

# Using Carbon Tax Revenues to Invest in Human Capital

GCET, Copenhagen

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# Outline

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- Background – the original idea
- The E3ME model
- How to model investment in human capital
- Modelling results
- Conclusions

# The original idea

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- At GCET 2014 in Kyoto Mr Rae-Kwon Chung (UNESCAP) floated the idea of incentivising a switch from energy to human capital
- This would produce a 'double dividend' of environmental gains and a more educated workforce
- Could it also bring economic benefits?

# Our approach

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- Our challenge was to provide a quantitative assessment
- The approach combines two distinct areas of research:
  - macroeconomic modelling
  - micro-level assessment of the returns to education

# Our approach (cont)

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- Our first set of finalised results, for Japan and Korea, will be published in September 2015:
  - Lee, T, H Pollitt, U Chewpreecha and S Na (2015) 'Using environmental taxes to invest in human capital', in *E3 Modelling for a Sustainable Low Carbon Economy in East Asia*.
- Today we present the methodology and some provisional results for the UK

# The E3ME Macroeconomic Model

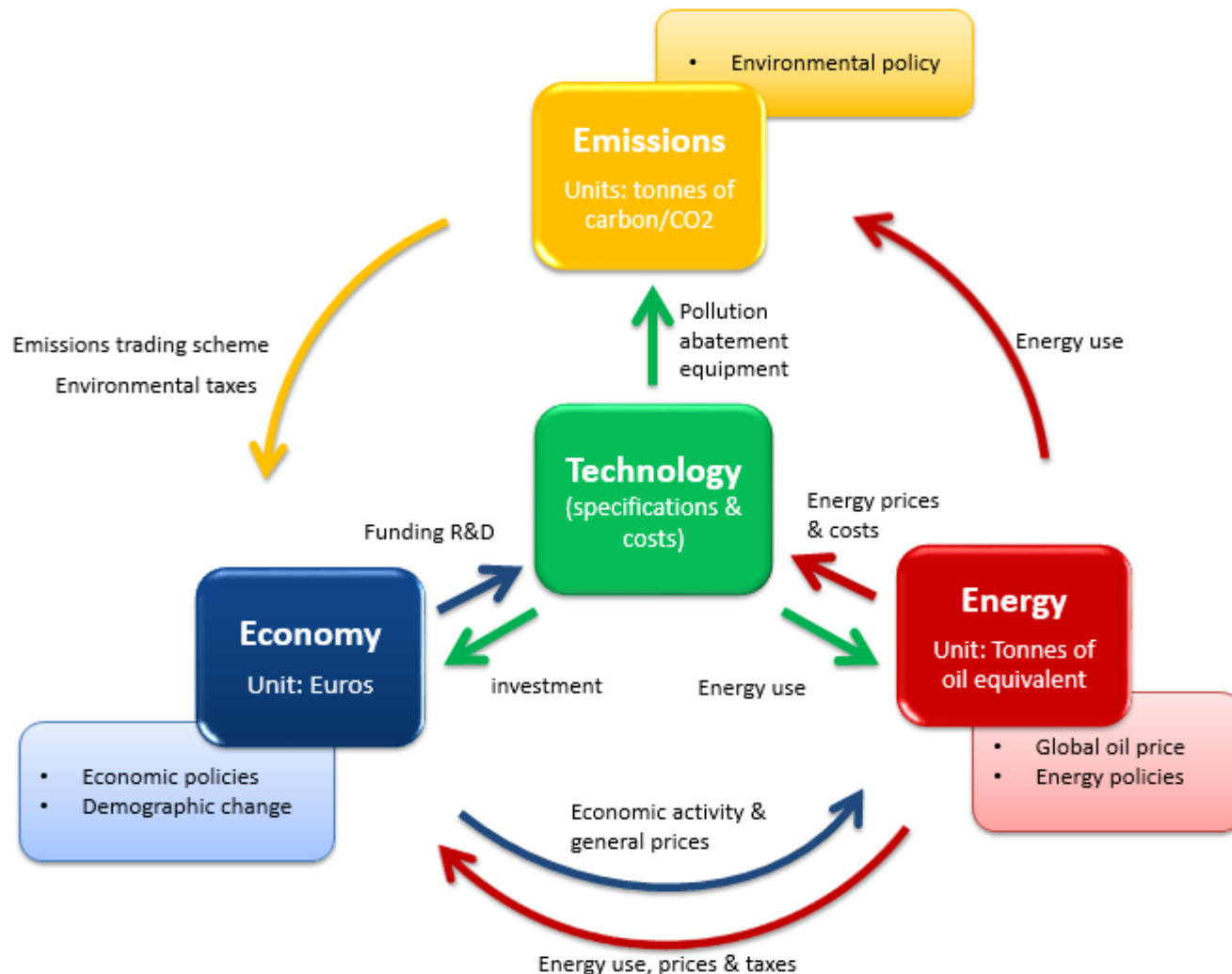
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The logo for the E3ME Macroeconomic Model, featuring the lowercase letters 'e3me' in a bold, blue, sans-serif font. The '3' is slightly larger and more prominent than the other characters.

- Global macro-econometric model
- Combines the world's economies with energy systems and GHG emissions
- Includes a detailed sectoral disaggregation

See [www.e3me.com](http://www.e3me.com) for further details

# The E3ME Macroeconomic Model



# Inputs to the Modelling

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- A carbon tax
  - applied to all non-ETS sectors and fuels
  - rate = €37.8/tCO<sub>2</sub> in 2030 (nominal)
- An estimate of the cost of one year of tertiary education:
  - €14,709.4 per person
  - Higher Education Statistics Agency (Income and expenditure of HE institutions statistics)
- An estimate of the wage increases from three years of tertiary education:
  - earnings return from an undergrad degree is around 27.4%
  - ‘The Returns to Higher Education Qualifications’, BIS, 2011

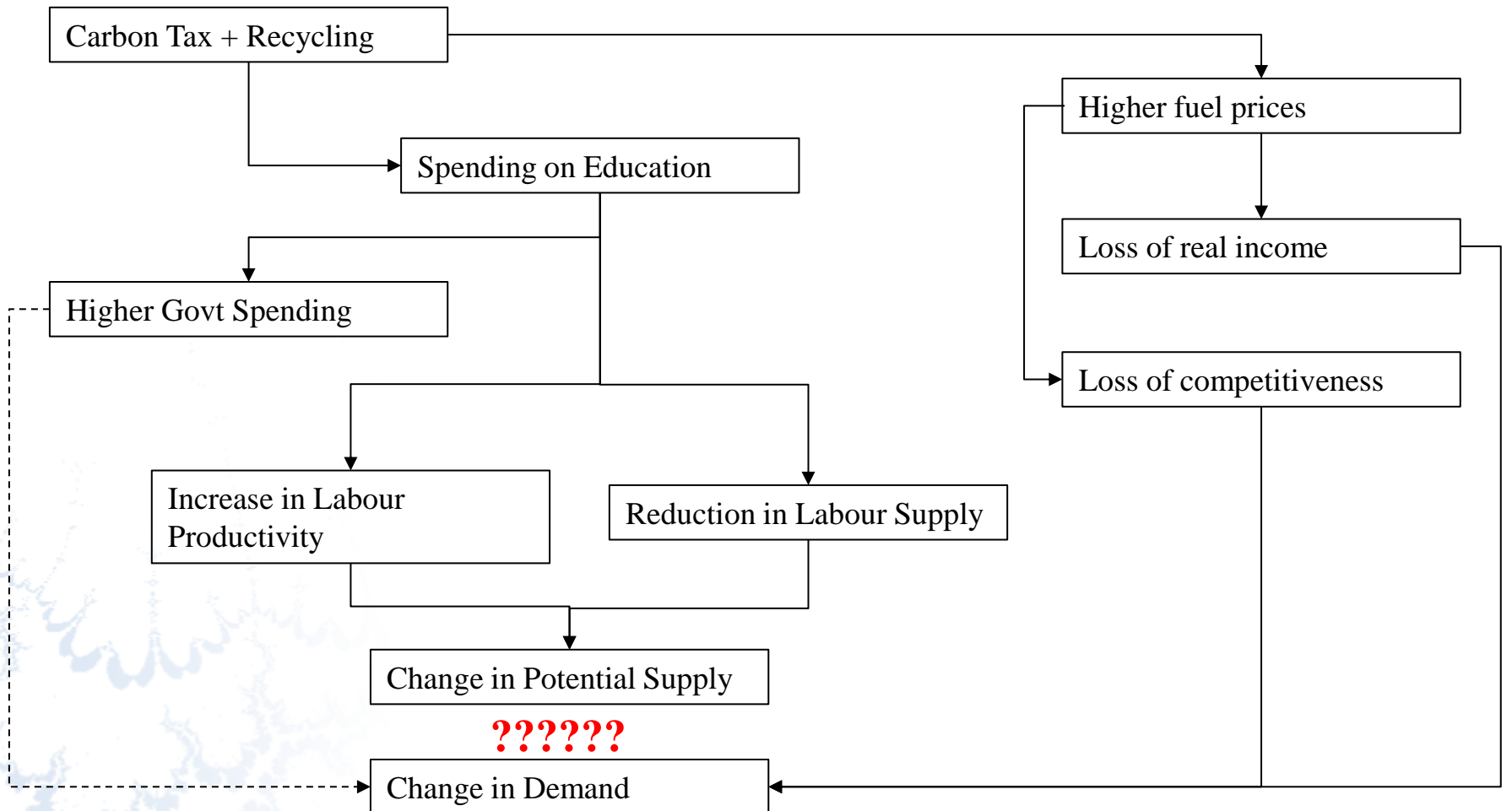


# And some assumptions...

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- All education is additional
- The increases in wages are assumed to match potential increases in productivity
- An increase in labour productivity provides an equivalent increase in economic capacity (Cobb-Douglas)
- Those in education are not in the labour force – but stay in the labour force once they finish their three year course (and they all finish!)

# Complicated Diagram

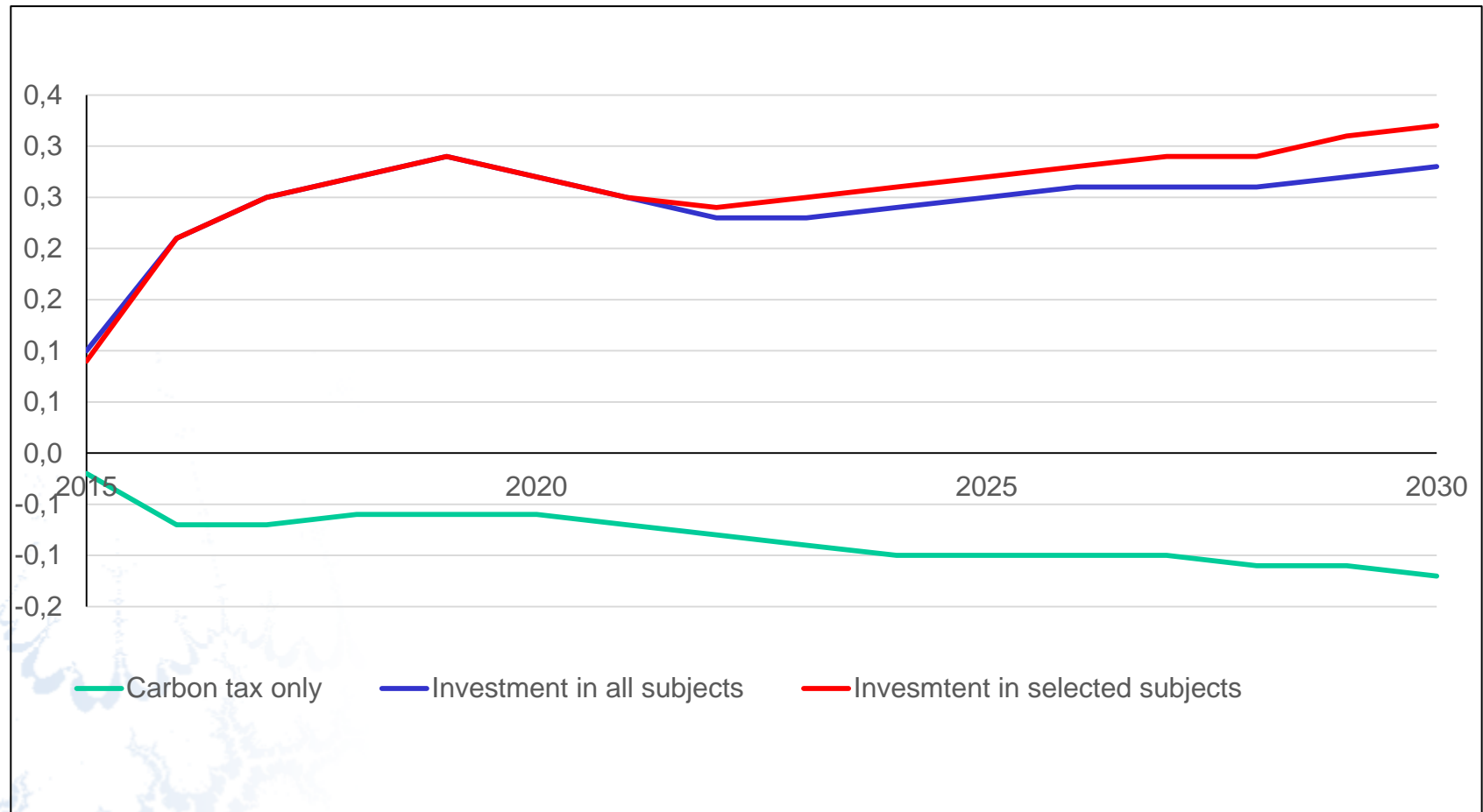


# Scenarios

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- **Baseline (standard EC projections)**
- **Carbon tax with no recycling**
  - revenues roughly €6.9bn in 2030 (nominal)
- **Investment in all subjects (revenue neutral)**
  - 100,000 people per year on 3 year courses
- **Investment in selected subjects linked to economic sectors (revenue neutral)**
  - 100,000 people per year on 3 year courses

# Impacts on GDP (% from base)



# Other Macro Indicators, 2030, % difference from baseline

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|                              | Carbon tax only | Investment in all subjects | Investment in selected subjects |
|------------------------------|-----------------|----------------------------|---------------------------------|
| GDP                          | -0.1            | 0.3                        | 0.3                             |
| Consumer expenditure         | -0.2            | 0.1                        | 0.0                             |
| Investment                   | -0.1            | -1.0                       | -0.7                            |
| Exports                      | -0.005          | 0.001                      | 0.01                            |
| Imports                      | -0.1            | -0.6                       | -0.6                            |
| Consumer price index         | 0.3             | -0.3                       | -0.2                            |
| Employment                   | -0.03           | -0.03                      | 0.003                           |
| Final government expenditure | 0.0             | 0.8                        | 0.8                             |
| Unemployment                 | -0.1            | -15.0                      | -14.7                           |

# Conclusions

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- This is a brand new approach that is challenging both conceptually and from a modelling perspective
- Many assumptions have been made along the way – some of these may be relaxed in due course
- Alternative scenarios, based on particular subject areas or types of education are envisaged – also other countries
- But overall, the modelling suggests this is a policy that deserves further investigation

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