Can Carbon Taxation Boost the Irish Economy and Reduce Inequality?

Kelly C. de Bruin *kelly.debruin@esri.ie*

Aykut Mert Yakut *mert.yakut@esri.ie*

ESRI ECONOMIC & SOCIAL RESEARCH INSTITUTE

MaREI Conference

30 May 2023

Carbon taxation is an important policy tool for reducing GHG emissions, but it has negative economic impacts and **regressive** distributional impacts across households.

Carbon tax revenues can be used to reduce the negative economic and distributional impacts of taxation.

This paper investigates whether we can achieve a **triple dividend**; reduction in emissions, higher economic activity and reduced inequality.

We use a dynamic computable general equilibrium (CGE) model for Ireland, **I3E**.

The common conclusions of hundreds of CGE papers on this topic are

- carbon taxation reduces carbon usage and hence emissions.
- carbon taxation is bad for the economy.
- carbon taxation can be regressive or progressive.
- revenue recycling (RR) reduces negative economic and distributional impacts.

Impact channels

- ***Income effect:*** Declining market income;
  - capital income is generally progressive,
  - mixed findings regarding labour income,
  - welfare transfers are very progressive.
- ***Expenditure effect:*** Higher energy prices increase other prices as well; the substitution effect is negative and regressive.
- ***Total effect:*** The model should
  - be able to quantify secondary (general equilibrium) impacts,
  - include the household heterogeneity regarding the compositions of income and expenditures.

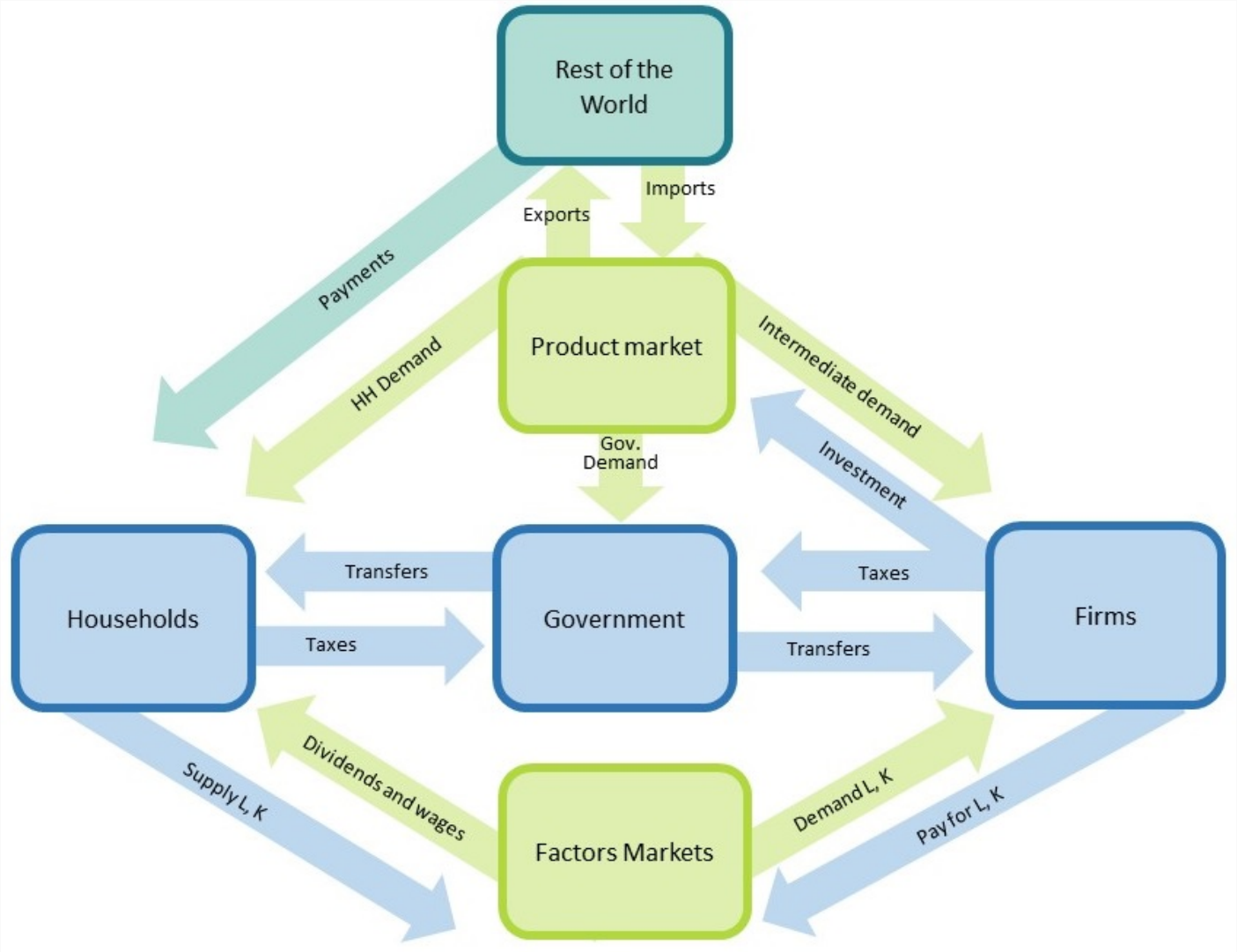
Revenue Recycling (RR)

A revenue recycling (RR) scheme can reduce economic impacts when used to reduce distortionary taxes, such as wage, corporate, and sales.

Increasing transfers can improve income inequality.

Efficiency equity trade-off: Can we improve both efficiency and equity by combining different RR schemes?

Only a few papers have examined the impacts of **mixed/hybrid RR schemes**.


Rest of the World
Imports
Exports
Payments
Product market
HH Demand
Intermediate demand
Gov. Demand
Investment
Households
Transfers
Government
Taxes
Firms
Taxes
Transfers
Supply L, K
Dividends and wages
Factors Markets
Demand L, K
Pay for L, K

Households

- 10 Ramsey-type RHGs maximising their intertemporal utility (CRRA type utility function) by choosing composite consumption.
- Five urban resident & five rural resident RHGs based on disposable income consists of net-of-tax wage and dividend income, welfare transfers, pensions, income from foreign asset holdings, and non-means tested transfers (e.g., COVID-related payments).
- Composite consumption is disaggregated based on a detailed nested structure.
- Data: Household Budget Survey & Survey on Income and Living Conditions

Production

- There are 39 sectors, 35 of which have dynamic investment decisions: maximising the present discounted value of the dividend stream by choosing capital, labour, and investment.
- Four sectors' investment is a function of their net-of-corporate tax profits.
- Three groups of non-electricity producers based on the composition of energy demand and electricity production.
- There are 49 commodities, 10 of which are energy commodities: coal, peat, crude oil, gasoline, LPG, fuel oil, diesel, kerosene, natural gas, and electricity.
- Data: Supply and Use Tables, Exiobase, Energy Balance & Business Energy Use Survey

ETS vs non-ETS

- Ireland applies two policies simultaneously.
  1. Firms subject to the EU ETS legislation are exempted from paying the Irish carbon tax on their ETS emissions.
  2. Since the *incurred* unit cost of energy commodities differs across sectors, the optimality condition of firms' intermediate input demand must be adjusted.
  3. The *incurred* unit cost: purchaser price (common to all agents, inclusive of all taxes) plus the net cost of EU ETS minus the carbon tax exemption

Labour Market

The labour market includes three labour types, low-, medium-, and high-skilled, and is characterised by

1. involuntary unemployment with wage equations,
2. international migration, half of which is high-skilled labour,
3. endogenous labour force participation, and
4. endogenous allocation of total labour supply across sectors based on a wage income maximisation problem
5. Data: LFS, SILC, COSMO & NiGEM

Government

- Income: direct taxes (from labour incomes and sectoral profits), indirect taxes on commodities (value-added tax, carbon tax, and export tax) and a production tax on production activities. Half of the total cost of the ETS goes to the government, whereas the second half goes to the EU Commission due to the legislation.
- Expenditure: consumption of commodities, transfers to households (welfare transfers and pensions), and interest payments over its debt stock.
- Policy variables are set without any objective function, but
  1. the total budget of welfare transfers is a positive function of both the unemployment rate and consumer price index
  2. it can borrow from the rest of the world without limitation, but the public savings-to-GDP ratio determines the risk premium.
- Data: National accounts

Scenarios

No RR scheme	
BaU	Includes key realisations between 2014 and 2021.
CT	Carbon tax increases gradually and reaches €100 in 2030 without any RR
Pure RR schemes	
CorpTax	Total carbon tax revenue (TCTR) is used to reduce corporate tax rate
SaleTax	TCTR is used to reduce sales tax rates of selected commodities[a]
WageTax	TCTR is used to reduce wage tax rates of labour types
Transfer	TCTR is used to increase the total budget of welfare transfers
LumpSum	TCTR is distributed across households per capita equally
Mixed / hybrid RR schemes	
WageTax20Transfer80	20% (80%) of the TCTR is used for WageTax (Transfer)
WageTax50Transfer50	50% (50%) of the TCTR is used for WageTax (Transfer)
WageTax80Transfer20	80% (20%) of the TCTR is used for WageTax (Transfer)
SaleTax20Transfer80	20% (80%) of the TCTR is used for SaleTax (Transfer)
SaleTax50Transfer50	50% (50%) of the TCTR is used for SaleTax (Transfer)
SaleTax80Transfer20	80% (20%) of the TCTR is used for SaleTax (Transfer)
CorpTax20Transfer80	20% (80%) of the TCTR is used for CorpTax (Transfer)
CorpTax50Transfer50	50% (50%) of the TCTR is used for CorpTax (Transfer)
CorpTax80Transfer20	80% (20%) of the TCTR is used for CorpTax (Transfer)

[a] The sales tax rates of all commodities except for carbon commodities and food, beverage, and tobacco products as there is an additional excise tax on alcoholic beverages and tobacco products in Ireland.

First dividend: Emissions

2030, % change w.r.t BaU

	2030			2040		
	Total	ETS	Non-ETS*	Total	ETS	Non-ETS*
CT	-15.81	-5.82	-12.09	-16.60	-6.41	-13.95
CorpTax	-15.32	-4.62	-11.84	-14.89	-4.33	-12.78
SaleTax	-15.11	-4.12	-11.87	-14.88	-3.69	-13.04
WageTax	-13.23	-3.34	-10.47	-11.24	-1.57	-10.25
Transfer	-14.34	-4.68	-11.17	-14.27	-4.39	-12.41
LumpSum	-14.36	-4.68	-11.18	-14.28	-4.39	-12.42

*: The figures are inclusive of the agricultural non-combustion emissions projections of the Environmental Protection Agency.

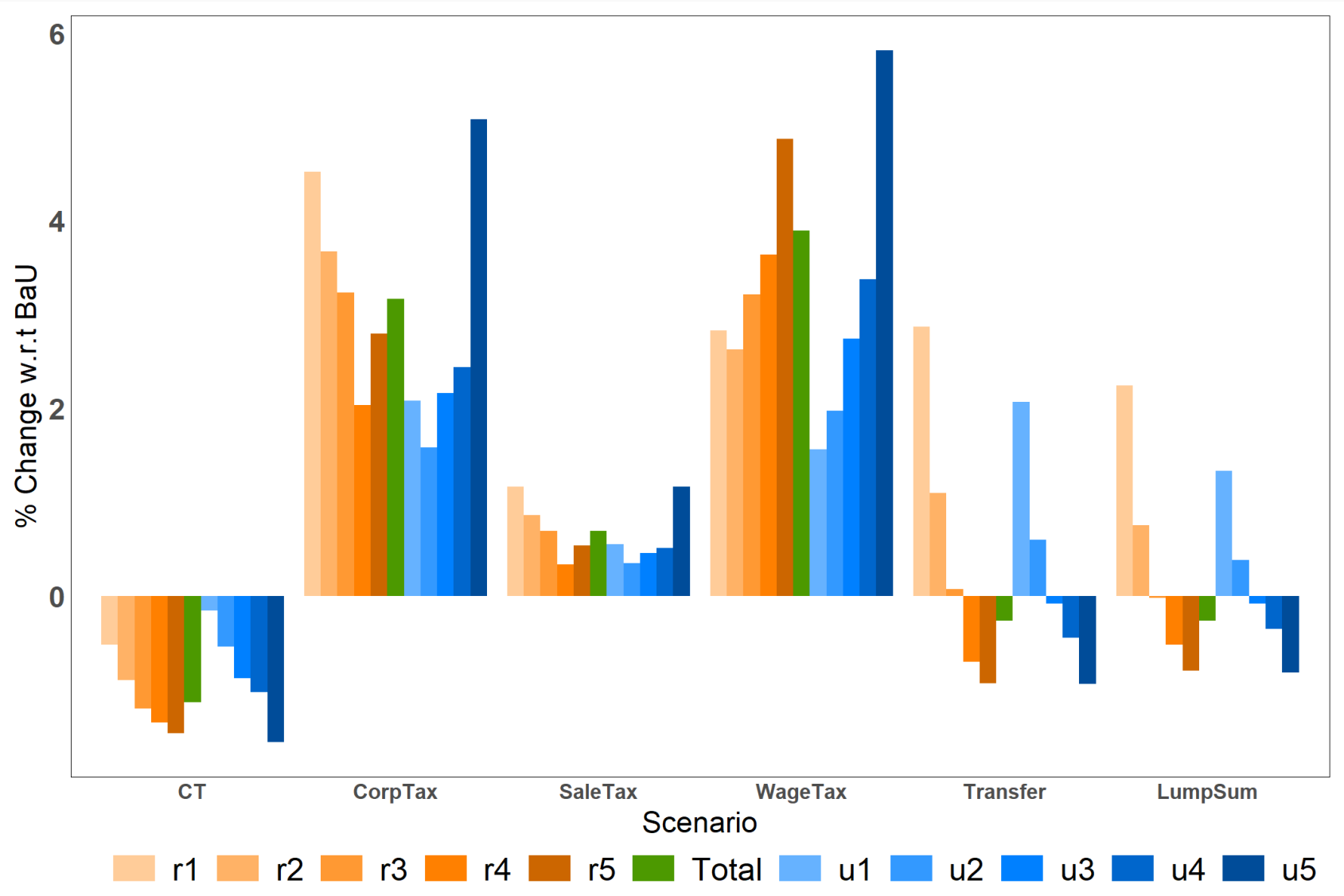
Second dividend: Economic growth

% change w.r.t. BaU in 2030

	Real GDP	Trade Balance-to-GDP Ratio	Real Investment	Debt-to-GDP Ratio	Total Employment	Real Mean Wage	Unemployment Rate*
CT	-1.4	1.2	-2.3	2.4	-1.7	-1.5	1.1
CorpTax	2.3	-4.5	9.8	-10.1	-0.2	-0.1	0.1
SaleTax	0.7	-1.5	4.3	-2.9	-0.3	-0.3	0.2
WageTax	1.2	-3.1	3.9	-6.2	0.3	-0.9	0.7
Transfer	-1.0	0.9	-1.8	3.0	-1.6	-1.4	1.0
LumpSum	-1.0	1.0	-1.8	3.0	-1.6	-1.4	1.0

* Difference from BaU.

Third dividend: Equity



The second dividend is achieved in all tax reduction scenarios.

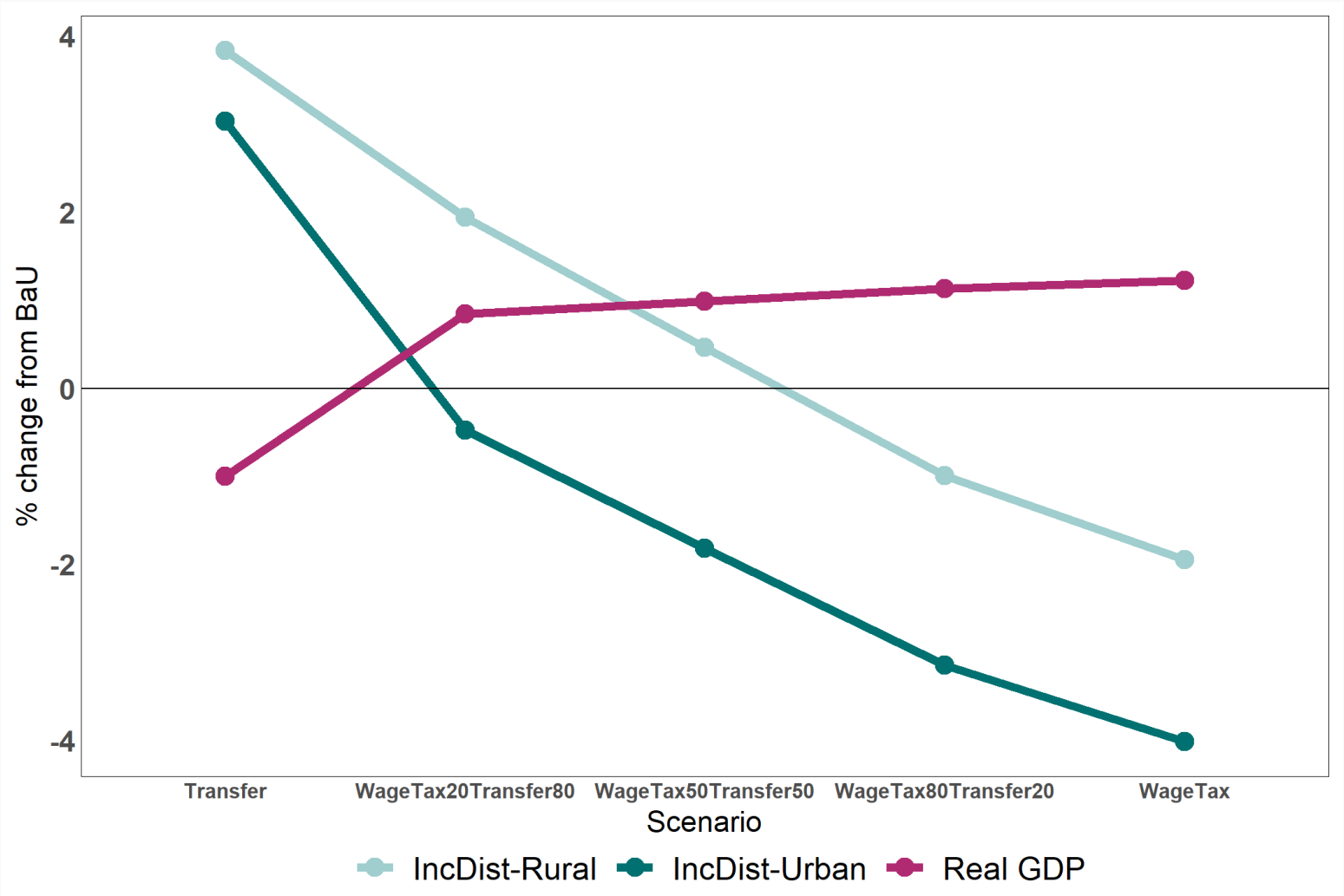
Corporate tax reduction is the best and followed by wage income tax rate reduction.

The third dividend is achieved with transfers to households.

Tax reduction makes carbon tax regressive.

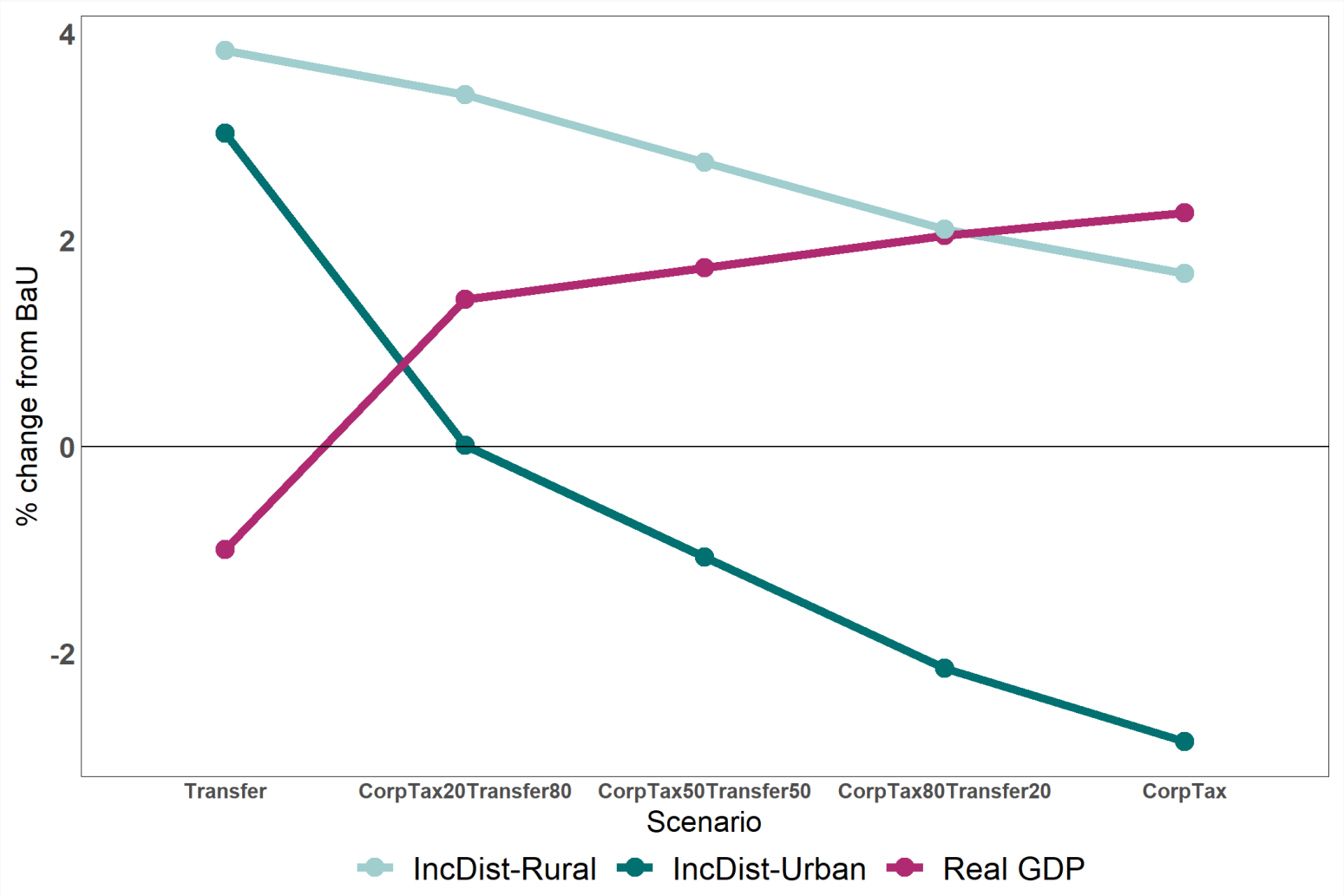
Mixed/hybrid RR - 1

Increasing household transfers and reducing wage income tax rates



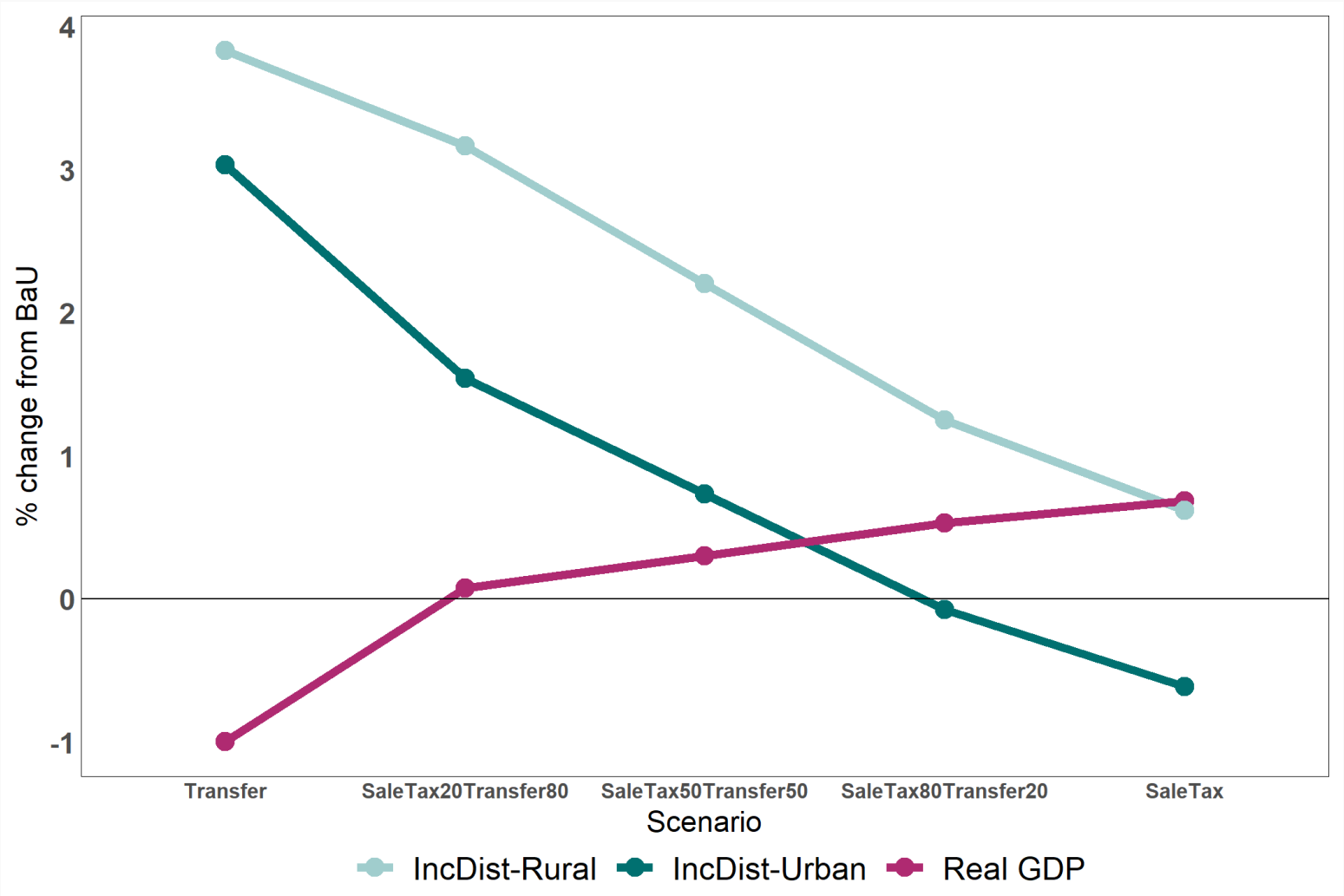
Mixed/hybrid RR - 2

Increasing household transfers and reducing the corporate tax rate



Mixed/hybrid RR - 3

Increasing household transfers and reducing sales tax rates



Conclusion

- Increasing carbon tax without other policies makes everyone worse off in a progressive manner.
- Revenue recycling to reduce tax rates can result in a double dividend but increases inequality.
- Transfers to households reduce inequality at the expense of efficiency.
- Mixing both purposes can create a triple dividend in the case of sales tax reduction.
- Government can trade off equity and efficiency.
- Revenue recycling is more important than carbon tax level.