

Cross Sectional Linkages to explain Structural Transformation in LLDCs.

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Data / Methodology ?

IO Tables – Static Image of an Economy.

-The I-O matrix does not show the interrelationship between value-added and final expenditures.

Social Accounting Matrix :

- Extension of an I-O table ; showing an entire circular flow of income at the macro level.

Commutable General Equilibrium Model -

Database

- **Three comprehensive datasets are applied :**
- **The GTAP Data base 9a (Aguiar et.al 2016).**
 - Contains complete bilateral trade information, transport and protection linkages.
 - 140 countries aggregated to 09 regions.
 - 57 commodities aggregated to 09 sectors.
 - 8 Factors of Production. (Land, 5 Labor types, Capital , Natural Resources)
- **Latest Available Nepal SAM- 2007-08 (*Selim Raihan, Bazlul Khondker, 2011*) –**
 - 57 Activities/Commodities.
 - 7 RH's
- **Lao PDR SAM 2002 (Menon and Warr / Carlos Ludena, 2008).**
 - 20 Activities/Commodities.
 - 4 HH types.

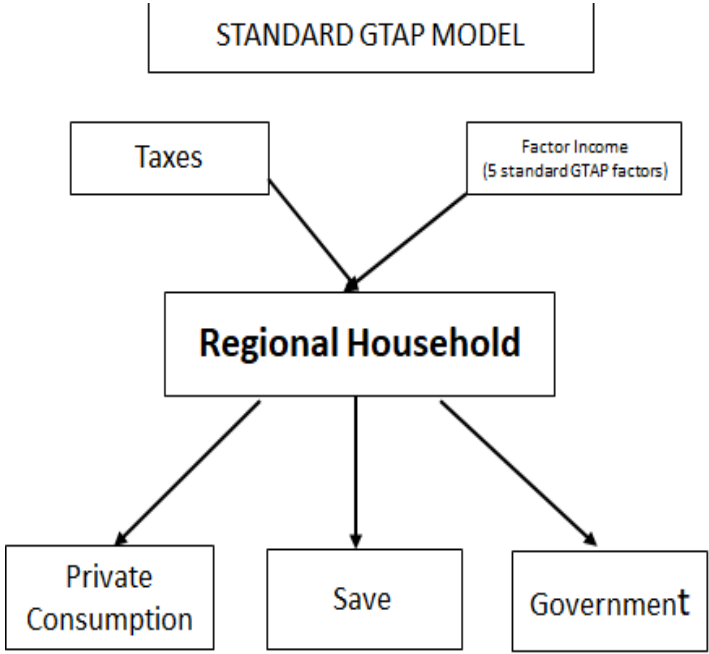
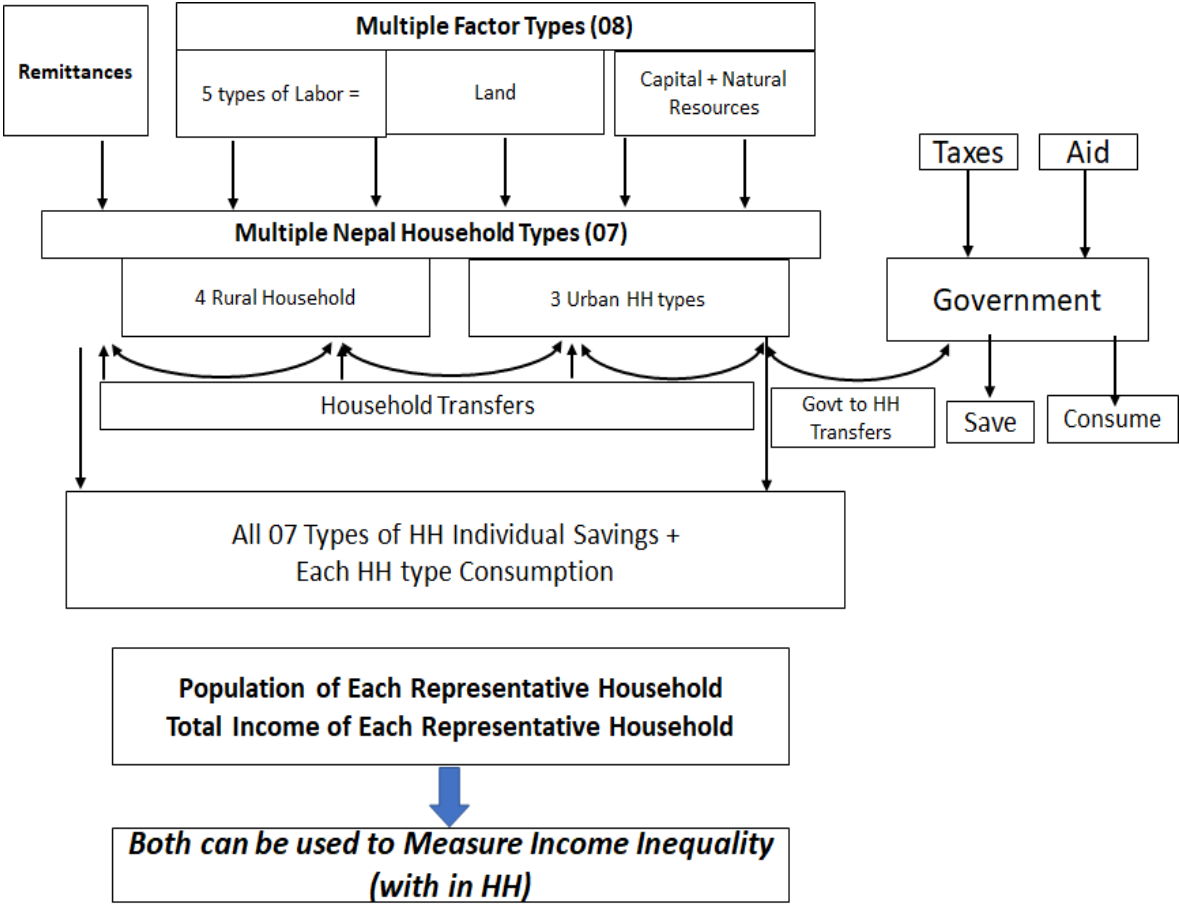
Sectoral and Regional Aggregation

Agriculture	pdr wht gro v_f osd c_b pfb ocr ctl oap rmk wol cmt omt pcr
Extraction	frs fsh coa oil gas omn
ProcFood	vol mil sgr ofd b_t
TextWapp	tex wap
LightMnfc	lea lum ppp fmp mvh otn omf
HeavyMnfc	p_c crp nmm i_s nfm ele ome
Util_Cons	ely gdt wtr cns
TransComm	trd otp wtp atp cmn
Services	ofi isr obs ros osg dwe

New region code	comprising
Nepal	npl
Laos	lao
Cambodia	khm
EastAsia	chn hkg jpn kor mng twm xea brn
SEAsia	idn mys phl sgp tha vnm xse
SouthAsia	bgd ind pak lka xsa
NAmerica	can usa mex xna
LatinAmer	arg bol bra chl col ecu pry per ury ven xsm cri gtm hnd nic pan slv xca xcb dom jam pri tto
EU_28	aut bel cyp cze dnk est fin fra deu grc hun irl ita lva lux mlt nld pol prt svk svn esp swe gbr bgr hrv

Source : GTAP 9a (2016)

Modification Made to Global GTAP Model (For Nepal and Laos PDR)



Modification Made to Global SAM in GTAP Data Base

	Commodities	Activities	Factors	Households	Government	Capital	Margins	Rest of World	Totals
Commodities	0	Combined Intermediate Use Matrix	0	WTC: Private Consumption	Government Consumption	Investment Consumption	Exports of Margins (<i>fob</i>)	Exports of Commodities (<i>fob</i>)	Total Demand for Commodities
Activities	Domestic Supply Matrix	0	0	0	0	0	0	0	Total Domestic Supply by Activity
Factors	0	WTF: Expenditure on Primary Inputs	0	0	0	0	0	0	Total Factor Income
Households	0	0	OWN: Distribution of Factor Incomes	TRNH: Transfers	TRNG: Transfers	0	0	RMIH, FYIH: Remittances	Total Household Income
Government	Taxes on Commodities	Taxes on Production	0	Direct/Income Taxes	0	0	0	Foreign aid	Total Government Income
		Taxes on Factor Use	Direct Taxes						
Capital	0	0	Depreciation Allowances	SAV: Household Savings	Government Savings	0	Balance on Margins Trade	Foreign Savings	Total Savings
Margins	Imports of Trade and Transport Margins	0	0	0	0	0	0	0	Total Income from Margin Imports
Rest of World	Imports of Commodities (<i>fob</i>)	0	0	RMOU, FYOH: Remittances	Foreign aid	0	0	0	Total Income from Imports

Updates to GTAP model

- Regional Household (Govt + Private HH)
- Transfer.
- Foreign Aid + Remittances.
- CDE + LES

With in Household Income Inequality .

Group	Members per Group	Income per Group	Income per Individual	Relative Deviation	Accumulated Income	Gini	Hoover	Theil
1	A_1	E_1	$\bar{E}_1 = E_1/A_1$	$D_1 = E_1/\Sigma E - A_1/\Sigma A$	$K_1 = E_1$	$G_1 = (2 * K_1 - E_1) * A_1$	$H_1 = \text{abs}(D_1)$	$T_1 = \ln(\bar{E}_1) * D_1$
2	A_2	E_2	$\bar{E}_2 = E_2/A_2$	$D_2 = E_2/\Sigma E - A_2/\Sigma A$	$K_2 = E_2 + K_1$	$G_2 = (2 * K_2 - E_2) * A_2$	$H_2 = \text{abs}(D_2)$	$T_2 = \ln(\bar{E}_2) * D_2$
3	A_3	E_3	$\bar{E}_3 = E_3/A_3$	$D_3 = E_3/\Sigma E - A_3/\Sigma A$	$K_3 = E_3 + K_2$	$G_3 = (2 * K_3 - E_3) * A_3$	$H_3 = \text{abs}(D_3)$	$T_3 = \ln(\bar{E}_3) * D_3$
4	A_4	E_4	$\bar{E}_4 = E_4/A_4$	$D_4 = E_4/\Sigma E - A_4/\Sigma A$	$K_4 = E_4 + K_3$	$G_4 = (2 * K_4 - E_4) * A_4$	$H_4 = \text{abs}(D_4)$	$T_4 = \ln(\bar{E}_4) * D_4$
Totals	ΣA	ΣE	$\bar{E} = \Sigma E/\Sigma A$			ΣG	ΣH	ΣT
Inequality Measures						$\text{Gini} = 1 - \Sigma G/\Sigma A/\Sigma E$	$\text{Hoover} = \Sigma H / 2$	$\text{Theil} = \Sigma T / 2$
Welfare Function						$W_G = \bar{E} * (1 - \text{Gini})$	$W_H = \bar{E} * (1 - \text{Hoover})$	$W_T = \bar{E} * (1 - \text{Theil})$

TRADE OVERVIEW

	Nepal Exports (% in Total Exports)			Nepal Imports (% in Total Imports)		
	2004	2007	2011	2004	2007	2011
Agriculture	3.78	3.48	7.42	6.02	8.10	6.63
Extraction	0.76	1.92	0.91	1.45	1.46	1.70
ProcFood	5.12	7.71	4.38	4.05	2.99	4.00
TextWapp	34.37	25.07	24.28	7.91	10.60	15.51
LightMnfc	6.10	5.40	6.09	14.11	12.70	10.88
HeavyMnfc	16.19	18.78	18.05	48.55	42.17	47.84
Util_Cons	2.55	2.94	2.55	0.76	1.22	1.04
TransComm	10.86	9.90	10.45	10.19	13.08	7.77
Services	20.27	24.79	25.88	6.96	7.69	4.63
Total X/M in Million US \$	1168.448	1171.129	1415.571	1842.101	3026.775	6351.832
	Laos PDR Exports (% in Total Exports)			Lao PDR Imports (% in Total Imports)		
	2004	2007	2011	2004	2007	2011
Agriculture	6.62	4.65	7.14	1.88	1.71	5.36
Extraction	9.62	8.25	27.70	0.57	1.27	1.84
ProcFood	1.52	1.01	0.77	14.25	9.82	9.06
TextWapp	28.23	12.35	6.93	9.64	6.29	3.35
Light Manufc	21.93	9.45	11.95	17.46	25.90	28.62
Heavy Mnfc	4.90	41.08	29.63	49.50	47.88	47.57
Util_Cons	2.48	7.77	6.25	1.84	2.56	1.67
TransComm	14.94	9.56	5.93	1.36	1.26	0.70
Services	9.91	5.89	3.69	3.48	3.32	1.82
Total Exports in Million US \$	620	1543.863	3128.172	1080.313	1828.493	4269.451

Source : GTAP 7 (2004), GTAP 8 (2007), GTAP 9a (2011)

Cost Structure of Firms (Nepal)

	Agri.	Extr.	P.Food	TexWap	L.Manu	H.Manu	Utl.Cons	TransComm	Services
Land	20.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tech_aspros	0.01	0.03	0.06	0.13	0.05	0.02	0.50	7.31	5.92
Clerks	0.01	0.16	0.03	0.06	0.02	0.01	0.03	17.72	0.14
Service_shop	0.06	0.08	0.31	0.63	0.24	0.11	0.31	2.25	9.89
Off_mgr_pros	0.17	0.39	0.28	0.58	0.22	0.10	4.82	1.13	15.16
Ag_othlowsk	40.18	14.76	4.03	8.19	3.14	1.42	5.41	2.01	1.64
Capital	11.86	44.45	13.51	10.50	18.87	14.25	31.36	35.50	29.78
NatRes	0.00	12.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Agriculture	20.23	0.00	58.09	8.91	3.74	0.00	0.00	0.00	3.14
Extraction	0.00	0.97	0.46	0.09	6.14	3.91	0.14	0.01	0.02
ProcFood	0.52	14.03	12.10	0.00	0.00	0.00	0.00	0.00	0.73
TextWapp	0.00	0.00	0.00	19.06	0.00	0.00	0.00	0.08	6.51
LightMnfc	0.08	0.00	0.06	2.81	23.96	11.77	0.57	4.14	2.88
HeavyMnfc	2.31	3.69	3.58	13.12	18.42	53.86	8.12	10.30	1.25
Util_Cons	0.35	2.53	1.74	1.07	3.11	9.42	1.17	1.29	0.78
TransComm	3.18	4.03	5.60	30.38	19.42	4.63	12.97	4.57	10.05
Services	0.70	2.85	0.15	4.48	2.67	0.50	34.59	13.69	12.09
Total	100	100	100	100	100	100	100	100	100

Source : Author's own calculation based on Nepal SAM and GTAP Data Base

Cost Structure of Firms (Laos PDR)

	Agri.	Extr.	P.Food	TexWap	L.Manu	H.Manu	Utl.Cons	TransComm	Services
Land	28.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tech_aspros	0.35	0.16	1.93	2.25	0.72	0.98	1.76	5.11	6.05
Clerks	0.06	0.02	0.31	0.36	0.12	0.16	0.12	10.57	1.51
Service_shop	0.09	0.05	0.30	0.35	0.11	0.15	0.20	0.91	4.12
Off_mgr_pros	0.55	0.32	1.66	1.93	0.62	0.84	1.89	2.49	10.25
Ag_othlowsk	23.41	16.32	8.68	10.10	3.23	4.40	6.45	8.45	3.19
Capital	8.19	32.42	21.75	30.23	11.48	20.42	18.64	40.29	18.83
NatRes	0.00	12.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Agriculture	26.03	0.31	35.55	7.53	1.09	0.00	0.00	0.00	0.64
Extraction	3.35	1.26	18.81	0.12	56.07	8.39	5.53	0.01	0.15
ProcFood	5.97	1.65	1.28	0.00	0.00	0.00	0.00	0.00	0.31
TextWapp	0.20	0.05	1.02	32.72	0.38	0.00	0.01	0.02	0.07
LightMnfc	0.18	5.84	0.33	2.05	9.19	2.64	13.23	9.21	23.75
HeavyMnfc	0.74	20.92	1.07	3.27	9.65	33.65	37.55	15.00	13.36
Util_Cons	0.24	0.81	0.25	1.22	2.06	10.77	1.59	2.67	3.51
TransComm	1.70	6.25	6.40	5.51	4.40	16.59	8.17	3.03	6.38
Services	0.66	1.23	0.66	2.34	0.87	1.01	4.86	2.24	7.88
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source : Author's own calculation based on Lao SAM and GTAP 9a (2011)

NEPAL	Disposition of Output (Million US \$)			Disposition of Domestic Goods (Million US \$)				Disposition of Imported Goods (Million US \$)			
	Domestic	Exports	Total	Prod.	Cons.	Govt.	Total	Prod.	Cons.	Govt.	Total
Agriculture	7097	105	7202	2079	5018	0	7097	179	242	0	421
Extraction	418	13	430	154	264	0	418	101	7	0	108
ProcFood	932	62	994	236	696	0	932	9	245	0	254
TextWapp	502	343	845	349	153	0	502	334	651	0	985
LightMnfc	1421	86	1507	990	432	0	1421	317	374	0	691
HeavyMnfc	1022	253	1276	738	284	0	1022	1860	1178	0	3038
Util_Con	3824	36	3860	3404	421	0	3824	60	5	0	66
TransComm	4698	148	4870	2576	2122	0	4698	221	273	0	494
Services	8223	366	8590	2886	3342	1995	8223	196	45	53	294
Total	28138	1412	29574	13412	12731	1995	28138	3279	3020	53	6352

NEPAL	Disposition of Output (%)			Disposition of Domestic Goods (%)				Disposition of Imported Goods (%)			
	Domestic	Exports	Total	Prod.	Cons.	Govt.	Total	Prod.	Cons.	Govt.	Total
Agriculture	99	1	100	29	71	0	100	42	58	0	100
Extraction	97	3	100	37	63	0	100	94	6	0	100
ProcFood	94	6	100	25	75	0	100	4	96	0	100
TextWapp	59	41	100	70	30	0	100	34	66	0	100
LightMnfc	94	6	100	70	30	0	100	46	54	0	100
HeavyMnfc	80	20	100	72	28	0	100	61	39	0	100
Util_Con	99	1	100	89	11	0	100	92	8	0	100
TransComm	96	3	100	55	45	0	100	45	55	0	100
Services	96	4	100	35	41	24	100	67	15	18	100
Total	95	5	100	48	45	7	100	52	48	1	100

Source : Author's own calculation based on Lao SAM and GTAP 9a (2011)

Laos PDR	Disposition of Output (Million US \$)			Disposition of Domestic Goods (Million US \$)				Disposition of Imported Goods (Million US \$)			
	Domestic	Exports	Total	Prod.	Cons.	Govt.	Total	Prod.	Cons.	Govt.	Total
Agriculture	4631	223	4854	2616	2015	0	4631	70	159	0	229
Extraction	1164	879	2043	1150	14	0	1164	78	0	0	79
ProcFood	2081	24	2106	546	1535	0	2081	57	330	0	387
TextWapp	152	216	368	85	67	0	152	104	39	0	143
LightMnfc	172	372	544	129	43	0	172	1051	171	0	1222
HeavyMnfc	339	925	1264	294	44	1	339	1724	135	173	2031
Util_Con	1019	196	1215	969	49	1	1019	61	10	1	71
TransComm	1468	185	1659	943	523	2	1468	9	8	13	30
Services	1596	116	1712	323	704	569	1596	6	3	69	78
Total	12622	3136	15764	7055	4995	572	12622	3159	854	257	4269

LAOS PDR	Disposition of Output (%)			Disposition of Domestic Goods (%)				Disposition of Imported Goods (%)			
	Domestic	Exports	Total	Prod.	Cons.	Govt.	Total	Prod.	Cons.	Govt.	Total
Agriculture	95	5	100	56	44	0	100	31	69	0	100
Extraction	57	43	100	99	1	0	100	99	0	0	100
ProcFood	99	1	100	26	74	0	100	15	85	0	100
TextWapp	41	59	100	56	44	0	100	73	27	0	100
LightMnfc	32	68	100	75	25	0	100	86	14	0	100
HeavyMnfc	27	73	100	87	13	0	100	85	7	9	100
Util_Con	84	16	100	95	5	0	100	85	14	1	100
TransComm	88	11	100	64	36	0	100	30	25	45	100
Services	93	7	100	20	44	36	100	7	3	89	100
Total	80	20	100	56	40	5	100	74	20	6	100

Source : Author's own calculation based on Lao SAM and GTAP 9a (2011)

What Scenarios should be designed to Study Cross-sectoral linkages to explain structural transformation ?

- **Reallocation of Labor from Agriculture to Manufacturing.**
- **Increase in Manufacturing/Services Output by 10 percent.**
- **Trade War.**
- **Trade liberalization.**
- **Unemployment closure.**

“Essentially, all models are wrong but some are useful”. The practical question is how wrong do they have to be to not be useful.

George Box

COMMENTS / SUGGESTION

Simulation : Increase in Manufacturing and Services output by 5 Percent

	Increase in Manufacturing and Services output by 5 Percent	
	Nepal	Laos PDR
Real GDP (qgdp)	1.85 (349)	0.59 (48.63)
Terms of Trade (tot)	0.41	0.05

Value added is a widely used measure of sector activity and is in contrast to sector output, which includes imported inputs.

Impact on Value Added in Industry	Increase in Manufacturing and Services output by 5 Percent	
	Nepal	Laos PDR
Agriculture	0.946	0.126
Extraction	-2.316	0.393
ProcFood	-10.605	-3.932
TextWapp	4.337	0.579
LightMnfc	0.304	3.806
HeavyMnfc	4.008	3.727
Util_Cons	3.458	-10.797
TransComm	1.907	0.804
Services	2.502	0.243