

Nuclear Power in Japan

Chapter 7

Hector Pollitt, Cambridge Econometrics

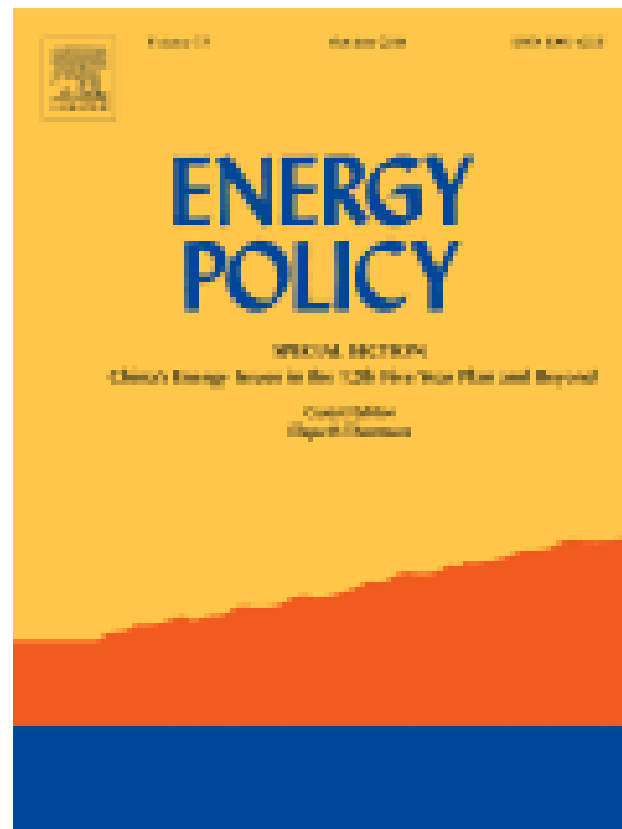
Outline of the presentation

- Background – the previous paper
- Results from E3ME
- Comparison with CGE modelling

Overview of the Chapter

- The chapter builds on the paper that was published in Energy Policy:

Pollitt, H, Soochool Lee, Seung-Joon Park and Kazuhiro Ueta (2014) 'An Economic and Environmental Assessment of Future Electricity Generation Mixes in Japan - An assessment using the E3MG macro-econometric model', Energy Policy, Volume 67 (2014), pp 243-254.

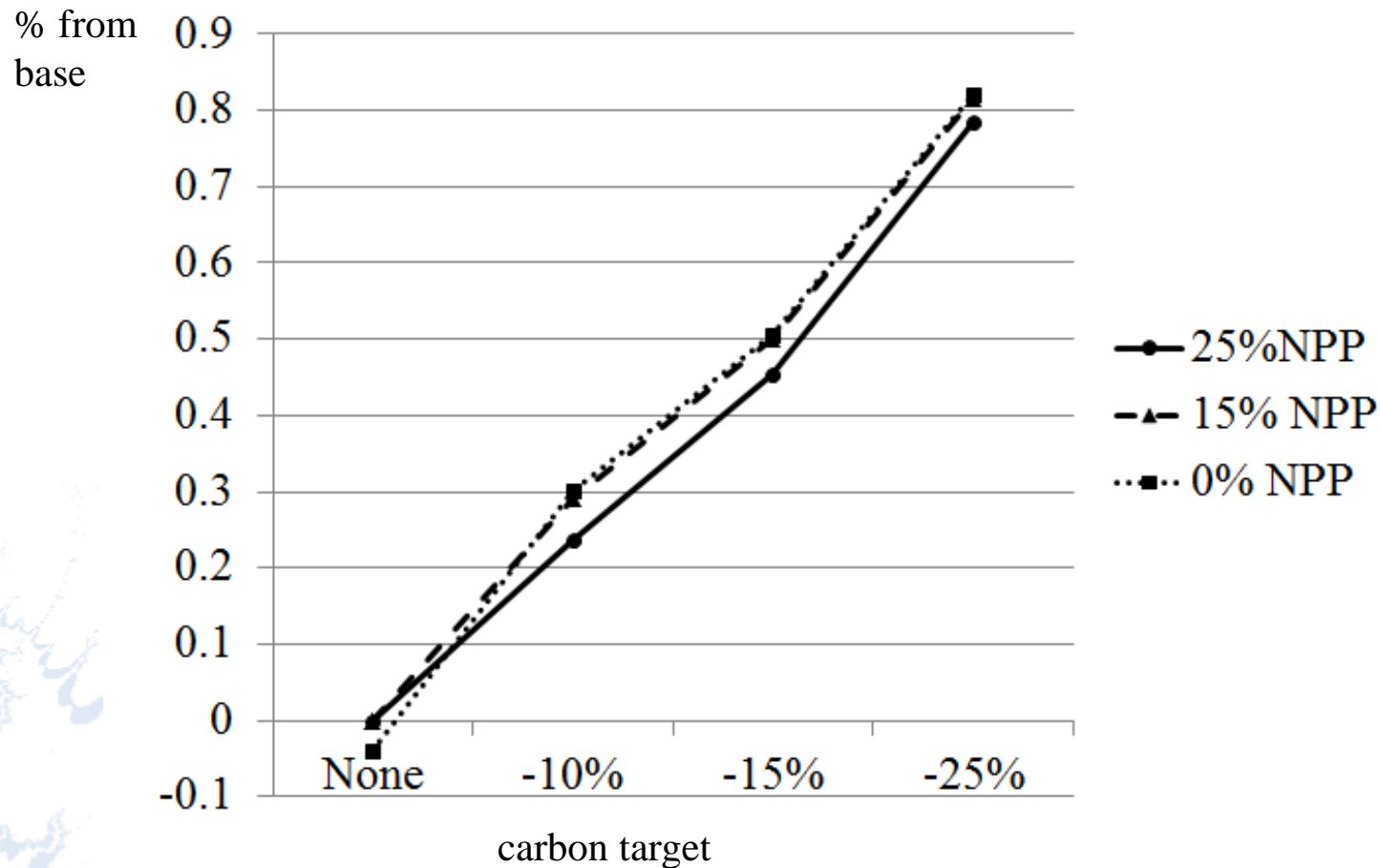


Comparison with the CGE Analysis

- Previously 4 CGE models were applied to assess the scenarios
- E3ME was applied to assess the same scenarios, and also the interaction with different carbon targets

		2010	2030						
			0% NPP		15% NPP		20-25% NPP		
			before measures	additional	after measures	additional			
Composition of Electricity Generation	NPP share	26%	0% (-25%)		0% (-25%)		15% (-10%)	20-25% (-5%--1%)	
	Renewables	10%	30% (+20%)		35% (+25%)		30% (+20%)	30-25% (+20--+15%)	
	Combustion	63%	70% (+5%)		65% (+0%)		55% (-10%)	50% (-15%)	
	Coal	24%	28% (+4%)		21% (-3%)		20% (-4%)	18% (-6%)	
	LNG	29%	36% (+7%)		38% (+9%)		29% (+0%)	27% (-2%)	
	Oil	10%	6% (-4%)		6% (-4%)		5% (-5%)	5% (-5%)	
Energy Conservation	Electricity Generation	1.1 trn kWh	1.0 trn kWh		1.0 trn kWh		1.0 trn kWh	1.0 trn kWh	
	End Energy Consumption	0.39 bn kL	0.31 bn kL		0.30 bn kL		0.31 bn kL	0.31 bn kL	
NPP	Dependence on NPP	26%	0% (-25%)		0% (-25%)		15% (-10%)	20-25% (-5%-1%)	
Energy Security	Dependence on Fossil Fuels	63%	70% (+5%)		65% (+0%)		55% (-10%)	50% (-15%)	
	Imported fuel values (total primary energy supply)	17 trn yen	17 trn yen		16 trn Yen		16 trn yen	15 trn yen	
			Promoting stronger shift to gas						
Climate Policy	Renewable Energy Share	10%	30% (+20%)		35% (+25%)		30% (+20%)	30-25% (+20--+15%)	
	Non-Fossil Energy Share	37%	30% (-5%)		35% (+0%)		45% (+10%)	50% (+15%)	
	Coal to Gas in combustion power plants including CHP	1: 1.2	1:1.3		1: 1.8		1: 1.5	1: 1.5	
	GHG emission	2030	-	-16%		-23%		-23%	-25%
		2020	-	+0% (0%NPP), -5% (14% NPP)		-0% (0% NPP) -7%(14%NPP)		-9% (21% NPP)	-10-11% (23-26% NPP)
	Generation Costs (yen/kWh)	8.6	-		15.1 (+6.5)		14.1 (+5.5)	14.1 (+5.5)	
	Transmission Investment (trn yen, accumulated to 2030)	-	3.4		5.2		3.4	3.4-2.7	
	Energy Saving Investment (trn yen, accumulated to 2030)	-	80 (saving 60)		100 (saving 70)		80 (saving 60)	80 (saving 60)	
	Household electricity price in 2030 (10 thousand yen/month)								
	NIES	1.0	-		1.4		1.4	1.4	
	Osaka Univ.		-		1.5		1.4	1.2	
	Keio Univ.		-		2.1		1.8	1.8	
	RITE		-		2.0		1.8	1.8	
	Real GDP in 2030 (trn yen)								
	NIES	511	636(2030 BAU)		628		634	634	
	Osaka Univ.		624(2030 BAU)		608		611	614	
	Keio Univ.		625(2030 BAU)		609		616	617	
	RITE		609(2030 BAU)		564		579	581	

E3ME Results – GDP



E3ME Results – Carbon Prices

	Nuclear share in 2030	CO ₂ emissions in 2020 compared to 1990 (%)	Carbon tax rate (yen / t-CO ₂) in 2020
N25Cn	25%	-3.8	0
N15Cn	10%	-2.7	0
N00Cn	0%	-1.1	0
N25C10	25%	-10.0	5,582
N15C10	10%	-10.0	7,462
N00C10	0%	-10.0	9,285
N25C15	25%	-15.0	14,773
N15C15	10%	-15.0	17,292
N00C15	0%	-15.0	20,262
N25C25	25%	-25.0	45,034
N15C25	10%	-25.0	49,801
N00C25	0%	-25.0	56,838

Conclusions

- The CGE models predict that a lower nuclear share leads to a small loss of GDP compared to base
- E3ME predicts virtually no change
- E3ME suggests that a higher carbon target could lead to a positive GDP effect, but with very high carbon prices required – especially with a low nuclear share