

Assessing the Potential Economic and Poverty Effects of the National Greening Program

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Background - Motivation

- Between 1990 and 2013, the Philippines lost 3.8 million hectares of forest

	Tot. Forest Cover (mil. ha)	Change (mil. ha)	Change as % of 1990 level
1990	10.6		
2000	7.9	-2.6	-24.8
2005	7.2	-0.8	-7.4
2013	6.8	-0.4	-3.4
Total		-3.8	-35.7

Source: Philippine Forestry Statistics

- Impact on the environment/ecosystem

- Land/agriculture productivity
- Human health
- Poverty

- National Greening Program (NGP, EO 26 - 2011) - *Reforestation*

Other goals: poverty reduction; food security; environmental stability and biodiversity conservation; climate change

Objective

- To assess the potential economic and poverty effects of NGP (2012 - 2050)

Framework of Analysis

Change in forest cover until 2050

- Without NGP
- With NGP



Environmental/ecosystem effects until 2050

- 3% decline in labor efficiency due to negative health effects
- 12% decline in land efficiency due to climate change



Model 1 - CGE

- Economy-wide effects
- Household Income
- Prices



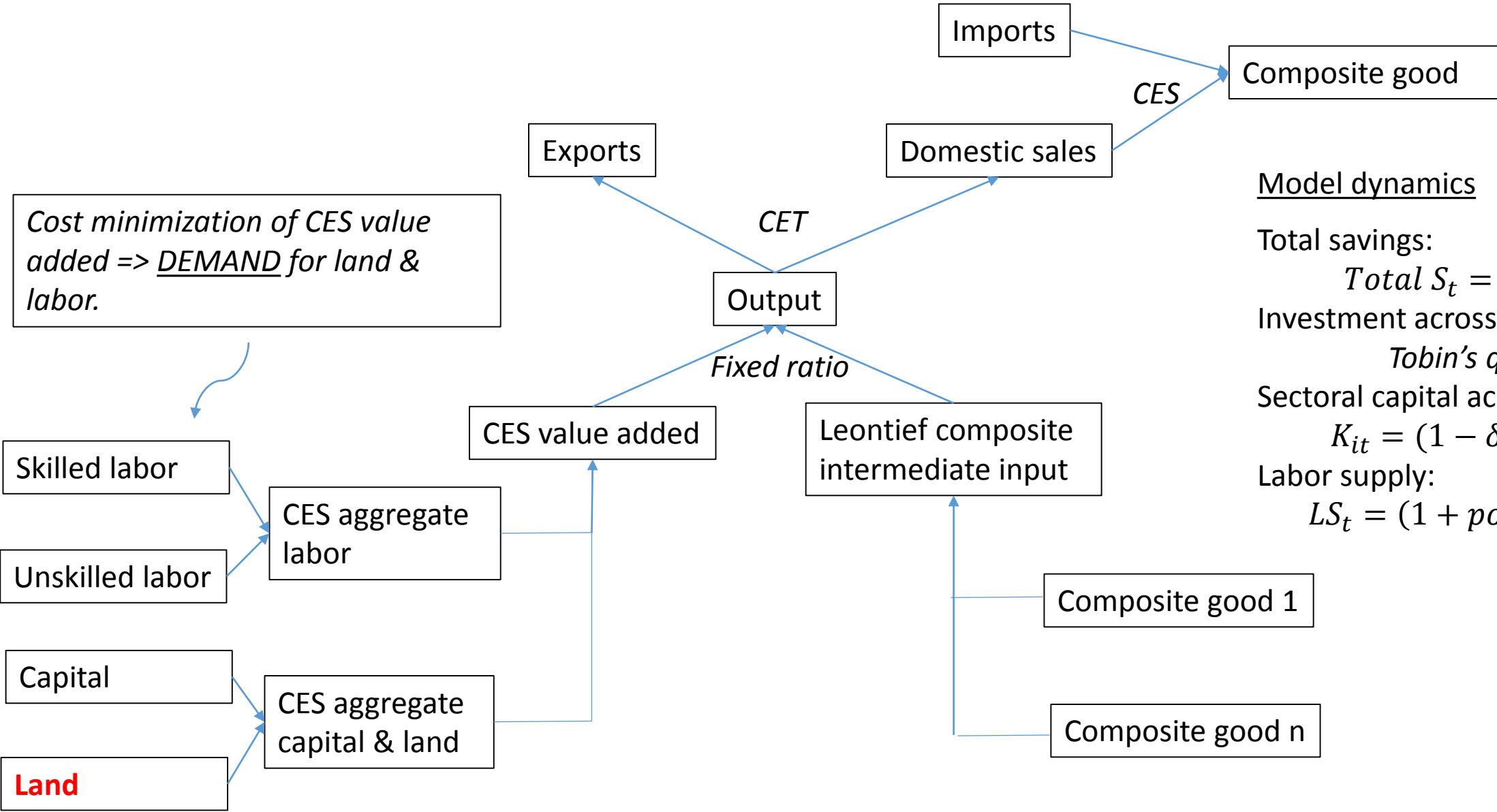
Model 2 - Microsimulation

- Poverty
- Income distribution

Tools used in the analysis

- Model 1 - Computable general equilibrium (CGE) model (calibrated to 2012 Social Accounting Matrix, SAM)
 - Two contributions:
 - Modeling land-use
 - Incorporating factor productivity/efficiency parameters
- Model 2 – Randomized poverty microsimulation model (calibrated to 2012 Family Income and Expenditure Survey, FIES)

CGE - Model structure



Model dynamics

Total savings:

$$Total S_t = Total I_t$$

Investment across sectors I_{it}

Tobin's q

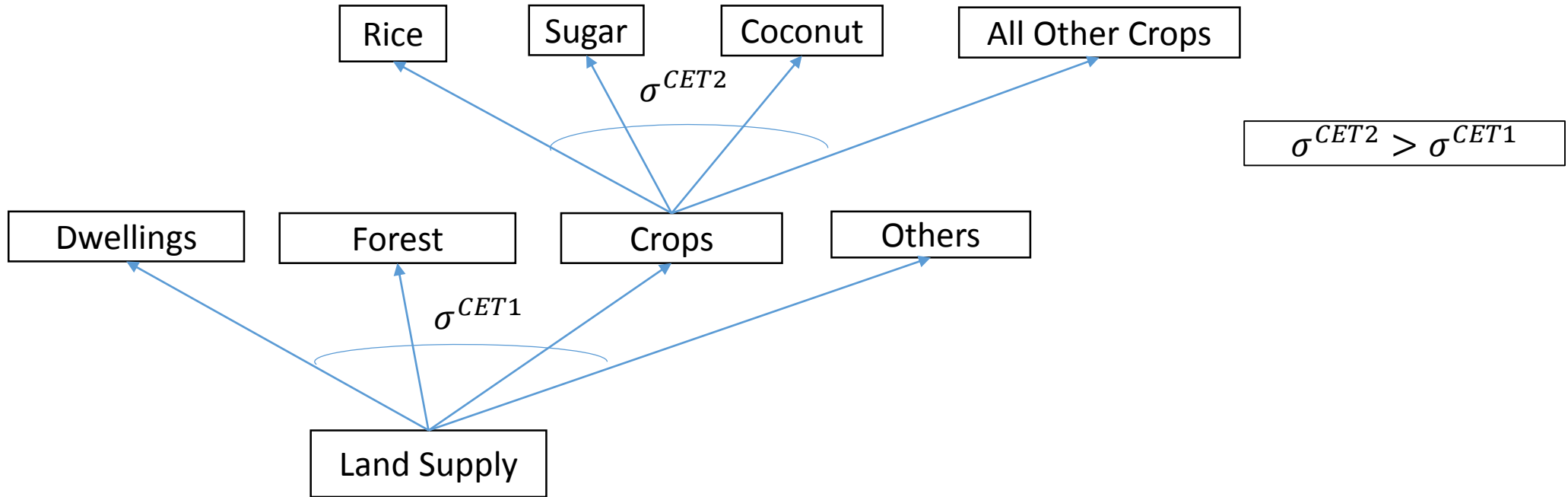
Sectoral capital accumulation:

$$K_{it} = (1 - \delta_i)K_{i0} + I_{it}$$

Labor supply:

$$LS_t = (1 + popgr)LS_{t-1}$$

CGE – Land Use



Revenue maximization of CET land allocation => SUPPLY of land

Each branch has marketing-clearing price

Factor Productivity Parameters

- Production function

$$Q = Q[(\lambda_L \cdot L), (\lambda_K \cdot K), (\lambda_{LN} \cdot LN)]$$

where:

Q = value added

L = labor; λ_L labor efficiency

K = capital; λ_K capital efficiency

LN = land, λ_{LN} land efficiency

- First order conditions include factor productivity/efficiency parameters

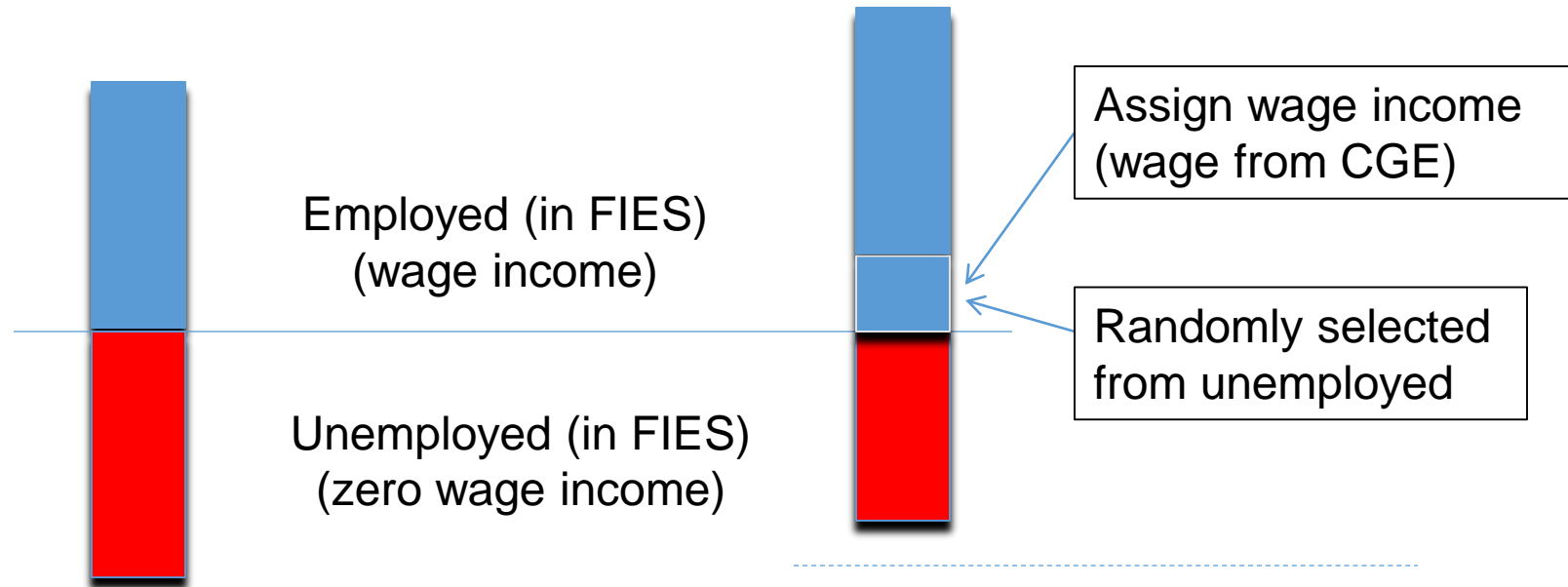
CGE – Model dimension

Sectors	Factors	Household Groups
Palay	Skilled labor	Decile (h1 to h10)
Coconut	Unskilled labor	
Sugar	Capital	
Other agriculture	<i>Land</i>	
<i>Forestry</i>		
Rice milling		
Coconut processing		
Sugar processing		
Other food		
All other manufacturing		
Other industry		
Dwellings		
Other service		
Public Administration		

Randomized Microsimulation Process

Pre CGE simulation

Post CGE simulation

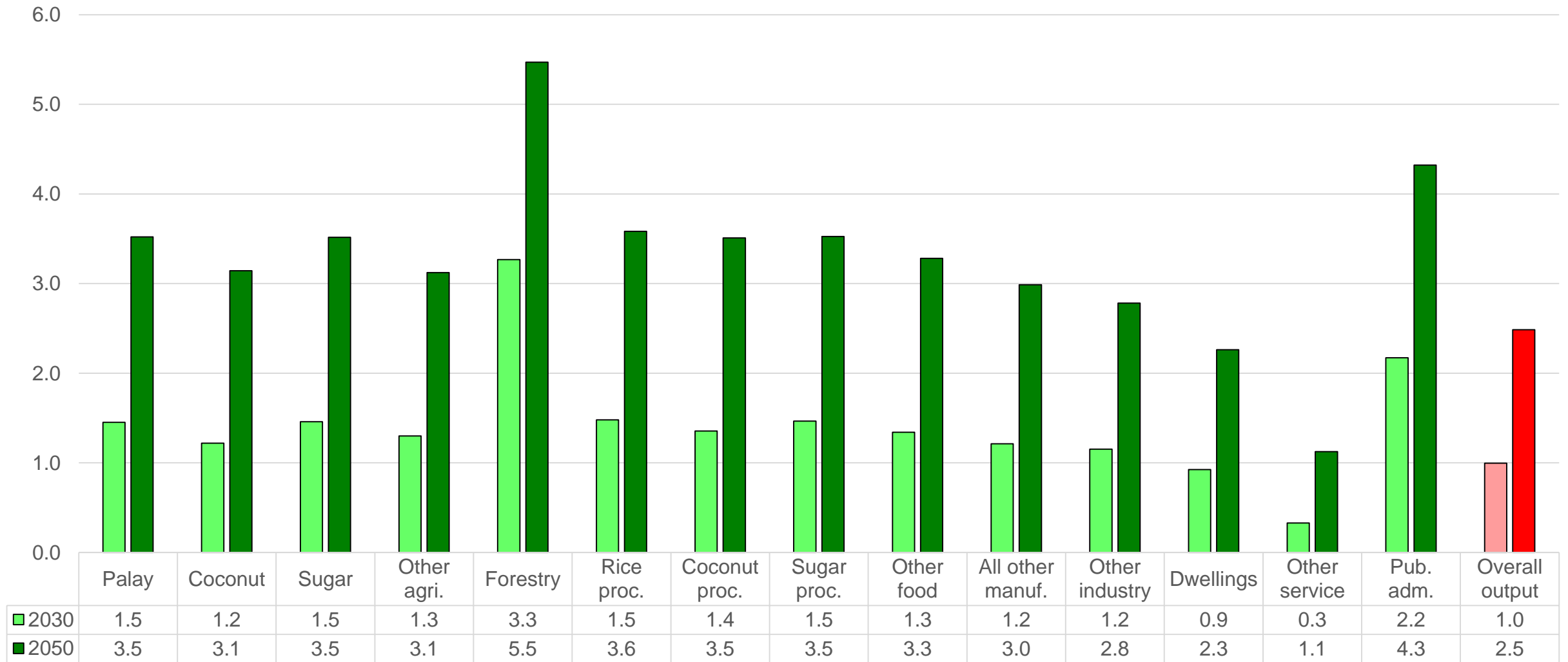


Repeat the process 30 times;
compute average and
confidence intervals of
estimates of poverty indices
and GINI coefficient

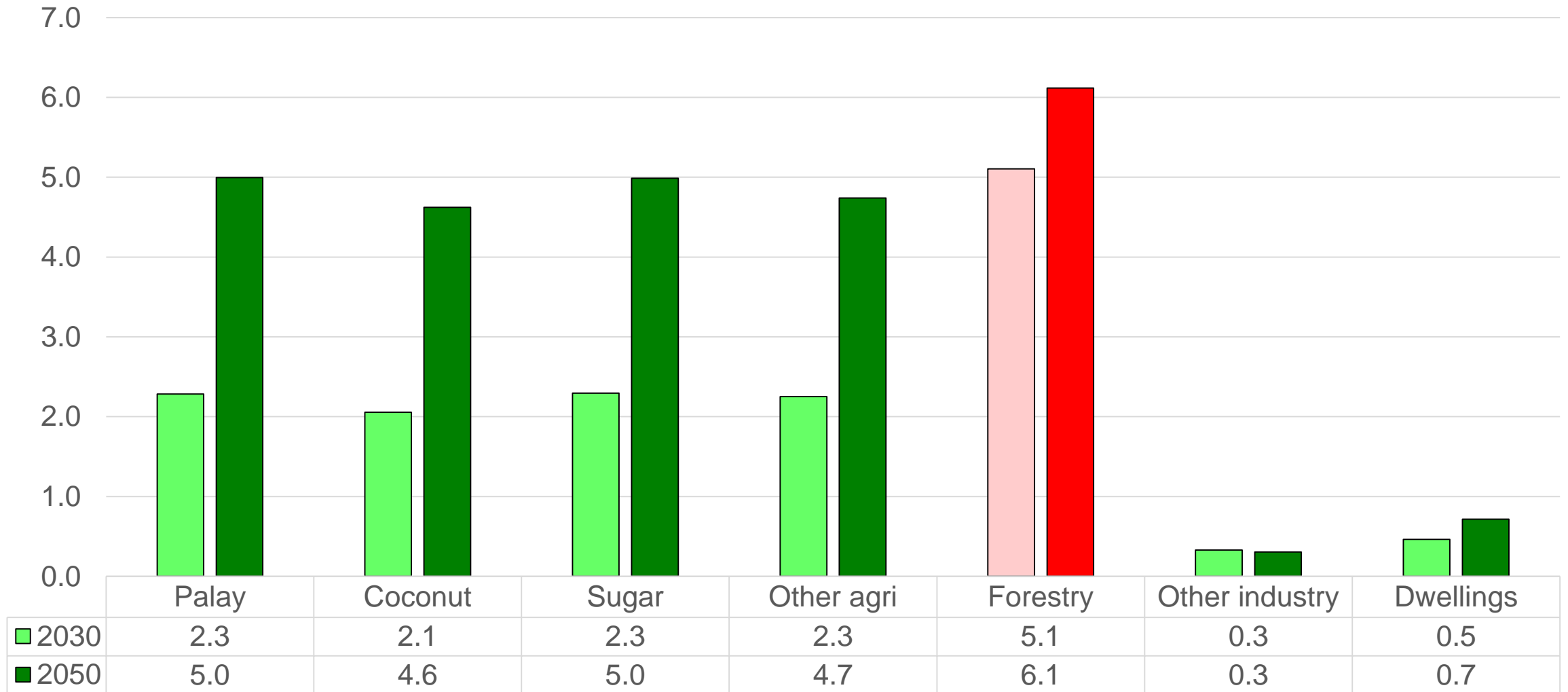
Simulations - definition

- Baseline (business as usual – BaU)
 - Deforestation – forest cover 6 million hectares in 2050
 - Negative impact on human health/labor supply-efficiency
($\lambda_L=1.00$ in 2012 ... $\lambda_L=0.97$ in 2050)
 - Decline in agricultural/land productivity-efficiency
($\lambda_{LN}=1.00$ in 2012 ... $\lambda_{LN}=0.88$ in 2050)
- NGP scenario
 - Maintain forest cover – 6.8 million hectares
 - No negative health/labor effects – ($\lambda_L=1.00$ 2012 - 2050)
 - No negative agricultural/land productivity effects – ($\lambda_{LN}=1.00$ 2012 - 2050)

Effects on Sectoral Output (% change from baseline)



Effects on land utilization, % change from baseline



Effects on Factor Incomes, % change from baseline

	2030	2050
<u>Factor returns:</u>		
Skilled labor	-0.06	0.62
Unskilled labor	-0.28	0.50
Capital	0.24	-0.04
Land	2.33	7.13
<u>Factor demand:</u>		
Skilled labor	1.45	3.00
Unskilled labor	1.45	3.00
Capital	0.65	1.91
Land	1.75	3.54
<u>Factor income:</u>		
Skilled labor	1.39	3.73
Unskilled labor	1.17	3.60
Capital	0.89	1.87
Land	4.12	10.92
Change in consumer prices*	-0.32	-0.67

*Computed using the change in sectoral Armington composite price, weighted by household expenditure shares

Effects on Household Income, % change from baseline

Household groups (Decile)	2030		2050	
	Income/1/	Prices/2/	Income	Prices
H1	1.047	-0.377	2.499	-0.786
H2	1.046	-0.372	2.519	-0.781
H3	1.047	-0.362	2.540	-0.764
H4	1.042	-0.354	2.546	-0.747
H5	1.041	-0.343	2.583	-0.727
H6	1.043	-0.332	2.611	-0.707
H7	1.033	-0.323	2.607	-0.688
H8	1.037	-0.314	2.631	-0.669
H9	1.024	-0.307	2.599	-0.653
H10	0.978	-0.286	2.390	-0.608
/1/ Nominal				
/2/ Computed using the change in the Armington composite price, weighted by household expenditure shares in each decile group				

Effects Poverty and Distribution

	Poverty Indices			% change*	
	2012	2030	2050	2030	2050
Philippines					
P0	24.85	24.18	23.29	-2.70	-6.28
P1	6.84	6.59	6.26	-3.65	-8.42
P2	2.68	2.56	2.42	-4.29	-9.81
Urban					
P0	11.57	11.23	10.77	-2.95	-6.92
P1	2.79	2.67	2.51	-4.34	-10.00
P2	0.99	0.94	0.88	-5.01	-11.39
Rural					
P0	35.58	34.64	33.41	-2.64	-6.11
P1	10.10	9.75	9.29	-3.49	-8.07
P2	4.04	3.88	3.66	-4.15	-9.50
GINI Coefficient	0.4713	0.4710	0.4708		
*Relative to 2012 Indices from the Family Income and Expenditure Survey					
P0 - poverty incidence		P1 - poverty gap		P2 - poverty severity	

Conclusions/Insights

- Higher output, particularly agriculture and food production
- Reforestation increases supply of productive land; improves utilization of land as forest
- Factor incomes improve; consumer prices decline; income improvement in poorer households relatively higher
- Poverty indicators drop; higher drop in extreme poverty indices
- GINI coefficient declines; favorable distributional effects
- These are potential effects; assume successful NGP
- Implementing NGP is a major challenge