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Steps towards a global hybrid database

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Presentation to the 6th ISIE conference

Berkeley, 2011.06.07-10.

Bo Weidema

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Content

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- What is a hybrid database?
- Tiered and embedded hybrid analysis
- The ecoinvent “IO repository”
- Imports, exports and final consumption as activity datasets
- Classification of activities and products
- Parallel use of monetary and physical units
- Physical resource inputs and emissions
- Integration of satellite tables (valuation, waste, final use, capital formation and use) in the core supply-use table
- From repository to hybrid database

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Hybrid databases

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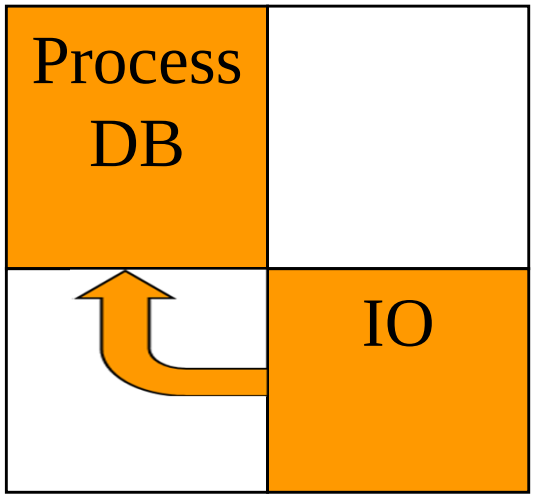
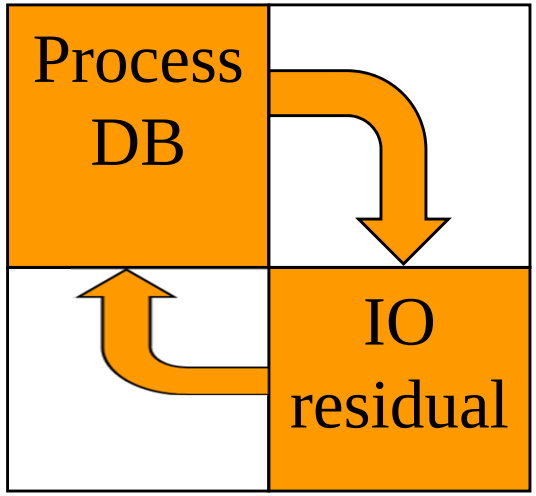
- Combining the detail of process-based data with the completeness of the make-use (IO) framework



tiered approach



embedded approach

- Make-Use convention: Columns = activities; Rows = products

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The ecoinvent “IO repository”

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- Repository: A place to store
- IO repository: A place to store Make-Use (IO) data
- One column in a Make-Use table = one activity dataset
- Each row = one exchange (input or output)
- Same format as process-based datasets: ecoSpold2
- Special activity types: IO and residual

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Imports, final consumption and exports

- Besides the core technology matrix (producing industries):
  - Imports
  - Final consumption
  - Exports
- Again: Each column =

  One activity dataset

Balanced MSUT	Activities	Import	Final use	Export	Valation	Total
Products	**V'**	**N**			Valuation	**q**
Total	**g**					
Products	**U**		**y**	**E**		**q**
Primary production factors	Labour costs					
	Net taxes					
	Net operating costs					
	Rent					
Total	**g**					

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Classification of activities and products

- Activities: UN ISIC Rev. 4
- Products: UN CPC Ver. 2
- More parallel classifications as well:
  - Original local classifications (e.g. NAICS)
  - Other classifications (e.g. GPC)
  - User-defined tags

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Parallel use of monetary and physical units

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- Make-Use tables can only handle one unit per exchange (input or output): Monetary and physical tables stored separately
- ecoSpold 2 - and therefore the IO repository - can handle unlimited number of properties of each exchange, e.g.:
  - Monetary
  - Mass (wet, dry)
  - Composition (Cadmium content, Carbon content, etc.)
  - Lifetime

  all stored in the same activity dataset
- Thus, from the same activity datasets, many different matrices can be produced, both monetary and physical

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Physical resource inputs and emissions

Balanced MSUT	Activities	Import	Final use	Export	Valation	Total
Products	V'	N			Valuation	q
Total	g					
Products	U		y	E		q
Primary production factors	Labour costs					
	Net taxes					
	Net operating costs					
	Rent					
Total	g					

Balanced PSUT	Activities	Import	Final use	Export	Total
Products	V'	N			q
Total	g				
Products	U		y	E	q
Net additions to stocks	$-\Delta S$				
Supply of wastes	$-W_V$				
Use of wastes	W_U				
Resources	R				
Emissions	-B				
Total	g				

From resource statistics

Factor-based emissions

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Integration of satellite tables

- The valuation table: Translating from V’ in basic prices to U in purchaser’s prices

Balanced MSUT	Activities	Import	Final use	Export	Valation	Total
Products	**V'**	**N**			Valuation	**q**
Total	**g**					
Products	**U**		**y**	**E**		**q**
Primary production factors	Labour costs					
	Net taxes					
	Net operating costs					
	Rent					
Total	**g**					

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Integration of satellite tables

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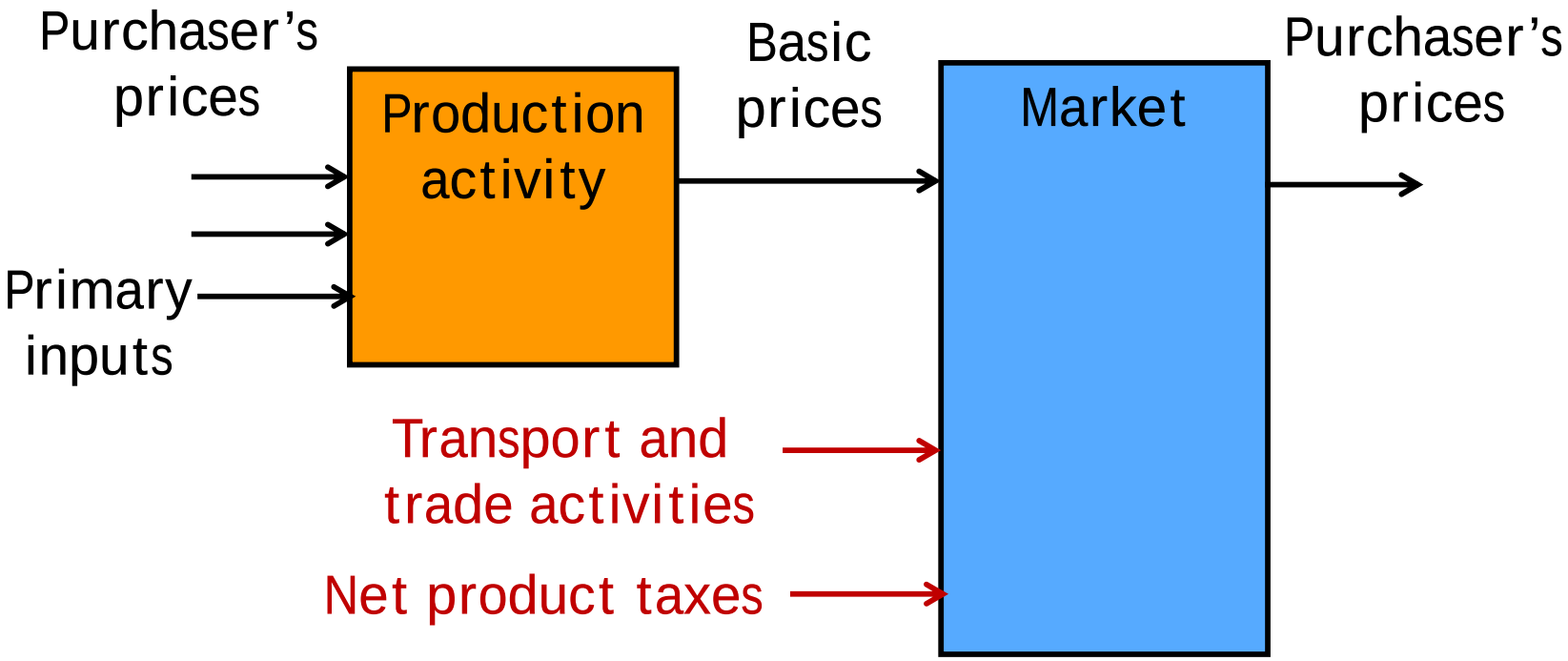
- The valuation table: Translating from V' in basic prices to U in purchaser's prices



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Integration of satellite tables

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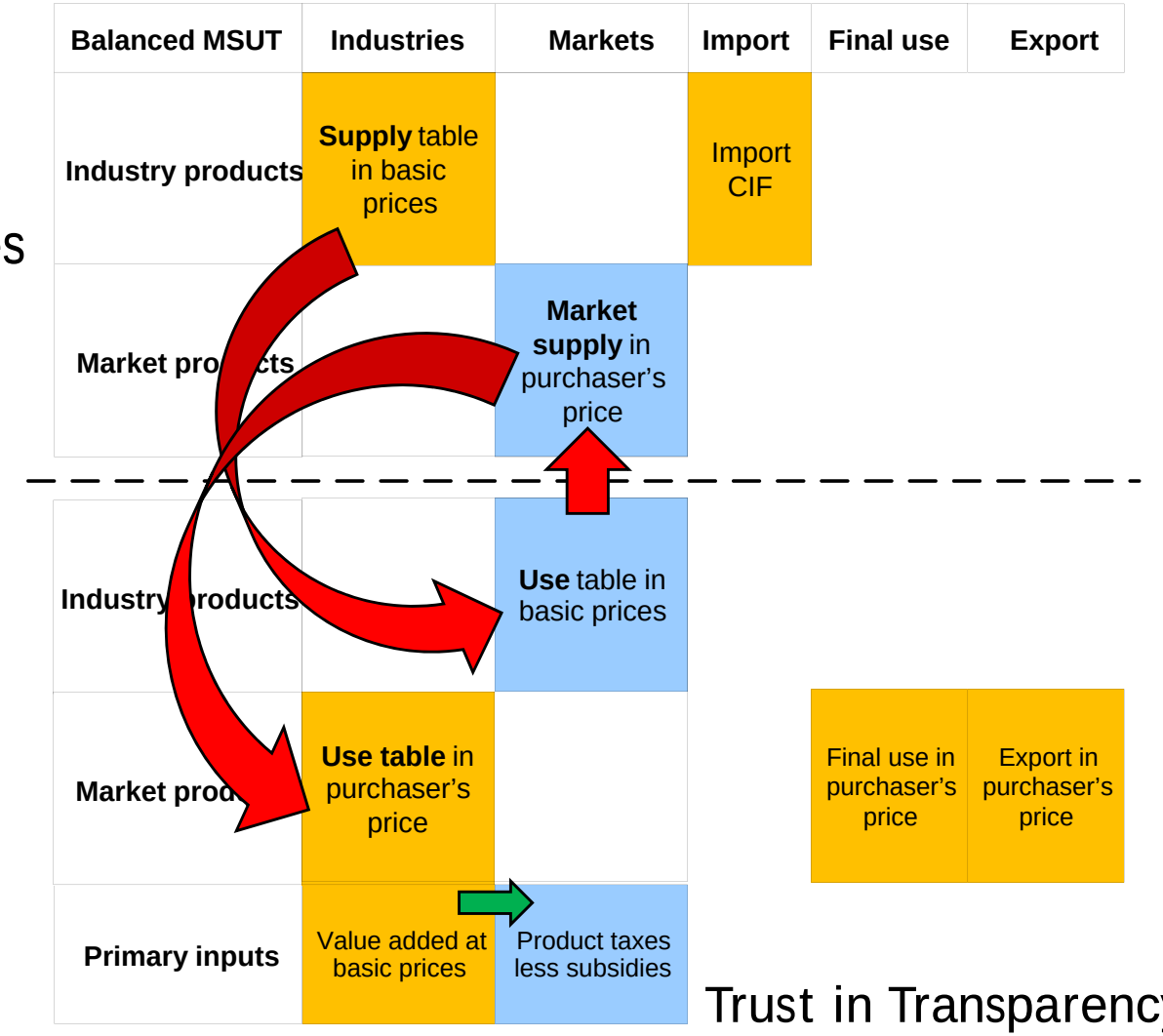
- The valuation table: Replaced by market activities translating from V' in basic prices to U in purchaser's prices



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Integration of waste satellite tables

Balanced MSUT	Activities	Import	Final use	Export	Valation	Total
Products	V'	N			Valuation	q
Total	g					
Products	U		y	E		q
Primary production factors	Labour costs					
	Net taxes					
	Net operating costs					
	Rent					
Total	g					

Balanced PSUT	Activities	Import	Final use	Export	Total
Products	V'	N			q
Total	g				
Products	U		y	E	q
Net additions to stocks	-ΔS				
Supply of wastes	$-W_V$				
Use of wastes	W_U				
Resources	R				
Emissions	-B				
Total	g				

← Additions to stock

← Supply and use of materials for treatment (wastes and materials for recycling)

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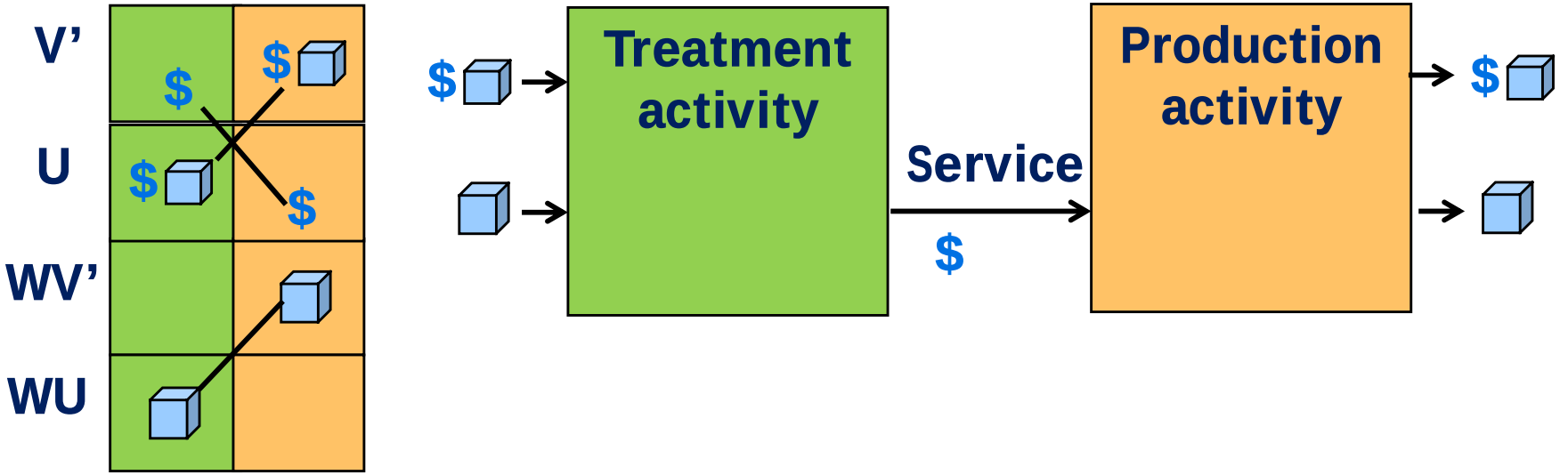
Integration of waste satellite tables



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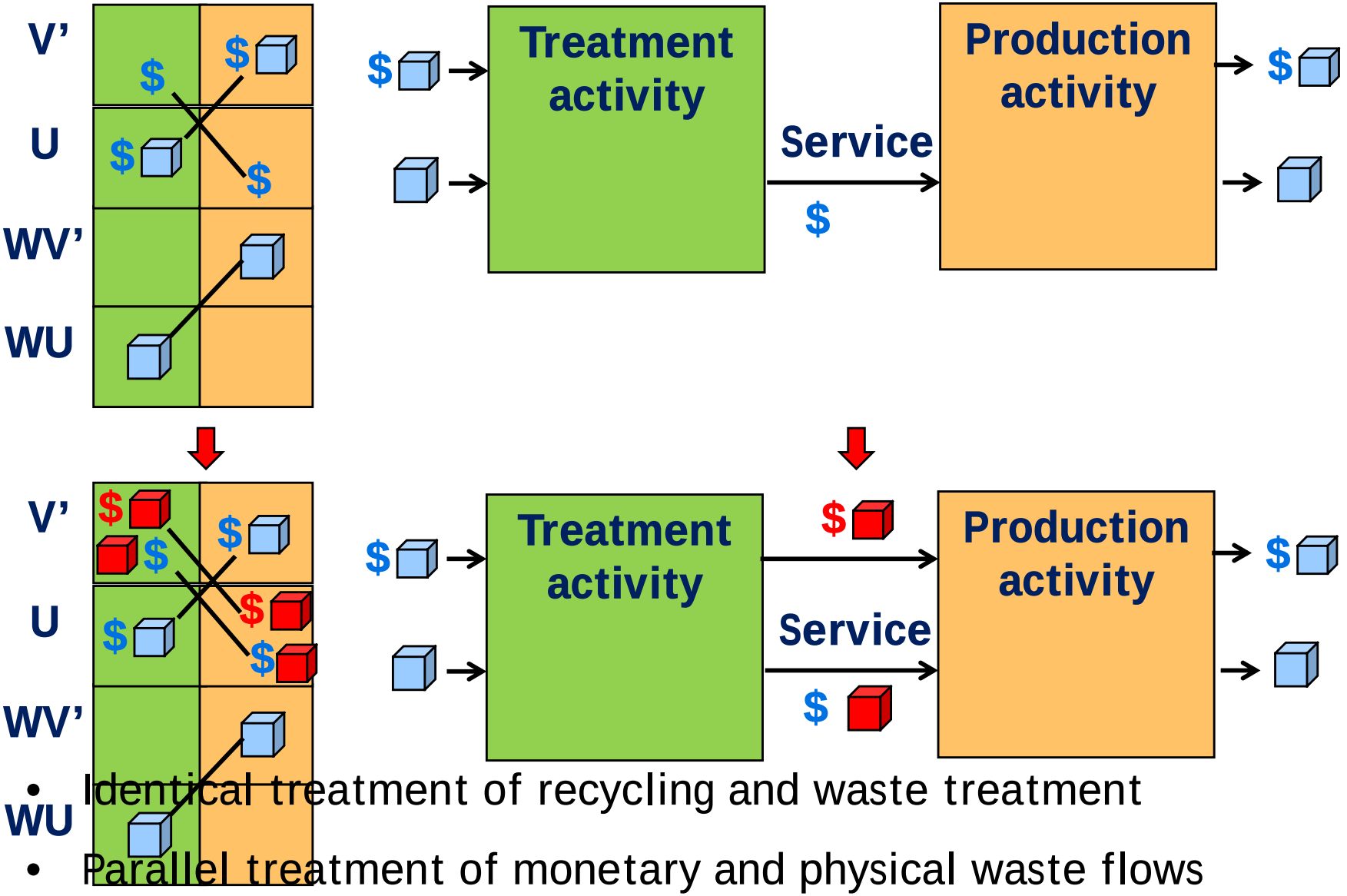
Integration of waste satellite tables



- Identical treatment of recycling and waste treatment
- Parallel treatment of monetary and physical waste flows

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Integration of satellite tables

- Additions to stock = linking to future waste treatment
- Capital formation and use integrated in the core make-use table through the use of an investment matrix

From repository to hybrid database

Balanced MSUT	Activities (a_U)	Products (c_U)	Export	Total
Activities (a_S)		V		g'
Products (c_S)	U		E	q
Import		N_V'		
Primary inputs	Labour and profit			
Total	g	q'		

IO

Add industry-internal processes

Subtract

Process-DB

Scale-up to IO-geography

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Balanced MSUT	Activities (a_U)	Products (c_U)	Export	Total
Activities (a_S)		V'		g'
Products (c_S)	U		E	q
Import		N_V'		
Primary inputs	Labour and profit			
Total	g	q'		

Hybrid DB: Scaled-up processes & residuals

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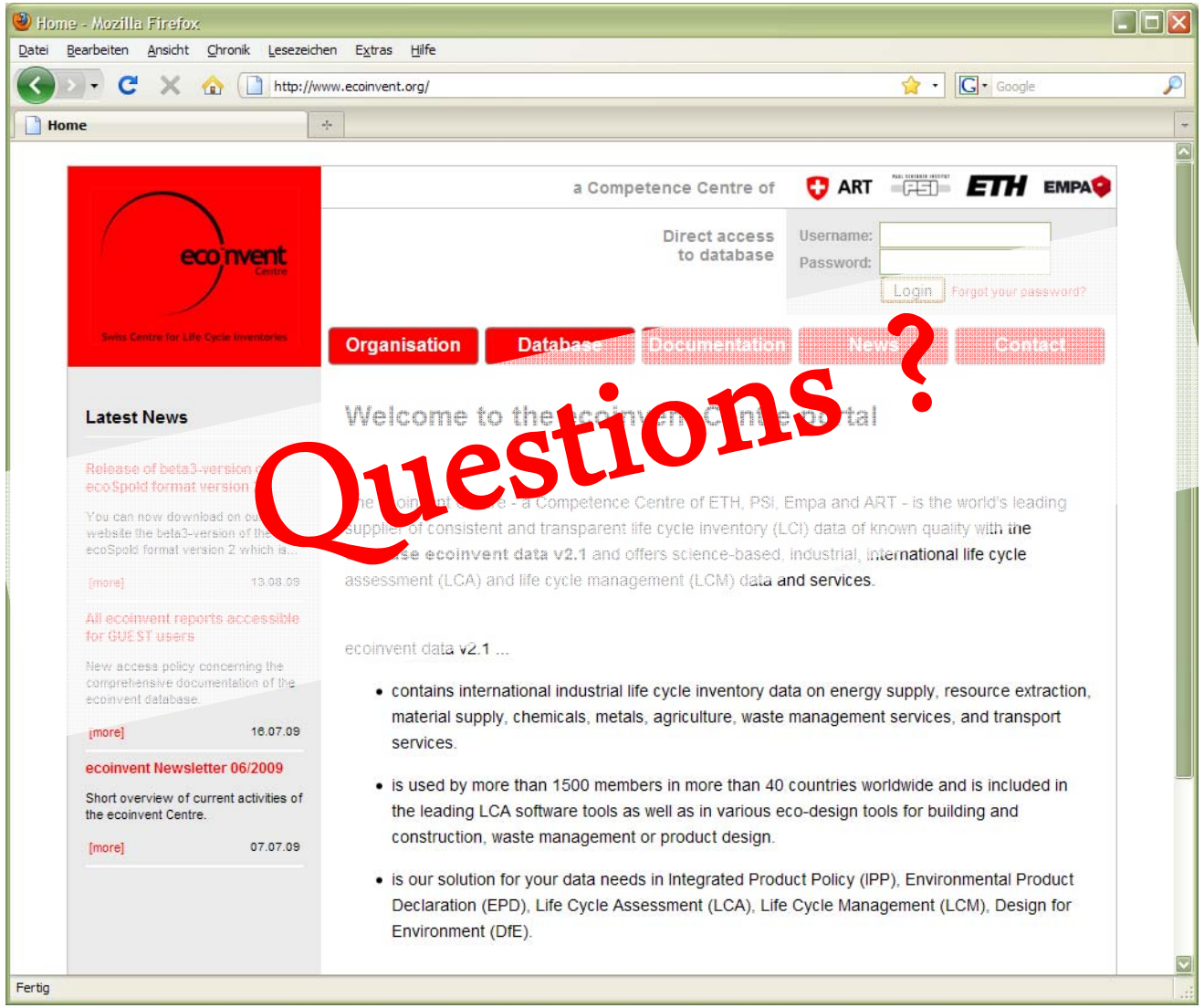

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