Modelling the Effect of Carbon Tax on high emission sectors employment using a System Dynamics Model

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Introduction

- Global warming is no longer a contested phenomenon – the issue is how to deal with it!
- SA government recognizes that the country is vulnerable to effects of climate change.
- Introduction of a CT is one of the policy interventions by SA government to mitigate global warming.
- Position of organized labour on the introduction of a CT has ranged from outright rejection to requesting delay in its implementation.
- Impact of a CT on employment in South Africa still uncertain.
- As a contribution to the debate, a SD is used to model the effect of CT on employment in high emission sectors.

The Carbon Tax Policy for South Africa

- Aimed at business that use and produce high emission products or services.
- Intension is to discourage such businesses from using high emissions processes during their production and subsequently to reduce their carbon foot print.
- Tax was set at a very low levels to make sure that it does not affect negatively local productive activities, and to avoid stifle of trade and loss of competitiveness
- A tax relief of 60% is provided across all sectors

Carbon Tax Thresholds for South Africa

Sector	Tax free threshold	Trade exposure additional allowance	Process emissions additional allowance	Maximum offset	Total tax avoided
	This % of a company's emissions will not be taxed at all.	Extra exemption for sectors that may be disadvantaged in competing with foreign companies who are not carbon-taxed.	Extra exemption for sectors that can do little about the emissions involved in production, without changing their business substantially.	Companies can deduct offsets from their emissions, which reduces the emissions they will be taxed on.	
Agriculture, forestry, land use	60%	-	40%	-	100%
Waste	60%	-	40%	-	100%
Iron & steel	60%	10%	10%	5%	85%
Aluminum	60%	10%	10%	5%	85%
Cement	60%	10%	10%	5%	85%
Glass & ceramics	60%	10%	10%	5%	85%
Chemicals	60%	10%	10%	5%	85%
Fugitive emissions: coal	60%	10%	10%	5%	85%
Petroleum (coal-to-liquid & oil refinery)	60%	10%	-	10%	80%
Pulp & paper	60%	10%	-	10%	80%
Sugar	60%	10%	-	10%	80%
Other	60%	10%	-	10%	80%
Electricity	60%	-	-	10%	70%

Labours' concerns and proposals

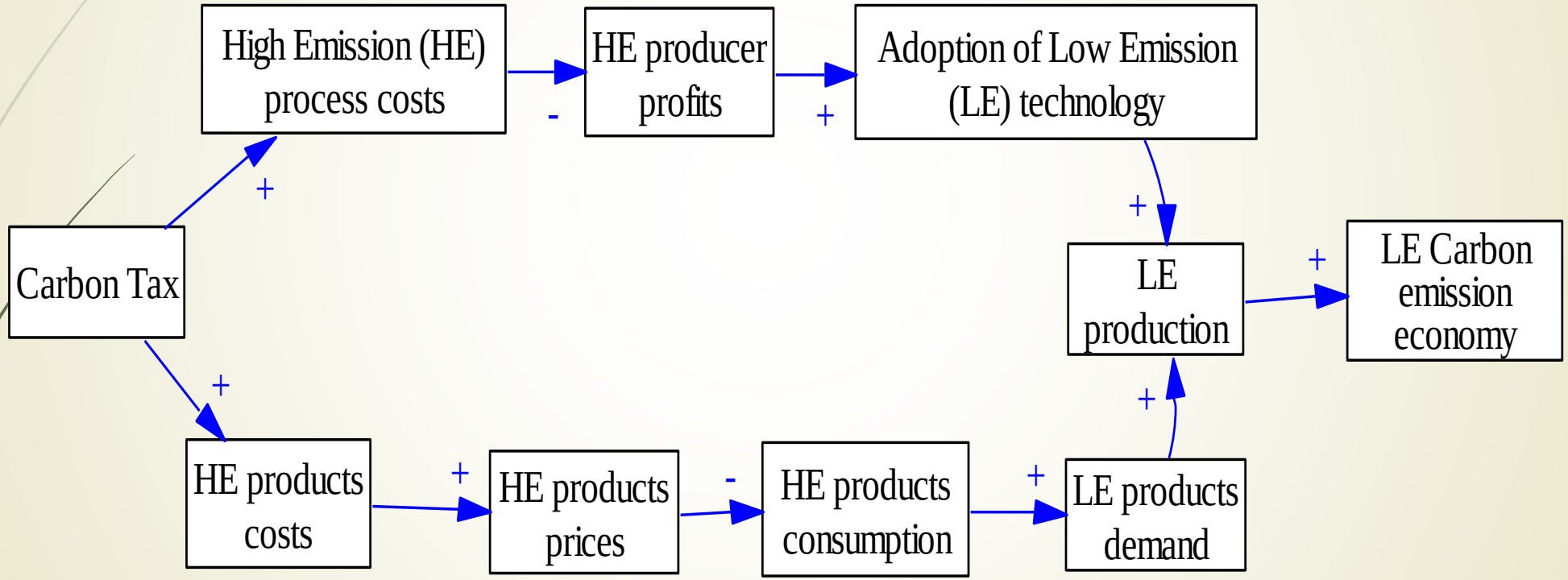
- Tax will adversely affect competitiveness of the local firms due to increase in operation costs.
- Loss of competitiveness will lead to less sales, reduced production and subsequently lower demand of factor inputs, one of which is labour.

Hence:

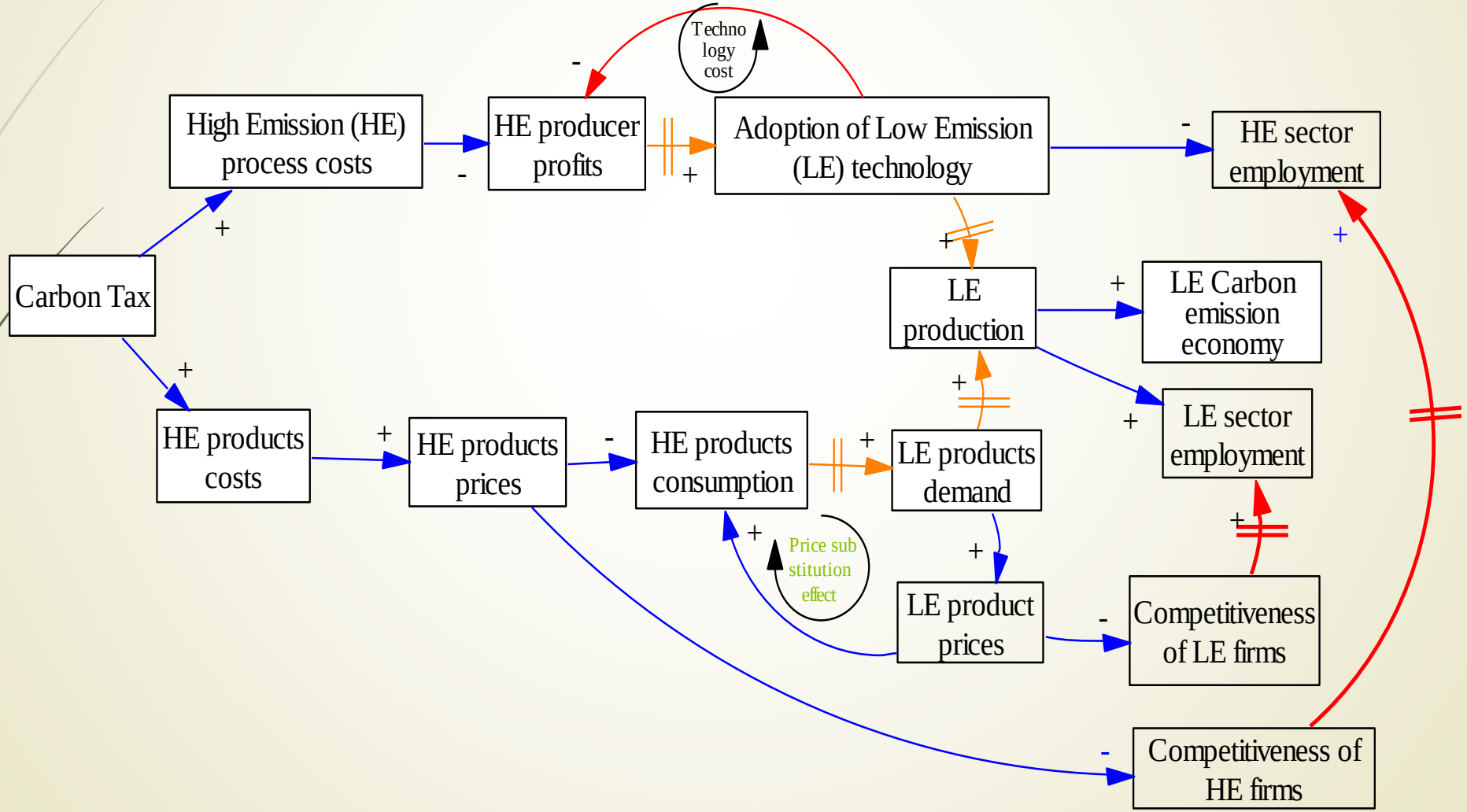
- Delay the implementation of Carbon Tax
- First put in place safe-guards on employment before implementation.

This project/paper is aimed at contributing to labour concerns and the general debate on the CT in SA by formalising the policy using SD approach.

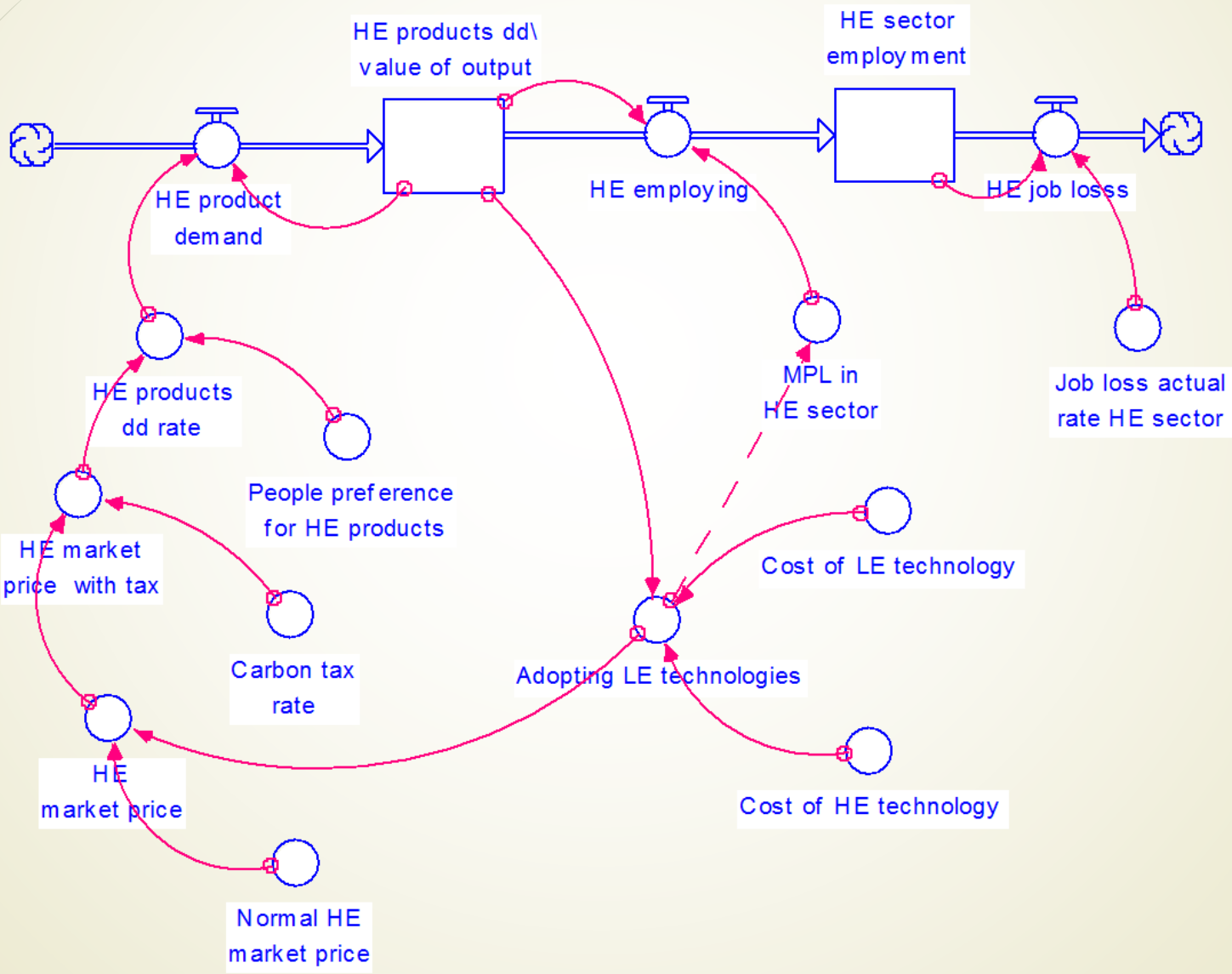
One-way causal model underlying South Africa's carbon tax



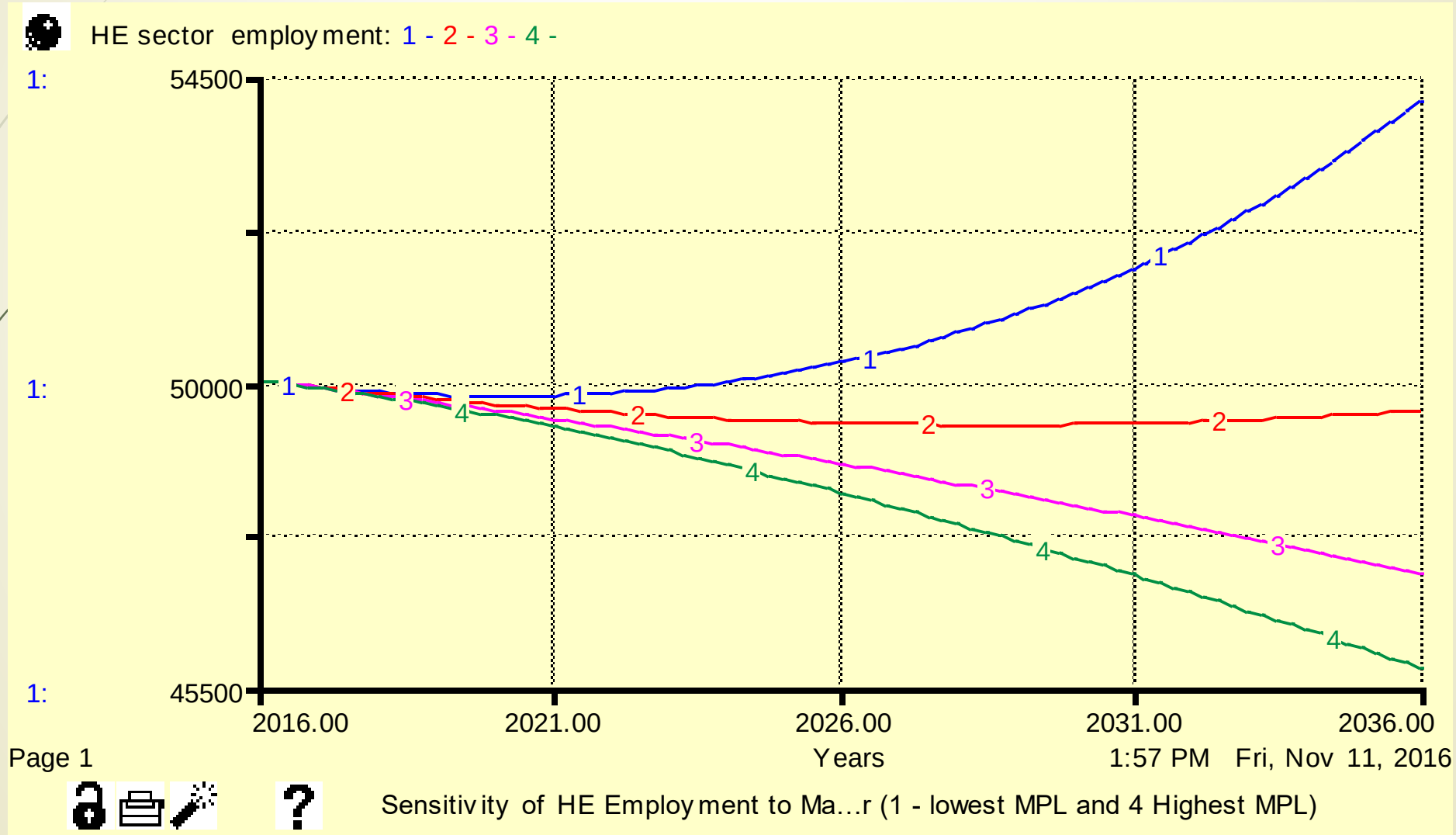
A qualitative system dynamics model of South Africa's carbon tax policy



A quantitative SD model of SA's Carbon Tax and HE Employment – Technologies cost sub-model



Sensitivity of HE sector employment to labour productivity (MPL) with a carbon tax policy



Insights from the articulation of South Africa's Carbon Tax Policy as a SD Model

1. Cost of LE technology relative to the HE technology will play an important part in the choice to switch to LE.

2. The price substitution effect between low emission and high emission products may end up making LE products more expensive as such limit their demand.

3. Loss of competitiveness of HE is almost certain with a CT, with a high likelihood of jobs losses in the sector. Job creating in LE sectors is possible but there are no guarantees it will replace all lost jobs in the HE sector.

4. Employment in HE sector is very sensitive to marginal product of labour (MPL). To the extent that new technologies may be adopted in HE sector in response loss of competitiveness due CT, more jobs are likely to be lost in HE sector

Conclusions

- Modelling exercise validates, to a reasonable extent, labour concerns that unconditional implementation of the CT in the country will lead to job losses in the HE despite being set at low levels.
- Competitiveness of HE firms is likely to be lost in the long term which will further reduce headcount in HE sector.
- Technology costs and adoption dynamics will play an important role achieving the objectives of the CT.
- To minimises potential jobs losses due to CT, local HE manufacturers need to be facilitated to have access to low-cost clean technology that does not substitute local labour force but supplements its efficiency.