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The R package Decompr

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Motivation for the package

1. GVCs are important:
 - “[O]ne of the most important factors shaping contemporary international trade [is] **the rise of global value chains.**”
Pascal Lamy, September 2012
 - World Economic Forum (2013): Reductions of GVC trade barriers could raise global GDP by 5% and international trade by 15%.
 - UNCTAD (2013): Economies with the fastest growing GVC participation have GDP per capita growth rates around two percentage points above the average.

Motivation for the package

2. Working with GVC data is non-trivial:

$$i2e_k^i = \left[\sum_l \sum_j vax_{lk}^{ji} \right] x \frac{1}{\mathbf{exports}_k}$$

$$\mathbf{V} (\mathbf{I} - \mathbf{A})^{-1} \mathbf{E} = \begin{pmatrix} v_k^i & 0 & 0 & 0 \\ 0 & v_k^j & 0 & 0 \\ 0 & 0 & v_l^i & 0 \\ 0 & 0 & 0 & v_l^j \end{pmatrix} \begin{pmatrix} b_{kk}^{ii} & b_{kk}^{ij} & b_{kl}^{ii} & b_{kl}^{ij} \\ b_{kk}^{ji} & b_{kk}^{jj} & b_{kl}^{ji} & b_{kl}^{jj} \\ b_{lk}^{ii} & b_{lk}^{ij} & b_{ll}^{ii} & b_{ll}^{ij} \\ b_{lk}^{ji} & b_{lk}^{jj} & b_{ll}^{ji} & b_{ll}^{jj} \end{pmatrix} \begin{pmatrix} e_k^i & 0 & 0 & 0 \\ 0 & e_k^j & 0 & 0 \\ 0 & 0 & e_l^i & 0 \\ 0 & 0 & 0 & e_l^j \end{pmatrix} =$$

$$\begin{pmatrix} v_k^i b_{kk}^{ii} e_k^i & v_k^i b_{kk}^{ij} e_k^j & v_k^i b_{kl}^{ii} e_l^i & v_k^i b_{kl}^{ij} e_l^j \\ v_k^j b_{kk}^{ji} e_k^i & v_k^j b_{kk}^{jj} e_k^j & v_k^j b_{kl}^{ji} e_l^i & v_k^j b_{kl}^{jj} e_l^j \\ v_l^i b_{lk}^{ii} e_k^i & v_l^i b_{lk}^{ij} e_k^j & v_l^i b_{ll}^{ii} e_l^i & v_l^i b_{ll}^{ij} e_l^j \\ v_l^j b_{lk}^{ji} e_k^i & v_l^j b_{lk}^{jj} e_k^j & v_l^j b_{ll}^{ji} e_l^i & v_l^j b_{ll}^{jj} e_l^j \end{pmatrix} = \begin{pmatrix} vax_{kk}^{ii} & vax_{kk}^{ij} & vax_{kl}^{ii} & vax_{kl}^{ij} \\ vax_{kk}^{ji} & vax_{kk}^{jj} & vax_{kl}^{ji} & vax_{kl}^{jj} \\ vax_{lk}^{ii} & vax_{lk}^{ij} & vax_{ll}^{ii} & vax_{ll}^{ij} \\ vax_{lk}^{ji} & vax_{lk}^{jj} & vax_{ll}^{ji} & vax_{ll}^{jj} \end{pmatrix}, \quad (1)$$

with $v_c^s = va_c^s / y_c^s = 1 - \sum_d a_{kc}^{ds} - \sum_d a_{lc}^{ds} \quad (c \in k, l \quad s \in i, k),$

$$\begin{pmatrix} b_{kk}^{ii} & b_{kk}^{ij} & b_{kl}^{ii} & b_{kl}^{ij} \\ b_{kk}^{ji} & b_{kk}^{jj} & b_{kl}^{ji} & b_{kl}^{jj} \\ b_{lk}^{ii} & b_{lk}^{ij} & b_{ll}^{ii} & b_{ll}^{ij} \\ b_{lk}^{ji} & b_{lk}^{jj} & b_{ll}^{ji} & b_{ll}^{jj} \end{pmatrix} = \begin{pmatrix} 1 - a_{kk}^{ii} & -a_{kk}^{ij} & -a_{kl}^{ii} & -a_{kl}^{ij} \\ -a_{kk}^{ji} & 1 - a_{kk}^{jj} & -a_{kl}^{ji} & -a_{kl}^{jj} \\ -a_{lk}^{ii} & -a_{lk}^{ij} & 1 - a_{ll}^{ii} & -a_{ll}^{ij} \\ -a_{lk}^{ji} & -a_{lk}^{jj} & -a_{ll}^{ji} & 1 - a_{ll}^{jj} \end{pmatrix}^{-1},$$

and $a_{cb}^{su} = \text{inp}_{cb}^{su} / y_b^u \quad (c, b \in k, l \quad s, u \in i, k)$

Aim of the package

- Simplify working with GVC data
 - to allow non-specialists to look into GVCs.
 - to spread the use of GVC data.
- Introduce researchers to novel GVC indicators
- Introduce researchers to R

How the package works

- Input: Inter-Country Input-Output tables

		Intermediate trade				Final goods trade		
		A		B		A	B	Total
		i	j	i	j	Final Demand	Final Demand	
A	i	1	1	1	1	2	2	8
	j	1	1	1	1	2	2	8
B	i	1	1	1	1	2	2	8
	j	1	1	1	1	2	2	8
	Total	4	4	4	4			
	VA	4	4	4	4			
	Output	8	8	8	8			

How the package works

- Output:
 - Foreign value added in exports along four dimensions:
using country, using industry, source country, source industry
- 16+ GVC indicators:
 - Foreign value added in final goods exports
 - Foreign value added in intermediate goods exports
 - Domestic value added absorbed abroad
 - ...

Some results

- Global Value Chains are expanding in length and volume
- Service sectors are strongly linked to international trade through indirect exports
- Chinese Taipei has moved up the value chain

China is moving up but still in an upstream position

India is lagging behind but has started to move up

Documentation

- qua.st/decompr
- r-project.org
- cran.r-project.org/package=decompr