

Introduction

- Testing 6 propositions of a general equilibrium model of environmental tax reform (Aubert & Chiroleu-Assouline, 2019) using an agent-based model
- Policy: revenue-neutral tax shift from labour to carbon
- Propositions 1-3: uncompensated pollution tax
- Propositions 4-6: pollution tax revenue recycled through labour tax cuts

Agentization of a general equilibrium model

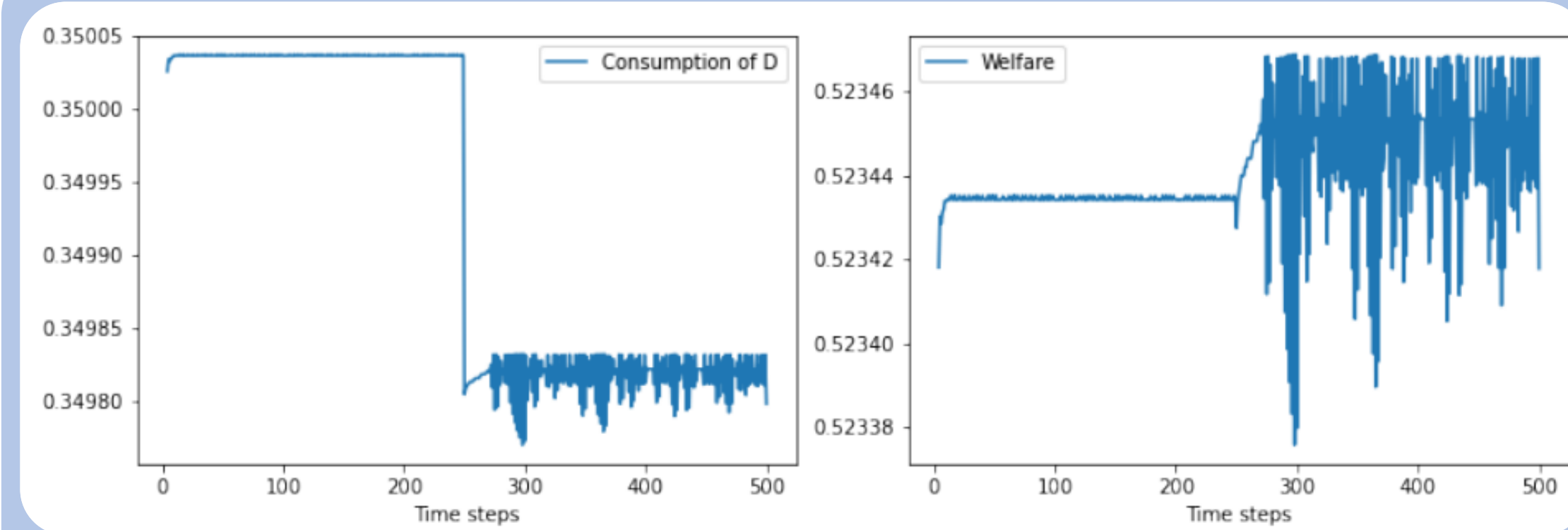
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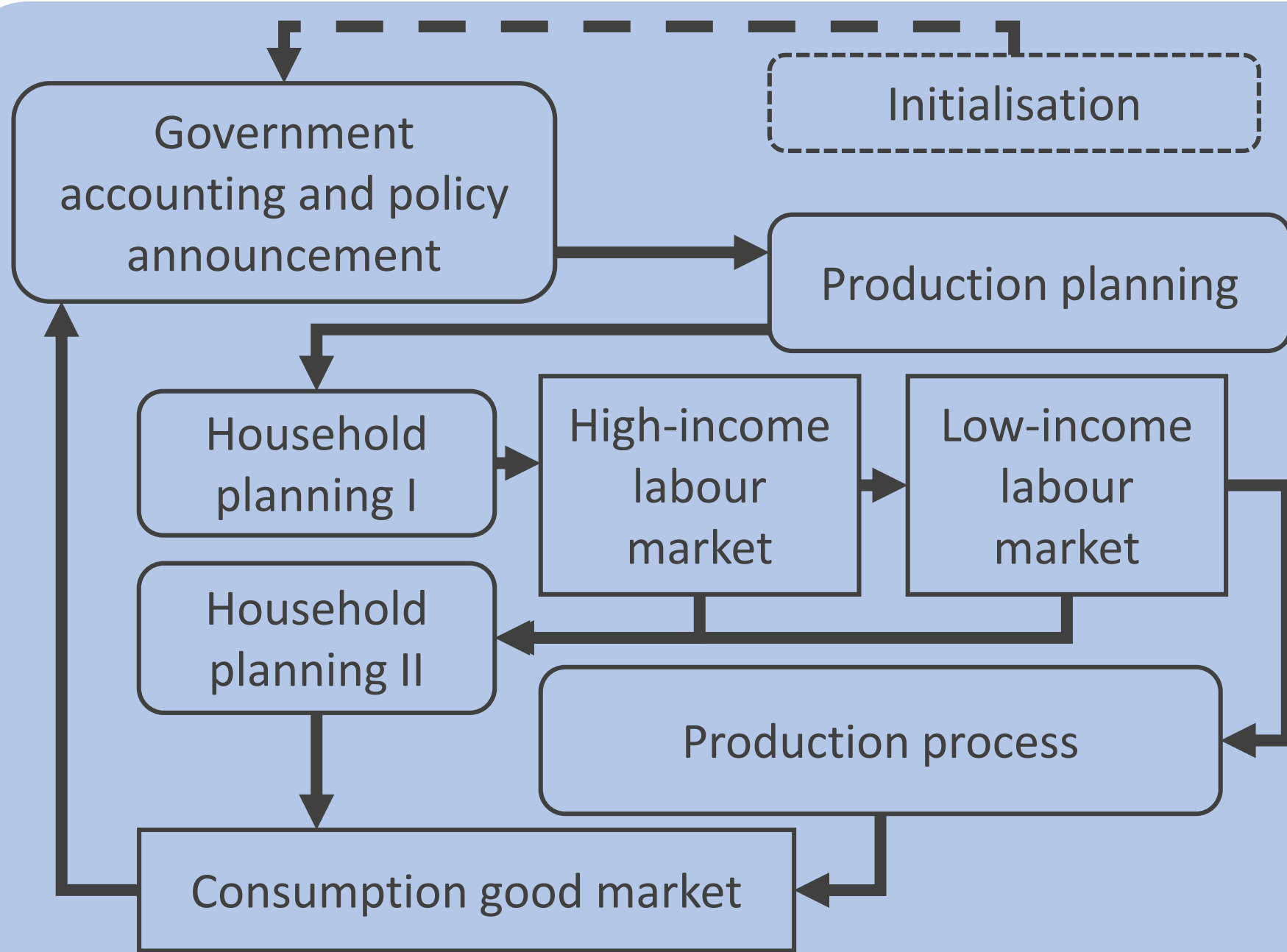
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Note: Tax reform at t=250. Baseline scenario.



References:

Aubert, D., & Chiroleu-Assouline, M. (2019). Environmental tax reform and income distribution with imperfect heterogeneous labour markets. *European Economic Review*, 116, 60-82.

Proposition 1: If utility depends on leisure (Z), a higher environmental tax lowers labour activity & production. Effects on productivity and labour substitution are ambiguous.

Z	Δu	ΔH_{real}	$\Delta C_{dem}/\Delta y_C$	$\Delta D_{dem}/\Delta y_D$	$\Delta \frac{L}{H}$	ΔMP_L	ΔMP_H
0	-0.30	-0.04	$-7.5e^{-6}/0.35$	-0.99/-0.65	0.09	-0.03	0.04
$1e^{-9}$	-1.27	-0.16	$-1.8e^{-6}/0.35$	-0.99/-0.65	0.34	-0.15	0.16
$1e^{-8}$	-1.28	-0.13	$-2.3e^{-6}/0.35$	-0.99/-0.65	0.38	-0.25	0.12

		$\Delta Income_H$	$\Delta Income_L$	$\Delta Gini$
Baseline	$\beta = \xi = 0.5$			
	$Z = 0, \eta_H = 0.5$	0.89	0.09	25392.7
	$\bar{D} = 0, \tau_D = 1\%$			
<i>Proposition 4</i>	$\tau_D = 10\%$	8.44	0.80	234804.2
	$\tau_D = 50\%$	33.81	3.20	858806.1
	$\tau_D = 100\%$	54.62	5.14	1298557.4

Proposition 4: In a Laffer-efficient tax system, under conditions of Proposition 2, any revenue-neutral tax reform with proportionate labour cuts is regressive.

The Model

Low-/high-wage households

Firms

Goods

Returns to scale

Prices

Search-and-matching

Profits

GEM

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A clean, a dirty and a public good

constant

1

For low-wage households

Zero by assumption

ABM

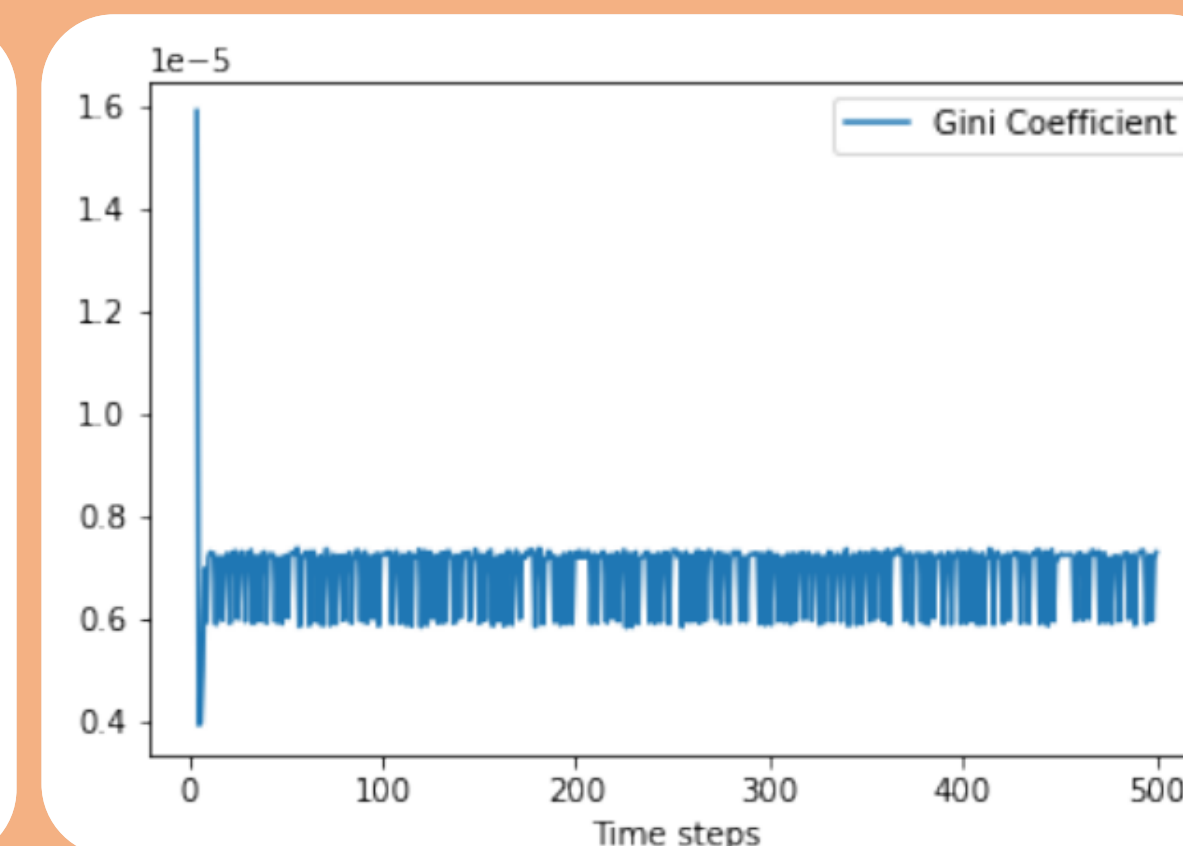
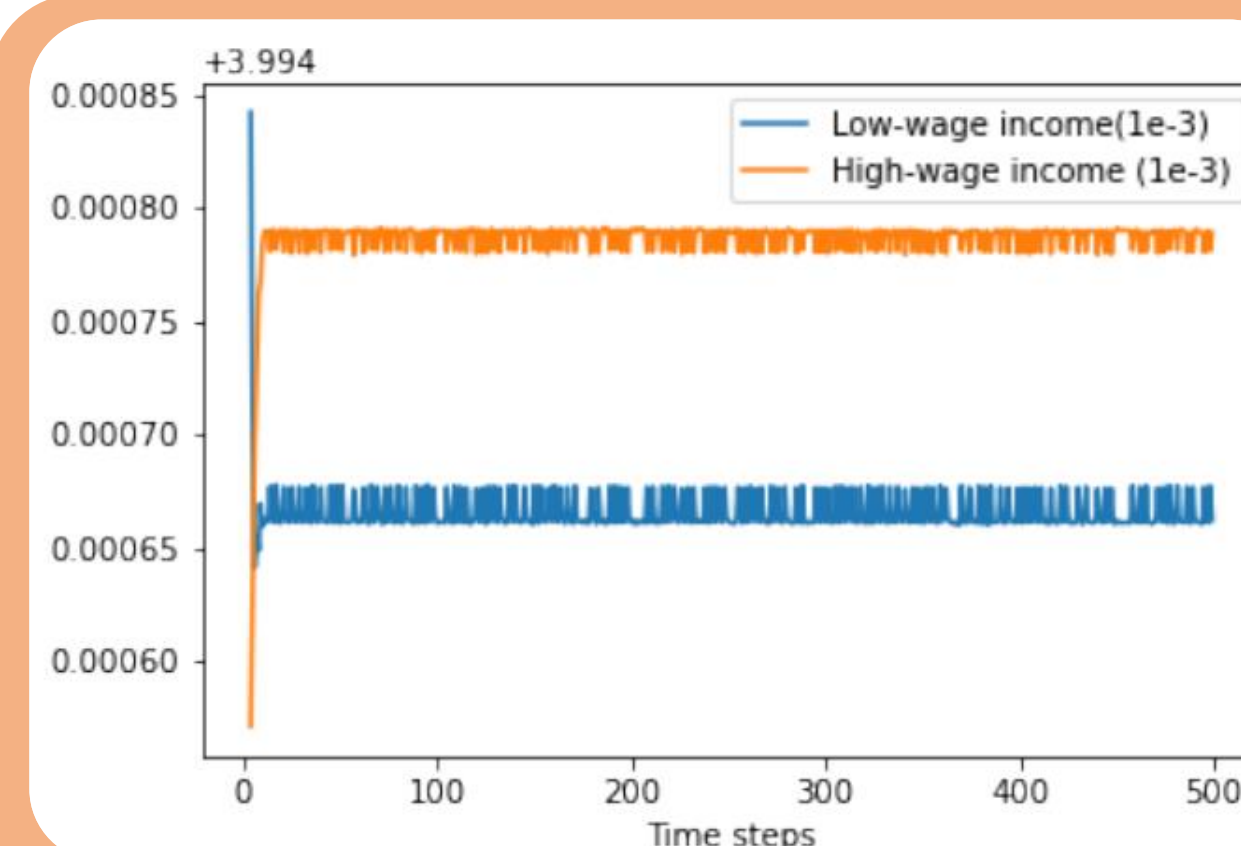
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decreasing

1.7496

Dividends to households



Proposition 2: Without any subsistence

(polluting) consumption, but with a balanced low-wage labour market & perfect labour substitution, the initial income distribution will be unaffected by a pollution tax increase.

		$\Delta Income_H$	$\Delta Income_L$	$\Delta Gini$
DD-Baseline	$\beta = \xi = 0.5$			
	$Z = 0, \eta_H = 0.5$	0.45	0.05	12869.3
	$\bar{D} = 0, \tau_D = 0.5\%$			
<i>Proposition 5</i>	$\beta = 0.7$	$7.1e^{-6}$	$-3.6e^{-6}$	0.18
	$\eta_H = 0.7$	$-2.9e^{-6}$	$3.6e^{-6}$	-0.19
	$\bar{D} = 0.0001$	$6.7e^{-6}$	$-1.2e^{-5}$	0.56

Proposition 5: If a tax reform fulfills the conditions for a double dividend, it tends to be more progressive if (i) β or (ii) η_H are higher, or if (iii) subsistence consumption is lower.

Double Dividend conditions

- Green dividend: reduced pollution through pollution tax
- Welfare dividend: higher welfare/employment through lowering labour-related taxes
- We have to lower the suggested tax rate from 1% to 0.5% in order to achieve a double dividend

Proposition 3: An uncompensated tax is more regressive when (i) unemployment is above optimum, (ii) the elasticity of both labour types differs more, (iii) level of subsistence consumption is higher.

	$\Delta Income_H$	$\Delta Income_L$	$\Delta Gini$
Baseline	$-4.03e^{-7}$	$-1.08e^{-5}$	0.31
Under-employment	$-1.01e^{-6}$	$-1.08e^{-6}$	-0.18
High elasticity of high-wage labour	$-1.07e^{-5}$	$1.71e^{-6}$	-0.38
High subsistence level	$-3.56e^{-6}$	$-6.01e^{-6}$	0.06

	$\Delta GiniIndex$	$\Delta Welfare$	ΔD
$\gamma = 0.45$	10394.7	-0.004	-0.33
$\gamma = 0.55$	9396.2	-0.004	-0.33
$\gamma = 0.99$	7344.41	0.002	-0.32

Proposition 6: Below a certain elasticity of high-wage labour supply, it is always efficient to redistribute tax revenues progressively.