The green metamorphosis of a small open economy

Discussion

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Research question and contribution

Study the dynamics of green transition = fall in brown energy use

- Direct impact of green transition on inflation and output
- Examine transitional policies: carbon taxes, green subsidies, and public investments (and monetary policy too)

Specific characteristics of the economy and supply frictions considered:

- Rigidities in the reallocation of researchers
- Intermediate goods production is characterized by low substitutability between energy and traditional inputs in the short run

Calibration exercise

- Model calibrated to the case of carbon tax in Chile

Key model feature: research and productivity

- Researchers can be allocated to improve productivity of capital and labor vs. efficiency of energy services.
- Fraction n of researchers endogenously determined to adjust to changes in the *relative price of energy*
- By changing n the producer can move resources, increasing the efficiency (or intensity) of the use of energy compared to that of labor and capital, allowing for medium-run increasing resource use

Key findings: A transition induced by brown energy taxes

Increase in cost of using brown energy:

- Type of energy: $\uparrow$ green $\downarrow$ brown
- Price of energy: $\uparrow$ brown and (low substitutability brown and green energy) $\uparrow$ green
- Costs: $\uparrow$ intermediate firm's MC and $\uparrow$ inflation
- Output: reallocation of researchers to improve energy efficiency $\rightarrow$ productivity of traditional inputs $\downarrow$ and $\rightarrow$ fall in output

Brown energy tax has substantial output and inflationary costs (greenflation), increase in energy efficiency in the long run, no substantial fiscal costs.

Key findings: Alternative fiscal policy tools

Green subsidies & public green invest. (increase in productivity of green energy):

1. $\downarrow$ price of green energy
2. Brown energy substituted for cheaper green energy
3. $\downarrow$ energy costs for firms, invest relatively more in TFP of traditional factors
4. Improve traditional inputs' energy efficiency

Both alternative policies boost capital investment and output, reducing inflation. However, fiscal costs are considerable.

Enter negative externality

Damage associated with brown energy reduces household consumption

Table 4: Welfare Comparisons

	No externality	**Low Externality e^B**	**High Externality e^B**
Carbon Tax	0.041	-0.023	-0.179
Green Subsidy 300%	0.042	-0.023	-0.198
Public Infrastructure	0.101	0.034	-0.148
Carbon Tax-Subsidy Mix	0.028	-0.036	-0.194
Carbon Tax-Green Capital Mix	0.040	-0.027	-0.194

Some questions and clarification points 1/2

- Monetary policy does not seem to play a role in the decision dynamics related to the green transition and this part is *undersold*.
- Supply frictions and substitutability play a crucial role in determining steady states and transitional dynamics
  - More rigid re-allocation of researchers: $\uparrow\uparrow$ inflation and $\downarrow\downarrow$ output
  - Lower substitutability: higher carbon tax to obtain same reduction in brown
  - What about elasticity of substitution between private and public stocks of green capital and the share of each in green energy production

some questions and clarification points 2/2

- Why government tax τ proportional to the *purchases of brown energy* $P_t^B e_t^B$ and not per-unit of emission?
- Assumption of quadratic adjustment costs for both capital and for green capital
- On the welfare comparison: carbon tax + subsidy vs. carbon tax + green capital