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IEA workshop: Evaluating the multiple benefits of energy efficiency. Macroeconomic outcomes

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Macroeconomic evidence part 1: energy security and economic resilience

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- Analysis by Ciscar et al using EU data showed that every $10 rise in the price of oil (bbl) leads to a 0.94 percent decline in GDP for those importing oil. A $30 rise results in a 2.56 percent decline
- In the 1970s oil prices increased 700 percent and caused stagnation of economic growth rates throughout Europe (IEA 2011)
  - **Question: at the time gas prices were coupled to oil prices causing further effects on fuel prices; how far is this the case now?**
- In Europe 83.5 percent of oil and 64.2 percent of gas consumed was imported in 2009/2010 and 26/27 Member States consumer more oil than they import.
- In 2010 the EU spent $297 billion on crude oil imported from outside the EU. At a price of $115bbl the oil import bill will rise to $433 billion per annum or 2.6 percent of GDP
- 2010 UK analysis (DECC) found that if energy prices doubled to $160bbl, the cumulative loss to the economy would be £45 billion over 2 years or 2.9 percent of GDP
- Energy efficiency acts as a hedge against forward fossil fuel volatility
  - **Hypothesis: Energy efficiency improvements can have a significant influence on stabilising an economy's inflation rates compared to most other factors … which is vital for generating foreign direct investment but also domestic investment**
- But what about the rebound effect? ….

Macroeconomic evidence part 2: Employment creation

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- Unemployment rates are above the natural rate of unemployment and a fiscal stimulus focused on energy efficiency could help address this
- Cyclical unemployment has risen since the onset of the financial crisis
- Theoretically EE has the potential to reduce frictional unemployment because improvements can be implemented with a wide geographic and sector spread, with jobs falling into both blue and white collar categories
- Theoretical risk of structural unemployment (energy efficiency policies may have crowding out effects on investment in fossil fuels) resides but the labour intensive nature of EE jobs is likely to more than compensate.
  - In addition the majority of jobs lost will be outside the EU (since only 16.5 percent of oil and 35.8 percent of gas consumed was produced in the EU in 2009)
  - There seems to be a lack of substantive analysis on this issue
  - **Question: is this an area that merits more research?**

Current unemployment rates are a major concern for many Member States

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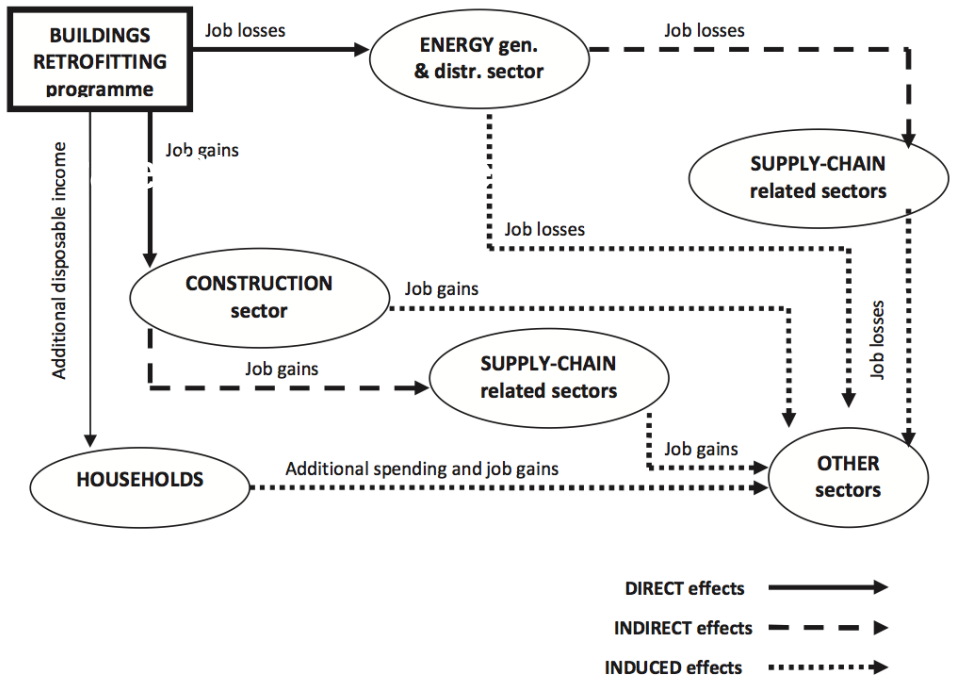
EU Natural & Actual Unemployment Rates (%)

Country	Unemployment Rates (%) in 2011		
	Natural Rate	Actual Rate	Actual minus Natural
European Union (27 countries)	8.70	9.70	1.00
Belgium	7.60	7.60	0.00
Bulgaria	10.16	12.20	2.04
Czech Republic	6.47	6.80	0.33
Denmark	5.34	7.40	2.06
Germany	6.86	6.10	-0.76
Estonia	11.31	12.50	1.19
Ireland	12.34	14.40	2.06
Greece	12.41	16.60	4.19
Spain	16.77	20.90	4.13
France	9.36	9.80	0.44
Italy	7.47	8.10	0.63
Cyprus	6.33	7.20	0.87
Latvia	14.80	16.10	1.30
Lithuania	13.11	15.10	1.99
Luxembourg	4.78	4.50	-0.28
Hungary	10.83	11.20	0.37
Malta	6.66	6.70	0.04
Netherlands	3.84	4.50	0.66
Austria	4.26	4.20	-0.06
Poland	8.67	9.30	0.63
Portugal	11.61	12.60	0.99
Romania	7.40	8.20	0.80
Slovenia	7.16	8.20	1.04
Slovakia	12.35	13.20	0.85
Finland	6.89	7.80	0.91
Sweden	6.93	7.40	0.47
United Kingdom	7.37	7.90	0.53

Source: AMECO data (Eurostat)

Job creation and loss from energy efficiency improvements in buildings (Arena et al.)



Data on direct job creation and returns to treasuries

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Job creation data

- EU Energy Efficiency Plan - 2 million jobs through meeting 2020 targets
- European Trade Union Conference - 2.59 million jobs in the buildings sector by 2030
- **Hypothesis: There are difficulties with estimating net employment effects because job losses and creation cross borders due to the globalised economy. Could further research focus on country- and sector-specific net employment effects help, especially moving beyond buildings?**

Returns to treasury

- KfW estimates for every €1 of public funds spent on its efficient house programme €5 is returned in tax revenue
- **Question: As more energy efficiency programmes are developed by public banks there should be a push for further data sharing?**

Macroeconomic evidence part 3: The economic benefits of improvements in living standards

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- Lower bills as a result of energy efficiency improvements provided technical measures must be accompanied by tailored energy advice (RELISH project)
  - This is turn increases the level of disposable income, boosting demand in the economy
- But for those in fuel poverty, who often underheat homes, rebound may well occur
- 'Fuel poverty' (spending >10 percent of income on fuel bills) is a very British notion - not recognised in all countries but a rising concern. Yet 50 million – 125 million Europeans live in 'fuel poverty' … and rising
- The fuel poor tend to suffer from health problems arising from living in cold and damp conditions. The economic case for tackling fuel poverty hinges around the fact that if not addressed, fuel poverty will increase and act to lower the productivity of the workforce
  - **Question: is this an area that merits further research?**
- In the UK the 2011 Marmot Review found the annual cost to the National Health Service of treating winter illness relating to fuel poverty was €990 million
  - For every €1 invested in improving heating in homes, €0.42 is saved in health costs
  - But is hard to accurately assess since it is difficult to distinguish the exact cause of health problems that relate to cold and damp homes since they are often contagious.
- In addition, tackling fuel poverty avoids the need for direct transfers to the fuel poor (Winter Fuel payments in Germany and UK; subsidised consumer tariffs in Spain that have resulted in €15 billion in accumulated debt)

A note on the macroeconomic rebound effect

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- The rebound effect is the increase in demand that results from reduction in prices of energy, following energy efficiency improvements and can be direct or indirect
- The scale of the rebound effect will vary between sectors of the economy, be that heavy industry, light industry, energy generation, agriculture, transport, buildings (residential and services) etc
- Rebound occurs when the direct and indirect demand response to energy efficiency improvements eventually results in more than a 100% increase in energy consumption
- Few accurate empirical studies into the magnitude rebound effect in different sectors of the economy exist because the concept is still relatively unexplored
  - It is also very difficult to accurately estimate and separate what constitutes as the direct and indirect rebound effect
  - This is because demand for energy (direct or indirect) is highly complex and difficult (not impossible) to measure
- This means that the debate surrounding the magnitude of the rebound effect, and therefore the potential for backfire, is highly contentious (Sorrell, 2007)
- This has not been good for energy efficiency proponents who often cannot empirically defend against sceptics' concerns
  - **Question – could an in-depth, country and sector-specific, scenario-based approach to estimating the magnitude of the rebound effect with sets of realistic assumptions be undertaken?**

Note on tax revenue, social security receipts and energy efficiency

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- Energy efficiency improvements have been linked to improvements in public budgets:
  1. Increased direct (income) and indirect (VAT) tax revenue
  2. Reduced unemployment benefits
  3. Reduced fuel subsidies (on end-user prices or to compensate consumers post-purchase monetary transfers)
  4. Reduced public healthcare expenditure
- These relationships are fairly intuitive though very few country-specific studies have been done to estimate their magnitude.
  - KfW (2011) estimated No. 1-3
  - European Fuel Poverty and Energy Efficiency (2009)
- Accurate estimates of public budget improvements 1-3 are closely linked to some of the earlier points for future focus (rebound effect, net employment effects).
- **Question – as energy efficiency programmes are developed could governments be encouraged to capture data to support preliminary analyses**

The quest for the 'killer statistic'

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- In making the case for support for energy efficiency statistics linking GDP and energy efficiency improvements would constitute the 'killer statistic' A few attempts have been made to quantify the impact.
- For example Saunders found a 20 percent EE improvement leads to a 2.3 percent increase in GDP (US data) BUT traditionally energy efficiency improvements in an economy are represented by the reduction in annual energy intensity measured as:
  - Total annual primary energy consumption in the economy/annual GDP
  - So GDP occurs on both sides of the input/output regression equation
  - This endogeneity causes overstated estimates of impact
  - Attempt have been made to correct for this problem with statistical tools and tests but the models are unlikely to be robust
- As a workaround Ayres and Warr at INSEAD use thermodynamic efficiency to construct an alternative measure of energy efficiency that doesn't rely on GDP
  - This measures the productivity for which a fuel/energy source can be converted into useful work
  - Studies are focused on the US economy but they are also starting to work on EU data
  - To date they have shown a 1 percent increase in energy efficiency leads to a 0.2 percent increase in GDP (USA data)
- **Question: Could this be a key area to support further research?**