General Equilibrium Modeling

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PTAC
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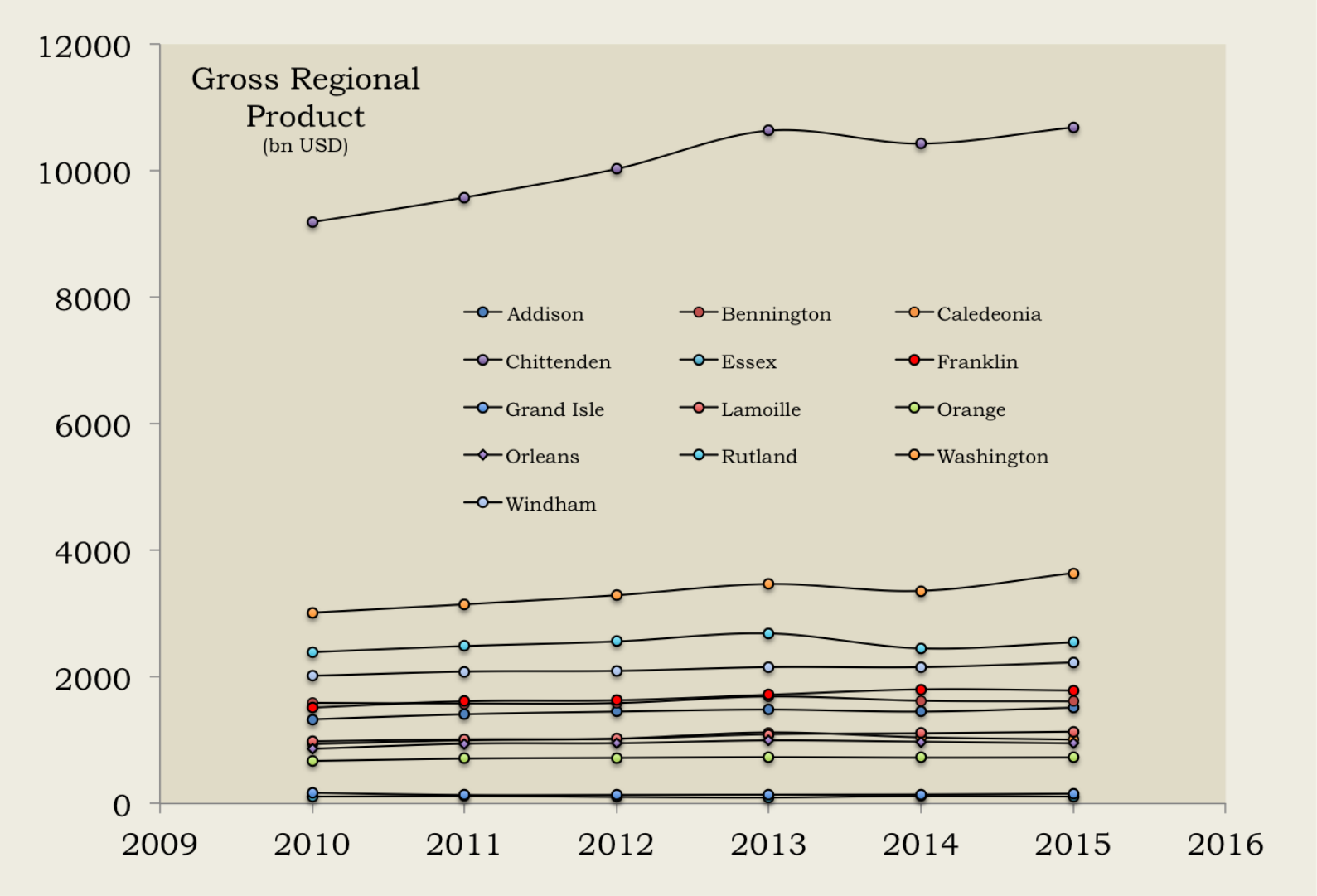
- As a function of market incentives as well as taxes and subsidies

Time series county level projections possible



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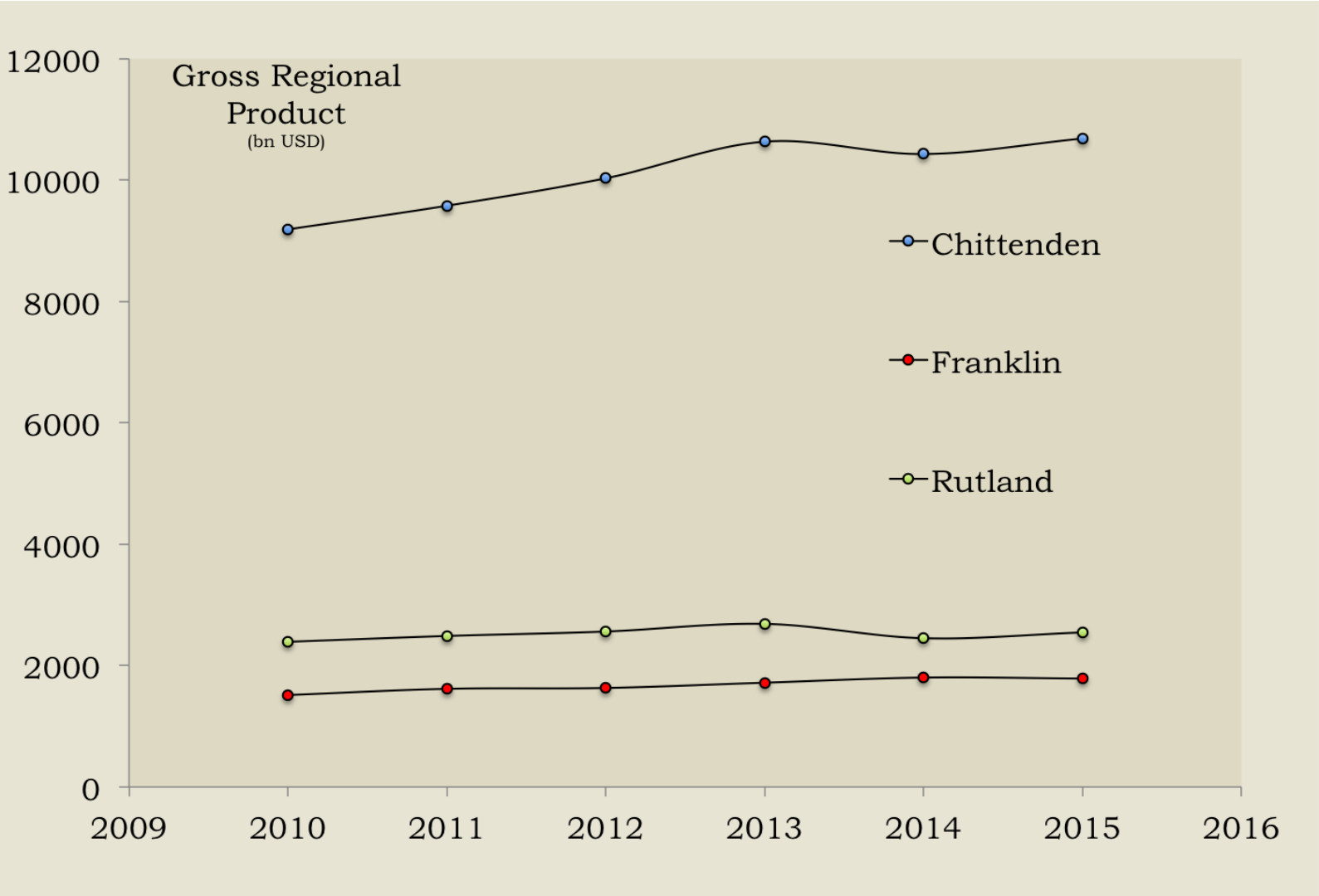
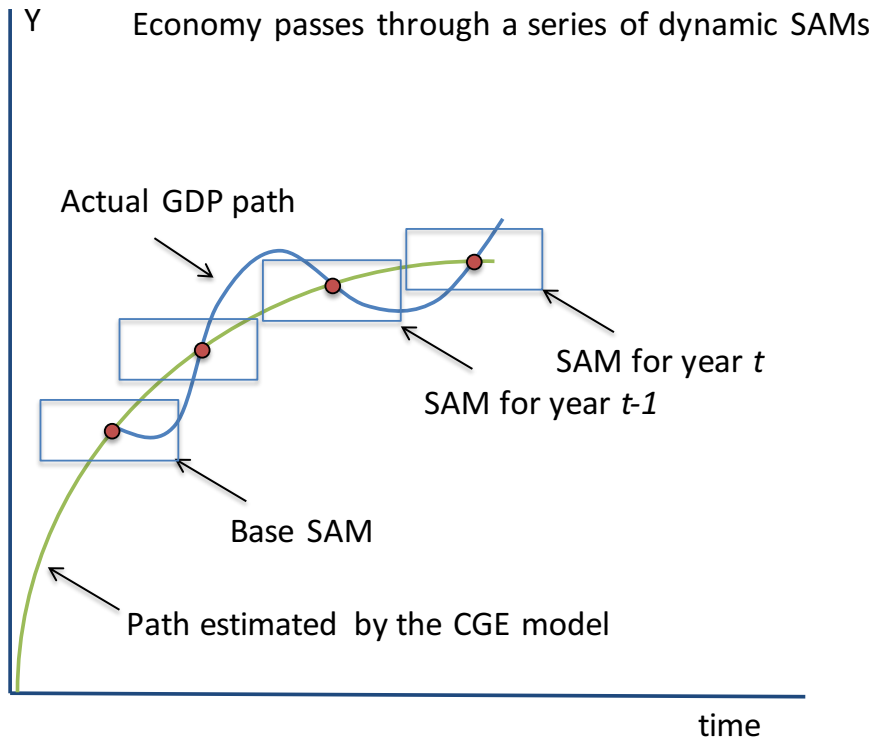


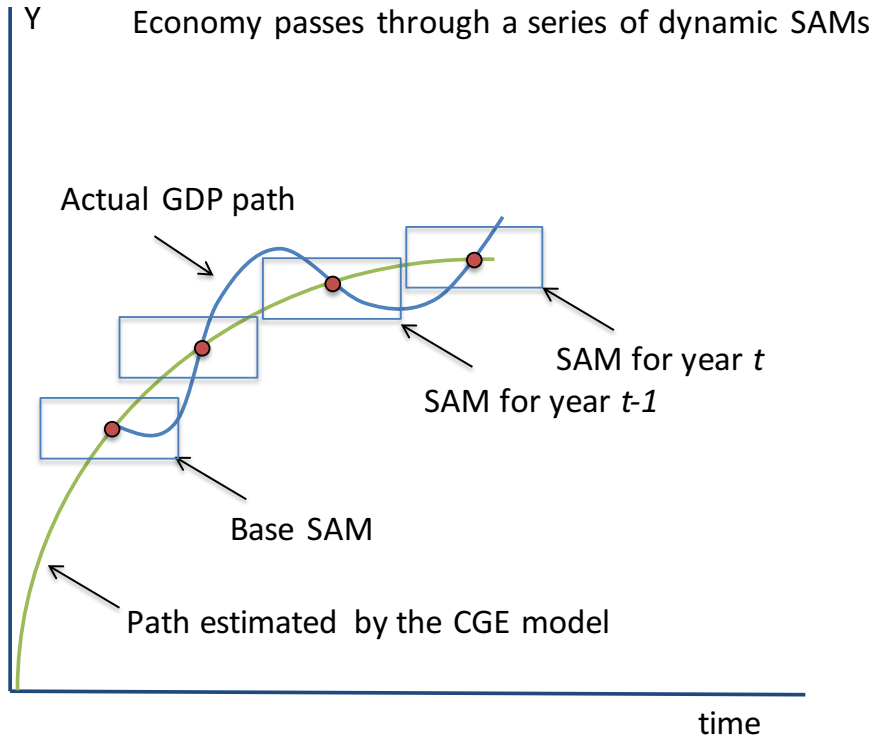
Dynamic CGEs

- Based on stock-flow consistency



Dynamic CGEs

- Based on stock-flow consistency
- Updated at each sweep of the model



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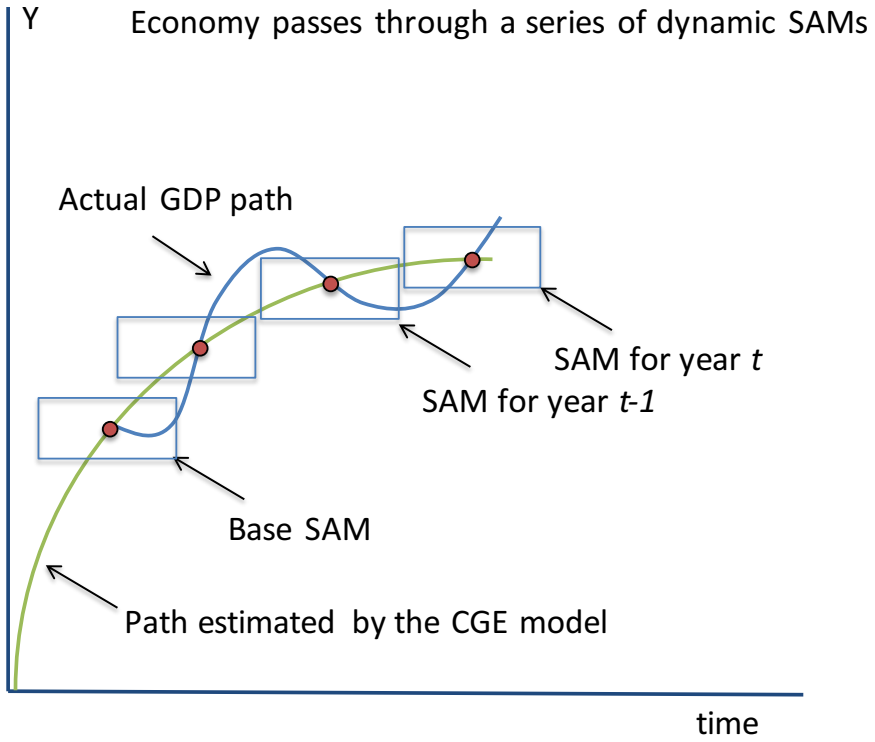

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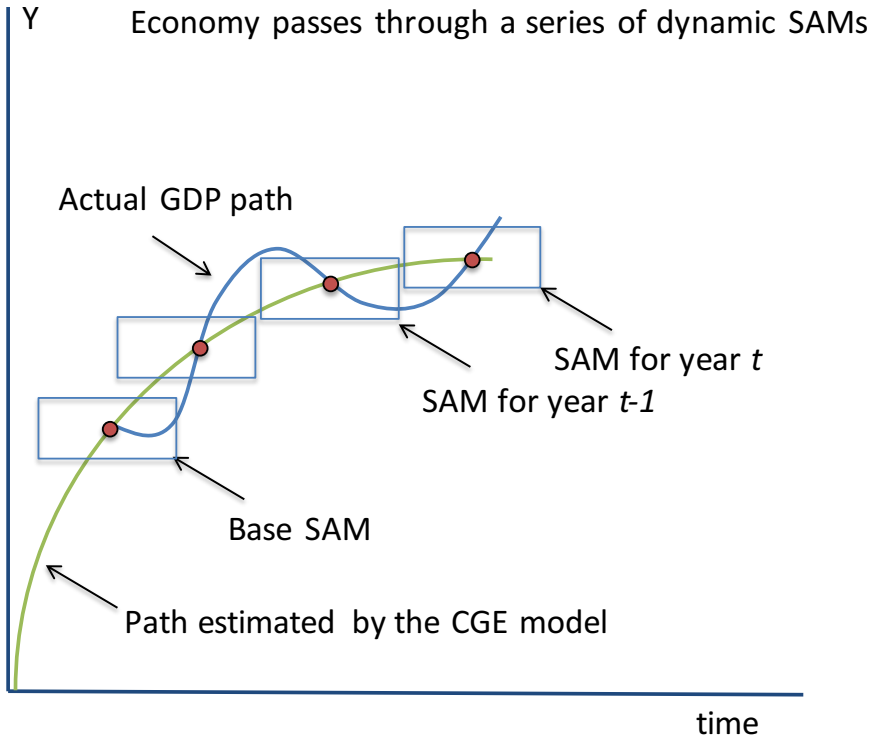

Dynamic CGEs

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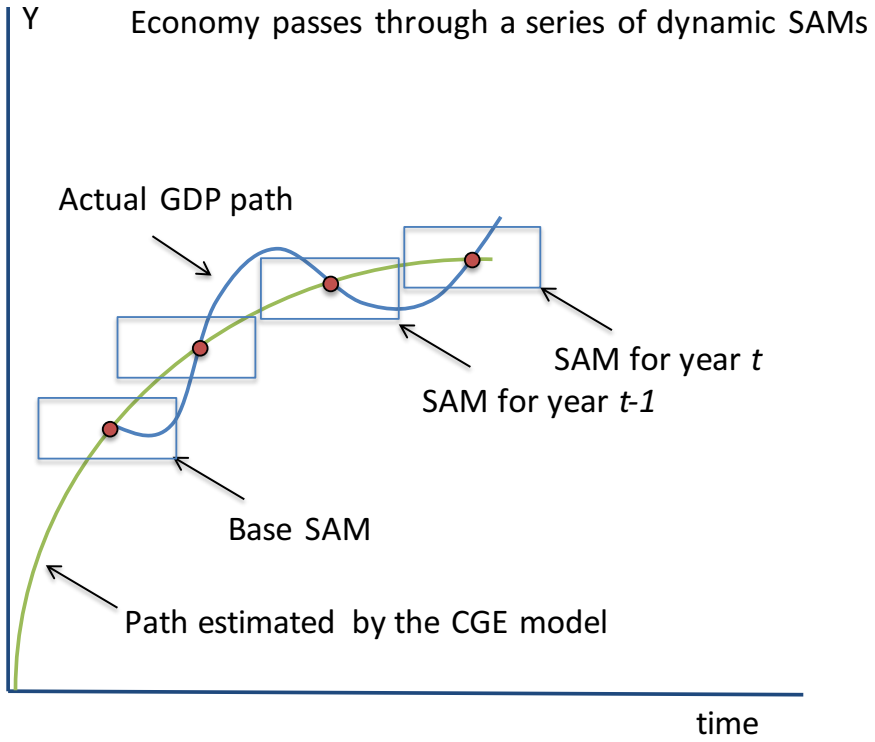
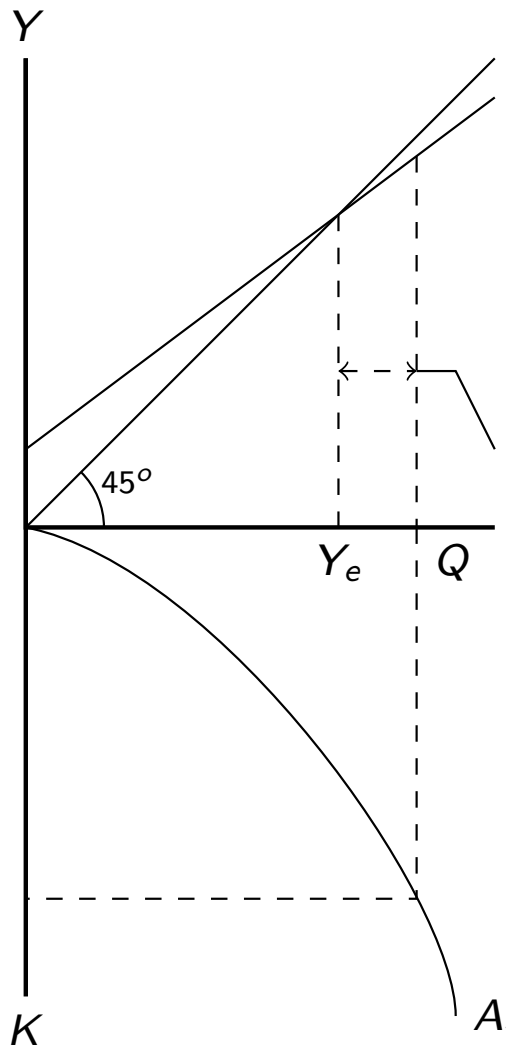
- Calibrated to time series
- Many levels of taxation
- Must account for tech change and productivity growth

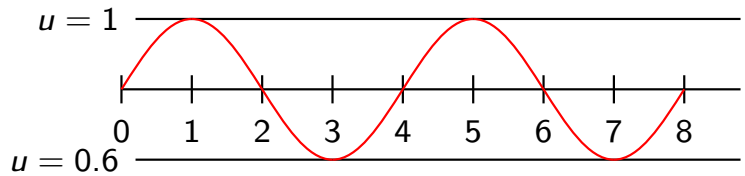


The Model in pictures



$$Y = C(Y) + I + G + X - M(Y)$$

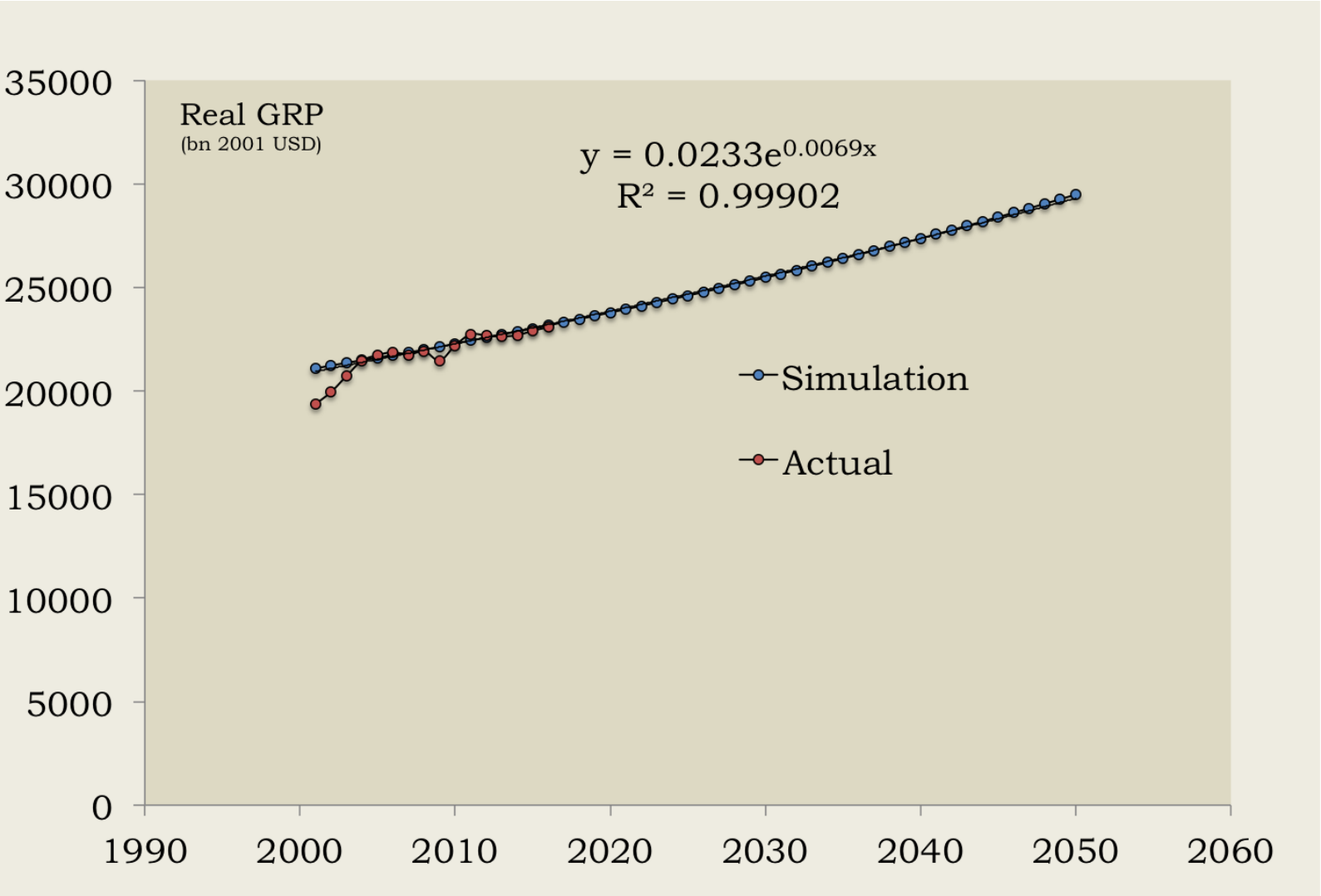
Under-utilized capacity $u(t) = Y/Q$



Time series of $u(t)$ must be *stationary*

$$AS = Q(K, L) = A(t)K^{\beta}L^{1-\beta}$$

Model tracks Real GDP



New Model

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- Model running with 138,764 equations and 138,764 unknowns

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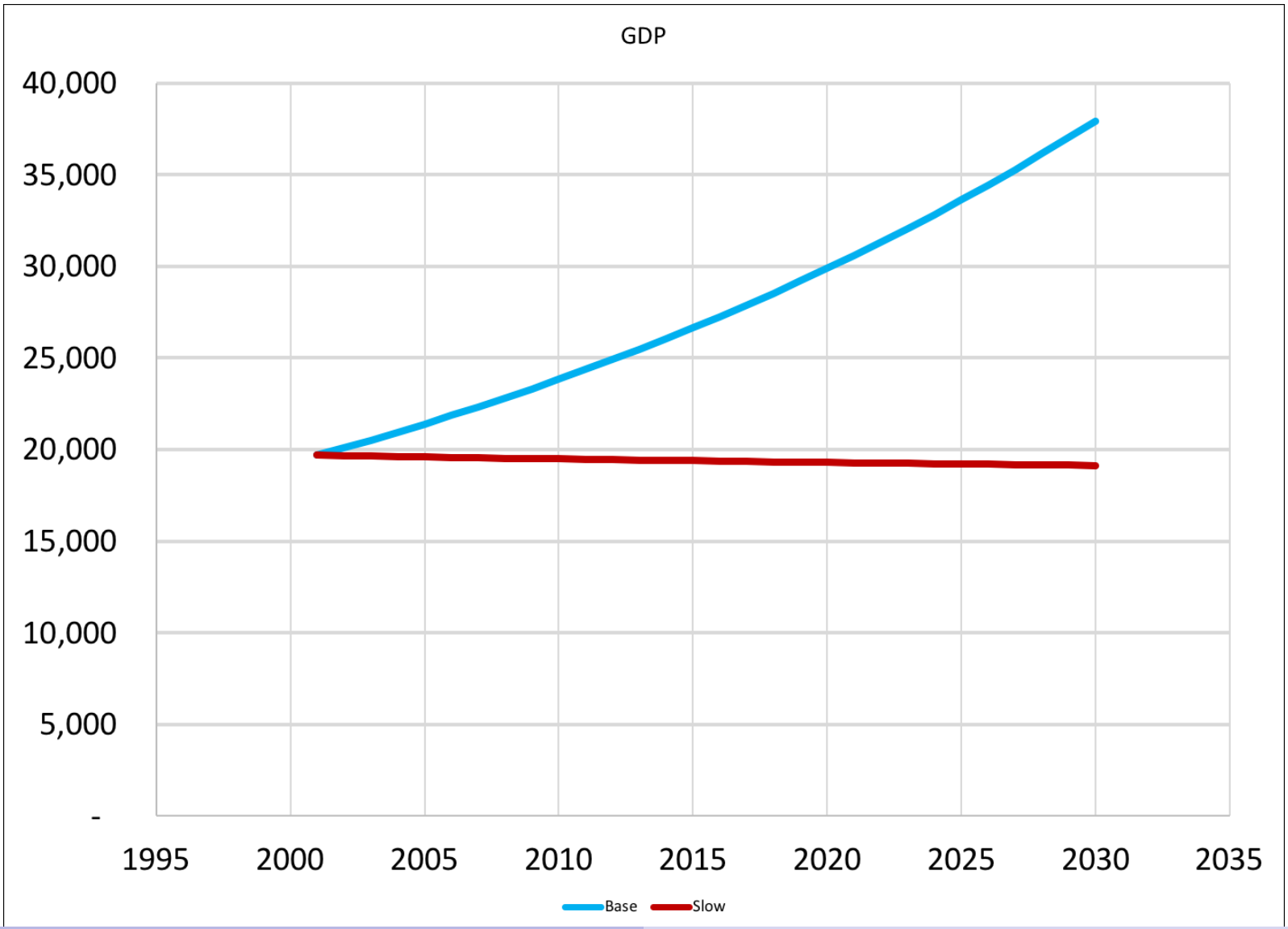
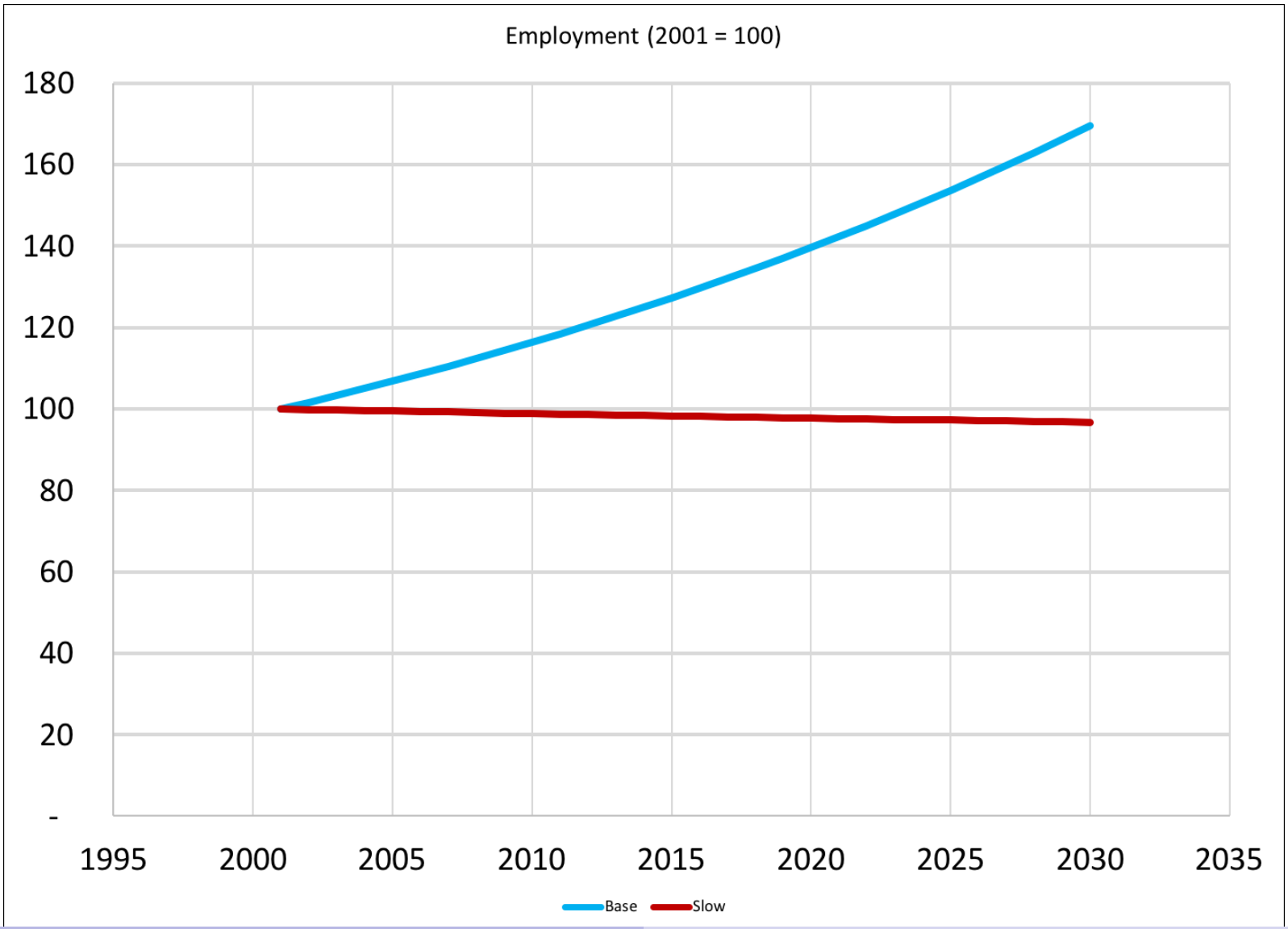
- Also held constant

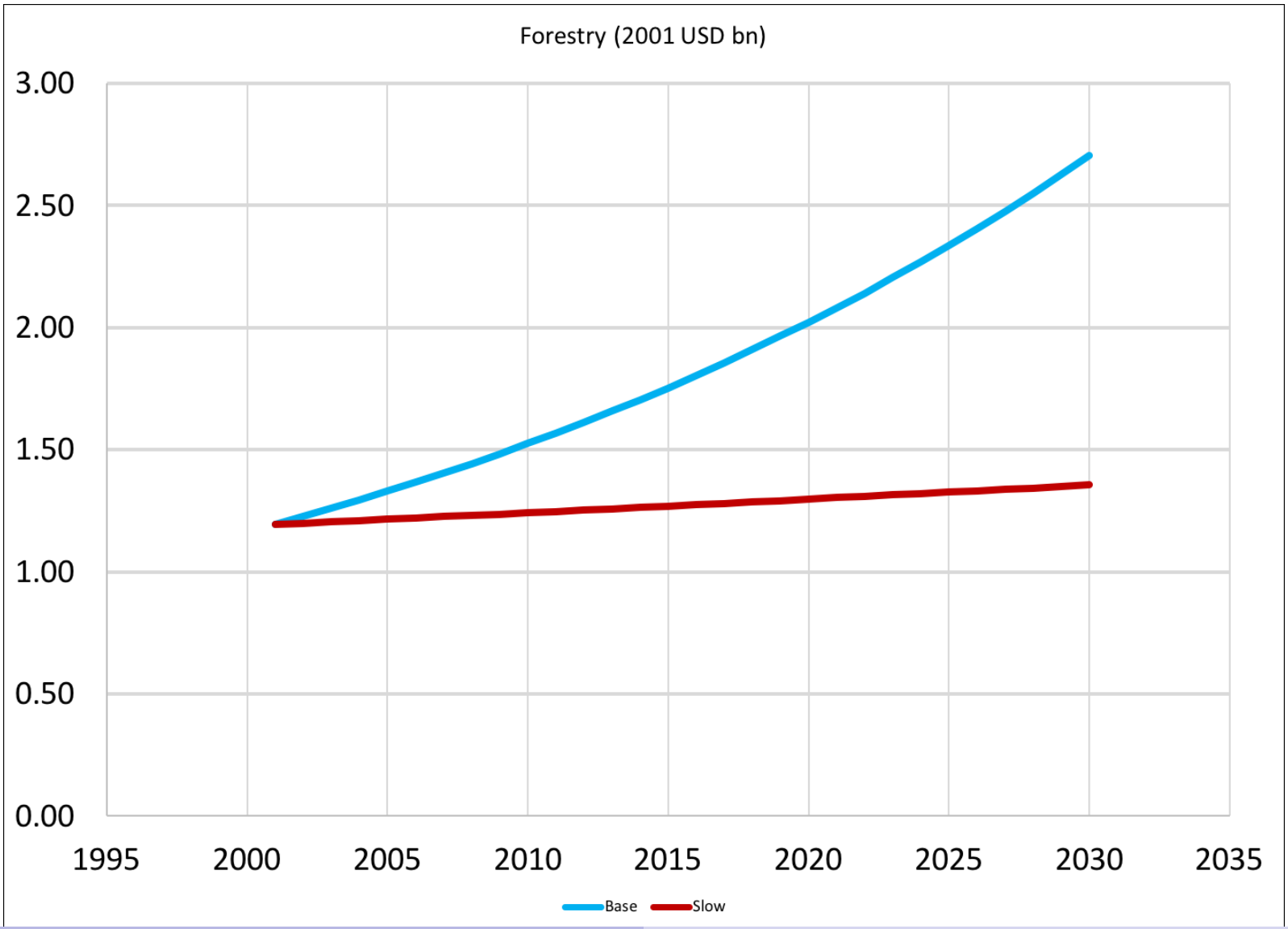
Real GDP


GDP
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
-
1995
2000
2005
2010
2015
2020
2025
2030
2035
Base
Slow

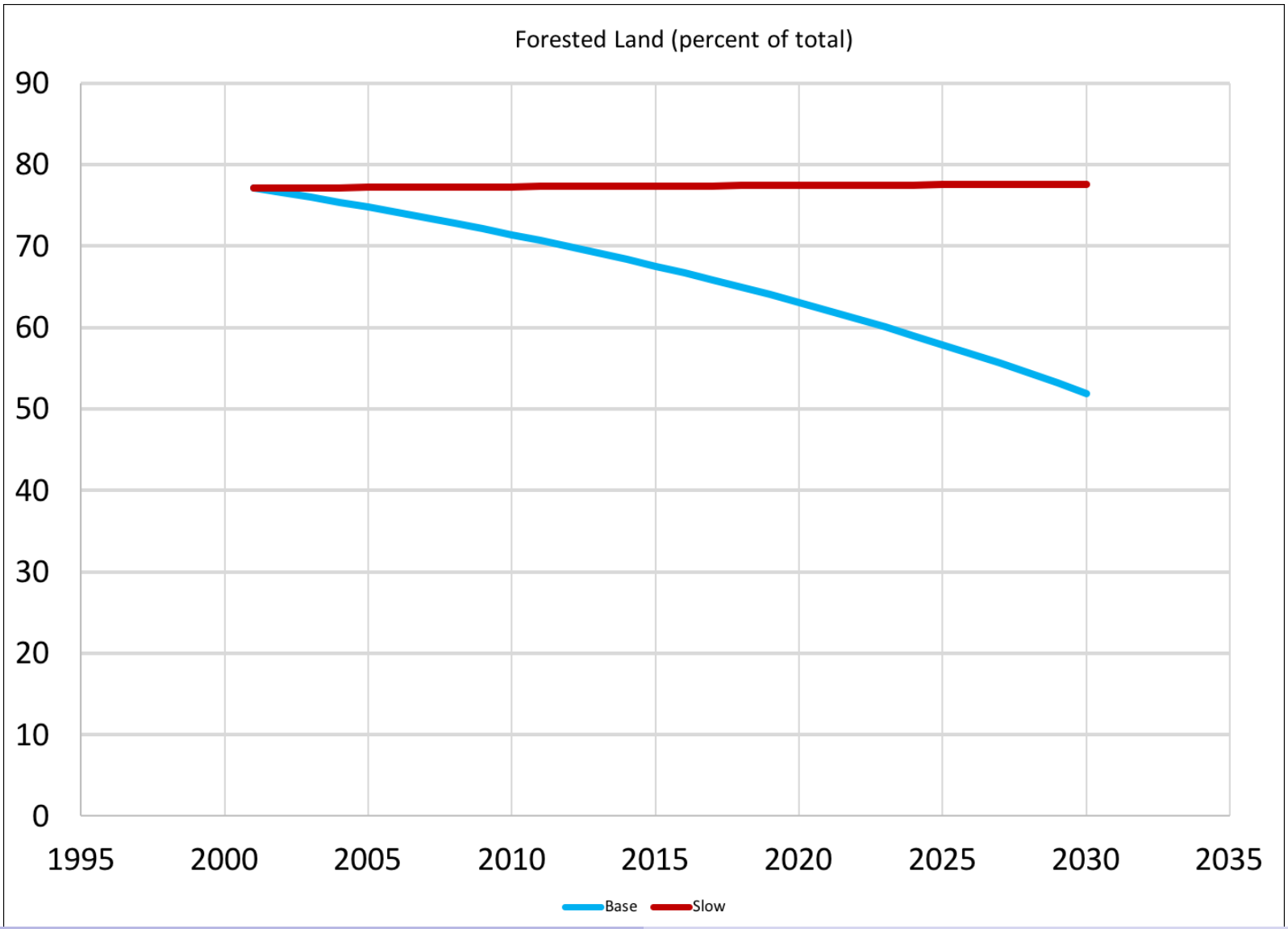
Employment


Employment (2001 = 100)
180
160
140
120
100
80
60
40
20
-
1995
2000
2005
2010
2015
2020
2025
2030
2035
Base
Slow

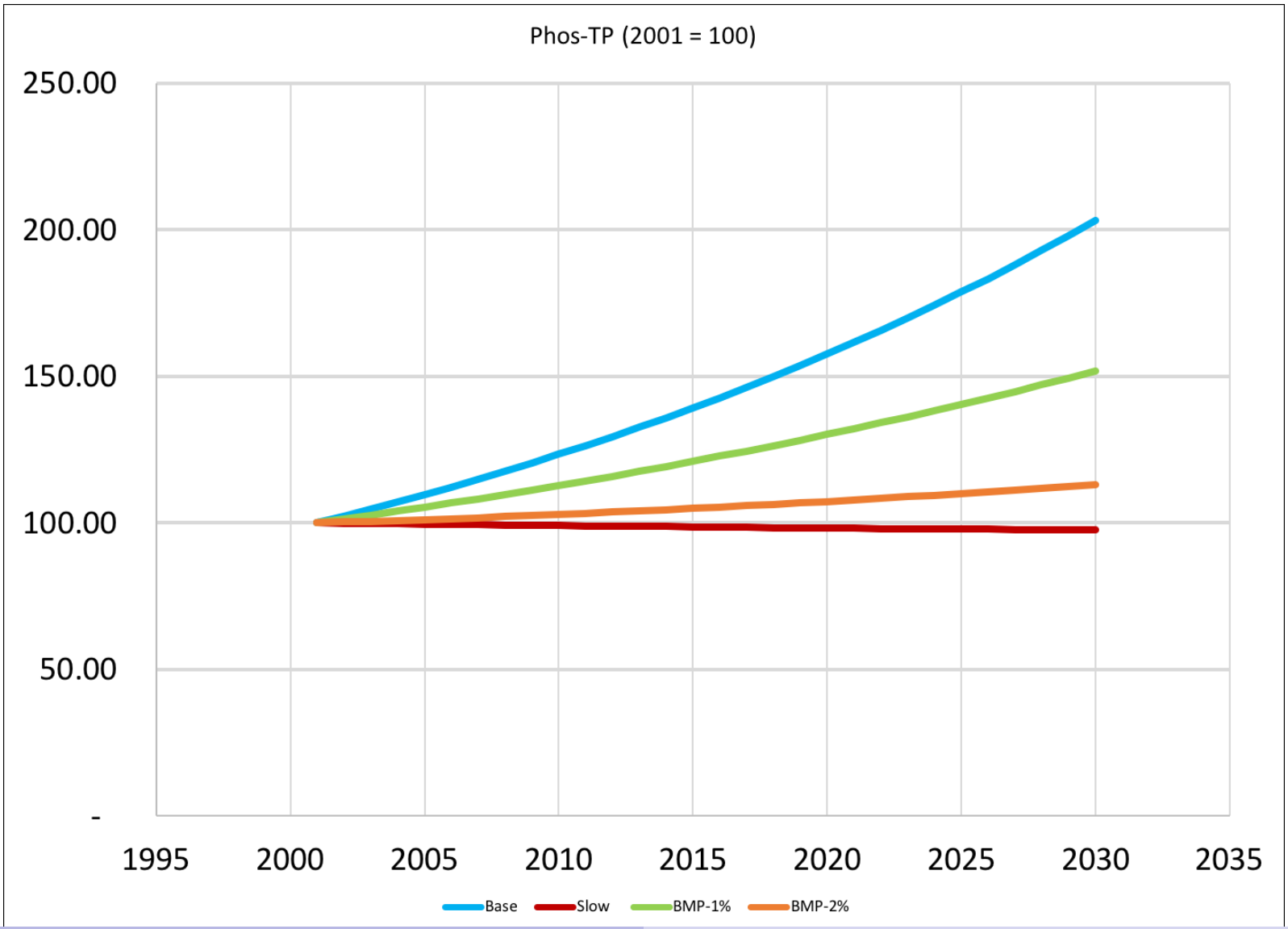
Forestry Real Value Added



Forestry Land Use



Phosphorus


Phos-TP (2001 = 100)
250.00
200.00
150.00
100.00
50.00
-
1995
2000
2005
2010
2015
2020
2025
2030
2035
Base
Slow
BMP-1%
BMP-2%

Elasticities

Percent change in output to obtain a one-percent change in P

Macro		**Sectoral value added**					
GDP	-0.94	Crops	-0.99	Brewery	-0.92	Housing	-0.62
Deflator	0.16	Dairy	-1.10	Meat	-0.78	Real Est	-0.86
Total Employment	-0.78	Animal	-1.08	Wood	-0.90	Landscape	-0.96
GDP per capita	-0.93	Forestry	-0.95	Mfg	-0.92	Rec	-0.91
Real Wage	-0.16	Primary	-0.91	Wholesale	-0.91	Services	-0.89
Gini	0.01	Utilities	-0.99	Retail	-0.89	Tourism	-0.96
		Const	-0.62	Transport	-0.90	Govt	-1.12
		Milk	-1.01	Info	-0.84		

Cost of phosphorus reduction?

- 2018-2030 lost output, employment, tax revenues

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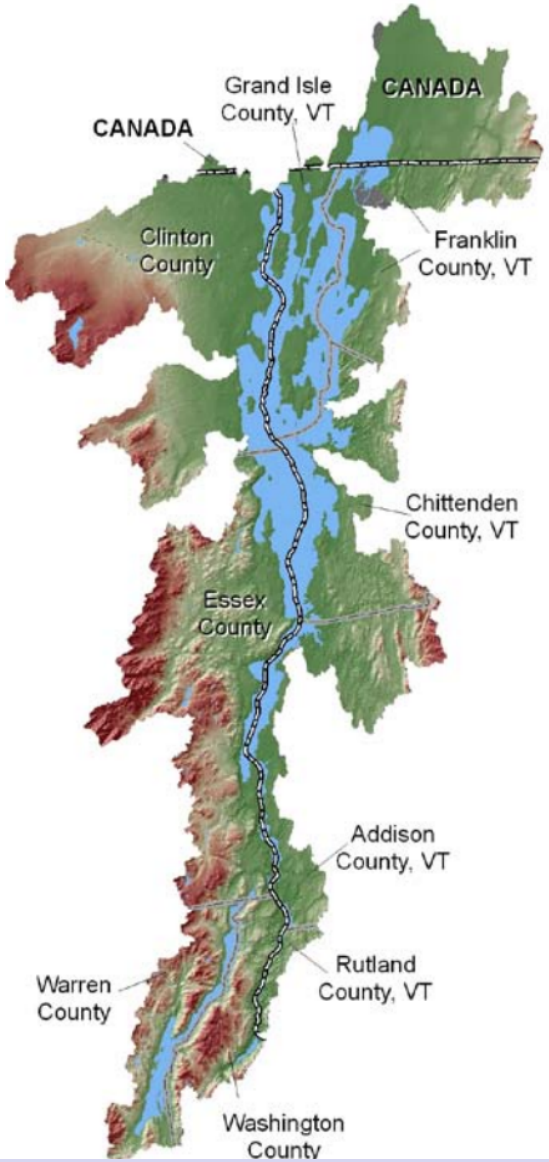
- Confirms that BMP rather than output reduction is only solution practically available

What is next?

- Use watershed information to lessen total impact of growth



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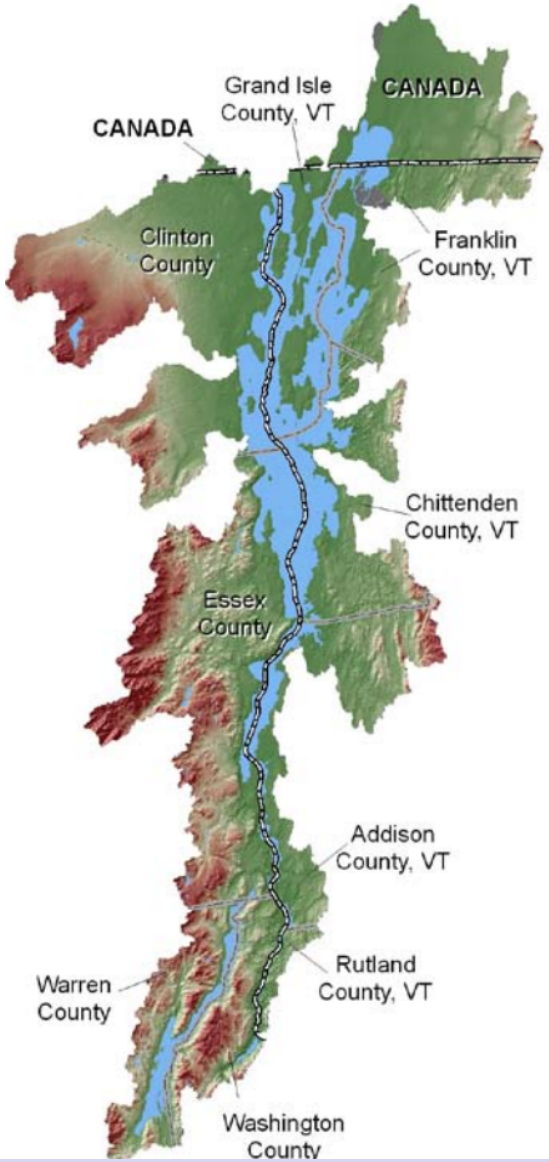

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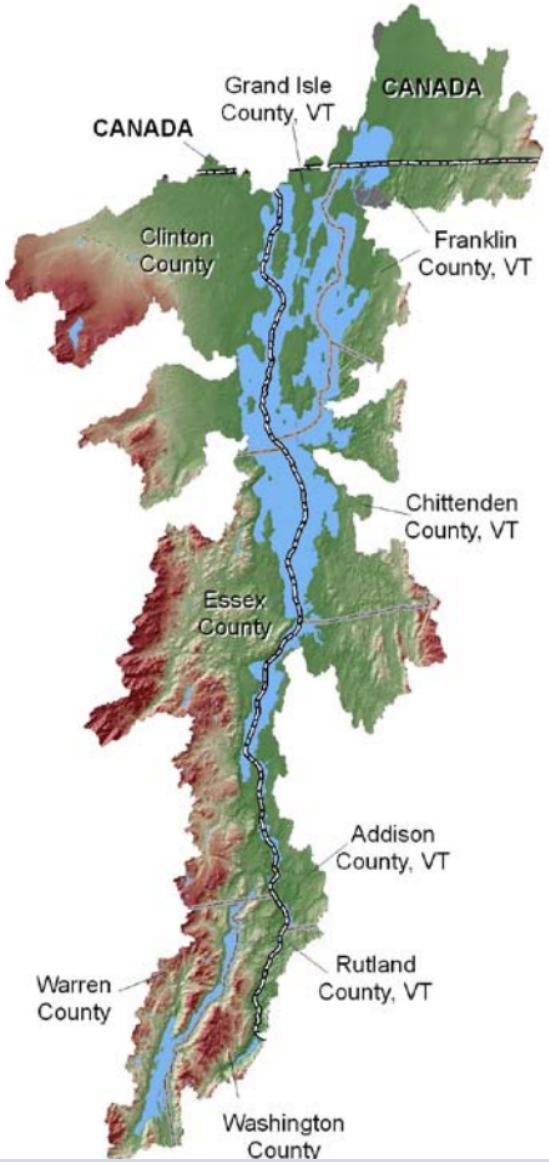

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- Run for longer time horizon