

# Climate Change: GVCs

Vilém Semerák

IES FSV UK  
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## Outline

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

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## GVCs and Climate Change

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### 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

Source: Miroudot, S., Global Forum on Trade Statistics, 2-4 April 2011

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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: ARTICQUEEC – all rights reserved.

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### GVC Accounting: MRIOs

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

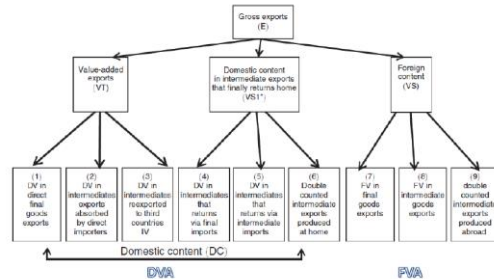
Source: Timmer et al. (2014)

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- 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

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Figure 4. Decomposition of Gross Exports



Source: Koopman et al (2014).

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### Changes in CO<sub>2</sub> Emissions

- Technology
- Trade
- Consumption

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### 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)

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Table 4: Global Value Chains Carbon Dioxide Emissions Accounting

Location of Production	Total Emissions		Change in Emissions 2008-1995	Change in emissions accounted for by changes in:				Consumption				
	1995	2008		Trade		Technology		Consumption		Global		
	1995	2008		Intermediate	Location of Final Assembly	GVC Emissions	Consumption Preferences	Levels	Consumption	Consumption Levels	n/w domestic	n/w foreign
<b>Asia</b>	5,311	14,423	4,215	631	759	-2,220	12	4,544	4,220	113		
People's Republic of China	2,723	5,523	3,200	350	675	-1,706	89	3,594	3,296	398		
Republic of Korea	222	522	300	19	19	-20	3	399	320	79		
Taipei, China	198	389	191	37	5	-37	23	104	42	62		
India	721	1,352	644	14	36	-226	44	779	704	75		
Indonesia	173	304	131	26	20	-16	0.0	100	65	35		
Japan	1,024	1,020	-3	-14	-13	-136	-17	138	74	64		
<b>Europe</b>	3,381	1,451	-1,930	-287	-40	-869	-41	1,839	628	1,212		
Europe (excl. UK)	2,838	2,320	-518	-299	-29	-566	-42	1,546	549	997		
of which, Germany	725	650	-74	-24	-1	-173	2	62	60	2		
Europe Emerging 12	742	676	-66	-87	39	-883	-40	378	299	79		
<b>NAFTA</b>	5,000	3,839	-1,161	-426	-137	-1,040	-347	2,309	2,098	290		
United States	4,940	4,050	-890	-388	-139	-1,009	-307	1,936	1,745	190		
Canada	368	665	297	18	2	-99	-18	520	353	167		
Mexico	260	353	93	-27	-6	-83	-11	173	148	25		
<b>Others</b>	1,939	2,399	462	-74	-66	-183	-787	1,324	1,022	302		
Brazil	175	274	99	14	4	-7	-3	90	71	19		
Turkey	139	242	102	36	7	-34	-6	99	83	16		
Russian Federation	1,422	1,575	153	-101	-63	-527	-166	967	720	247		
Australia	271	959	688	-24	-14	-36	-31	174	188	86		
Rest of the world	3,377	4,982	1,605	166	122	-1,018	468	1,877	1,382	495		
<b>World</b>	18,046	25,058	6,851	200	659	-3,774	24	11,951				

Source: Ferrarini & de Vries (2015)

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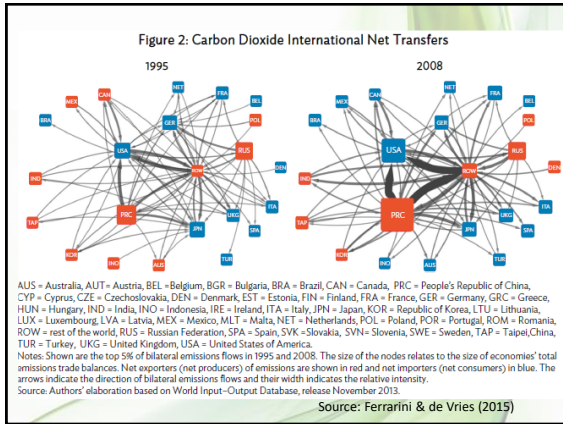
Table A.3: Global Value Chains Carbon Dioxide Emissions Accounting for European Countries

Location of Production	Total Emissions		Change in Emissions 2008-1995	Change in Emissions Accounted for by Changes in:				Consumption			
	1995	2008		Trade		Technology		Consumption		Global	
	1995	2008		Intermediate	Location of Final Assembly	GVC Emissions	Consumption Preferences	Levels	Consumption	Consumption Levels	n/w domestic
Austria	44	54	10	0	4	-2	-9	-1	15	5	9
Belgium	101	96	-4	-20	-2	-16	-2	-2	36	11	25
Bulgaria	57	49	-8	-8	-8	-1	-4	2	26	25	11
Cyprus	4	7	3	0	0	-1	1	3	3	1	
Czech Republic	107	107	0	-5	-107	8	-11	37	23	16	
Denmark	725	690	-34	-24	-1	-179	2	162	60	102	
Spain	64	100	36	24	0	-15	-2	29	9	20	
Sweden	203	261	58	-17	-3	-44	2	119	93	26	
Estonia	17	16	-1	-1	1	9	-8	-14	13	10	3
Finland	183	87	-96	3	-6	-1	-137	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	-1	1	19	14	5	
Italy	360	378	18	-3	-17	-50	-10	98	52	46	
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	189	35	-7	-3	-26	-7	88	25	34	
Poland	314	290	-24	-17	22	-163	-17	171	139	32	
Portugal	46	83	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	
Switzerland	47	49	3	-7	-2	-8	0	19	8	10	

GVC = global value chain; Home 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 2015.

Source: Ferrarini & de Vries (2015)

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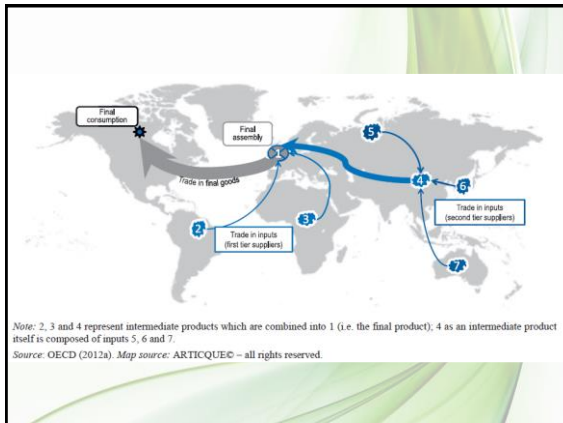


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## Policy Implications

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

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## Motivation for the Change

- Elasticity of substitution
- Push factors
- Pull factors

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## 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

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## References

- Baldwin: Global supply chains: why they emerged, why they matter, and where they are going. In Elms & Low (eds.): Global value chains in a changing world. 2013
- De Backer & Miroudot (2014): Mapping global value chains.
- Ferrarini & de Vries (2015): What Accounts for the Growth of Carbon Dioxide Emissions in Advanced and Emerging Economies? The Role of Consumption, Technology, and Global Supply Chain Trade. ADB Economics Working Paper Series. No. 458, October 2015
- OECD (2013), *Interconnected Economies: Benefiting from Global Value Chains*, OECD Publishing.

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