837	25,737	25,169	1,194	229,013	156,850	17,197	20,256	22,174
53	Real Estate and Rental and Leasing	1,566	287,718	117,079	42,621	33,362	19,226	947	254,996	140,233	32,062	34,394	13,969
54	Professional and Technical Services	1,457	428,540	168,233	36,493	32,333	28,631	1,127	500,883	171,765	26,145	27,393	26,361
55	Management of Companies and Enterprises	423	75,594	32,008	5,327	6,640	5,925	395	72,153	33,623	5,028	6,331	5,606
56	Administrative and Waste Services	1,668	353,837	157,789	50,925	62,566	26,436	1,565	344,250	196,761	48,276	63,803	27,476
61	Educational Services	487	126,722	28,839	7,624	10,971	5,900	399	120,432	28,380	6,796	10,124	5,242
62	Health Care and Social Assistance	3,362	469,675	137,206	62,590	74,429	30,903	3,344	479,589	138,801	59,296	74,633	30,108
71	Arts, Entertainment, and Recreation	338	174,239	52,901	16,841	10,878	9,529	298	188,635	65,167	15,780	9,610	7,703
72	Accommodation and Food Services	3,039	336,395	136,873	58,621	50,353	26,202	3,167	369,126	150,229	59,945	54,152	28,721
81	Other Services, except Public Administration	3,285	369,436	103,166	48,096	46,181	23,649	4,578	415,177	121,505	55,715	55,624	29,195
92	Government and government enterprises	16,513	614,703	158,219	112,418	127,344	51,424	16,140	552,104	144,460	106,935	116,994	46,628
	Total	59,792	5,453,436	1,914,177	772,394	796,189	403,856	66,362	5,551,877	2,066,830	746,969	790,846	404,256

Year: 2004; Unit: Number

# SCI-SAM vs. REMI

	REMI						SCI-SAM					
	Imperial	Los Angeles	Orange	Riverside	San Bernardino	Ventura	Imperial	Los Angeles	Orange	Riverside	San Bernardino	Ventura
Imperial	162	0	0	0	0	0	271	156	0	0	12	1
Los Angeles	3	18939	37	11	26	40	16	28342	0	0	9	6
Orange	10	1976	10085	72	129	39	14	384	17369	0	6	4
Riverside	20	224	28	5990	343	12	70	171	0	10250	14	1
San Bernardino	7	215	20	141	3885	9	34	168	0	0	7100	1
Ventura	0	64	1	1	2	1913	17	429	0	0	8	2894

# Impact Analysis Example

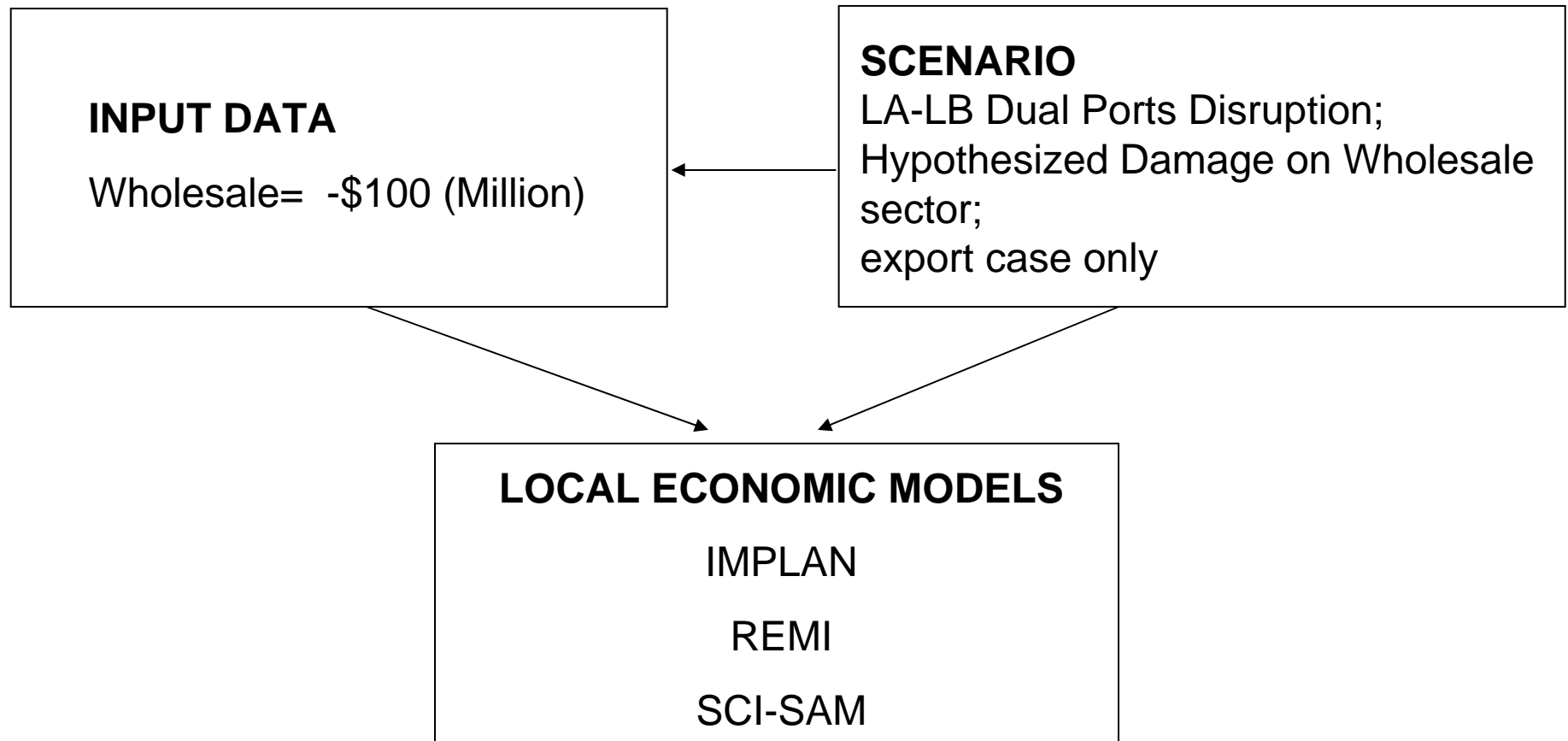


Figure 2. Scenario-Data-Economic model

# LA-LB Dual Ports Disruption Scenario

- LA-LB ports scenario has been widely applied to the terrorist threats in terms of 'dirty bomb' attack (see Park (2008), Park et al. (2007), Gordon et al. (2006)).
- The disruptions in the 'dirty bomb' studies are assumed to impact commodity sectors (that is, non-service sectors) only, and behaviors relating to commodity sectors (that is, service sectors, e.g. wholesales, utility, etc.) were traced via indirect impacts
- However, the dual ports disruption stemming from the scenario may immediately stop those services. Indeed, question to develop input data set is to understand the services are sequential or simultaneous?

# LA-LB Dual Ports Disruption Scenario

- While the trade of commodities can be measured using international/domestic trade data, the services are not easy to take from secondary data sources; which service will take what proportion of the total service?
- Another issue is how we can convert the commodity sector system, e.g. Standard Classification of Transported Goods (SCTG) or Harmonized System (HS) codes to industry sector system, e.g. North American Industry Classification System (NAICS)
- In this preliminary test comparing the three models, we only assume that Wholesale sector, a common sector for the three models, be damaged \$100 million.

# Results: Total Outcome

		REMI	base year 2007	SCI-SAM	v1, base year 2004	IMPLAN	v2, based year 2004
		Input (\$M, wholesale)	Total (\$M, chained to multi 2000)	Input (\$M, wholesale)	Total (\$M, chained to multi 2004)	Input (\$M, wholesale)	Total (\$M, chained to 2004)
GDP /Total Output(LA)	2004				-100		-169
	2007	-100	-150				
	2008-2010		4				
	Sub total		-146		-194	1.94	-169 1.69
GDP/Total Output (Other 5 counties)	2004				0		-40
	2007	0	-19				
	2008-2010		-5				
	Sub total		-24	0.24		-40	0.4
GDP/Total Output (Total)	2004				-100		-169
	2007	-100	-169	1.69			
	2008-2010		-1				
	Total		-170	1.7		-234	2.34

Multi=multipliers

# Findings

- IMPLAN V2. shows many limitations lacking, e.g.
  - i.interregional interindustrial connections;
  - ii.commuting information in the industry and its indirect impacts;
  - iii.dynamic coefficients and forecasting analysis.
- REMI has many strengths in the analysis including, e.g.,
  - i.Dynamic module and long-term analysis option;
  - ii.Interregional interindustrial connections;
  - iii.Commuting information, job relocation and population changes; but
  - iv.the simulating results needs more thorough investigation to accept as is.

# Findings

- SCI-SAM V1 has also benefits including
  - i. Interregional interindustrial connections;
  - ii. Commuting information, (via connecting to DIIM) job relocation and population changes;
  - iii. Possibility to expansion connected to other transportation, environment, land-use, demographic and so other models.

But it requires

- I. Dynamic module and long-term analysis option using temporal updates of I-O models (Gordon et al., 2008);
- II. Only 20 industry sectors are defined – necessary to expand sectorally

# Conclusion and Future Study

- While commercial software packages are widely and easily accepted as a local model, the current results show that those economic models at the basis of national level input-output require local adjustment before being run.
- As a local model, SCI-SAM provides a useful, convenient tool for obtaining interregional connected information.
- Also, this type of SCI-SAM can be easily expanded to other local models, e.g. transportation model.

# Conclusion and Future Study

- Flexible approach recently suggested by Gordon et al (2008) and Park et al (2007) can make the SCI-SAM stronger, reporting forecasting effects
- For a next study, SCI-SAM will add San Diego County and upgraded to V.2 for the base year of 2008.
- SCI-SAM needs to be tested interlocked with DIIM.
- Next test will be made for 2008 versions of REMI, IMPLAN V.3 and SCI-SAM V2 with actual ports trade data; assume service sectors and all other human behaviors are indirectly impacted.