How to measure trade in value-added and GVCs: a toolkit for researchers

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Overview

Overview of the tools

1. `icio`

   A flexible Stata program.

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2. GVC data on World Bank WITS

   Data and visualizations on GVC participation in trade and output.

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1. `icio`
   A flexible Stata program.
2. GVC data on World Bank WITS
   Data and visualizations on GVC participation in trade and output.
3. World Bank World Development Report Database
   Value-added trade breakdown.

icio

`icio` in Stata: the setup

Belotti, Borin, Mancini, 2021, `icio`: Economic Analysis with Inter-Country Input-Output Tables in Stata, forthcoming *Stata Journal*.
World Bank Working Paper version

Info and news: tradeconomics.com/icio/.

- `ssc install icio`

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- `ssc install icio`

- `help icio`

Loading ICIO tables

- See the available ICIO databases:

```
. icio_load, info
```

table	version	from	to
wiodn	2016	2000	2014
tivan	2018	2005	2015
eora	199.82	1990	2015
adb	2021	2000	2019
wiodo	2013	1995	2011
tivao	2016	1995	2011

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- Load an Input-Output table: WIOD, TiVA, EORA ready to use

  `icio_load, iciot(adb) year(2019)`

- Info on countries and sectors covered by the selected database:

  `icio, info`

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```
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```

- Info on countries and sectors covered by the selected database:

```
icio, info
```

- User-provided tables might be used:

```
icio_load, iciot(user, userp("D:\data\euregio")
tablen(euregio2010) countrylist(list.csv))
```

ICIO tables

World Input-Output Database (2016 version)

- 43 countries + ROW
- 56 sectors
- Time series: 2000-2014
- Based on official statistics

OECD Trade in Value-Added (2018 version)

- 64 countries + ROW
- 36 sectors
- Time series: 2005-2015
- Incorporation of firm heterogeneity: processing trade correction for China and Mexico.

ICIO tables

EORA (199.82 version)

- 189 countries
- 26 sectors
- Time series: 1990-2015
- Pros and cons of having 189 countries.

ADB-MRIO (2021 version)

- 62 countries + ROW
- 35 sectors
- Time series: 2000 and 2007-2019
- Augmented versio of WIOD.

ICIO tables (not in `icio`)

EU-REGIO

- EU NUTS2 regions + WIOD countries (2013 version)
- 14 sectors
- Time series: 2000-2010
- Regional level, but not updated.

FIGARO

- EU + UK + US + other OECD TiVA countries
- 21 sectors, 17 for other OECD TiVA countries
- Time series: 2010-2019
- Official EU ICIO. Will be updated on regular basis.

`icio`'s features

1. Supply-demand linkages
2. Value-added in trade flows
3. GVC-related exports
4. User-provided tables and advanced coding

icio's features

1. **Supply-demand linkages**
2. Value-added in trade flows
3. GVC-related exports
4. User-provided tables and advanced coding

Supply-demand linkages

Exploit ICIO tables to uncover supply-demand linkages between countries and sectors, regardless of trade routes.

- Value-added by country/sector of origin
- Final demand by country/sector of destination
- Value-added by country/sector of origin and country/sector of destination

Supply-demand linkages: implementation

1. Value-added:
   `icio, origin(`*`country-code[,sector-code]`*`)`
2. Final demand:
   `icio, destination(`*`country-code[,sector-code]`*`)`
3. Value-Added by origin-destination
   `icio, origin(`*`country-code[,sector-code]`*`)`
   `destination(`*`country-code[,sector-code]`*`)`

```
. icio_load
Loading table wiod 2014...  loaded

. *What is the value-added originated in Germany and absorbed in China?
.   icio, origin(deu) destination(chn)

Value-Added by origin/destination:
Origin: DEU
Destination: CHN
Output: Value-Added
```

	Millions of $	% of total
Value-Added	101042.25	*100.00*

```
. *What is the Germany´s GDP?
.   icio, origin(deu)

Value-Added by origin/destination:
Origin: DEU
Output: Value-Added
```

	Millions of $	% of total
Value-Added	3620310.26	*100.00*

Supply-demand linkages: other examples

- *What is the GDP (value-added) produced by each country?*
  `icio, origin(all)`
- *How much value-added does each country produces in a given sector?*
  `icio, origin(all,19)`
- *What is the aggregate final demand of each country?*
  `icio, destination(all)`
- *Where the value-added produced in the Italian sector 19 is absorbed?*
  `icio, origin(ita,19) destination(all)`
- *Which final demand sectors in China are the most important for the absorption of US-made value-added?*
  `icio, origin(usa) destination(chn,all)`
- *Where the GDP produced in each country is absorbed? Save the output as supplydemand.xls in the current working directory?*
  `icio, origin(all) destination(all) save(supplydemand.xls)`
- *How much USMCA (former NAFTA) countries' final demand in sector 20 is satisfied by Chinese productions?*
  `icio, origin(chn) destination(usmca,20) groups(usa, mex, can, "usmca")`

`icio`'s features

1. Supply-demand linkages
2. **Value-added in trade flows**
3. GVC-related exports
4. User-provided tables and advanced coding

Tracing value-added in trade flows

In many empirical applications, supply-demand linkages are not enough: need to trace Value-Added in trade flows.

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Start from the aggregate exports of country s:

$$\mathbf{u}_N \mathbf{E}_{s*} = \underbrace{\mathbf{V}_s \mathbf{B}_{ss} \mathbf{E}_{s*}}_{\substack{\text{domestic} \\ \text{content } (\mathbf{DC}_s)}} + \underbrace{\sum_{t \neq s}^{G} \mathbf{V}_t \mathbf{B}_{ts} \mathbf{E}_{s*}}_{\substack{\text{foreign} \\ \text{content } (\mathbf{FC}_s)}} .$$

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Main problem: some intermediate goods cross country s border several times, i.e. they are double counted in exports (Koopman et al., 2014).

Different perspectives for different questions

Insights to select the most suited perspective:

- Need a breakdown of the aggregate exports of a country?
- Need a breakdown of some disaggregate flow, consistent with the aggregate exports of a country?
- Need to retrieve the entire VA of a country/sector in a given disaggregate trade flow?

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  The default (additive) exporting country perspective.
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  The default (additive) exporting country perspective.
- Need to retrieve the entire VA of a country/sector in a given disaggregate trade flow?
  Perspective in line with the selected trade flow.

Different perspectives for different questions

Cotton exports, re-imported as fabric, re-exported as apparel.

Cotton found twice in country's aggregate exports, once in GDP.

Two possible goals:

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Two possible goals:

- **Allocate value-added across the two export flows**, and obtain aggregate GDP: set country's exports as perimeter, found cotton once as value-added (cotton exports), once as double-counting (apparel exports). `exporter` perspective.

Different perspectives for different questions

Cotton exports, re-imported as fabric, re-exported as apparel.
Cotton found twice in country's aggregate exports, once in GDP.
Two possible goals:

- **Allocate value-added across the two export flows**, and obtain aggregate GDP: set country's exports as perimeter, found cotton once as value-added (cotton exports), once as double-counting (apparel exports). `exporter` perspective.
- **Assess value-added exposed to a tariff on apparel**: set exports of apparel as perimeter, cotton will be accounted as value-added exposed to shock. `sectbil` perspective.

Different perspectives for different questions

In `icio`, double counting defined when items cross twice:

Different perspectives for different questions

In `icio`, double counting defined when items cross twice:

- Exporting country border: `exporter`, the default.
- Exporter-importer border: `bilateral`.
- Exporting country/sector-importer border: `sectbil`.
- Exporting country/sector border: `sectexp`.
- Importing country border: `importer`.
- Importing country/sector border: `sectimp`.
- A generic border (FVA/FDC only): `world`.

Accounting for VA in trade: implementation

Depending on the empirical application, the user should select:

1. The desired trade flow with the options `exporter(`*`country-code[,sector-code]`*`)` and/or `importer(`*`country-code[,sector-code]`*`)`

Accounting for VA in trade: implementation

Depending on the empirical application, the user should select:

1. The desired trade flow with the options `exporter(`*`country-code[,sector-code]`*`)` and/or `importer(`*`country-code[,sector-code]`*`)`
2. The best suited accounting `perspective()`, and `approach()` if needed.

Accounting for VA in trade: implementation

Depending on the empirical application, the user should select:

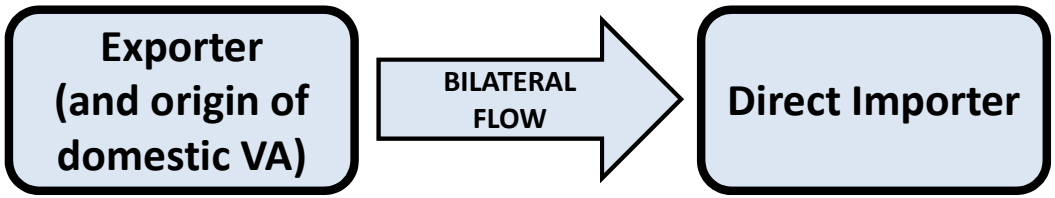
1. The desired trade flow with the options `exporter(`*`country-code[,sector-code]`*`)` and/or `importer(`*`country-code[,sector-code]`*`)`
2. The best suited accounting `perspective()`, and `approach()` if needed.
3. The appropriate `return()` measure and the other options:
   - Return for exports: `detailed`, `gtrade`, `dc`, `fc`, `va`, `dva`, `fva`.
   - Return for imports: `gtrade`, `va`.

Accounting for VA in trade: implementation

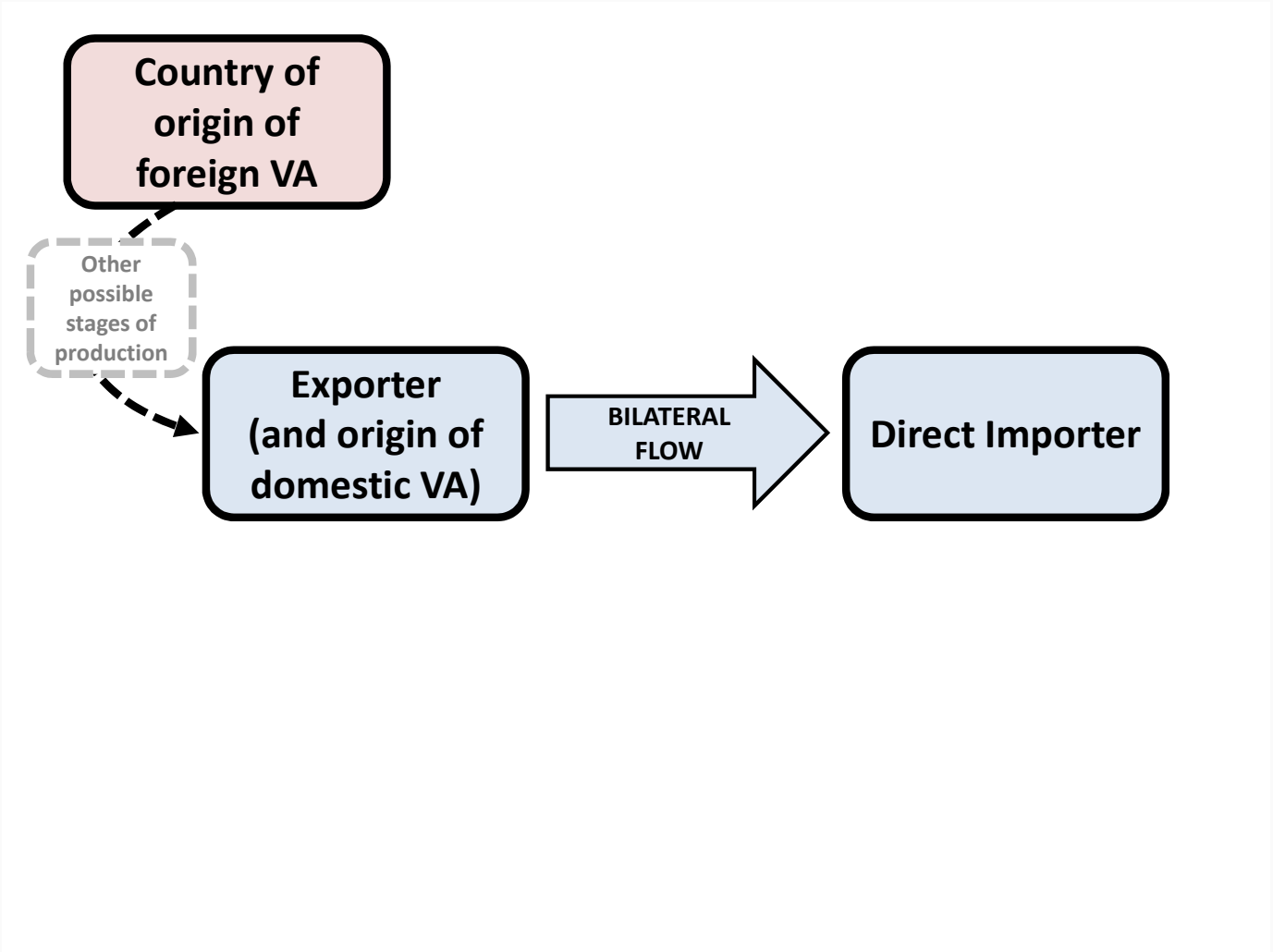
Depending on the empirical application, the user should select:

1. The desired trade flow with the options `exporter(`*`country-code[,sector-code]`*`)` and/or `importer(`*`country-code[,sector-code]`*`)`
2. The best suited accounting `perspective()`, and `approach()` if needed.
3. The appropriate `return()` measure and the other options:
   - Return for exports: `detailed`, `gtrade`, `dc`, `fc`, `va`, `dva`, `fva`.
   - Return for imports: `gtrade`, `va`.
   - Origin/destination of the flow: `origin(`*`country-code[,sector-code]`*`)` and/or `destination(`*`country-code[,sector-code]`*`)`

Origin and destination



Origin and destination



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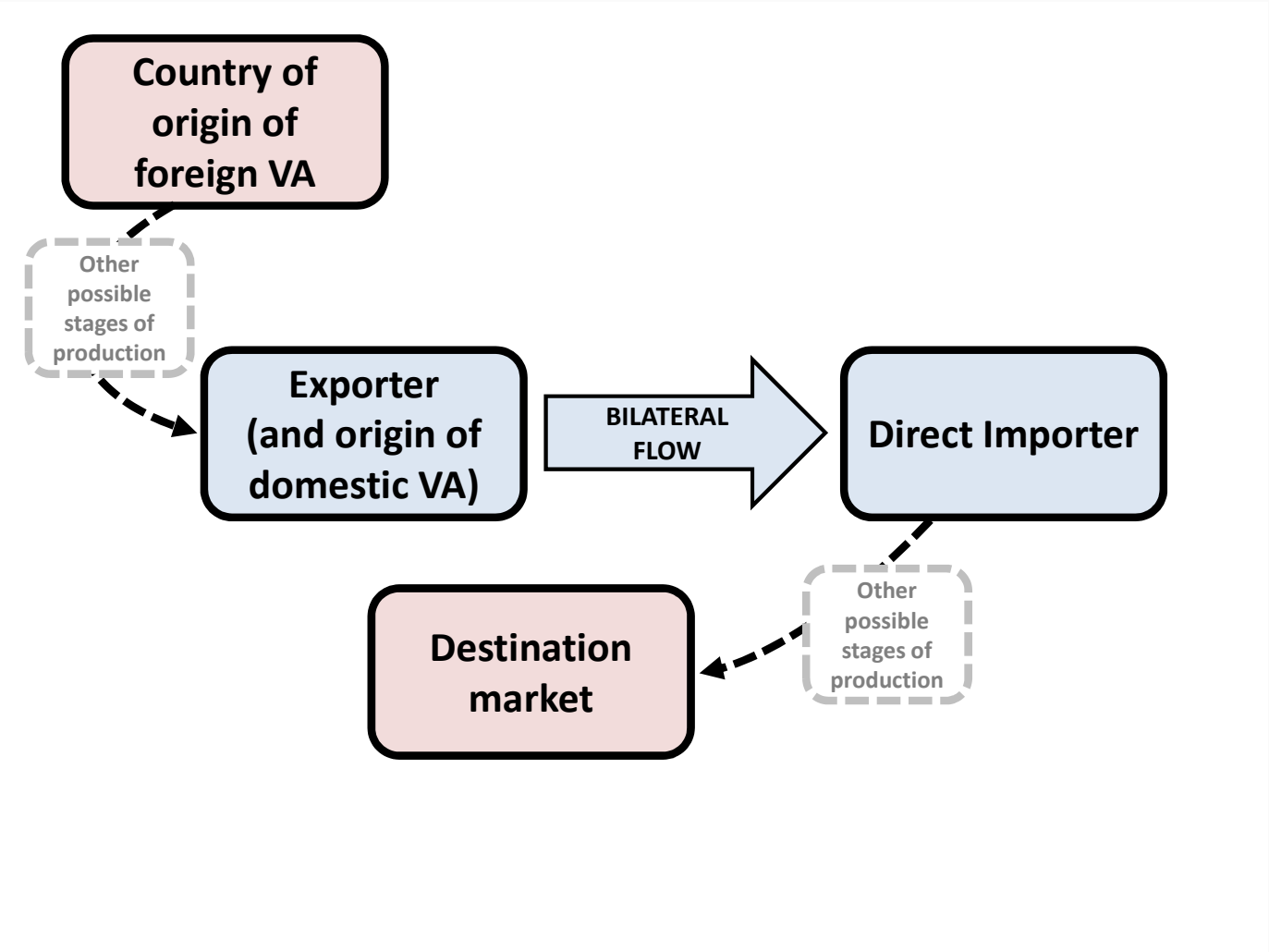

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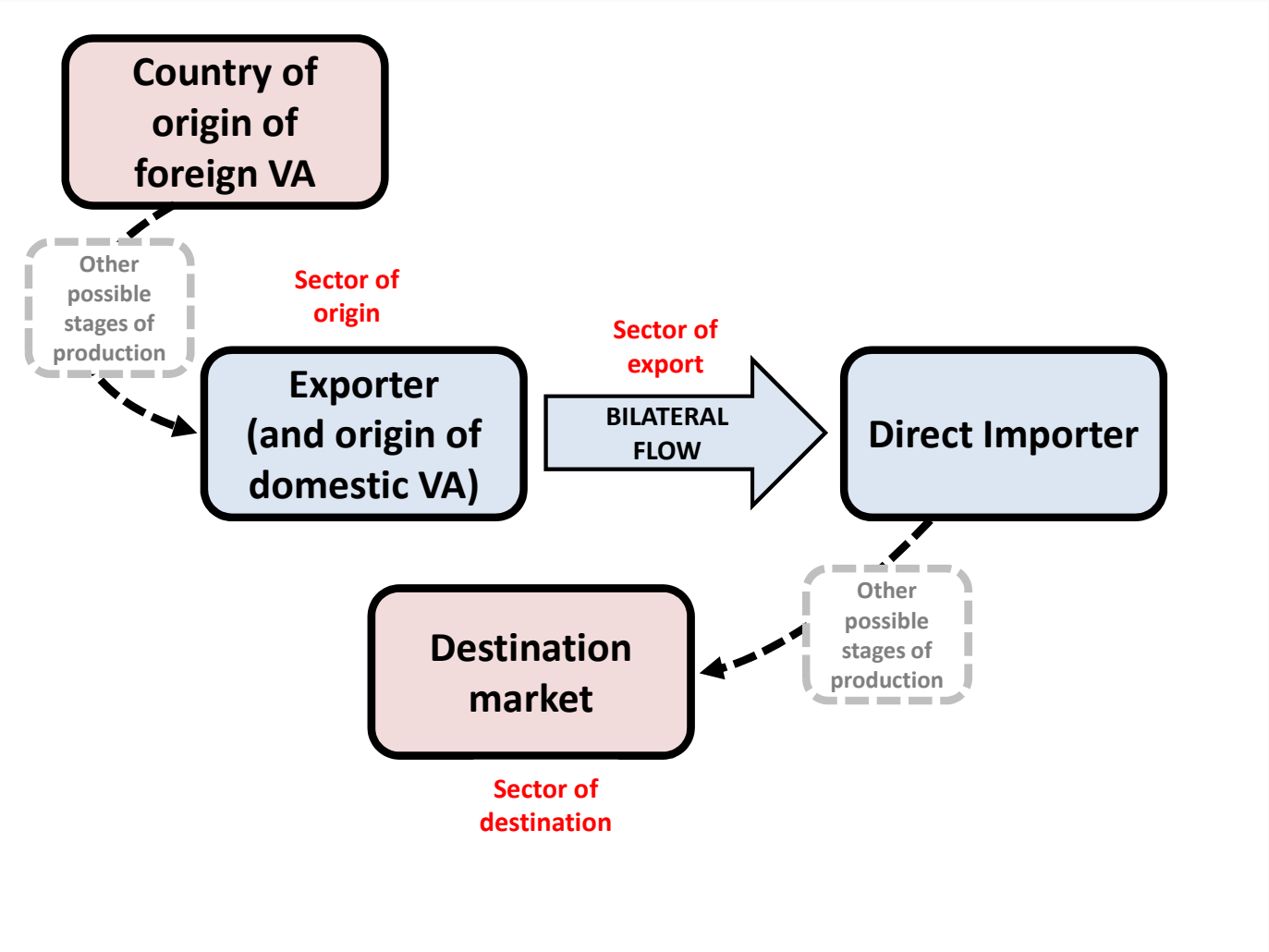

```
. icio, exporter(deu)

Decomposition of gross exports:
Perspective: exporter
Exporter: DEU
Importer: total DEU exports
```

	Millions of $	% of export
Gross exports (GEXP)	1681987.25	*100.00*
Domestic content (DC)	1232206.98	*73.26*
Domestic Value-Added (DVA)	1208782.54	*71.87*
VAX -> DVA absorbed abroad	1173781.66	*69.79*
Reflection	35000.88	*2.08*
Domestic double counting	23424.44	*1.39*
Foreign content (FC)	449780.27	*26.74*
Foreign Value-Added (FVA)	439123.84	*26.11*
Foreign double counting	10656.43	*0.63*
GVC-related trade (GVC)	778175.78	*46.27*
GVC-backward (GVCB)	473204.71	*28.13*
GVC-forward (GVCF)	304971.07	*18.13*

```
. icio, exporter(chn,17) importer(usa)

Decomposition of gross exports:
Perspective: exporter
Exporter: CHN
Importer: USA
Sector of export: 17
```

	Millions of $	% of export
Gross exports (GEXP)	107292.76	*100.00*
Domestic content (DC)	79824.00	*74.40*
Domestic Value-Added (DVA)	77386.31	*72.13*
VAX -> DVA absorbed abroad	76957.76	*71.73*
DAVAX	72570.84	*67.64*
Reflection	428.55	*0.40*
Domestic double counting	2437.68	*2.27*
Foreign content (FC)	27468.76	*25.60*
Foreign Value-Added (FVA)	26827.72	*25.00*
Foreign double counting	641.04	*0.60*
GVC-related trade (GVC)	34721.92	*32.36*
GVC-backward (GVCB)	29906.44	*27.87*
GVC-forward (GVCF)	4815.48	*4.49*

```
DAVAX: Value-Added directly absorbed by the importer
```

```
. icio, exporter(chn,17) importer(usa) perspective(sectbil)
```

Decomposition of gross exports:
Perspective: sectbil
Exporter: CHN
Importer: USA
Sector of export: 17

	Millions of $	% of export
Gross exports (GEXP)	107292.76	*100.00*
Domestic content (DC)	79824.00	*74.40*
Domestic Value-Added (DVA)	79815.64	*74.39*
VAX -> DVA absorbed abroad	79373.64	*73.98*
Reflection	442.00	*0.41*
Domestic double counting	8.36	*0.01*
Foreign content (FC)	27468.76	*25.60*
Foreign Value-Added (FVA)	27465.88	*25.60*
Foreign double counting	2.88	*0.00*

Exporting country perspective (i.e. additive)

- *Which part of a country's total exports is home produced, i.e. is domestic GDP?*
  `icio, exporter(deu) return(dva)`
- *Which part of a country's total exports can be traced back to other countries GDP?*
  `icio, exporter(deu) return(fva)`
- *Where the foreign value-added in German exports is produced?*
  `icio, origin(all) exporter(deu) return(fva)`
- *With respect to the total DVA in Italian exports, how much of it is exported to Germany, and where is it absorbed?*
  `icio, exporter(ita) importer(deu) destination(all) return(dva)`
- *How can be obtained a breakdown of sectoral US exports, consistent with aggregate US exports?*
  `icio, exporter(usa,all) save(usa.xlsx)`

Non-additive perspectives

- *Which is the Chinese GDP that at any point in time, passes through a certain bilateral trade flow, say Chinese exports to the US?*
  `icio, exp(chn) imp(usa) persp(bilat) return(dva)`
- *Which is the German GDP potentially exposed to US tariffs on all imports?*
  `icio, origin(deu) imp(usa) persp(importer) return(va)`
- *Which is the German GDP that could be affected by US tariffs on imports in sector 20?*
  `icio, origin(deu) imp(usa,20) persp(sectimp) return(va)`
- *Which is the exposure of US GDP to a Chinese tariff on US imports in sector 17?*
  `icio, exp(usa,17) imp(chn) persp(sectbil) return(dva)`
- *To what extent are Italian sectors exposed to a shock on German's exports in sector 20?*
  `icio, origin(ita,all) exp(deu,20) persp(sectexp) return(va)`

`icio` features

1 Supply-demand linkages

2 Value-added in trade flows

3 **GVC-related exports**

4. User-provided tables and advanced coding

GVC-related exports (Borin Mancini, 2015, 2019)

Natural measure of GVC: Value of goods and services crossing more than one border. In `icio`:

- Backward: import content of exports (i.e. pure backward GVC + two-sided GVC)
- Forward: domestic value-added re-exported by the bilateral partner (i.e. pure forward GVC)

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`icio` allows to single-out GVC trade at any level of aggregation of trade flows, both for aggregate and sectoral exports.

Exporting country perspective, source-based approach.

GVC exports: implementation

Step 1: Selection of the export flow:

- `icio, exporter(`*country-code*`)`
- `icio, exporter(`*country-code*`,`*sector-code*`)`
- `icio, exporter(`*country-code*`) importer(`*country-code*`)`
- `icio, exporter(`*country-code*`,`*sector-code*`) importer(`*country-code*`)`

Step 2: Selection of return():

- total GVC participation: `gvc`
- backward GVC participation: `gvcb`
- forward GVC participation: `gvcf`

- *Which share of the German exports is related to GVC, i.e. cross more than one border?*

  ```
  icio, exporter(deu) return(gvc)
  ```

- *Which share of the German exports is related to backward and forward GVC?*

  ```
  icio, exporter(deu) return(gvcb)
  icio, exporter(deu) return(gvcf)
  ```

- *Which share of the German exports to France is related to GVC?*

  ```
  icio, exporter(deu) import(fra) return(gvc)
  ```

- *Which share of the German exports of motor vehicles to France is related to GVC?*

  ```
  icio, exporter(deu,20) import(fra) return(gvc)
  ```

`icio` features

1. Supply-demand linkages
2. Value-added in trade flows
3. GVC-related exports
4. **Groups, user-provided tables and advanced coding**

Country groups

`icio` allows to set country groups.

Within the group, countries become like regions, i.e. there are no borders.

Remark: each country within the group will have a different underlying IO matrix, i.e. the ICIO table is not collapsed on the group.

Advanced coding: groups

```
mat res = J(1,2,.)
mat check  = J(1,2,.)

qui icio, exp(deu) return(gtrade)
mata : st_matrix("out", st_matrix("r(gtrade)")[1,1])
mat res = out

qui icio, exp(fra) return(gtrade)
mata : st_matrix("out", st_matrix("r(gtrade)")[1,1])
mat res = res , out

qui icio, exp(deu_fra)  return(gtrade) groups(deu,fra "deu_fra")
mata : st_matrix("res_g", st_matrix("r(gtrade)")[1,1])

mata : st_matrix("diff", rowsum(st_matrix("res"))-st_matrix("res_g"))
di diff[1,1]
231099.52

qui icio,  exp(fra)  imp(deu)   return(gtrade)
mata : st_matrix("out", st_matrix("r(gtrade)")[1,1])
mat check =  out

qui icio,   exp(deu) imp(fra)  return(gtrade)
mata : st_matrix("out", st_matrix("r(gtrade)")[1,1])
mat check = check , out

mata : st_matrix("test", rowsum(st_matrix("res"))-st_matrix("res_g")-rowsum(st_matrix("check")))
di test[1,1]
6.403e-10
```

Advanced coding: groups

```
qui icio, exp(chn) imp(usa) return(gvc)
mata : st_matrix("gvc", st_matrix("r(gvc)")[1,1])
mat result_gvc = nullmat(result_gvc) , gvc

qui icio, exp(chn) imp(mex) return(gvc)
mata : st_matrix("gvc", st_matrix("r(gvc)")[1,1])
mat result_gvc = result_gvc , gvc

qui icio, exp(chn) imp(can) return(gvc)
mata : st_matrix("gvc", st_matrix("r(gvc)")[1,1])
mat result_gvc = result_gvc , gvc

qui icio, exp(chn) imp(usmca) return(gvc) groups(usa,mex,can "usmca")
mata : st_matrix("gvc_group", st_matrix("r(gvc)")[1,1])

mata : st_matrix("diff", rowsum(st_matrix("result_gvc"))-st_matrix("gvc_group"))
di diff[1,1]
18601.699
```

User-provided tables

`icio` can be run on any ICIO table. Steps to follow:

1. Format the table as $(GN) \times (GN + GU)$
2. Save the file as csv.
3. Save the (vector of) country list in csv.
4. Load the files in `icio`:

```
icio_load, iciot(user, userp("D:\data\euregio")
tablen(euregio2010) countrylist(list.csv))
```

```
. icio_load, iciot(user, userp("D:\Dati\EUREGIO") tablen(euregio2010.csv) countrylist(list.csv))
Loading D:\Dati\EUREGIO/euregio2010.csv...  loaded
loaded

. icio, origin(all) importer(usa) output(va)

Decomposition of gross imports:
Perspective: importer
Importer: USA
Origin: ALL
Exporter: total USA imports
Output: Value-Added
```

	Millions of $	% of import
AT11	99.94	*0.01*
AT12	673.66	*0.04*
AT13	986.53	*0.06*
AT21	250.86	*0.02*
AT22	540.69	*0.03*
AT31	786.75	*0.05*
AT32	325.41	*0.02*
AT33	423.95	*0.03*
AT34	211.26	*0.01*
AUS	18109.45	*1.12*
BE10	2089.21	*0.13*
BE21	2504.91	*0.15*
BE22	938.01	*0.06*
BE23	1288.77	*0.08*
BE24	1376.92	*0.09*
BE25	1414.20	*0.09*
BE31	564.13	*0.03*
BE32	843.50	*0.05*
BE33	1045.55	*0.06*
BE34	221.05	*0.01*

Advanced coding: output

`icio` output can be exported to Excel or stored in Stata. Some suggestions:

- Export to Excel: better for small queries. The Excel output is already formatted and labelled in the proper way (no need to add countries' names or indicators' names).
- Store in Stata: better for loops involving origin or destination, groups and so on.

Advanced coding: output in Excel

```
loc exporters "deu fra ita esp"
loc importers "deu fra ita esp"
foreach e of local exporters {
    foreach m of local importers {
        if "`e´"!="`m´" {
            di  "`e´ to `m´"
            icio, exporter(`e´) importer(`m´)   save("exp_`e´_`m´.xlsx", replace)
        else {
            }
        }
    }
}
```

Advanced coding: output in Excel

	A	B	C	D
1			Millions of $	% of export
2		Gross exports (GEXP)	84725.5	100.0
3		Domestic content (DC)	61293.1	72.3
4		Domestic Value-Added (DVA)	60099.4	70.9
5		VAX -> DVA absorbed abroad	58144.1	68.6
6		DAVAX	41581.5	49.1
7		Reflection	1955.3	2.3
8		Domestic double counting	1193.7	1.4
9		Foreign content (FC)	23432.5	27.7
10		Foreign Value-Added (FVA)	22883.0	27.0
11		Foreign double counting	549.4	0.6
12		GVC-related trade (GVC)	43144.0	50.9
13		GVC-backward (GVCB)	24626.1	29.1
14		GVC-forward (GVCF)	18517.9	21.9
15				

Advanced coding: output in Stata

```
icio_load, iciot(tivan) year(2015)
set obs 100
gen value=.
gen share=.
gen origin=""
gen destination=""
gen exporter=""
gen sector=.
gen importer=""
local usmca "usa,mex,can"
local eu_group "aut,bel,bgr,cyp,cze,deu,dnk,esp,est,fin,fra,grc,hrv,hun,irl,ita,ltu," ///
+ "lux,lva,mlt,nld,pol,prt,rou,svk,svn,swe"
local east_asia "hkg,idn,ind,jpn,mys,phl,sgp,tha,twn,vnm"
local dest "eu_group usmca"
foreach d of local dest {
  local nd=`nd´+1
    forvalues s = 1(1)20 {
        local i=(`nd´-1)*20+`s´
        icio, origin(east_asia) exp(chn,`s´) imp(`d´) destination(`d´) ///
        output(gtrade) groups( `east_asia´ "east_asia",`eu_group´ "eu_group",  `usmca´ "usmca"  )
        mat a = r(gtrade)
        replace importer="`d´"  in `i´
        replace destination = "`d´" in `i´
        replace origin = "east_asia" in `i´
        replace exporter="chn"  in `i´
        replace sector=`s´ in `i´
        replace value = a[1,1] in `i´
        replace share= a[1,2] in `i´
    }
}
```

Advanced coding: output in Stata

	value	share	origin	destination	exporter	sector	importer
1	19.89809	1.029908	east_asia	eu_group	chn	1	eu_group
2	.3233639	1.344414	east_asia	eu_group	chn	2	eu_group
3	5.736512	1.599831	east_asia	eu_group	chn	3	eu_group
4	.226587	1.729579	east_asia	eu_group	chn	4	eu_group
5	63.94399	1.325736	east_asia	eu_group	chn	5	eu_group
6	1254.066	2.775538	east_asia	eu_group	chn	6	eu_group
7	63.37637	2.223497	east_asia	eu_group	chn	7	eu_group
8	31.60356	2.147403	east_asia	eu_group	chn	8	eu_group
9	11.65682	2.331041	east_asia	eu_group	chn	9	eu_group
10	334.4594	2.667338	east_asia	eu_group	chn	10	eu_group
11	285.8977	3.318031	east_asia	eu_group	chn	11	eu_group
12	143.5921	2.214521	east_asia	eu_group	chn	12	eu_group
13	149.2494	1.836323	east_asia	eu_group	chn	13	eu_group
14	241.3938	2.287319	east_asia	eu_group	chn	14	eu_group
15	7317.671	11.12969	east_asia	eu_group	chn	15	eu_group
16	1508.085	4.218581	east_asia	eu_group	chn	16	eu_group
17	809.5144	3.35718	east_asia	eu_group	chn	17	eu_group
18	153.4019	3.30555	east_asia	eu_group	chn	18	eu_group
19	138.482	2.67971	east_asia	eu_group	chn	19	eu_group
20	518.04	3.10718	east_asia	eu_group	chn	20	eu_group
21	21.82297	1.091541	east_asia	usmca	chn	1	usmca
22	.0932839	1.521211	east_asia	usmca	chn	2	usmca
23	4.137098	1.856751	east_asia	usmca	chn	3	usmca
24	.3985	1.768374	east_asia	usmca	chn	4	usmca
25	118.6916	1.398938	east_asia	usmca	chn	5	usmca
26	2647.366	2.97098	east_asia	usmca	chn	6	usmca
27	185.502	2.395264	east_asia	usmca	chn	7	usmca
28	141.4914	2.460506	east_asia	usmca	chn	8	usmca

Tips and tricks

`icio` might be slow, especially if the underlying ICIO tables are big (regional data, EORA). How to speed up computation? Some tips:

- If possible, use a laptop with a fast CPU and sufficient RAM.
- Do not use loops if not necessary, use `all`.
  Countries:
  - `icio, origin(all) exp(deu)`
  - `icio, origin(all,17) exp(deu)`
  - `icio, origin(all) exp(deu) destination(all)`

  Sectors:
  - `icio, exp(deu,all)`
  - `icio, origin(fra,all) exp(deu)`
  - `icio, origin(fra,all) exp(deu) destination(ita,all)`
- Loading ICIO tables takes time. Place it in the first layer of loops.
- Use groups. Sometimes no need to loop over countries.

GVC data on World Bank WITS

World Bank GVC Database

https://wits.worldbank.org/gvc/global-value-chains.html
Based on Borin, Mancini, Taglioni (2021) and Borin and Mancini (2019).
Unit of observation: country (output) or exp-imp (trade) and sector of export or production.

- GVC-related trade: traditional trade vs GVC-trade; modes of participation (pure backward, pure forward, two-sided).
- GVC-related output: purely domestic output vs output related to traditional trade vs GVC-output; modes of participation (pure backward, pure forward, two-sided).

Featured ICIO tables (same as `icio`): WIOD (2013 and 2016 version), OECD TiVA (2016 and 2018 version), EORA, ADB-MRIO.

World Bank World Development Report Database

World Bank WDR Database

http://tradeconomics.com/icio/dataset/bm2019_va_data.csv
Update of the WDR Database, based on Borin and Mancini (2019).
Unit of observation: exporting country, sector of export.

- Value-added breakdown of exports (exporting country perspective, source approach; DVA/FVA and double counting terms, GVC).

Featured ICIO tables (same as `icio`): WIOD (2013 and 2016 version), OECD TiVA (2016 and 2018 version), EORA, ADB-MRIO.

Thank you for your attention!