AEC Integration and Internal Migration: A Dynamic CGE Model Approach

International Conference on ASEAN Studies (ICONAS 2)
Chulalongkorn University, Bangkok, Thailand
August 3-5, 2015

Kitti Limsakul
Faculty of Economics, Chulalongkorn University

Nattapong Puttanapong
Faculty of Economics, Thammasat University

Thongchart Bowonthumrongchai
Faculty of Economics, Chulalongkorn University

Main topics

1) **Status of labor market in ASEAN**
2) **Data aggregation**
   1) **Data aggregate from GTAP's database**
   2) **Global Bilateral Migration database**
   3) **Construction of Myanmar's Social Accounting Matrix**
3) **Model's specification and validation**
4) **Simulation results**
5) **Policy recommendations**

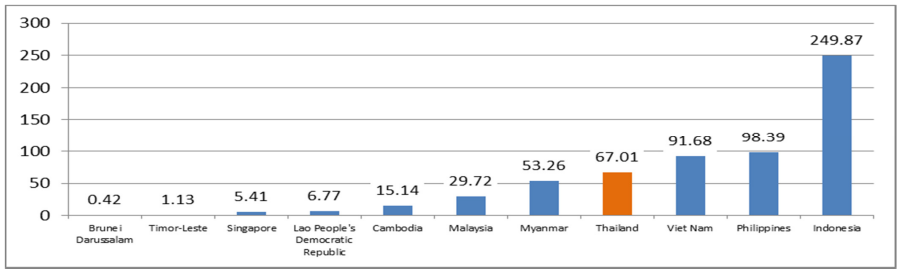
1) Status of labor market in ASEAN

1) Broad difference of **total population** among ASEAN members
2) Different ratios of **labor participation**
3) Different country's **labor supply**
4) Different magnitudes of **labor dependency ratios**

1) Status of labor market in ASEAN

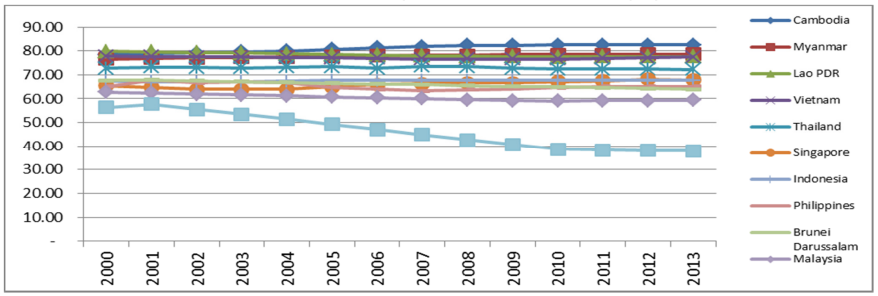
1) Broad difference of **total population** among ASEAN members
2) Different ratios of **labor participation**
3) Different country's **labor supply**
4) Different magnitudes of **labor dependency ratios**

ASEAN Population 2013 (Unit: Millions)



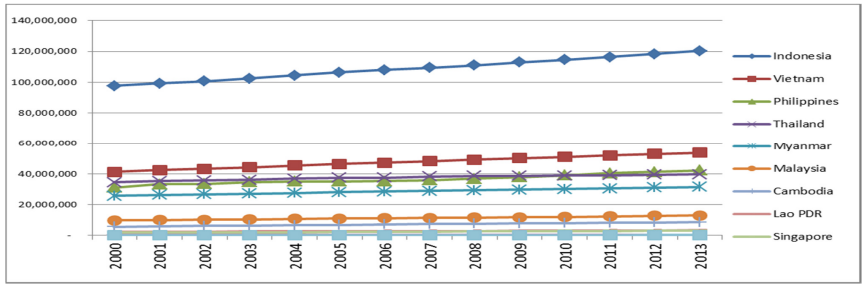
Source: World Development Indicator, World Bank 2014

Labor Force Participation rate (% of total population)



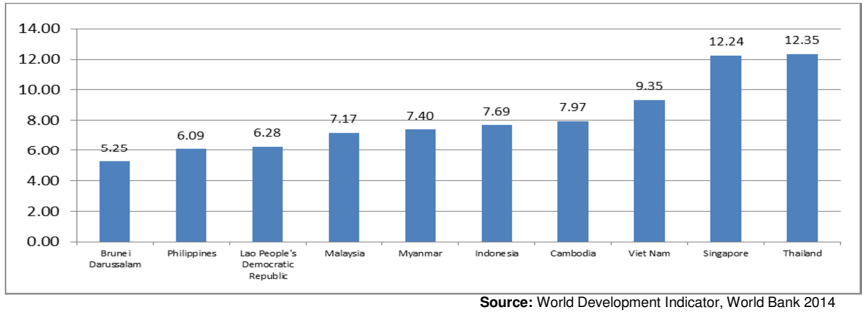
Source: World Development Indicator, World Bank 2014

ASEAN's labor force (unit: persons)



Source: World Development Indicator, World Bank 2014

Age dependency ratio (% of working-age population)



Source: World Development Indicator, World Bank 2014

2) Data aggregation

2.1) Data aggregate from GTAP's database

- The main dataset is obtained from GTAP which is the world economic data of year 2007 covering 132 regions and 57 commodities.
- To simplify the structure of model and emphasize on Thailand and CLMV, the original data has been aggregated to 6 regions and 10 commodities.

2) Data aggregation

No.	Abbreviations model/dataset	Commodities
1	Grains Crops	Wheat, cereal, grains, vegetables and fruits
2	MeatLstk	Meat and meat products
3	Extraction	Extraction
4	ProcFood	Processes food
5	TextWapp	Textiles and wearing apparel
6	LightMnfc	Light manufactures
7	HeavyMnfc	Heavy manufactures
8	Util	Utilities
9	TransComm	Transportation and communications
10	OthServices	Other services

No.	Abbreviations model/dataset	Countries/regions
1	Tha	Thailand
2	Lao	Laos
3	Vnm	Vietnam
4	Khm	Cambodia
5	ROSAEAN	Rest of ASEAN countries
6	ROW	Rest of the world

2) Data aggregation

2.2) Global Bilateral Migration database

- In addition to the domestic economic and international trade statistics, the migration data has been gathered and integrated.
- The World Bank's Global Bilateral Migration is the main source of labor flows.
- This data is matrix of 231*231 countries.
- This matrix has been constructed every 10 years since 1960. The latest matrix shows that among ASEAN countries in 2010,

2) Data aggregation

	Numbers of emigrating workers (unit: persons)					% Change			
	1960	1970	1980	1990	2000	1960 vs. 1970	1970 vs. 1970	1980 vs. 1990	1990 vs. 2000
Brunei Darussalam	20,551	32,892	50,954	73,196	104,127	60%	55%	44%	42%
Indonesia	1,859,454	1,170,217	736,452	463,465	149,741	-37%	-37%	-37%	-68%
Cambodia	381,238	321,297	4,157	38,348	236,597	-16%	-99%	822%	517%
Lao PDR	19,627	20,673	21,735	22,849	21,718	5%	5%	5%	-5%
Myanmar	286,553	272,571	188,037	133,523	98,007	-5%	-31%	-29%	-27%
Malaysia	56,883	736,297	674,645	951,460	1,503,266	1194%	-8%	41%	58%
Philippines	219,663	217,413	121,633	136,170	322,483	-1%	-44%	12%	137%
Singapore	519,217	530,840	526,978	726,959	1,351,787	2%	-1%	38%	86%
Thailand	484,824	347,382	272,886	287,570	688,997	-28%	-21%	5%	140%
Vietnam	3,997	4,414	4,874	7,288	40,599	10%	10%	50%	457%

2) Data aggregation

2.3 Construction of Myanmar's Social Accounting Matrix

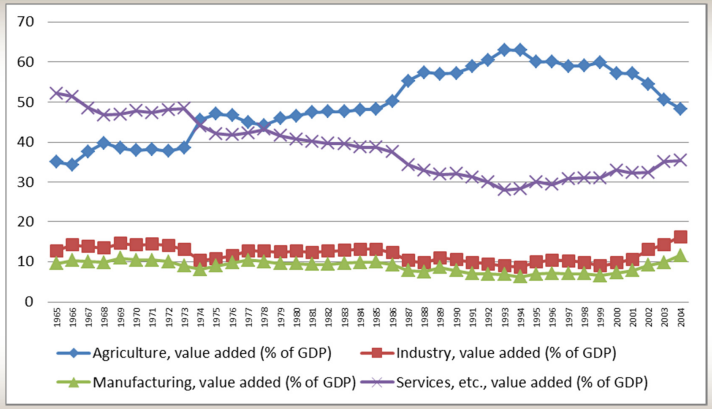
- Because the database of GTAP version 8.0 does not include the separated Social Accounting Matrix (SAM) of Myanmar, this study has gathered data from various sources and applied the Epochal approach to estimate the structural data of Myanmar economy.
- The estimation is also based on the empirical structure of Myanmar's economy, which indicates that agricultural sector is main activity while service and manufacturing sectors are the second and the third largest ones, respectively

2) Data aggregation

- The evolution has been transforming from agricultural-based toward the manufacturing and service intensive.
- For the estimated data of Myanmar in 2007 used in this study, the agriculture was accounted for 43.64% of total production.
- The service sector, mainly the wholesales and retails, was 21.58% and the industrial sector was 14.95% of the aggregate output, respectively.
- For the aggregate demand based on ADB's data, the total private consumption had the share of 85.11%, while the investment was the second largest component.

2) Data aggregation

Percentage share of main production activities in total output of Myanmar



Source: ADB

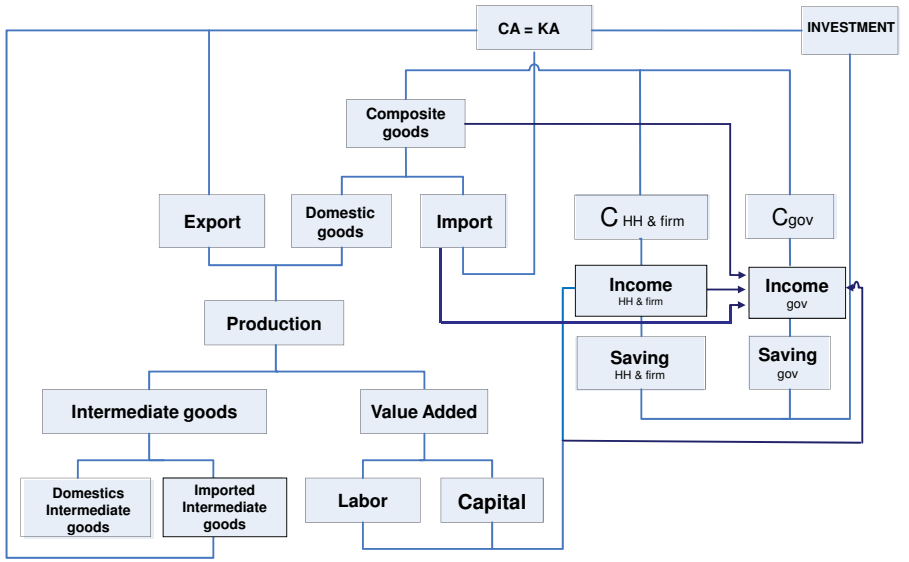
3) Model specification and validation

- This study follows the structure of dynamic multi-region CGE model introduced by PEP-MPIA.
- We have applied **World Migration Matrices of WB (2014) for calibration** of migration flows.
- We also apply **SAMs (2007) from GTAP, World Trade Matrices, World Saving-Investment, skilled/un-killed labor**, other economic accounts are used as starting data to construct the model's database of 2010 by GAMs algorithm developed by our study.
- Since the **main concentration of this model is the migration among Thailand and CLMV countries**, the data of Thailand, Cambodia, Myanmar, Vietnam and Laos are defined as the individual country in the database and in the model, while the rest of countries are aggregated into the rest of ASEAN members and the rest of the world.

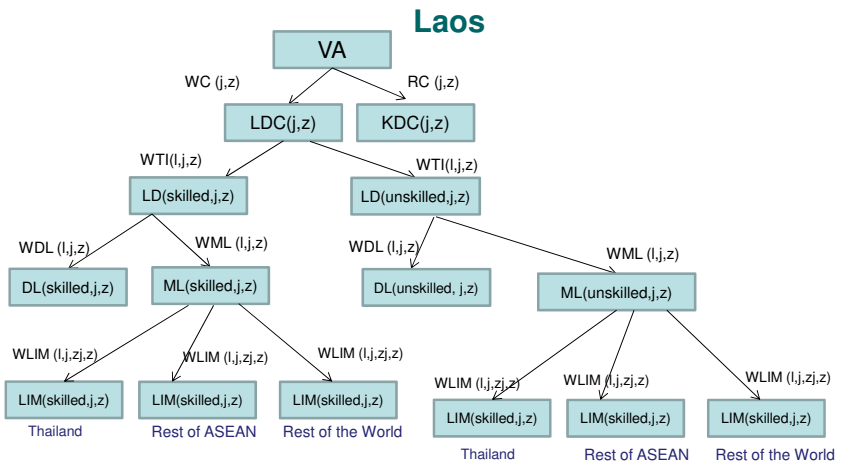
3) Model's specification and validation

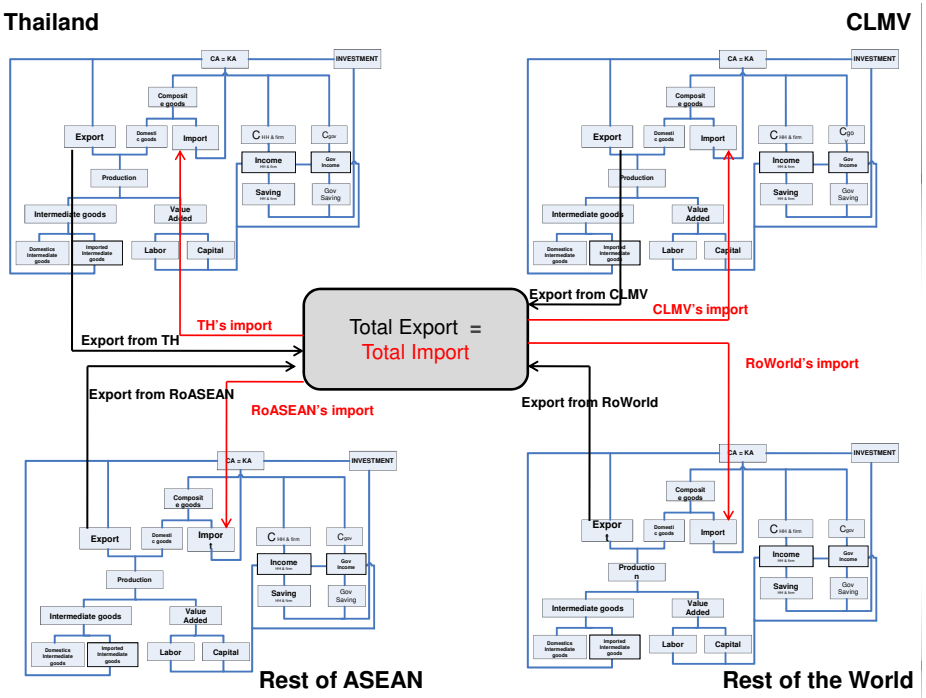
- The dynamic multi-region model has been specified the classification based on the aggregate data of labor migration.
- Particularly there are **labors with 7 nationalities**, which are Thailand, Myanmar, Laos PDR, Cambodia, Vietnam, the rest of ASEAN, and the rest of the world.
- There are **two levels of labor's skill** which are skilled and unskilled.
- Following the GTAP's database, this classification is based on occupation.

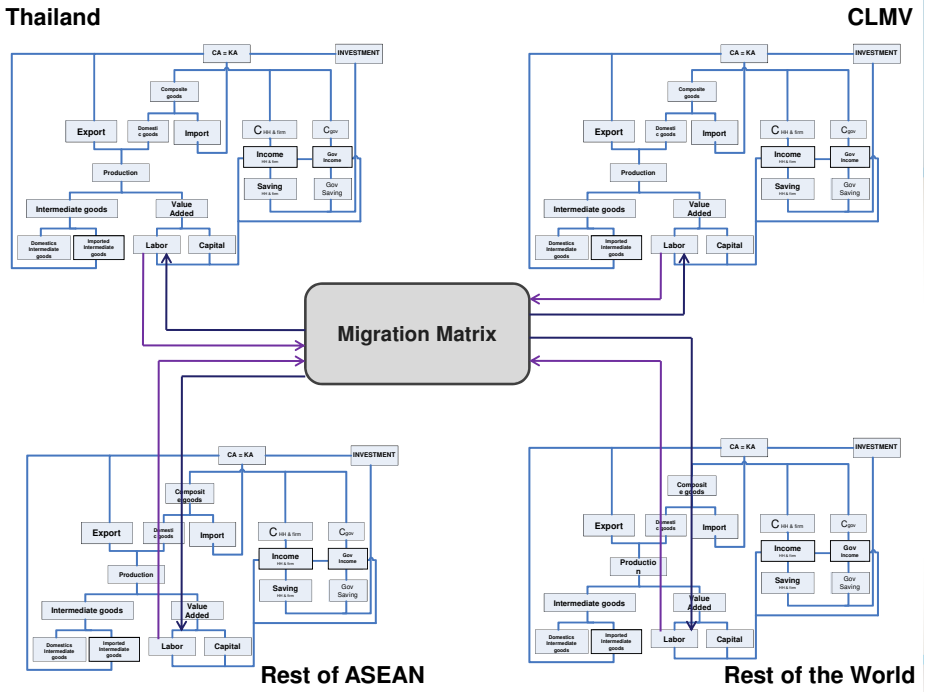
The Structure of Single-Country CGE



Nested-Structure of Employment







3) Model's specification and validation

- In order to replicate the key adjustment behavior of each region, the model has been calibrated by adjusting some shift coefficients in the nested structure of production functions.
- The calibration has enabled the simulation to **closely replicate the adjustment of main 6 economic indicators** of each region, which are:
  - (1) real GDP
  - (2) total private consumption
  - (3) total investment
  - (4) total government revenue
  - (5) total export
  - (6) total import .

Model's validation (comparing simulation results with actual data)	Thailand	Laos	Vietnam	Cambodia	Rest of ASEAN	Rest of the World
(1) Real GDP						
Root-Mean-Square Error (RMSE) (unit: million US dollar)	4,957.3	10.1	214.3	118.0	13,617,273,285	716,298.3
RMSE as % of the average real GDP during 2007-2010	*2.48%*	*0.28%*	*0.30%*	*1.44%*	*1.68%*	*1.44%*
(2) Total private consumption						
Root-Mean-Square Error (RMSE) (unit: million US dollar)	1,416.2	34.5	1,434.9	411.1	6,635.6	247,101.5
RMSE as % of the average of the private consumption during 2007-2010	*1.29%*	*1.38%*	*3.00%*	*6.06%*	*1.49%*	*0.84%*
(3) Total investment						
Root-Mean-Square Error (RMSE) (unit: million US dollar)	2,445.9	58.6	1,133.0	136.8	3,442.6	553,789.8
RMSE as % of the average of total investment during 2007-2010	*4.63%*	*5.46%*	*4.17%*	*8.05%*	*1.79%*	*4.95%*
(4) Total government expenditure						
Root-Mean-Square Error (RMSE) (unit: million US dollar)	301.1	31.0	69.2	17.4	1,227.8	43,455.7
RMSE as % of the average of government expenditure during 2007-2010	*1.18%*	*9.01%*	*1.64%*	*3.30%*	*1.51%*	*0.51%*
(5) Total export						
Root-Mean-Square Error (RMSE) (unit: million US dollar)	9,123.3	51.4	3,456.1	576.2	35,314.3	1,059,801.1
RMSE as % of the average of total export during 2007-2010	*5.94%*	*4.30%*	*6.86%*	*9.77%*	*4.90%*	*7.31%*
(6) Total import						
Root-Mean-Square Error (RMSE) (unit: million US dollar)	13,574.0	142.3	3,577.8	838.2	40,835.0	865,334.6
RMSE as % of the average of total export during 2007-2010	*9.59%*	*9.38%*	*5.95%*	*12.22%*	*6.48%*	*6.10%*

4) Simulation result

There are 3 simulations:

Scenario 1: Base case (no AEC integration)

Scenario 2: With AEC integration (free flows of goods and labors)

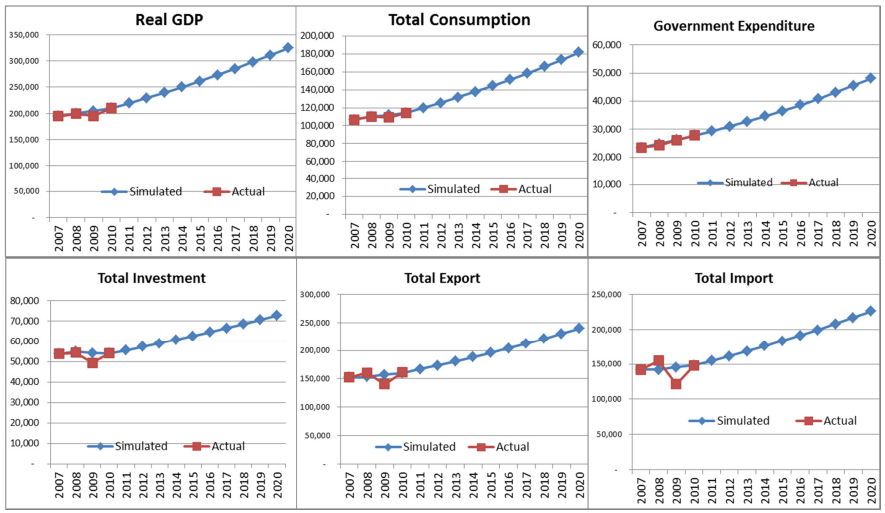
Scenario 3: With AEC integration and Thailand's restructure

4) Simulation result

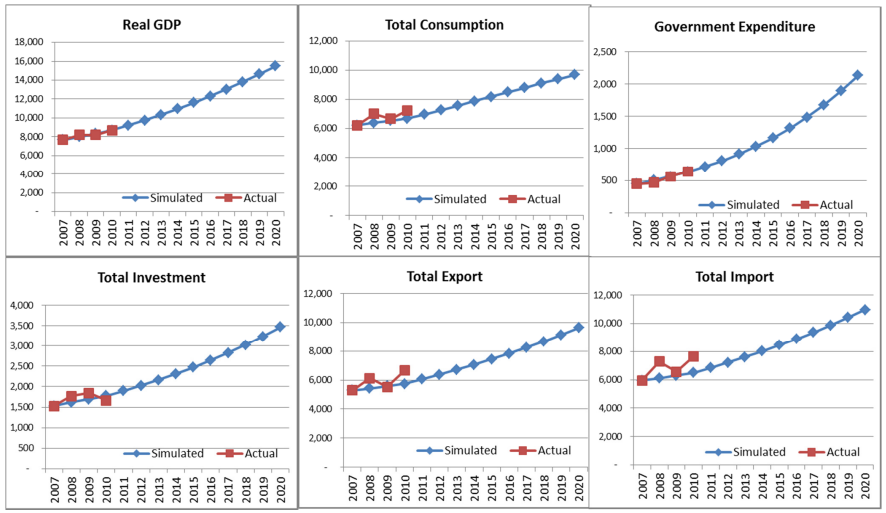
Scenario 1: Base case (no AEC integration)

- Thai economy will grow at the rate of 3.88% to 4.16% annually.
- The annual growth of CLMV will be higher, at around 6.3 to 7.84%, due to their stage of development.

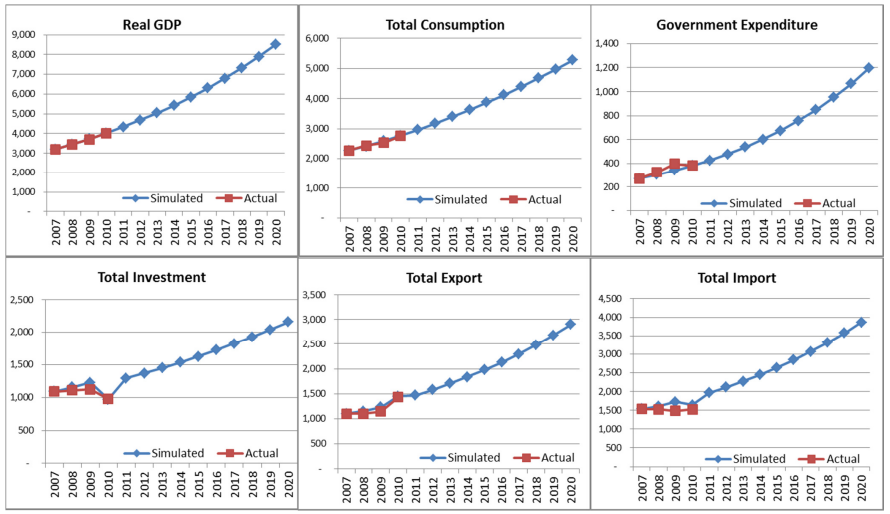
Macroeconomics indicators during 2007-2020 (a result of BAU simulation) - **Thailand**



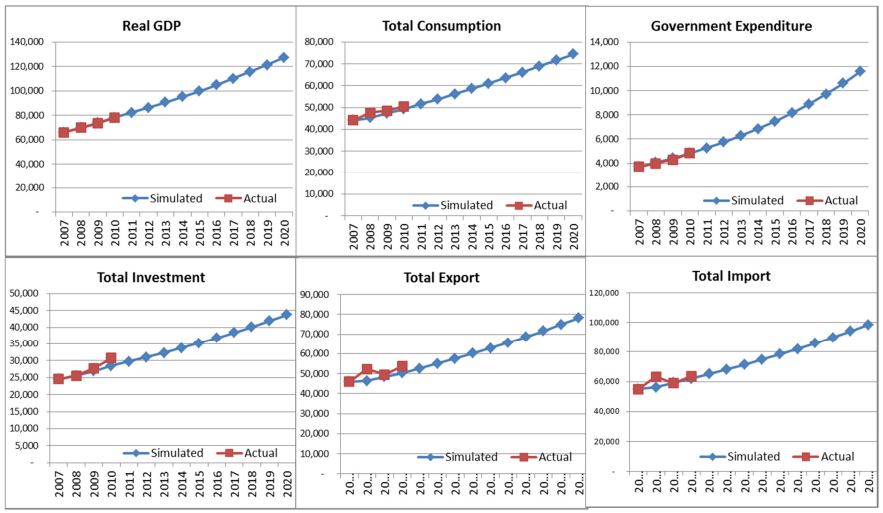
Macroeconomics indicators during 2007-2020 (a result of BAU simulation) - **Cambodia**



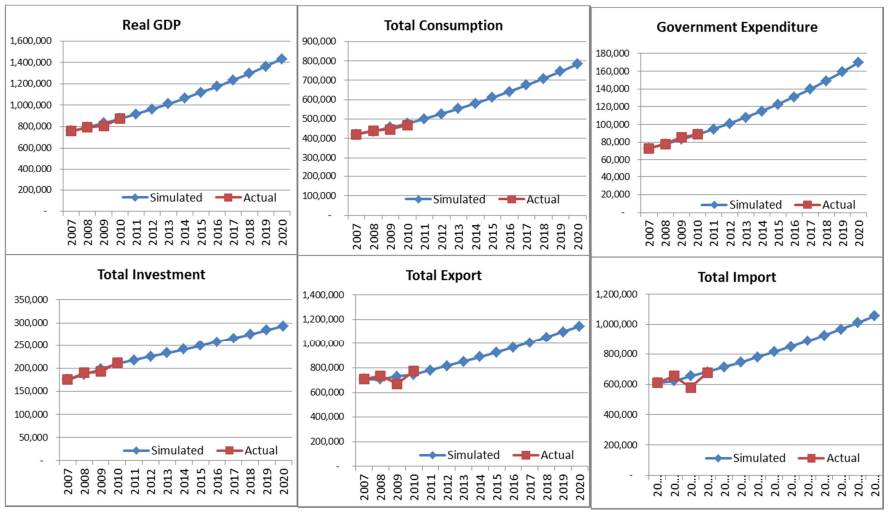
Macroeconomics indicators during 2007-2020 (a result of BAU simulation) – **Laos PDR**



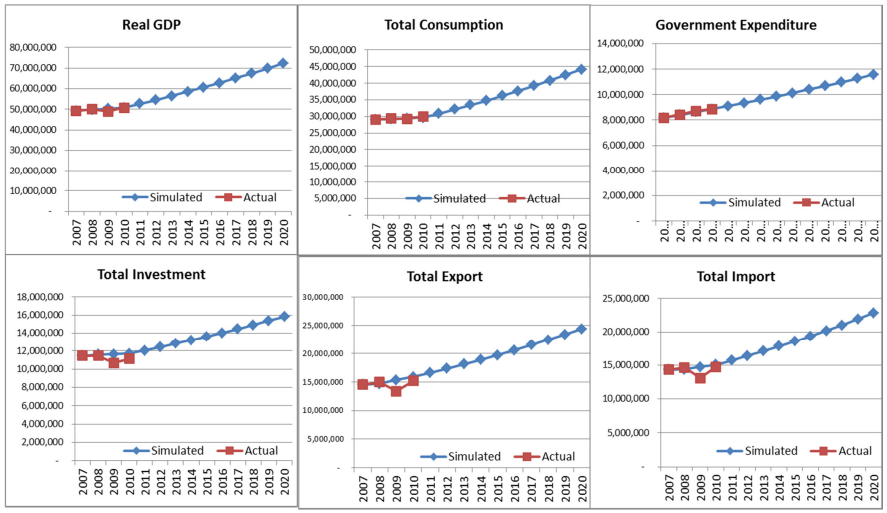
Macroeconomics indicators during 2007-2020 (a result of BAU simulation) - **Vietnam**



Macroeconomics indicators during 2007-2020 (a result of BAU simulation) – **Rest of ASEAN**



Macroeconomics indicators during 2007-2020 (a result of BAU simulation) – **Rest of the World**



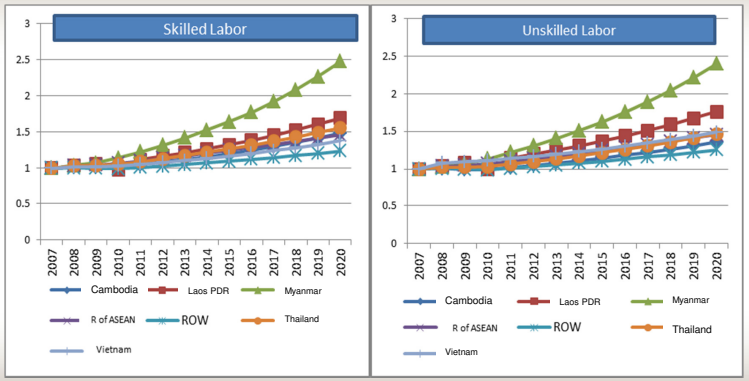
4) Simulation result

Employment and migration (scenario 1)

- The projection indicates that the wage of Myanmar and Laos will have the highest growth rate for both skilled and unskilled labors.
- The main factor is the high GDP growth rate of both countries, inducing the high demand for labors.

4) Simulation result

Scenario 1 : Wage index (year 2007 = 1.000)



4) Simulation result

Scenario 2: With AEC integration (free flows of goods and labors)

- The projection results of the first alternative scenario which imposed the free flows of all trades and labors as targeted by AEC integration.
- The projection indicates that the economic integration will lead to positive impacts for most countries, as indicated by their higher GDP growths.
- The negative impacts on Myanmar economy is based on the dataset, especially the Social Accounting Matrix (SAM) of Myanmar which indicates the structure of economy relying on imposts due to insufficient domestic production capability.

% Change of GDP due to AEC	2015	2016	2017	2018	2019	2020
Cambodia						
Business As Usual	1.119	1.186	1.256	1.331	1.410	1.494
AEC integration	1.119	1.186	1.257	1.333	1.413	1.498
Percentage Change	*0.000%*	*0.001%*	*0.081%*	*0.158%*	*0.231%*	*0.301%*
Laos PDR						
Business As Usual	0.745	0.803	0.865	0.933	1.005	1.084
AEC integration	0.745	0.803	0.866	0.933	1.006	1.084
Percentage Change	*0.000%*	*0.035%*	*0.050%*	*0.064%*	*0.077%*	*0.090%*
Myanmar						
Business As Usual	0.560	0.610	0.665	0.725	0.790	0.861
AEC integration	0.560	0.610	0.665	0.725	0.790	0.861
Percentage Change	*0.000%*	*0.005%*	*-0.007%*	*-0.015%*	*-0.021%*	*-0.024%*
Rest of ASEAN						
Business As Usual	132.147	138.841	145.874	153.263	161.026	169.183
AEC integration	132.147	138.841	145.887	153.290	161.068	169.240
Percentage Change	*0.000%*	*0.000%*	*0.009%*	*0.018%*	*0.026%*	*0.034%*
Rest of the World						
Business As Usual	6,343.194	6,571.537	6,808.100	7,053.179	7,307.080	7,570.121
AEC integration	6,343.194	6,571.540	6,808.088	7,053.155	7,307.044	7,570.074
Percentage Change	*0.000%*	*0.000%*	*0.000%*	*0.000%*	*0.000%*	*-0.001%*
Thailand						
Business As Usual	30.016	31.353	32.750	34.209	35.732	37.324
AEC integration	30.016	31.353	32.754	34.218	35.746	37.342
Percentage Change	*0.000%*	*-0.001%*	*0.013%*	*0.026%*	*0.038%*	*0.049%*
Vietnam						
Business As Usual	8.593	9.023	9.475	9.949	10.447	10.970
AEC integration	8.593	9.036	9.491	9.968	10.467	10.991
Percentage Change	*0.000%*	*0.136%*	*0.170%*	*0.187%*	*0.195%*	*0.197%*

4) Simulation result

Employment and migration (scenario 2)

- The AEC integration will induce a higher degree of migration, especially for labor in Laos, Cambodia and Vietnam.
- Labors in those countries will migrate to work in heavy and light industries, and also in service sector.
- The migration and employment pattern is consistent to the expansion of these local economies which these sectors will have the highest growth rates.
- Myanmar will be the only country that has the netted emigrants, reflecting the potential of sufficient local demands for labors.

% Change of sectoral employment	Cambodia	Laos PDR	Myanmar	Thailand	Vietnam	Rest of ASEAN	Rest of the World
Extraction	-1.36%	0.77%	1.01%	0.04%	-0.85%	0.02%	0.02%
Agriculture	-1.04%	-0.59%	-0.53%	1.48%	6.91%	-0.64%	-0.01%
Heavy Industry	0.46%	6.43%	-0.51%	1.91%	1.24%	1.01%	-0.01%
Light Industry	16.92%	6.53%	-0.79%	0.01%	1.79%	0.79%	0.00%
Meat Processing	-0.02%	-0.85%	-0.42%	0.21%	0.63%	0.34%	0.00%
Service	0.32%	1.51%	-0.83%	0.55%	1.33%	0.47%	0.00%
Food Processing	-6.23%	-0.89%	-0.88%	2.88%	1.41%	1.17%	-0.01%
Textile	6.52%	4.07%	-1.49%	0.47%	2.91%	0.43%	0.00%
Transport & Communication	4.06%	2.81%	-0.74%	0.98%	3.55%	0.76%	0.00%
Utility	3.04%	4.68%	-0.43%	1.10%	2.67%	0.75%	0.00%
Average	1.60%	1.79%	-0.75%	0.98%	2.37%	0.55%	0.00%

Change in Migration Stock in Thailand after AEC integration (unit: persons)

	Scenario 1 (Base case)	Scenario 2	difference	% change
2016	2,420,084	2,441,200	21,117	0.87%
2017	2,531,547	2,554,635	23,087	0.90%
2018	2,650,326	2,675,276	24,951	0.93%
2019	2,777,006	2,803,859	26,853	0.96%
2020	2,912,331	2,941,160	28,829	0.98%

4) Simulation result

Scenario 3: With AEC integration and Thailand's restructure

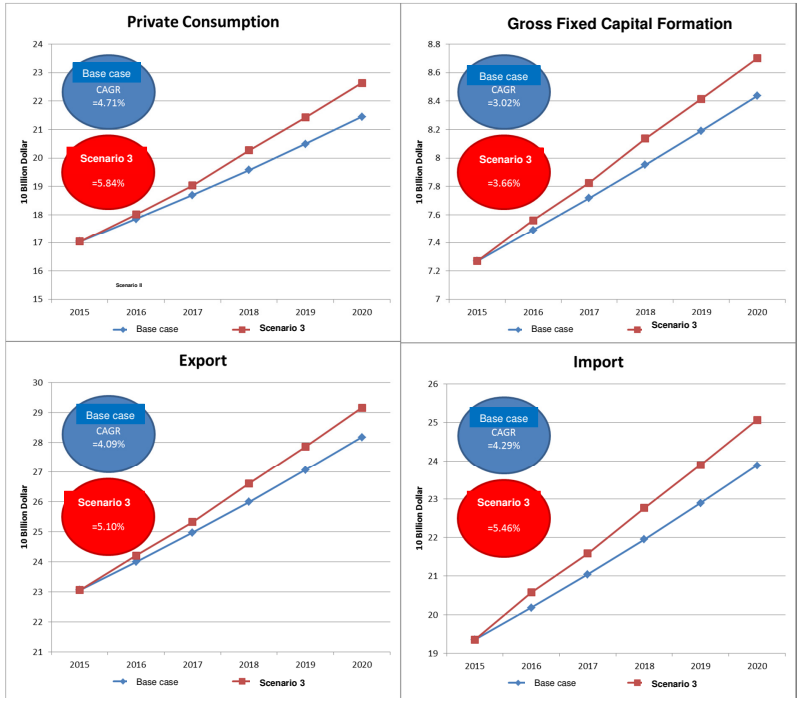
- **This scenario assumes that Thailand will re-structure the economy through investment in innovation and technology that leads to the capital intensive activity.**
- Also it is assumed that this investment will influence the Marginal Productivity of Capital to be at the rate of 1% higher than that of previous scenario throughout the years after AEC integration.
- In addition this scenario assumes that all labor will retire at the age of 64 years old, and this will increase the domestic labor supply by approximately 2%.

4) Simulation result

Scenario 3: Impact on GDP of Thailand

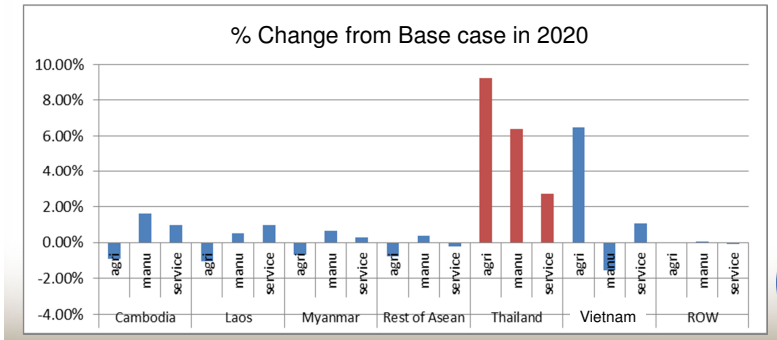
	Scenario 1 (Base case) (unit: 10 billion $ at constant price)	% Annual Growth	Scenario 3 (unit: 10 billion $ at constant price)	% Annual Growth	% change from Basecase
2015	30.016	-	30.016	-	-
2016	31.353	4.45%	31.583	5.22%	0.73%
2017	32.750	4.45%	33.241	5.25%	1.50%
2018	34.209	4.45%	35.237	6.01%	3.01%
2019	35.732	4.45%	37.095	5.27%	3.81%
2020	37.324	4.45%	39.049	5.27%	4.62%

All macroeconomic indicators exhibit all expansions, especially the real GDP in 2020 that will be 4.62% higher than that of the base case (i.e. scenario 1).



4) Simulation result

With the re-structuring scheme, the production activities will obtain the higher ratio of value added per labor. This restructuring will also influence the cross-sector adjustment, where workers will leave the resource-based sector to the manufacturing and service activities.



4) Simulation result

Employment and migration (scenario 3)

- With the higher labor productivity and expanding labor supply, this simulation shows that Thailand's demand for immigrants will be 2,521,257 persons, lower than that of previous scenario (2,912,331 persons).
- The majority of immigrant is still Myanmar workers. This result identifies the significance of investment in innovation and technology and also the domestic policy regarding ageing society and mobility of labors

4) Simulation result

The projection of migration stock in 2015

2015								
	Tha	cam	lao	MYM	ROASEAN	ROW	vie	Migration Ou
Tha		106,850	4,729	117	197,915	660,534	1,133	**971,278**
cam	214,868		1,356	47	8,957	309,632	127	**534,987**
lao	183,421	925		53	11,554	339,594	183	**535,730**
MYM	1,261,521	185	393		41,356	187,378	645	**1,491,477**
ROASEAN	24,067	1,892	20	905		4,818,458	9,216	**4,854,559**
ROW	617,386	11,416	4,336	170,200	2,516,972		13,794	**3,334,104**
vie	12,869	129,997	9,245	303	54,035	1,996,558		**2,203,007**
Migration In	**2,314,133**	**251,264**	**20,079**	**171,626**	**2,830,789**	**8,312,153**	**25,099**	

The projection of migration stock in 2020

2020								
	Tha	cam	lao	MYM	ROASEAN	ROW	vie	Migration Ou
Tha		141,604	6,108	187	236,629	758,841	1,412	**1,144,781**
cam	230,032		1,743	75	10,709	355,714	159	**598,432**
lao	196,366	1,225		84	13,814	390,136	229	**601,854**
MYM	1,350,036	245	506		49,446	215,265	804	**1,616,302**
ROASEAN	27,003	2,303	28	1,444		5,535,585	11,462	**5,577,825**
ROW	704,036	15,144	6,080	271,499	3,009,320		17,199	**4,023,278**
vie	13,785	172,280	12,058	483	64,605	2,293,704		**2,556,915**
Migration In	**2,521,257**	**332,801**	**26,524**	**273,773**	**3,384,523**	**9,549,245**	**31,264**	

5) Policy recommendations

Recommendation 1: Eradicating any obstruction to obstruct the process of AEC integration.

- Without doubt, AEC integration would create the larger markets and opportunities in exploiting lower labor cost. The free flow would also increase the mutual wealth and welfare among ASEAN members.

5) Policy recommendations

Recommendation 2: Thailand would need to prepare for the proper labor law and regulation as well as enhancement on labor qualification and competency scheme.

- The model simulation has shown the demand for the composite labor which is the combination of both skilled and unskilled labors.
- Without the proper regulation and the development of labor's skills, the implementation of AEC integration may not fully benefit the country as targeted.

5) Policy recommendations

Recommendation 3: A policy on production relocation is required, especially for the labor-intensive industries.

- The simulation result has shown that the proper capital deepening and investment in human capita would gain the positive impacts on Thai economy after AEC integration.
- This relocation policy should consider implicit costs which also include cultural issues, language barriers, and labor laws in other countries. Hence, more studies on these issues are required to support the proposed policy.

Thank you

Acknowledgement: All PowerPoint templates used in this presentation were obtained from www.fppt.com