

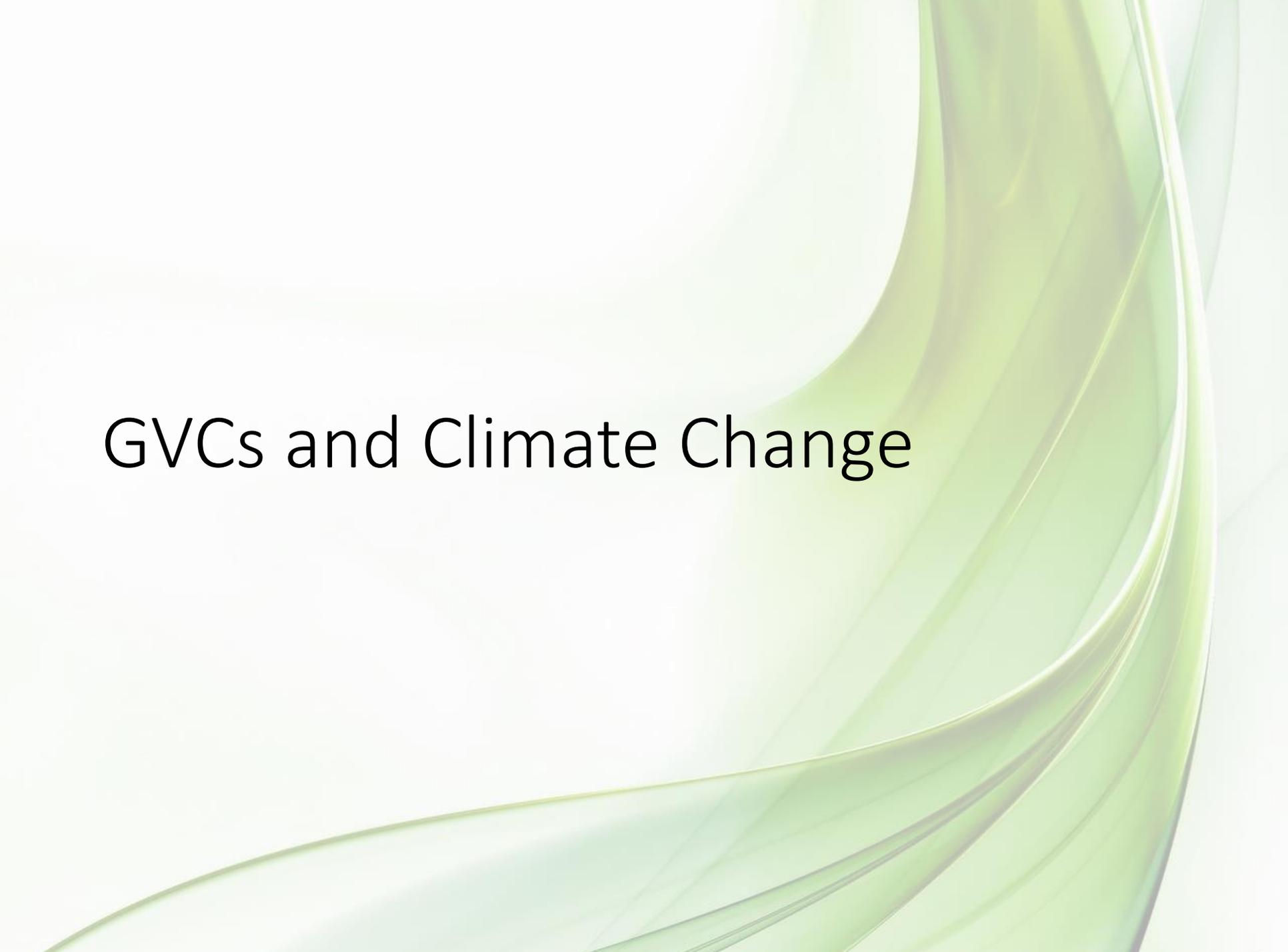
Climate Change: GVCs

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Outline

- ~~Low carbon economy~~
 - ~~Costs~~
- GVCs and global value chains
 - Asymmetries across countries
 - Push & pull factors



GVCs and Climate Change

Example: US Trade Balance in iPhones

USD millions, 2009 data

	China	Japan	Korea	Germany	Rest of World	World Total
Traditional measure	-1,901.2	0	0	0	0	-1,901.2
Value added measure	-73.5	-684.8	-259.4	-340.7	-542.8	-1,901.2

Traditional trade statistics: China exports the high technology product to the USA, US have deep trade deficit with China

Reality: only a small fraction of the value actually stays China, the rest is spend on imports of components and payments for patents/technologies to Korea, Japan, Germany



Note: 2, 3 and 4 represent intermediate products which are combined into 1 (i.e. the final product); 4 as an intermediate product itself is composed of inputs 5, 6 and 7.

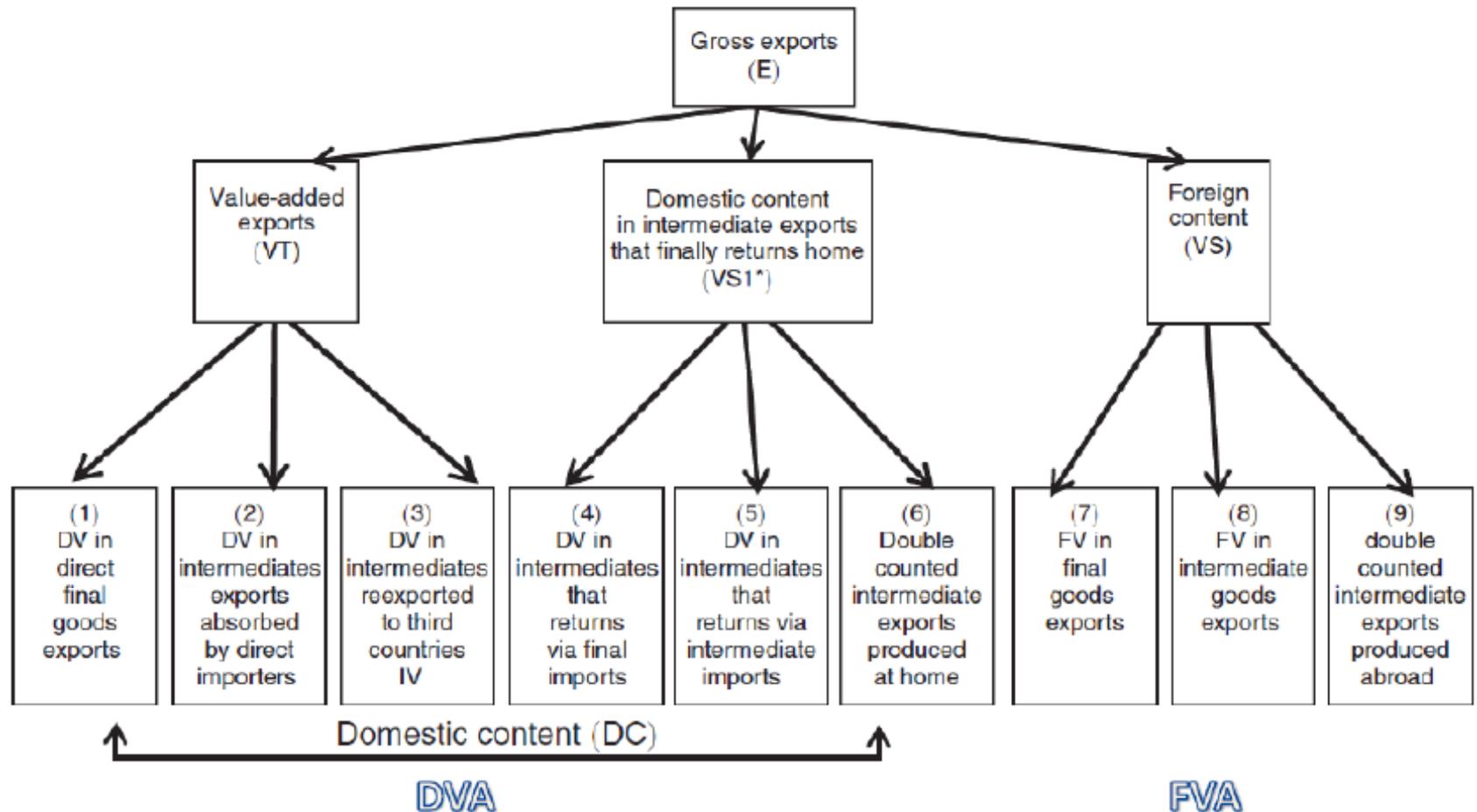
Source: OECD (2012a). *Map source:* ARTICQUE© – all rights reserved.

GVC Accounting: MRIOs

			Final products of a global value chain, identified by country and industry of completion							Value added
			Country 1			...	Country M			
			Industry 1	...	Industry N	...	Industry 1	...	Industry N	
Value added from country- industries participating in global value chains	Country 1	Industry 1								
		...								
		Industry N								
								
	Country M	Industry 1								
		...								
Industry N										
Total final output value										World GDP

- Ferrarini & de Vries (2015):
 - the rise of GVCs has dramatically changed the nature of production and international trade, **blurring the attribution of ultimate responsibility** for CO2 emissions.
- Problems:
 - How to calculate this?
 - Data!
 - Evaluation of changes?
 - Elasticities....
 - **Relocation effects**

Figure 4. Decomposition of Gross Exports



Source: Koopman et al (2014).

Changes in CO₂ Emissions

- Technology
- Trade
- Consumption

The Determinants of Change in an Economy's Total Carbon Dioxide Emissions

Determinant	Equation (5) term	Descriptive examples
Global value chains trade	5a. Relocation of intermediates production	Japanese hard disk drive production facilities and related carbon emissions move to Thailand. The PRC starts sourcing certain electronic parts domestically, instead of relying on US imports.
	5c. Changes in the location of final assembly	Laptop assembly and related emissions moves from Taipei, China to the PRC, due to lead firms' strategic search of locational advantages or changes in consumer preferences.
GVC emission intensity	5b. Changes in the amount of emissions generated along the GVC	Asian GVCs centered on the PRC's assembly and other supplying economies increase the energy efficiency of production over time. Emissions fall as a result.
Consumption	5d. Changes in the consumption bundle	Consumer preference shifts toward products that are more energy-intensive along their GVCs. Relative demand for these products increases and so do the emissions by economies involved in these GVCs.
	5e. Changes in consumption levels	Expanding GDP increases the demand for final goods and the emissions associated with their production.

GDP = gross domestic product, GVCs = global value chains, PRC = People's Republic of China, US = United States.

Source: Authors' compilation.

Source: Ferrarini & de Vries (2015)

Table 4: Global Value Chains Carbon Dioxide Emissions Accounting

Location of Production	Total Emissions		Change in Emissions 2008 Minus 1995	Change in emissions accounted for by changes in:						
	1995	2008		Trade		Technology	Consumption			
				Location of Intermediate Stages	Location of Final Assembly	GVC Emissions	Consumption Preferences	Global Consumption Levels	o/w domestic	o/w foreign
Asia	5.191	9.426	4.235	631	739	-2.231	142	4.954	4.221	733
People's Republic of China	2.723	5.923	3.200	550	673	-1.706	89	3.594	3.216	379
Republic of Korea	372	522	149	19	19	-91	3	199	120	79
Taipei, China	178	289	111	37	5	-57	23	104	42	62
India	721	1.367	646	14	36	-226	44	779	704	75
Indonesia	173	304	131	26	20	-15	0.01	100	65	35
Japan	1.024	1.021	-3	-14	-13	-136	-17	178	74	104
Europe	3.381	3.431	51	-287	-40	-899	-43	1.319	828	492
Europe Advanced 15	2.638	2.757	119	-199	-79	-546	-4	946	549	397
of which: Germany	725	690	-34	-24	-1	-173	2	162	60	102
Europe Emerging 12	742	675	-68	-87	39	-353	-40	373	279	95
NAFTA	5.000	5.359	359	-426	-137	-1.040	-347	2.309	2.018	290
United States	4.342	4.550	208	-381	-131	-909	-307	1.935	1.745	190
Canada	398	456	58	-18	2	-99	-28	200	125	75
Mexico	260	353	93	-27	-8	-33	-11	173	148	25
Others	1.997	2.399	402	-74	-66	-585	-197	1.324	1.012	312
Brazil	175	274	99	14	4	-7	-3	90	71	19
Turkey	139	242	102	36	7	-34	-6	99	83	16
Russian Federation	1.412	1.515	103	-101	-63	-527	-166	961	720	241
Australia	271	369	98	-24	-14	-16	-21	174	138	36
Rest of the world	3.377	4.982	1.605	156	122	-1.018	468	1.877	1.382	495
World	18.946	25.598	6.651	-0.01	619	-5.774	24	11.783		

GVC - global value chain, NAFTA - North American Free Trade Agreement.

Notes: Emission in megatons (Mt). Share is in percentage of world total. Growth is the percentage change between 1995 and 2008. Europe Advanced 15 comprises Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom. Europe Emerging 12 comprises Bulgaria, Cyprus, Czechoslovakia, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, and Slovenia. Detailed results for European countries are shown in Appendix Table A.3.

Source: Authors' computations based on World Input-Output Database, release November 2013; and the World Input-Output Tables in previous years' prices, release December 2014.

Table A.3: Global Value Chains Carbon Dioxide Emissions Accounting for European Countries

Location of Production	Total Emissions 1995 2008		Change in Emissions 2008 Minus 1995	Change in Emissions Accounted for by Changes in:						
				Trade		Technology	Consumption			
				Location of Intermediate Stages	Location of Final Assembly	GVC Emissions	Consumption Preferences	Consumption Global Levels	o/w domestic	o/w foreign
Austria	44	54	10	4	2	-9	-1	15	6	9
Belgium	101	96	-4	-20	-2	-16	-2	36	11	25
Bulgaria	57	49	-8	-8	-3	-29	6	26	15	11
Cyprus	4	7	3	0	0	-1	1	3	3	1
Czech Republic	107	101	-5	-10	8	-42	0	39	23	16
Germany	725	690	-34	-24	-1	-173	2	162	60	102
Denmark	64	100	36	24	0	-15	-2	29	9	20
Spain	203	261	58	-17	-3	-44	2	119	93	26
Estonia	17	16	-1	-1	9	-8	-14	13	10	3
Finland	53	57	3	-5	-1	-17	1	25	14	11
France	284	273	-11	-58	11	-52	-14	101	61	40
United Kingdom	451	449	-2	-69	-42	-93	2	201	141	60
Greece	75	93	18	-6	-21	-19	21	43	40	3
Hungary	48	46	-2	-2	1	-16	-6	20	13	7
Ireland	26	32	6	-5	1	-11	2	19	14	5
Italy	360	378	18	-3	-17	-50	-10	98	52	45
Lithuania	13	13	0	0	0	-8	-1	9	6	3
Luxembourg	6	3	-3	-4	0	-1	0	2	1	1
Latvia	9	8	-1	0	0	-6	-1	6	4	1
Malta	2	2	0	0	0	0	0	1	1	0
Netherlands	154	169	15	-7	-3	-26	-7	58	25	34
Poland	314	290	-24	-37	22	-163	-17	171	139	32
Portugal	46	53	7	-2	-2	-11	2	20	14	6
Romania	120	90	-30	-25	-3	-60	-5	62	50	12
Slovakia	40	37	-3	-7	5	-20	0	19	11	8
Slovenia	11	15	4	0	0	-2	-1	6	4	2
Sweden	47	49	3	-7	-2	-8	0	19	8	10

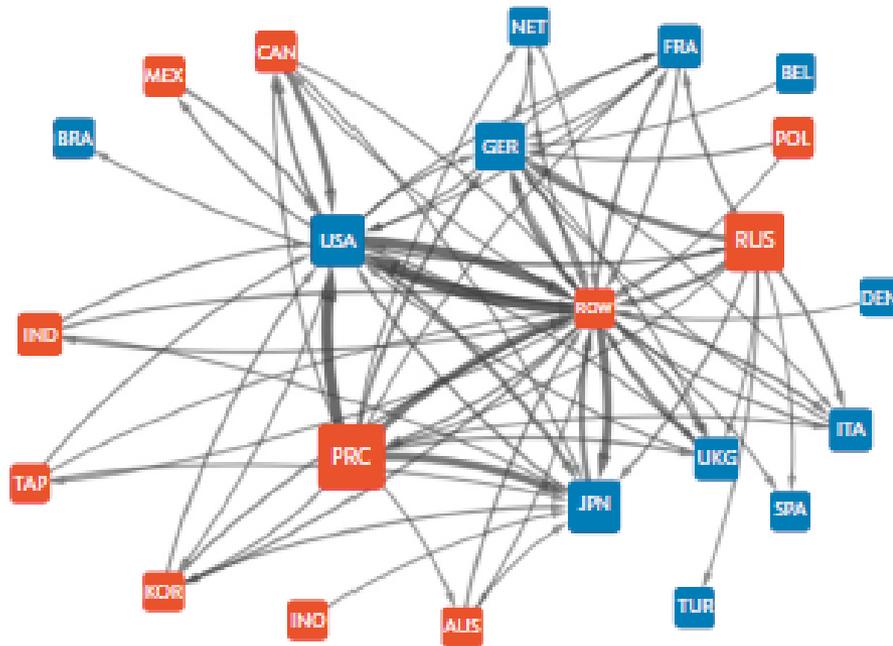
GVC = global value chain.

Notes: Emission in megatons (Mt). Share is in percentage of world total. Growth is the percentage change between 1995 and 2008.

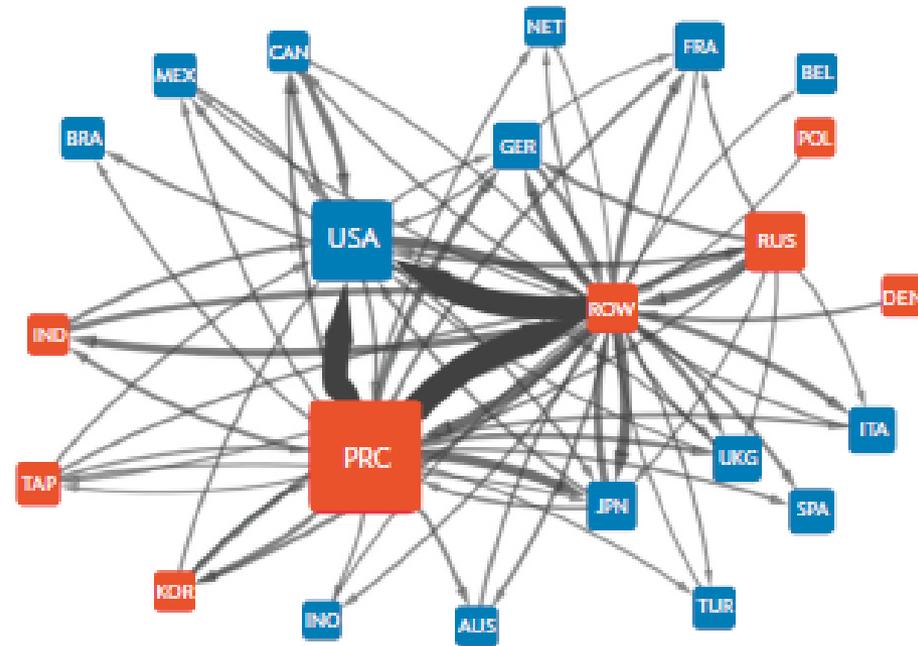
Source: Authors' computations based on World Input-Output Database, release November 2013.

Figure 2: Carbon Dioxide International Net Transfers

1995



2008



AUS = Australia, AUT= Austria, BEL =Belgium, BGR = Bulgaria, BRA = Brazil, CAN = Canada, PRC = People's Republic of China, CYP = Cyprus, CZE = Czechoslovakia, DEN = Denmark, EST = Estonia, FIN = Finland, FRA = France, GER = Germany, GRC = Greece, HUN = Hungary, IND = India, INO = Indonesia, IRE = Ireland, ITA = Italy, JPN = Japan, KOR = Republic of Korea, LTU = Lithuania, LUX = Luxembourg, LVA = Latvia, MEX = Mexico, MLT = Malta, NET = Netherlands, POL = Poland, POR = Portugal, ROM = Romania, ROW = rest of the world, RUS = Russian Federation, SPA = Spain, SVK =Slovakia, SVN= Slovenia, SWE = Sweden, TAP = Taipei,China, TUR = Turkey, UKG = United Kingdom, USA = United States of America.

Notes: Shown are the top 5% of bilateral emissions flows in 1995 and 2008. The size of the nodes relates to the size of economies' total emissions trade balances. Net exporters (net producers) of emissions are shown in red and net importers (net consumers) in blue. The arrows indicate the direction of bilateral emissions flows and their width indicates the relative intensity.

Source: Authors' elaboration based on World Input-Output Database, release November 2013.

Policy Implications

- Wider collective action needed?
 - Global standards?
 - But how?
 - WTO and carbon tariffs?
- Innovations: more complex with the value chains?
- Demand pressure needed?



Note: 2, 3 and 4 represent intermediate products which are combined into 1 (i.e. the final product); 4 as an intermediate product itself is composed of inputs 5, 6 and 7.

Source: OECD (2012a). *Map source:* ARTICQUE© – all rights reserved.

Motivation for the Change

- Elasticity of substitution
- Push factors
- Pull factors

Stability of the Attitude to Climate Change Policies

- Any relevant and solution requires
 - Systematic approach
 - Ability to commit to a stable long run policy
 - Ability to avoid too extreme distortions caused by rent-seeking
 - Overhaul of public preferences
- Commitment issues
 - (European) governments and relatively frequent elections
 - Lobbying
 - Pressure of “more urgent” needs
- Diversity/focus (economies of scale)
- Efficiency considerations

References

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