

Macro-economic perspectives on the just transition to a CE

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JUST2CE

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JUST2CE

A Just Transition to Circular Economy



The JUST2CE project has received funding from the European Union Horizon 2020 research and innovation programme under grant agreement No 101003491

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- Two main milestones / deliverables linked with WP5:
 - o a **systematic review** of current literature on macroeconomic models for assessing the transition towards a CE
 - o a **formal model** (or set of models) to simulate and compare alternative CE policies and transition scenarios

A SYSTEMATIC LITERATURE REVIEW

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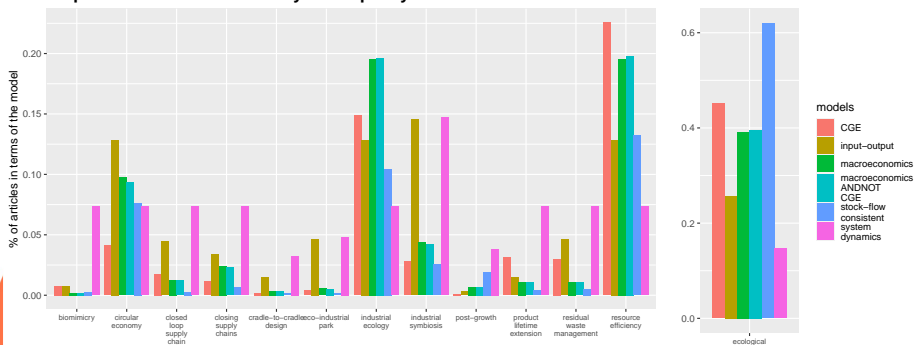
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- We have focused on both topics and modeling techniques
- We have identified, discussed, and assessed the most popular/promising tools (to model the transition...)



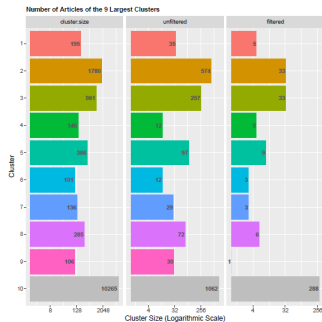
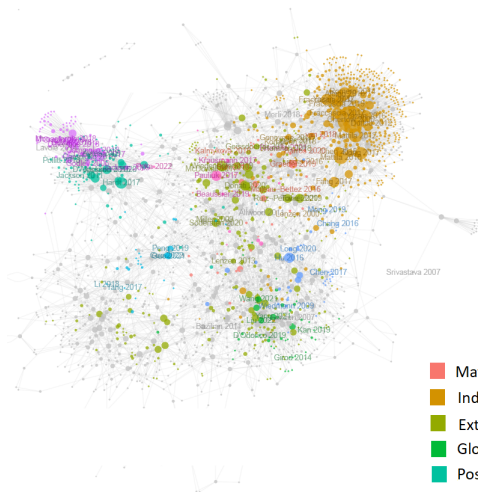
FIGURE A1. CONCEPTS AND MODELS

Emphasis on Circular Economy Concepts by Model



Source: Feveireiro et al. (2023)

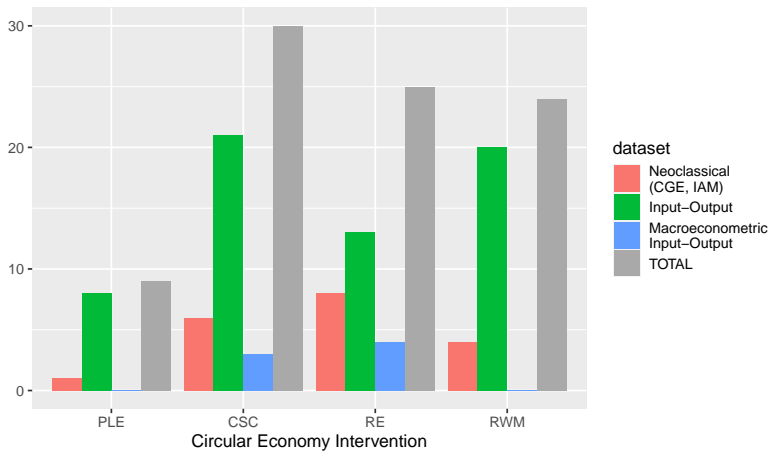
FIGURE A2. CITATION NETWORK OF FILTERED ENTRIES



- Material flow analysis
- Industrial symbiosis
- Extended IO
- Global value chain
- Post-growth SFC
- CGE (electric vehicles)
- Carbon footprint analysis
- Post-Keynesian SFC
- IAMs

Source: elaboration on Feveaire et al. (2023)
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FIGURE A3. CIRCULAR ECONOMY INTERVENTIONS



Source: elaboration on Feveireiro et al. (2023)

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FIGURE A4. JOURNAL AND MODELS



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 - 2) **SFC models**. PROS: dynamics, finance. CONS: homogeneous output
- In principle, we can disaggregate SFC models by crossbreeding them with IO models... (**Hardt and O'Neill 2017**)

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 - 2) To bridge the gap by developing a benchmark 2A-IO-SFC model (and related codes)

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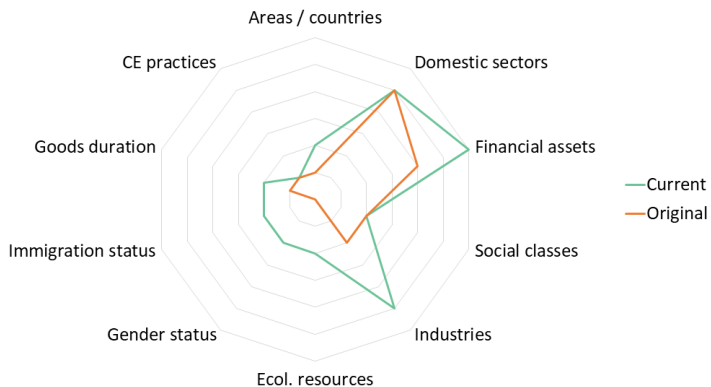
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- c) Identification: *Exiobase* (EU vs RoW) / literature / reasonable values

FIGURE 1. MODEL DIMENSIONS



ASSETS AND LIABILITIES

TABLE 1: Balance-sheet matrix in period 20 (curr. p., EU currency)

	EU					<i>xr</i>	RoW					Tot
	H	F	G	B	CB		H	F	G	B	CB	
Money	83.13	0	0	0	-83.13	1	270.40	0	0	0	-270.4	0
Advances	0	0	0	0	0	1	0	0	0	0	0	0
Deposits	554.25	0	0	-554.25	0	1	2163.29	0	0	-2163.29	0	0
Loans	-110.50	-371.11	0	481.61	0	1	-424.54	-1658.9	0	2083.44	0	0
EU bills	87.81	0	-255.42	72.64	66.27	1	28.70	0	0	0	0	0
RoW bills	26.34	0	0	0	16.86	1	287.02	0	-680.47	79.85	270.4	0
EU shares	219.53	-248.23	0	0	0	1	28.70	0	0	0	0	0
RoW shares	17.56	0	0	0	0	1	516.64	-534.2	0	0	0	0
Capital stock	0	619.34	0	0	0	1	0	2193.1	0	0	0	2812.45
Net financial wealth	-878.13	0	255.42	0	0	1	-2870.21	0	680.47	0	0	-2812.45
Total	0	0	0	0	0		0	0	0	0	0	0

TRANSACTIONS AND Δ IN STOCKS

TABLE 2: Transactions-flow matrix in period 20 (curr. p., EU currency)

	EU							RoW						Tot
	H	F (y)	F (k)	G	B	CB	xr	H	F (y)	F (k)	G	B	CB	
Consumption	-831.32	831.32	0	0	0	0	1	-2703.96	2703.96	0	0	0	0	0
Investment	0	212.26	-154.84	-57.42	0	0	1	0	923.48	-657.93	-265.55	0	0	0
Government spending	0	269.91	0	-269.91	0	0	1	0	766.98	0	-766.98	0	0	0
Export of EU	0	217.08	0	0	0	0	1	0	-217.08	0	0	0	0	0
Import of EU	0	-213	0	0	0	0	1	0	213	0	0	0	0	0
[Value added]	0	[1195.75]	0	0	0	0	1	0	[4018.28]	0	0	0	0	0
Wage bill	614.74	-614.74	0	0	0	0	1	1976.22	-1976.22	0	0	0	0	0
Corporate profit	414.20	-418.75	0	0	0	0	1	1338.91	-1334.36	0	0	0	0	0
Amortization	0	-154.84	154.84	0	0	0	1	0	-657.93	657.93	0	0	0	0
Bank profit	4.81	0	0	0	-4.81	0	1	42.45	0	0	0	-42.45	0	0
CB profit	0	0	0	1.00	0	-1.00	1	0	0	0	5.41	0	-5.41	0
Income tax revenue	-207.18	0	0	207.18	0	0	1	-668.56	0	0	668.56	0	0	0
VAT revenue	0	-102.09	0	102.09	0	0	1	0	-352.69	0	352.69	0	0	0
Tariffs revenue	0	-19.73	0	19.36	0	0	1	0	-19.36	0	19.73	0	0	0
Interests on deposits	5.54	0	0	0	-5.54	0	1	21.62	0	0	0	-21.62	0	0
Interests on loans	-2.20	-7.42	0	0	9.63	0	1	-12.71	-49.77	0	0	62.48	0	0
Interests on EU bills	0.88	0	0	-2.55	0.73	0.66	1	0.29	0	0	0	0	0	0
Interests on RoW bills	0.53	0	0	0	0	0.34	1	5.74	0	0	-13.61	1.60	5.41	0
Change in money stock	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Change in advances	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Change in deposits	-0.31	0	0	0	0.31	0	1	-0.94	0	0	0	0.94	0	0
Change in loans	0.31	0	0	0	-0.31	0	1	0.94	0	0	0	-0.94	0	0
Change in EU bills	0	0	0	0.25	0	-0.25	1	0	0	0	0	0	0	0
Change in RoW bills	0	0	0	0	0	0.25	1	0	0	0	-0.25	0	0	0
Change in EU shares	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Change in RoW shares	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Revaluation effects							1							0
Total	0	0	0	0	0	0		0	0	0	0	0	0	0

CROSS-INDUSTRY INTERDEPENDENCIES

TABLE 3: Baseline: IO matrix in period 20 (curr. p., EU currency)

	A in EU	M in EU	S in EU	W in EU	R in EU	A in RoW	M in RoW	S in RoW	W in RoW	R in RoW	Final demand	Output
Agriculture in EU	5.03	22.86	2.43	0.01	0.05	0.24	1.03	0.45	0.01	0	28.04	60.14
Manufacturing in EU	11.38	305.85	98.08	1.22	7.42	1.65	45.32	16.6	0.14	0.29	480.15	968.11
Services in EU	8.63	167.66	387.89	2.36	6.28	0.76	13.59	28.67	0.16	0.1	891.13	1507.23
Waste manag. in EU	0.25	3.56	4.17	1.28	0.37	0.07	0.23	0.21	0.01	0	0	10.16
Recycling in EU	0.13	18	1.92	0.09	1.91	0.01	2.48	0.22	0	0.04	0	24.78
Agriculture in RoW	0.98	2.71	0.67	0	0.03	49.5	156.01	26.02	0.21	0.12	169.45	3934
Manufacturing in RoW	1.96	75.84	14.96	0.14	2.62	51.04	1761.35	455.15	5.33	5.22	1560.39	405.69
Services in RoW	0.39	12.49	31.17	0.15	0.4	54.46	577	1244.55	7.22	3.54	2826.04	4757.39
Waste manag. in RoW	0.02	0.22	0.09	0.02	0.01	2.84	11.88	20.57	2.05	0.1	0	37.8
Recycling in RoW	0	0.29	0.02	0	0.02	0.87	11.67	0.49	0.02	1.1	0	14.48
Value added												
- Compensation of employees	5.73	163.52	462.92	1.9	4.05	111.89	507.12	1433.5	11.09	2.84		2704.57
- G.O. surplus and mixed inc.s	25.63	195.13	502.9	2.99	1.61	132.37	846.32	1530.98	11.55	1.14		3250.63
Taxes on production	0	0	0	0	0	0	0	0	0	0		
Output	60.14	968.11	1507.23	10.16	24.78	405.69	3934	4757.39	37.8	14.48	5955.19	

AREA-SPECIFIC PHYSICAL FLOWS

TABLE 4: Physical flow matrix in period 20 (matter = Gt, energy = EJ)

	EU matter	RoW matter	Global matter	EU energy	RoW energy	Global energy
Inputs						
Extracted matter	317.86	2141.84	2459.7			
Recycled matter	7.72	55.3	63.03			
Renewable energy			0	1176.34	1461.97	2638.31
Non-renewable energy	17.37	23.33	40.7	7204.01	8980.65	16184.66
Oxygen	46.37	62.3	108.66			
Outputs						
Industrial CO ₂ emissions	-63.73	-85.63	-149.36			
Discarded stock	-28.34	-276.51	-304.84			
Dissipated energy				-8380.36	-10442.61	-16760.72
Δ in socio-economic stock	297.24	1920.64	2217.88			
Difference	0	0	0	0	0	0

GLOBAL PHYSICAL STOCKS AND RELATED CHANGES

TABLE 5: Physical stock-flow matrix in period 20 (matter = Gt, energy = EJ)

	Material reserves	Energy reserves	CO ₂ concentration	Socio-economic stock
Initial stock	9451266.99	-201040.39	2101.05	40831.85
Resources converted into reserves	193156.73	1536.04		
CO ₂ emissions			149.36	
Production of material goods				2522.72
Extraction/use of matter/energy	-2459.7	-16184.66		
Distruccion of socio-ec. stock				-304.84
Final stock	9647311.66	-197232.48	2442.4	37174.38
Difference	0	0	0	0

FIGURE 2. SANKEY DIAGRAM OF TRANSACTIONS (IN $t = 20$)

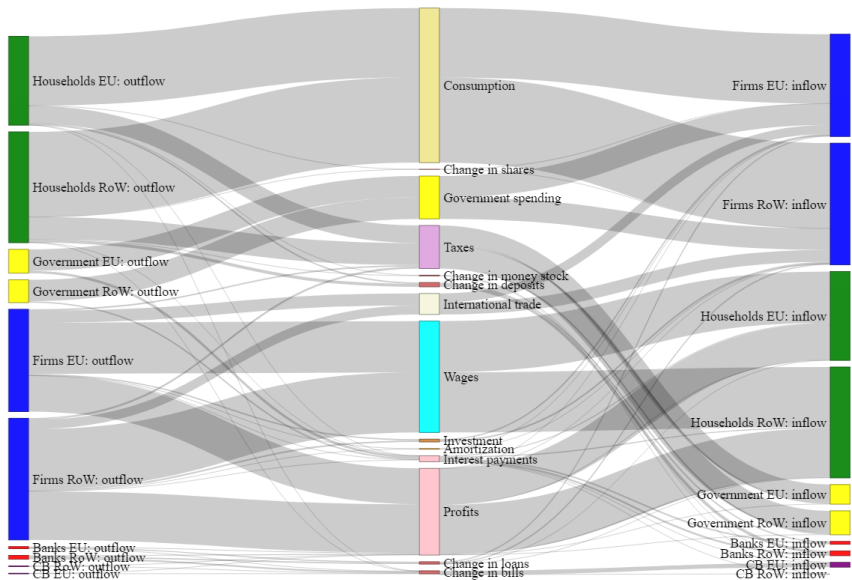


FIGURE 3. CROSS-INDUSTRY INPUT-OUTPUT FLOWS (IN $t = 20$)

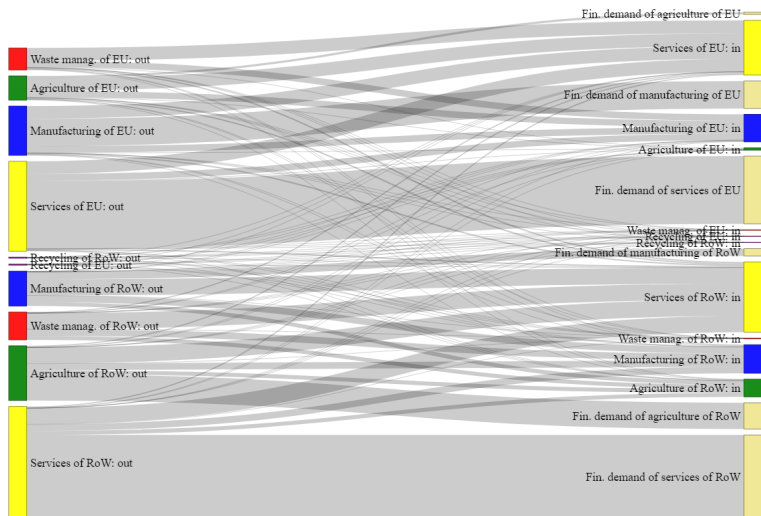
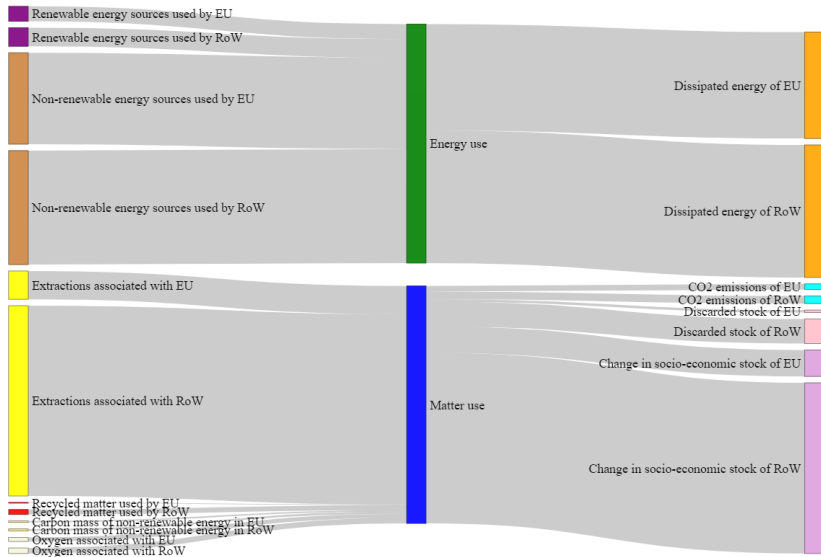


FIGURE 4. PHYSICAL FLOWS OF MATTER AND ENERGY (IN $t = 20$)



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- Regional trade-offs and social aspects (apart from employment) are usually not there.
- Market economies lack an inherent mechanism that leads to a true transition to a CE
- Government spending oriented towards the CE can be effective, but...

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- 'Win-win' results (e.g. lower environmental pressure).
- Regional trade-offs and social aspects (apart from employment) are usually not there.
- Market economies lack an inherent mechanism that leads to a true transition to a CE
- Government spending oriented towards the CE can be effective, but...
- The transition to a CE must first and foremost be a transition to a fairer society, requiring redistributive policies and planning.

Thank you

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JUST2CE
A Just Transition to Circular Economy



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