A Growth Model with Social Welfare and Contemporaneous Externalities

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Economic growth and social well-being

• European Commission recently pushed for higher investment levels
  • Boost productivity and generate jobs
  • Social innovation and entrepreneurship: high quality of life, higher standard of living

• Does economic growth guarantee social well-being?
  • Is an optimal economic growth path socially desirable as well?
Growth and the environment

• Economic activity results in emissions
• Emissions accumulate in the environment
• Feedback on economic activity with some time delay
• Efforts have gone into modeling and predicting the ecological damage on the real economy
• Very little has been said on the negative well-being impact of emissions (contemporaneous externalities) in the economics literature
  • Some discussions in the ecological literature
Gaps in economic literature

• Neo-classicals discuss the role of supply as the long-run solution to growth problems
  • Factors of production are fully substitutable
  • Solutions to factor prices can give the environmental solution as well

• Keynesians highlight the importance of demand in determining growth
  • Ignore supply side constraints
  • Do not explicitly model ecological limits

• Impact of emissions is taken as an economic problem
  • Non-economic factors are not captured
  • Rising unemployment/inequality, bio-diversity loss, poor air quality
Fontana and Sawyer (2015)

Identify three growth paths in PK literature with supply side constraints

• A demand-driven growth path determined by the interaction between investment and savings where the economy converges to a steady state ($\hat{g} = 0$) (in spirit of Harrod-Domar)

• A full-employment growth path where output is high enough to ensure there is no unemployment ($g = n = 0$) (in spirit of Solow)

• An ecological growth path where change in emissions is minimized ($\min \Delta E = 0$) (in spirit of Ecological Economics literature)
Our contribution

• We add a fourth option:
  • A social welfare growth path where the welfare function is maximized (max \( W = 0 \))

• We introduce well-being into a PK environmental growth model

• We bring insights from two EE debates within a PK growth model
  • Limits to growth/emissions
  • Social costs vs private costs

• We allow for two kinds of environmental effects
  • Emissions vs well-being

• We thus get a growth path for well-being that is distinct from warranted, natural, and environmental growth
  • Generates complicated time paths
Three scenarios

- Normal growth path
- High externalities
- Low emissions adjustment
- Low externalities
- High emissions adjustment
# Growth scenarios

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Description</th>
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<tbody>
<tr>
<td>$g: I = S$</td>
<td>Warranted growth path</td>
</tr>
<tr>
<td>$g = \dot{Y} = 0$</td>
<td>No growth</td>
</tr>
<tr>
<td>$g = n$</td>
<td>Natural growth (Solow)</td>
</tr>
<tr>
<td>$g: \dot{E}_t = 0$</td>
<td>2 degree growth path</td>
</tr>
<tr>
<td>$g: \text{Max } W_t$</td>
<td>Socially desirable growth path</td>
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Next steps

• Define a social welfare function
  • Unemployment (-)
  • Change in emissions (-)
  • Level of emissions (-)
  • Change in output (+)
  • Change in income levels (+)

• Calculate the output, employment, emissions and social-welfare impact of each growth path

• Calculate the trade-offs and costs of achieving each of these growth paths

• Finding possible solutions to check whether some environment and welfare optimizing paths are achievable