Paper for ECB Sintra Forum 2021

Climate Policies and Monetary Policies in the Euro Area[1]

https://www.bis.org/review/r210702k.htm

Data

Table 1. Carbon taxes in the Euro area

Jurisdiction	Date	Initial rate (EUR/DM)	2020 rate (EUR)	Coverage
Finland	1990	2.01	56.71	0.36
Slovenia	1996	7.56	15.82	0.24
Estonia	2000	0.42	1.83	0.03
Latvia	2004	0.50	8.23	0.15
Ireland	2010	17.13	23.78	0.49
Spain	2014	24.16	13.72	0.03
France	2014	8.46	5.48	0.35
Portugal	2015	5.25	21.60	0.29

Notes: This table summarizes the carbon taxes used for the empirical analysis All rates are expresse in 2018 EUR per ton of carbon dioxide (CO2) equivalent (e) emissions, using the German GDP deflat

Coverage is the share of total greenhouse gas (GHG) emissions covered by the tax in 2019. Source: https://carbonpricingdashboard.worldbank.org/. Accessed 15.02.2021.

Table 2. Descriptive Statistics on dependent variables

	Headline CPI			Core CPI			HICP			GDP			PPI		
Country	First	Mean	S.D.	First	Mean	S.D.	First	Mean	S.D.	First	Mean	S.D.	First	Mean	S.D.
Austria	1985	79.73	16.69	1985	80.40	16.35	1996	88.41	11.99	1985	10.40	0.24	2000	93.33	8.75
Belgium	1985	80.59	16.72	1985	81.28	16.16	1996	88.86	12.51	1985	10.34	0.23	1985	83.82	16.95
Estonia	1998	84.60	18.31	1998	87.84	14.44	1996	80.81	20.75	1995	9.21	0.60	1994	82.86	18.08
Finland	1985	81.86	15.26	1985	82.87	15.31	1996	88.45	10.93	1985	10.41	0.22	1985	84.06	12.82
France	1985	83.92	14.10	1985	84.89	13.31	1996	90.53	10.21	1985	10.30	0.17	1985	89.25	9.91
Germany	1985	82.99	14.83	1985	84.10	14.32	1996	90.38	9.97	1985	10.37	0.19	1985	88.09	10.39
Greece	1985	71.26	29.73	1985	73.01	30.02	1996	88.37	14.24	1985	9.66	0.29	1985	72.39	29.34
Ireland	1985	80.39	18.38	1985	79.68	18.94	1996	91.06	11.17	1985	10.37	0.55	1985	82.56	15.26
Italy	1985	77.57	20.09	1985	78.01	19.98	1996	88.23	11.92	1985	10.17	0.17	1991	86.53	13.55
Latvia	1991	70.52	30.67	1995	82.49	20.46	1996	80.51	21.92	1995	8.95	0.62	1995	80.51	20.38
Lithuania	1991	74.89	29.74	1995	87.98	14.95	1996	85.18	16.89	1995	8.97	0.64	1998	91.73	15.24
Luxembourg	1985	79.30	16.85	1985	79.70	16.36	1996	86.62	13.96	1985	11.07	0.39	1985	76.12	19.68
Netherlands	1985	80.17	16.55	1985	79.84	16.61	1996	89.08	11.77	1985	10.44	0.26	1985	81.77	16.55
Portugal	1985	75.48	24.05	1985	74.13	26.13	1996	88.84	12.42	1985	9.55	0.37	1985	81.25	22.42
Slovakia	1991	74.23	26.82	1995	81.34	21.18	1996	83.38	19.95	1990	9.11	0.59	1994	95.88	11.14
Slovenia	1985	62.69	37.72	2000	92.77	10.43	1996	84.05	18.77	1995	9.75	0.24	1994	82.74	18.84
Spain	1985	75.93	21.90	1985	78.33	21.41	1996	87.76	13.63	1985	9.89	0.29	1985	79.00	18.23

Notes: Table lists the first year of observation, mean and standard deviation of each dependent variable for the empirical analysis, by country. The sample includes all Euro area countries, excluding Cyprus and Malta.

Estimation

$$\Delta CPI_{i,t+h} = \alpha_i + \Theta_h \tau_{i,t} + \beta(L)\tau_{i,t-1} + \delta(L)\Delta CPI_{i,t-1} + \gamma_t + \epsilon_{i,t}$$

$\tau_{i,t}$ i t Θ_h

t h

α_i γ_t

$\epsilon_{i,t}$

Results

Table 3. Dynamic Impulse Responses to Carbon Tax Shock

Sample	Impact in year 0	1–2	3–5	Controls	N	R2
a) GDP	−0.68***	−0.21	0.09	Country FE	497	0.(
	(0.23)	(0.38)	(0.38)			
	−0.75***	−0.21	0.31	Economic	276	0.3
	(0.18)	(0.17)	(0.56)			
	0.18*	0.13	0.15	Country & Time FE	497	0.8
	(0.10)	(0.09)	(0.31)			
b) Headline CPI	−0.06	0.07	−0.89	Country FE	454	0.1
	(0.29)	(0.32)	(0.56)			
	−0.01	0.19	−0.67*	Economic	247	0.4
	(0.38)	(0.32)	(0.37)			
	0.26	1.03***	0.28	Country & Time FE	454	0.5
	(0.33)	(0.40)	(0.64)			
c) Core CPI	−0.53***	−0.16	−0.87***	Country FE	367	0.1
	(0.20)	(0.31)	(0.26)			
	−0.42*	−0.04	−0.29	Economic	246	0.2
	(0.24)	(0.28)	(0.38)			
	−0.37	0.34	−0.32	Country & Time FE	367	0.3
	(0.27)	(0.35)	(0.28)			
d) HICP	−0.06	−0.12	−1.11***	Country FE	333	0.(
	(0.25)	(0.23)	(0.39)			
	0.36	0.37	−0.80**	Economic	276	0.4
	(0.35)	(0.28)	(0.32)			
	0.05	0.85***	0.12	Country & Time FE	333	0.6
	(0.24)	(0.23)	(0.23)			
e) PPI	−0.12	−0.35	−2.48	Country FE	414	0.11
	(0.93)	(0.63)	(0.8			
	0.49	−0.45	−2.1	Economic	245	0.47
	(0.97)	(1.01)	(1.0			
	0.78**	1.08*	−0.2	Country & Time FE	414	0.72
	(0.37)	(0.60)	(0.8			

CPI to a 40 Euro carbon tax with 30% emission
pita GDP (log), panel b headline CPI, panel c uses
rmonized index (HICP) and panel e the producer
trols include per capita GDP (except in panel a)
nd R2 represent the means over the six individual
lasticity robust. Significance levels denoted by ***

Notes: Table shows the dynamic impulse responses of
coverage for the Euro area sample. Panel a uses per cap
core CPI (excl. energy and food), panel d uses the har
price index (manufacturing, domestic). Economic con
and the ECB policy rate. The number of observations a
regressions, respectively. Standard errors are heteroscec
$p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Figure 1. Cumulative Impulse Response for GDP

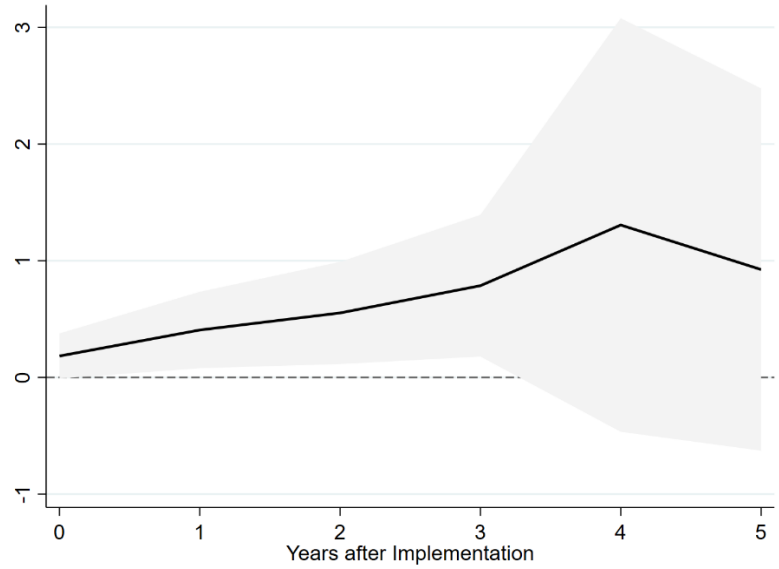


Figure 2. Cumulative Impulse Response for Headline CPI

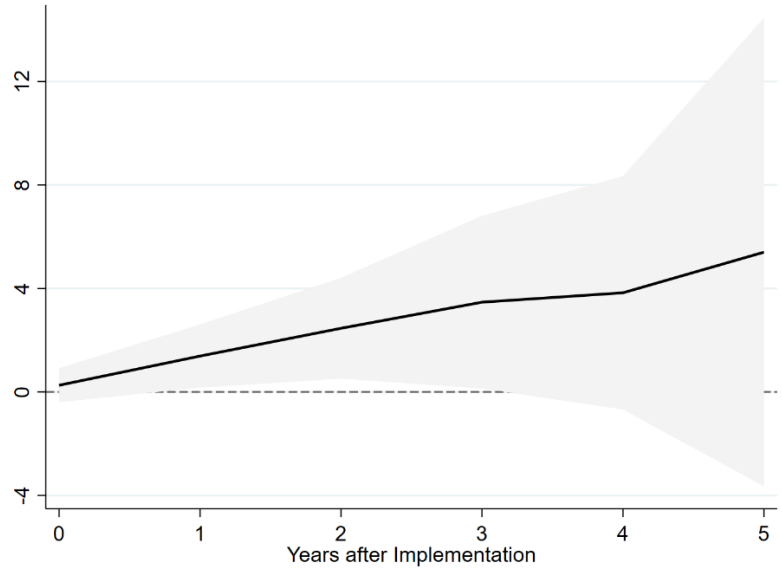
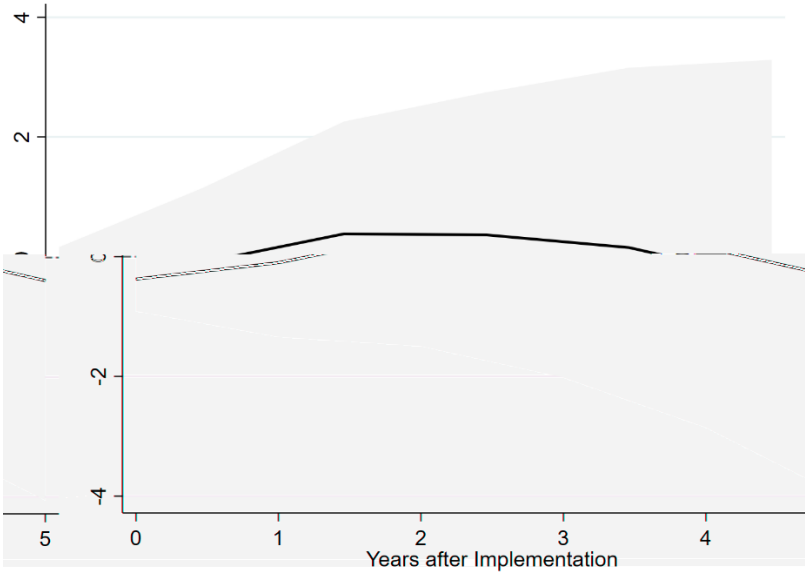


Figure 3. Cumulative Impulse Response for Core CPI



Monetary policy

Inflation

depreciation on the Euro

Figure 6. Euro Area Inflation, Prices and Interest Rates under a global climate shock

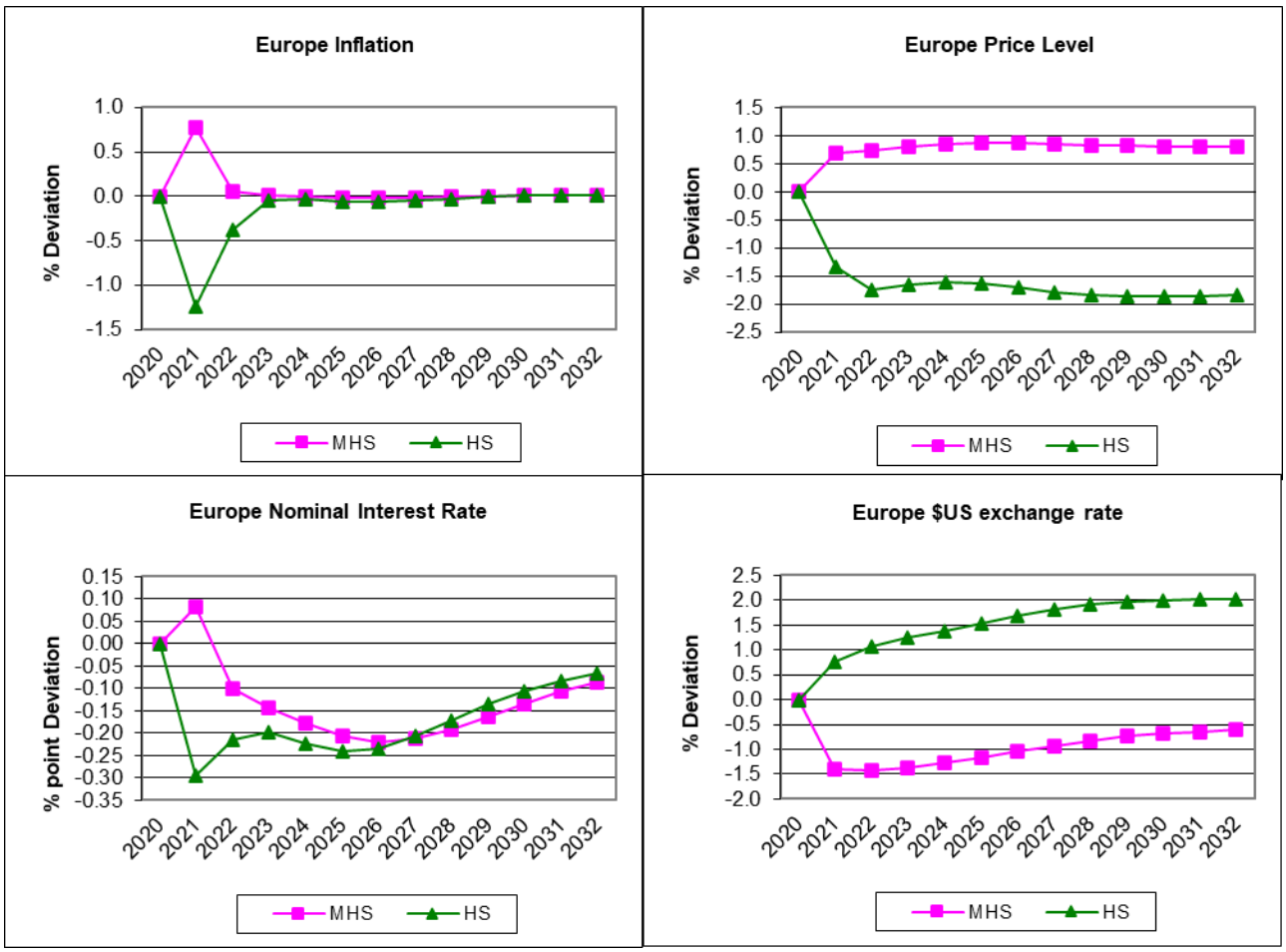


Figure 7. Euro Area Sectoral Output under a Global Climate Shock

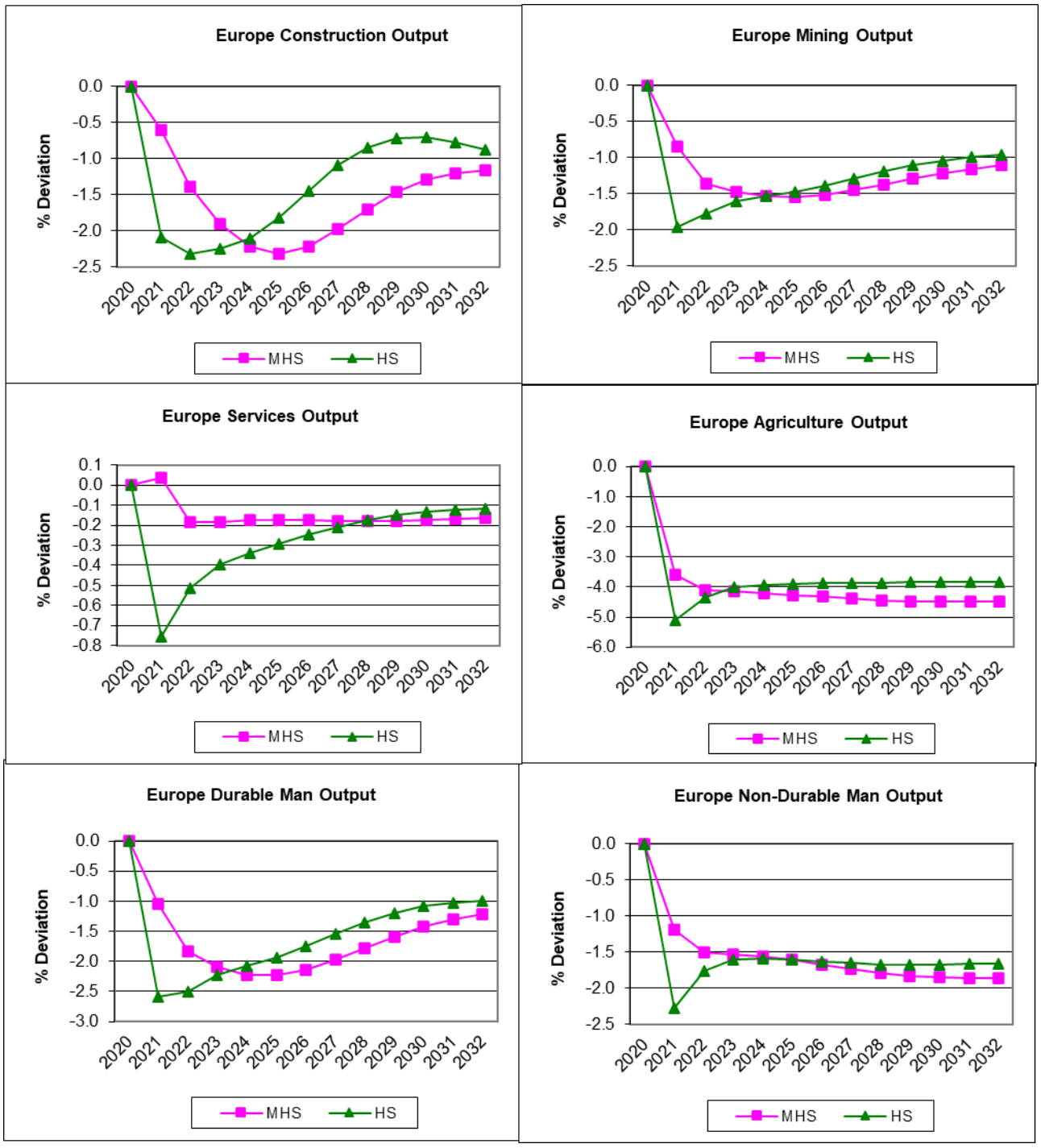
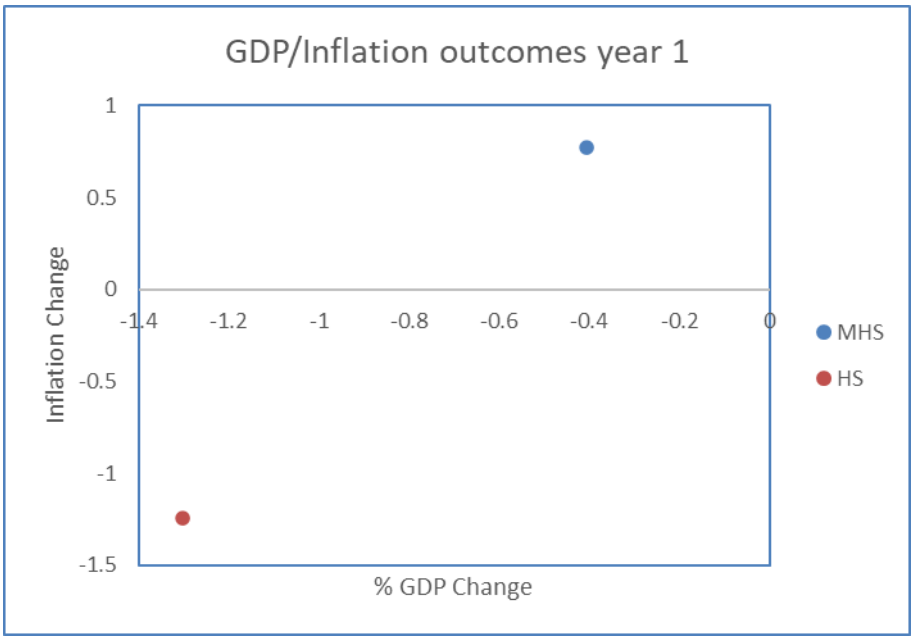
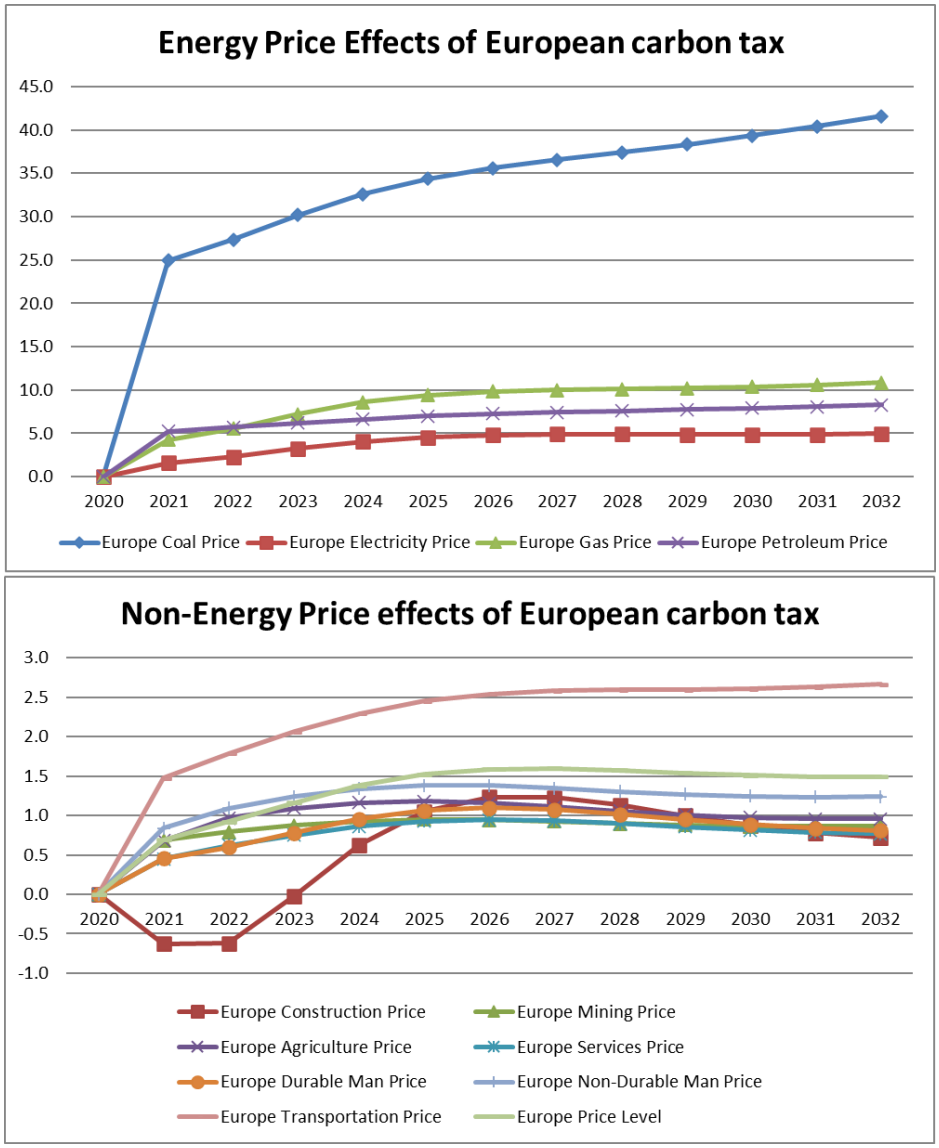


Figure 8. GDP/Inflation outcomes in year 1 of the climate Shock



50 euro per ton carbon tax rising at 3% per year

Figure 9. Decomposition of prices (after tax) for the scenario of a European carbon tax (Percent deviation form baseline)



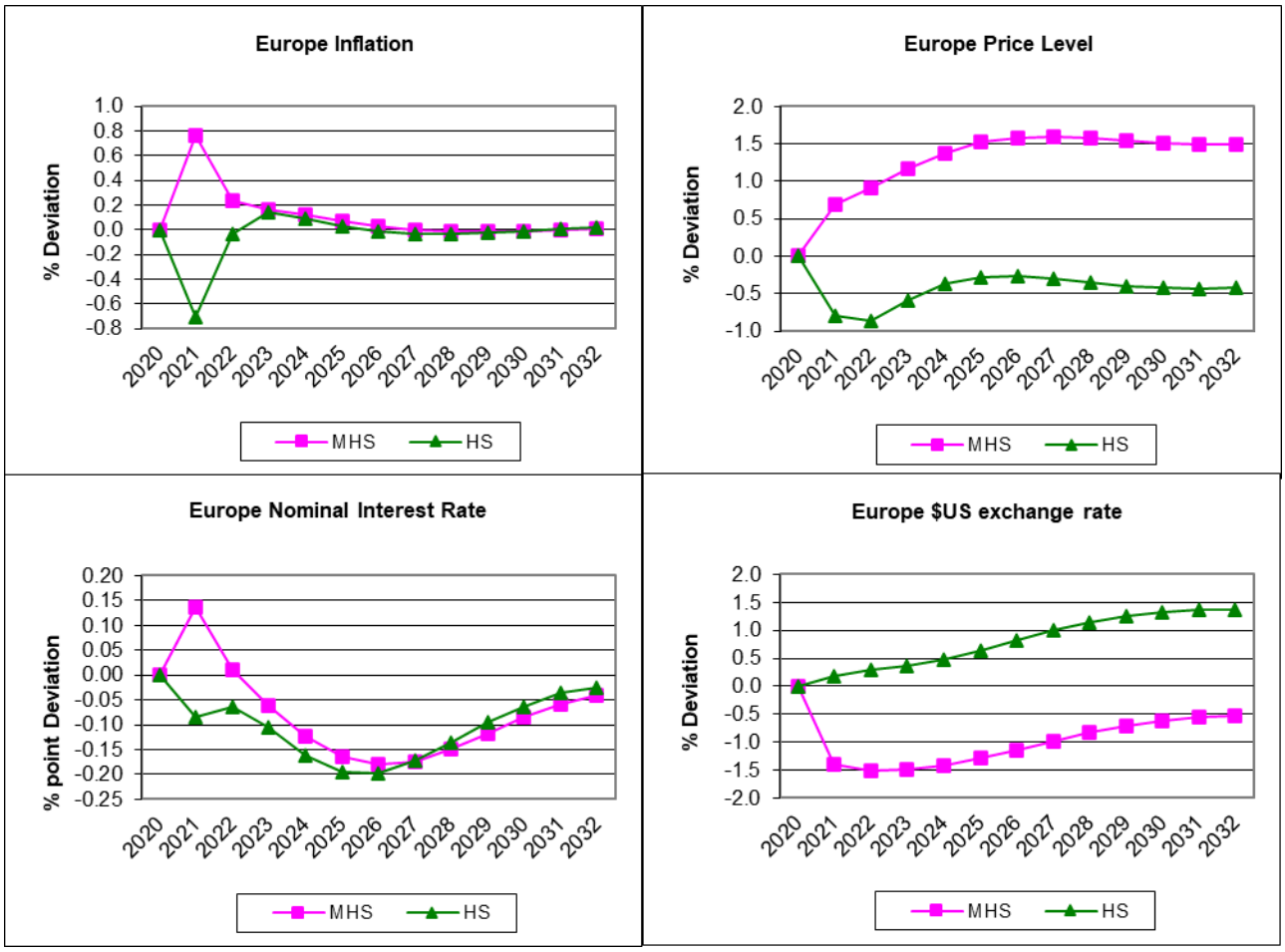
Effects on Inflation, Interest Rates and Exchange Rate

forward-looking HS rule

MHS rule

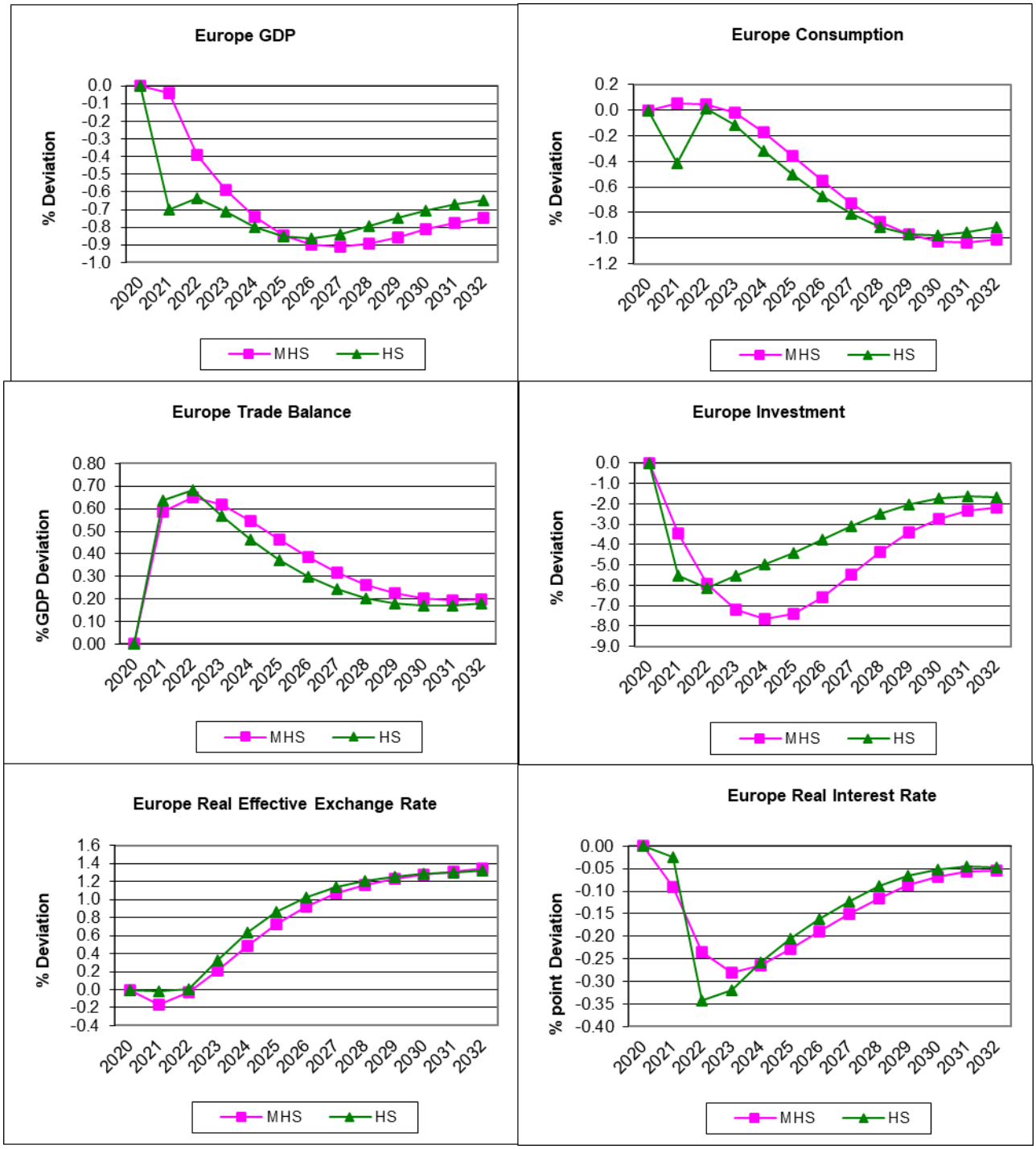
inflation would increase

Figure 10. Euro area Inflation, Prices and Interest Rates under a European carbon tax (Percent deviation form baseline)



Both monetary rules control inflation within four years

Figure 11. Euro Area Aggregate Quantity Effects of a European carbon tax

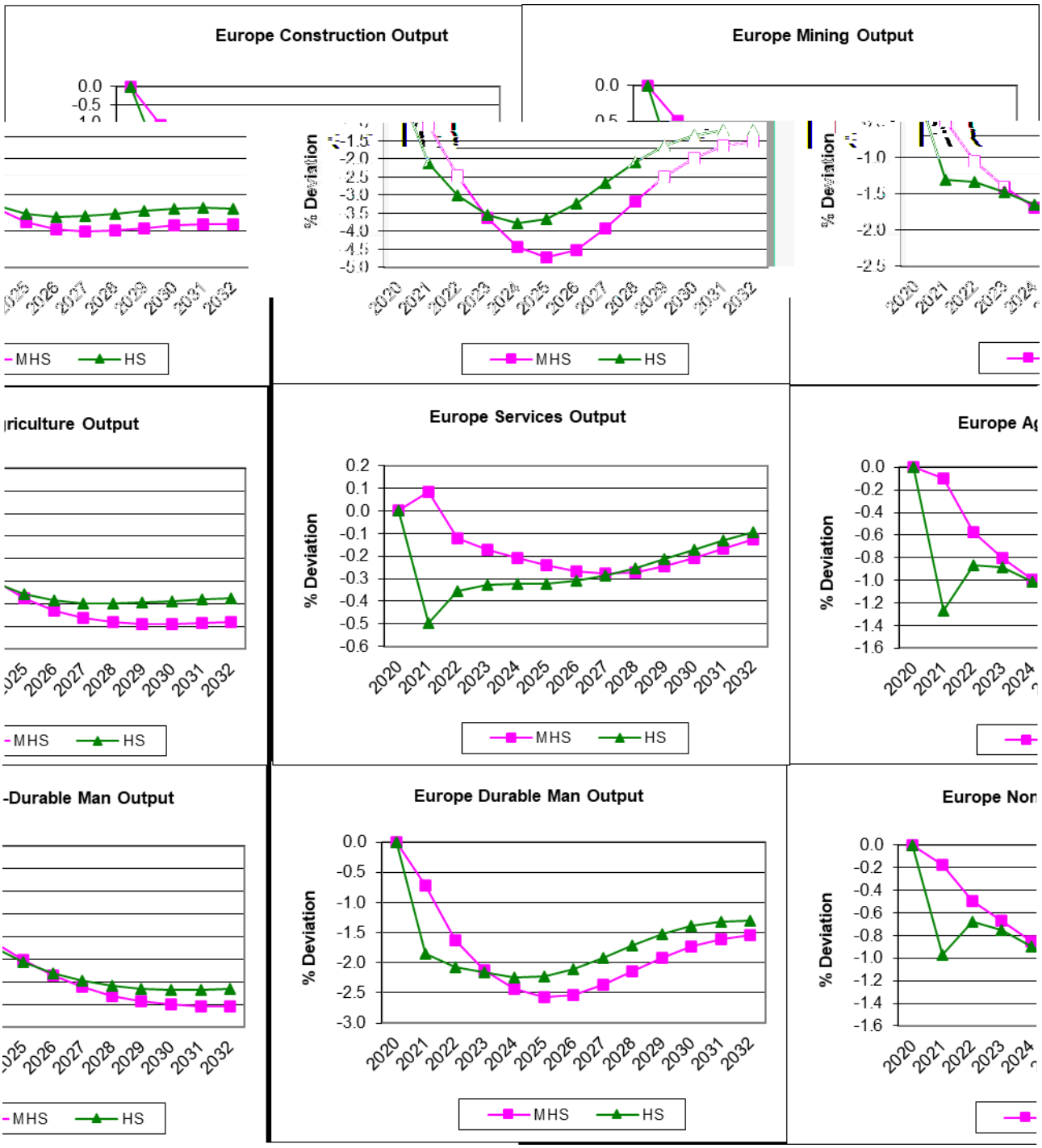


output

Investment

Sectoral Differences:

Figure 12. Euro Area Sectoral Output under European Carbon Tax



Energy Output:

Figure 14. GDP/Inflation outcomes in year 1 of the carbon tax

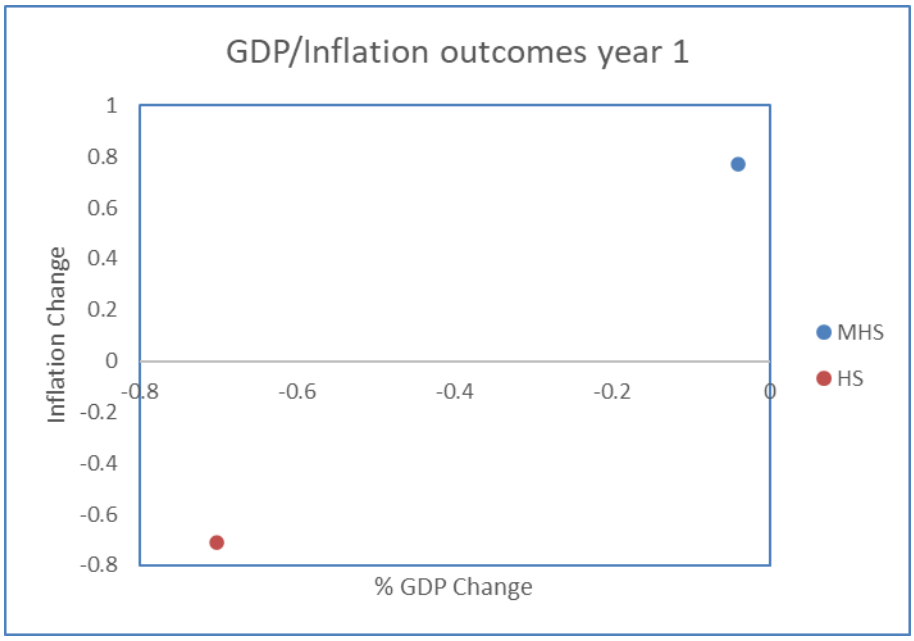
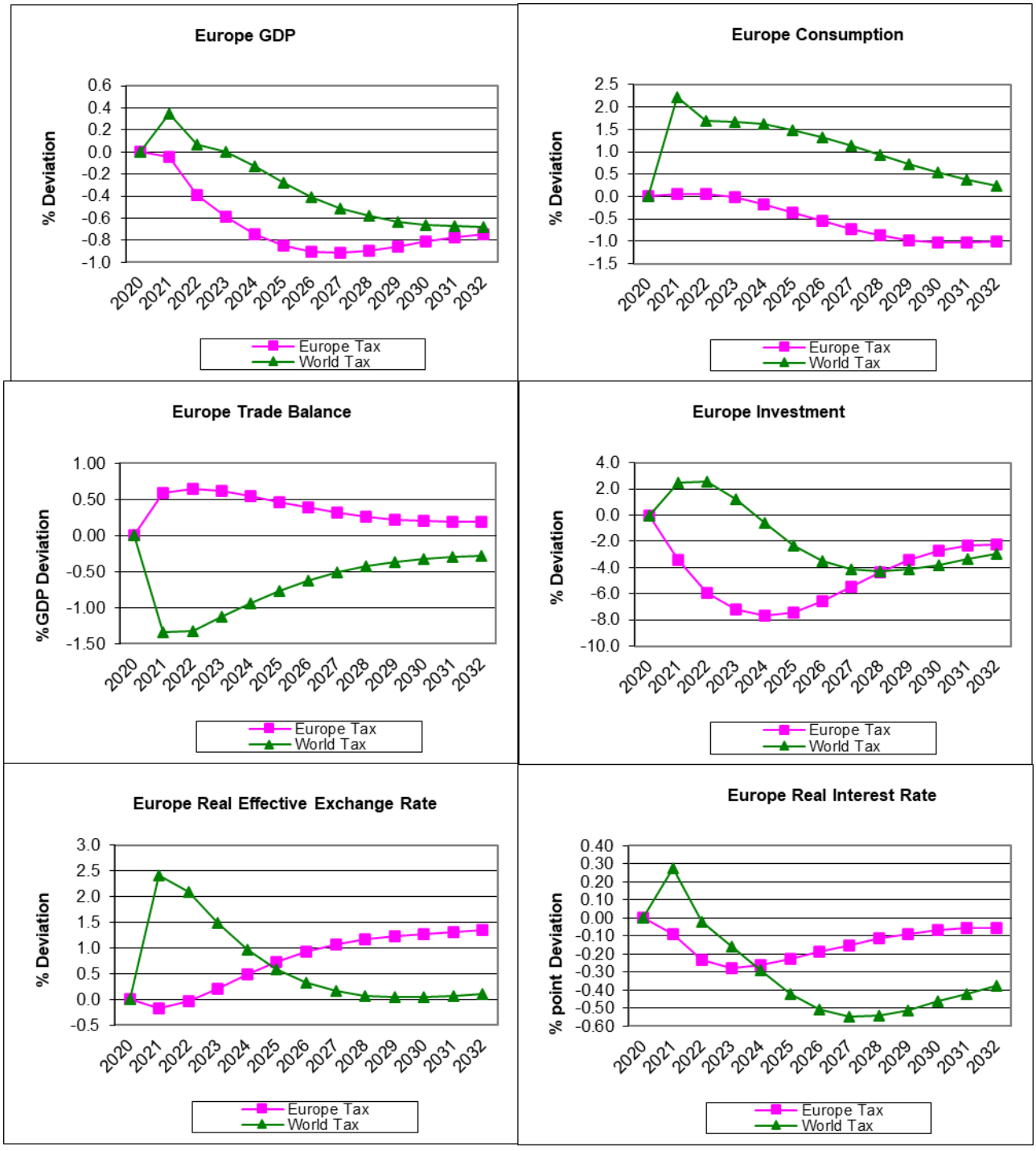


Figure 15. Euro Area Aggregate Quantity Effects under a European carbon tax versus a global carbon tax (Percent deviation form baseline)



appreciate the Euro, which puts downward pressure on inflation through lower import prices for final goods and imported intermediate goods

Figure 16. Euro Area Inflation, Prices and Interest Rates under a European carbon tax versus a global carbon tax (Percent deviation form baseline)

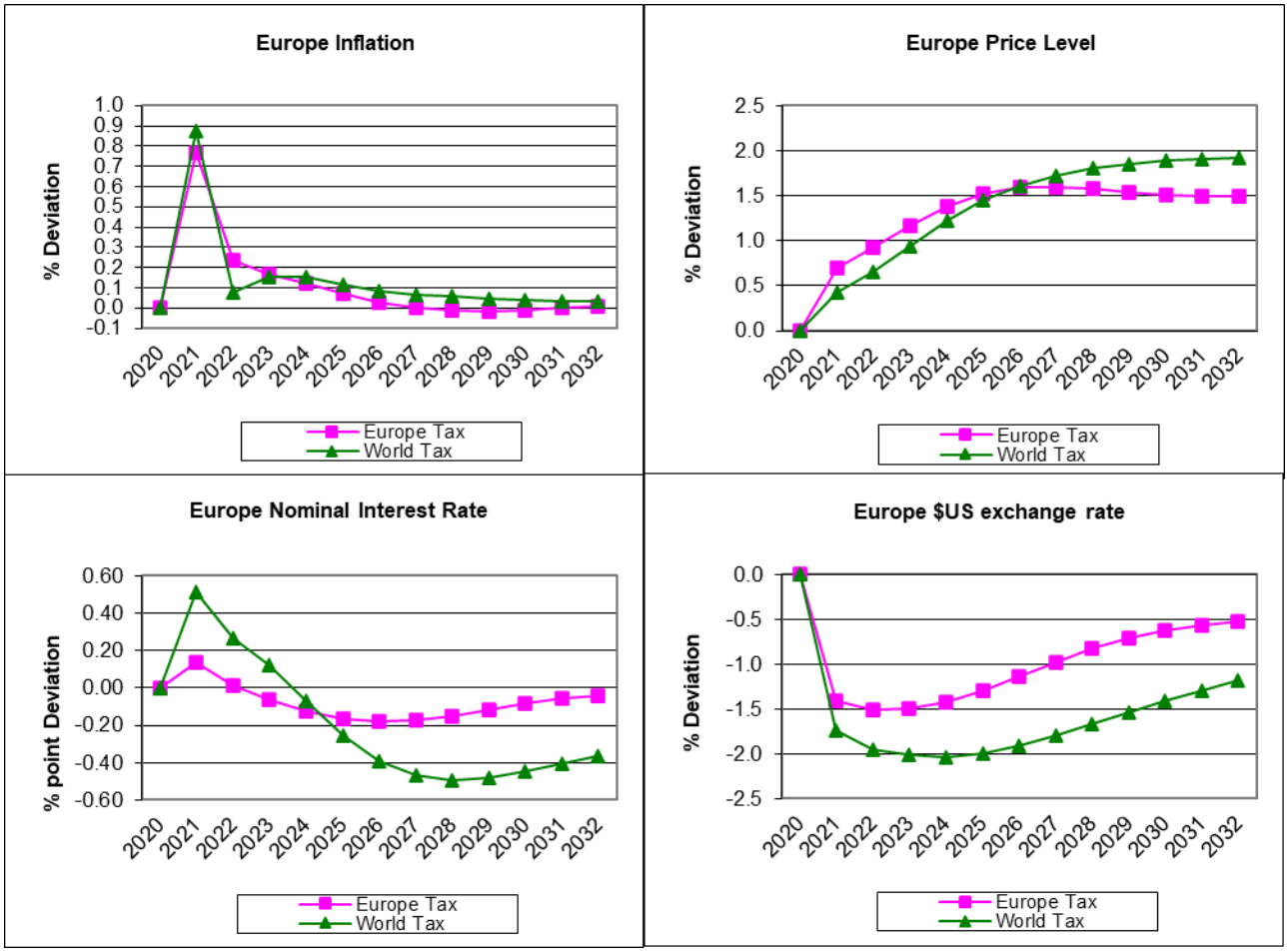


Figure 17. Euro Area Sectoral Output under a European versus Global Carbon Tax

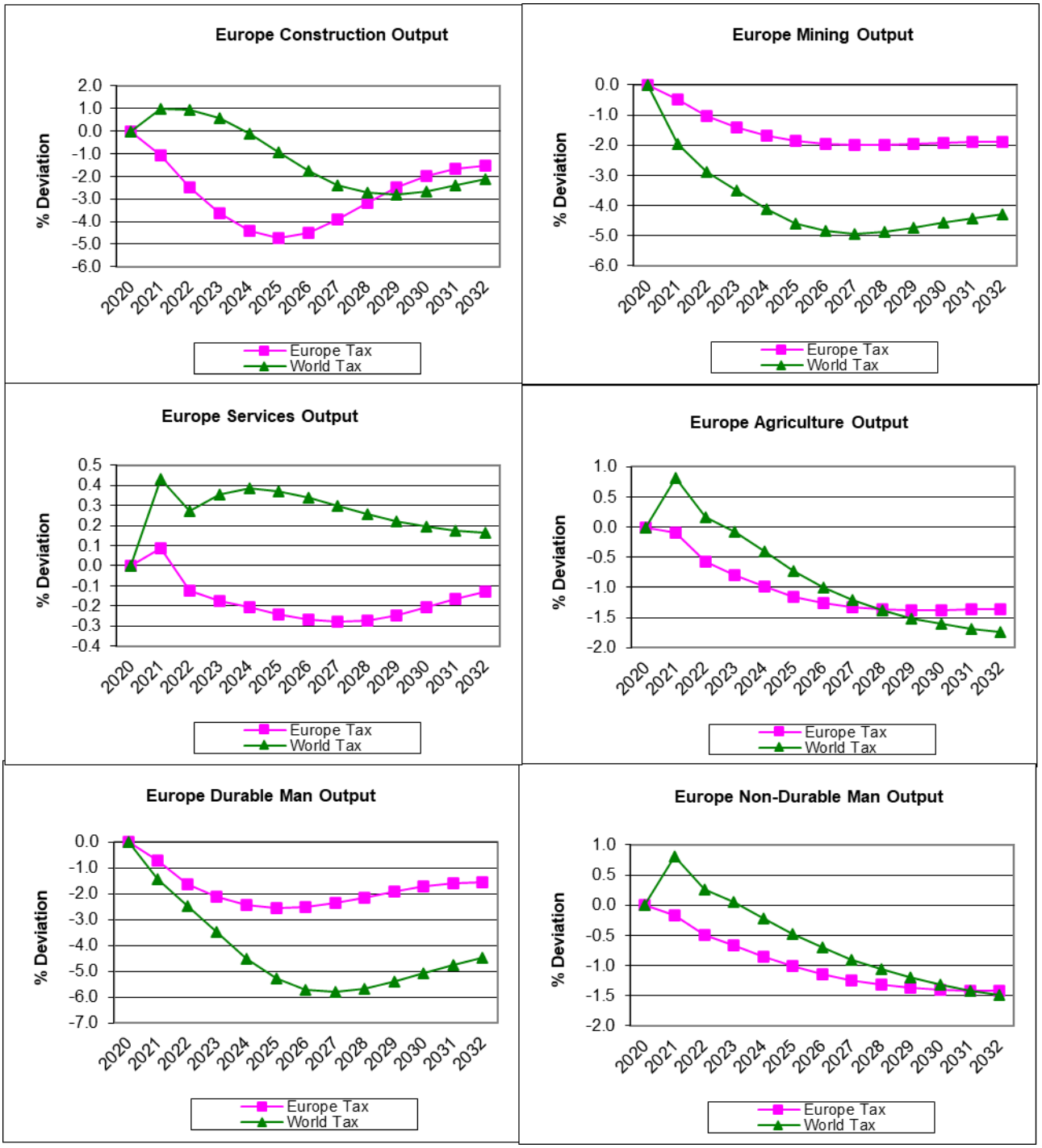


Table 6. Summary of G-Cubed Simulations under the MHS Rule after 1 year and 10 years, relative to baseline

a) Effect after 1 year

Variable	(1) Climate shock	(2) Euro area carbon tax	(3) Global carbon tax
GDP	−0.41	−0.04	0.35
Inflation	0.77	0.77	0.88
Price level	0.70	−0.69	0.43
Trade balance	0.03	0.58	−1.34
Real exchange rate	−0.28	−0.17	2.41
Durable goods output	−1.04	−0.72	−1.44

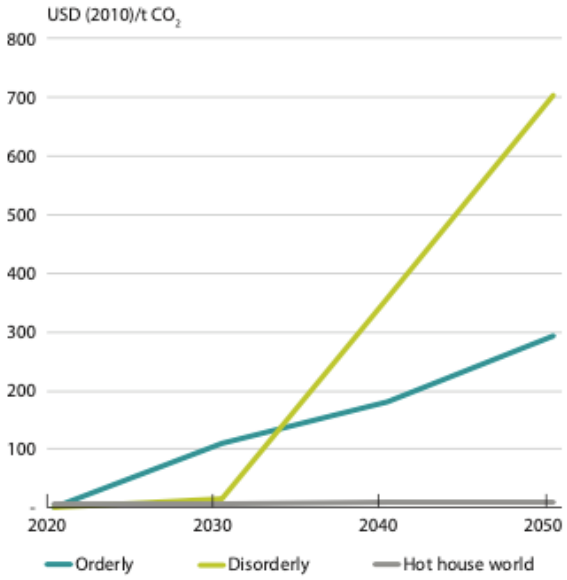
b) Effect after 10 years

Variable	(1) Climate shock	(2) Euro area carbon tax	(3) Global carbon tax
GDP	−7.45	−6.99	−2.76
Inflation	0.78	1.34	1.67
Price level	8.17	13.49	13.61
Trade balance	0.31	4.25	−7.74
Real exchange rate	−4.52	6.90	8.20
Durable goods output	−18.35	−20.17	−44.94

[22] See IMF (2020) and Jaumotte et al (2021) for analysis of this issue.

Emission price development

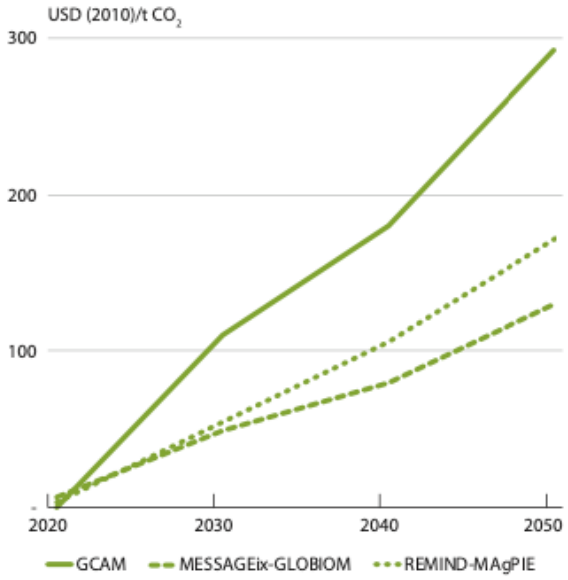
Representative scenarios



Source: IIASA NGFS Climate Scenarios Database, using marker models.

Emission price development across models

Orderly scenario



Source: IIASA NGFS Climate Scenarios Database.