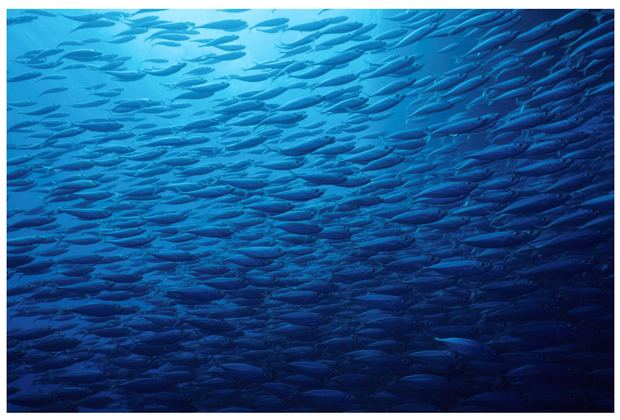
DYNAMIX

Decoupling growth from resource use and environmental impacts



Quantitative modelling of material taxation as a part of policy mix for dematerialisation

We employ the DSGE MEWA model developed by WISE Institute in order to assess the macroeconomic impacts of introducing significant (200%) materials tax, which is a part of the policy mix for dematerialisation delivered by the DYNAMIX project. The tax is a part of the broader Green Tax Refom, which aims at reducing labour taxation while increasing taxes on resource use and pollution. We also consider alternative scenarios, which highlight the importance of removing non-market barriers to material efficiency and spending the materials tax revenue efficiently.

Methods – MEWA model

MEWA is a large-scale DSGE (dynamic stochastic general equilibrium) model developed by WISE Institute. It has several distinct features:

- Its calibration method allows to reflect an **extensive production structure**. Within the DYNAMIX project, 18 economic sectors were considered at the EU level.
- It takes into account price and labour market rigidities so that the results reflect reallocation challenges and **macroeconomic transition dynamics**
- It includes **capital-embodied technical progress**, which allows to reflect the results of various R&D-related policies.

Modelling assumptions

In line with policy instrument description delivered by Ekvall et al. (2015), we assume that:

- Sales from forestry, metal ores mining, other non-fuel mining, recycling, chemical industry, and other material-related industries are taxed (sales to chemical industry and other material-related industries are not taxed in order to avoid double taxation).
- Imports are taxed while exports are not taxed
- Tax rate:
  - 2021-2030: linearly increasing (+3 p.p. per year) up to 30% in 2030
  - 2031-2050: linearly increasing (+8.5 p.p. per year) up to 200% in 2050

Furthermore, we model **three scenarios** of the **policy implementation**:

- Base case: tax revenues are used to decrease labour taxation, companies are able to pursue material efficiency improvements through R&D;
- Alternative 1: similar to base case, but companies are unable to pursue material efficiency improvements through R&D (e.g. because of physical limits or lock-in effects);
- Alternative 2: similar to base case, but tax revenues are redistributed to households in a form of transfers (e.g. through a universal basic income scheme).

The base case represents material taxation as a part of **broader green tax reform** proposed by Ekvall et al., while alternative scenarios show two major factors – technological barriers and policy choices – which may hinder its effectiveness in terms of stimulating both decoupling and employment in the EU.

Discussion

MEWA modelling results indicate that **successful introduction of green fiscal reform results in significant macroeconomic benefits** by 2050, both in terms of GDP (+5.8%) and employment (+7.2%). This requires both significant material efficiency adjustments in the private sector and deep fiscal restructuring. If enterprises are not able to invest in the material efficiency upgrades (alternative 1), the positive impact of decrease in labour taxes will not fully offset the negative impact of material taxation on GDP. Investments in material efficiency may be hindered by various non-market barriers. Thus, complementary instruments in the policy mix (e.g. information and coordination measures) might play an important role in decreasing the transition costs by unlocking the potential of material efficiency improvements.

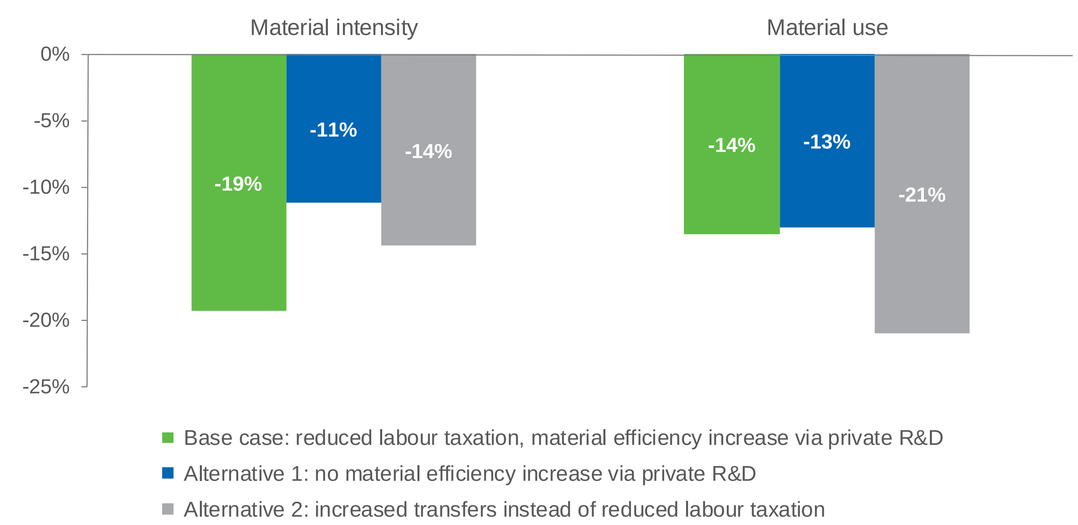
There is a strong **interdependency between the labour market developments and material efficiency improvements**. Green tax reform (decreasing labour taxation) provides significant benefits both in terms of employment and material efficiency. However, tax revenue recycling through direct transfers to households (alternative 2) decreases incentives to seek employment among the working age population. In order to attract workers, companies have to increase wages, which provides them with stronger incentive to invest in labour efficiency improvements. As a result, less resources to invest in material efficiency are available. Thus, by increasing prices of both materials and labour, the combination of material taxation and increased transfers leads to less material efficiency improvement than in the case the green tax reform. In absolute terms, however, the material consumption decreases the most when transfers are increased. This is a result of significant GDP drop.

Modelling results

GDP and employment impacts of materials tax in the EU in various scenarios

Scenario	GDP			Employment		
	2030	2040	2050	2030	2040	2050
Base case: reduced labour taxation, material efficiency increase via private R&D	0.92%	3.44%	5.81%	1.11%	4.20%	7.16%
Alternative: no material efficiency increase via private R&D	0.11%	-0.10%	-1.80%	0.14%	0.36%	0.14%
Alternative: increased transfers instead of reduced labour taxation	-0.62%	-2.88%	-6.55%	-0.05%	-0.35%	-1.11%

Change in material intensity and absolute material use in the EU in 2050



References

Policy mix description:

Ekvall, T. et al. 2015. Development of DYNAMIX Policy Mixes – Deliverable D4.2. Gothenburg, Sweden: IVL.

Economic quantitative ex-ante modelling results:

Eboli, F. et al. (in prep). Economic quantitative ex-ante assessment of DYNAMIX policy mixes. DYNAMIX Deliverable D6.2. Venice/Milan: FEEM.

http://dynamix-project.eu/results

Contact

Maciej Bukowski maciej.bukowski@wise-institute.org.pl
Aleksander Śniegocki aleksander.sniegocki@wise-institute.org.pl

Warsaw Institute for Economic Studies (WISE Institute)

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