



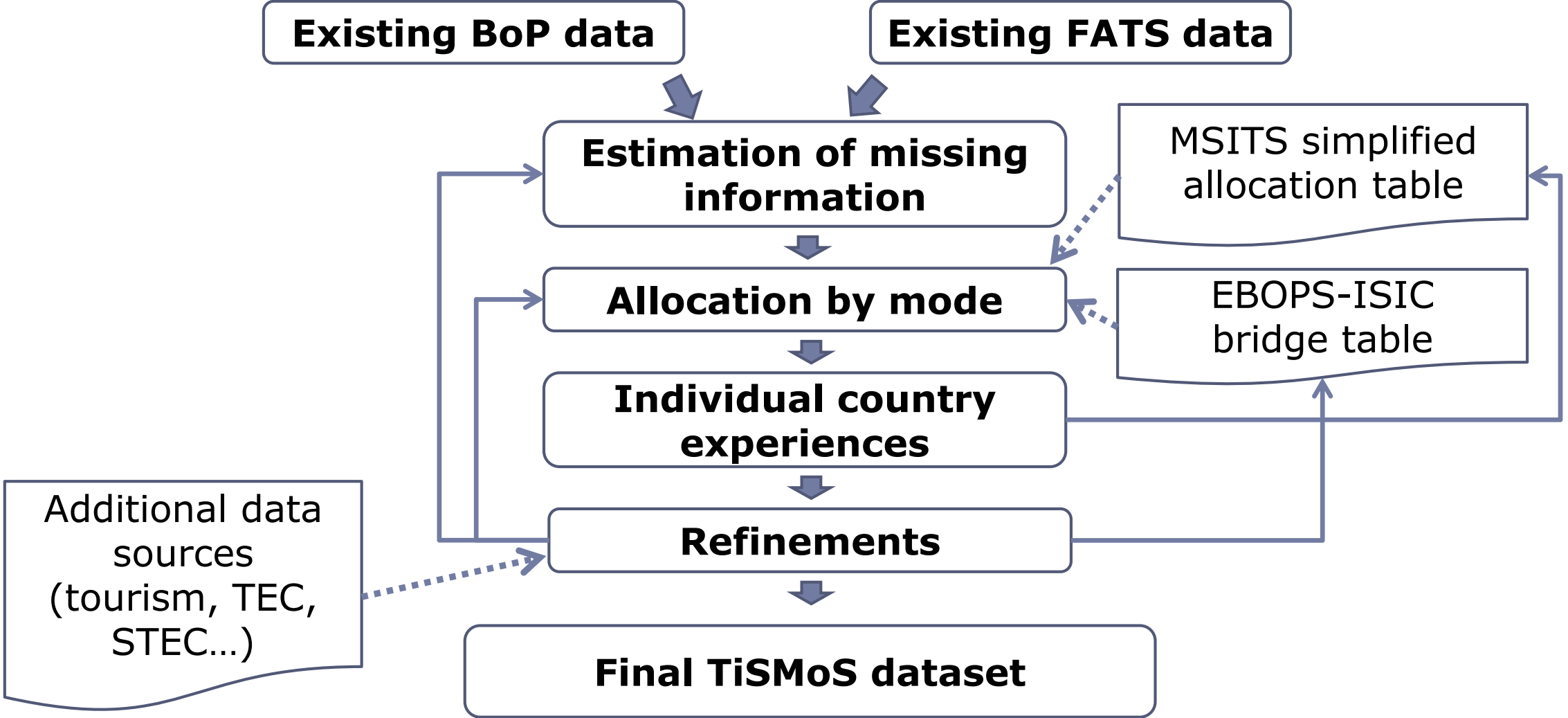
# **A global trade in services data set by mode of supply (TiSMoS)**

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# Building TiSMoS: the approach





# Why?

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- ▶ **Aim of this project: create and maintain an experimental dataset on international trade in services by mode of supply:**
  - ▶ Based on reported data by national authorities to the extent possible
  - ▶ Complemented with estimations, as close as possible to MSITS2010 recommendations
- ▶ **Possible applications:**
  - ▶ Orient trade negotiating strategies => commitments under most trade agreements specified according to the four modes of supply
  - ▶ Better understand world trade developments
  - ▶ Respond to analytical questions => looking for economic mechanisms, estimating impacts (e.g. effects of RTAs, regulatory heterogeneity, etc.)



# The BoP dataset

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Starting point: WTO/UNCTAD/ITC trade in services dataset

- ▶ Imports and exports
- ▶ 215 reporter countries, partner world
- ▶ 2005 to 2017
- ▶ 59 items
- ▶ Includes estimations/corrections based on official information
  - ▶ BUT:  $\approx 50\%$  of observations are missing (especially most detailed items)



# Estimations in BoP dataset

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## Top-down approach:

- ▶ Total commercial services, goods-related services, Travel, Transport, other commercial services already complete in base data
- 1. Simple derivations using item-subitem relationships
- 2. Some information exists in the time series for a given item
  - a) Interpolations
  - b) Back-casting and forecasting
- 3. No information exists in the time series for a given item
  - 1. Mirror statistics
  - 2. Averages within clusters



# Disentangling the Travel item

- ▶ Isolate goods component in travel:
  1. Use SD1 - alternative breakdown (by product) => but limited data availability (around 15 economies report non zero values)
  2. For Italy, Poland, Spain and Austria: ratios provided to Eurostat MoS task force (X and M)
  3. Estimate the expenditure on goods using available tourism statistics (OECD - Internal Tourism Consumption dataset – 34 economies)  
$$\Rightarrow \frac{\text{other consumption products}}{\text{total consumption products}}$$
 in inbound tourism expenditure
  4. Use averages of reported SD1 for economies not in the OECD sample
- ▶ Goods component removed from items in the presentation of travel by purpose (business/personal)
- ▶ Total commercial services trade reduced by around 6.5%



# Distribution services in BoP

- A. Trade-related services (SJ34 - in other business services)
- B. Trade margins included in goods' value => estimation needed for GATS purposes

1. 
$$\frac{X \text{ of goods by wholesalers/retailers}}{\text{total } X \text{ of goods}} = \% \text{ goods exported/imported by wholes\&ret}$$

(from OECD TEC)

2. 
$$\frac{\text{gross margins on goods for resale}}{\text{turnover}} = \text{trade margin of wholes\&ret}$$

(from Eurostat Structural Business Statistics)

3. 
$$\text{Distribution services} = SW =$$
  
$$\text{Total Goods } X(M) * \% \text{ goods } X \text{ by wholes\&ret} * \text{trade margin}$$

4. estimated value for distribution services allocated Mode 1 and added to total commercial services



# Construction in BoP

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- ▶ Total exports/imports of construction recalculated:
  - ▶  $\widehat{SE}$  exports = construction abroad (SE1) exports
  - ▶  $\widehat{SE}$  imports = construction in reporting economy (SE2) imports
- ▶ Both allocated to modes 3 and 4 (50%)
- ▶ Value of goods included remains an open issue



# Completed BoP dataset



| <b>Step</b>          | <b>Code</b> | <b>Description</b>   | <b>% points</b> | <b>% value</b> |
|----------------------|-------------|--|-----------------|----------------|
| Existing information | E6          | Correction of mistakes in source data                                | 0.03%           | -              |
|                      | E7          | Correction of mistakes in source data (parent – sum of children < 0) | 0.12%           | -              |
| Estimates            | E1          | Simple derivation  | 4.8%            | -              |
|                      | E8          | Interpolation, backcasting and forecasting                           | 3.7%            | 3.89%          |
|                      | E1.2        | Simple derivation after Step 1                                       | 8.0%            | 0.01%          |
|                      | E4          | Estimate completely missing information using bilateral BOP data     | 2.6%            | 1.7%           |
|                      | E5          | Estimate completely missing information using clusters               | 35.9%           | 16.1%          |
| Sum of estimates     |             |  | 51.4%           | 22.6%          |
| Transformations      | E3          | Goods in travel  |                 |                |
| Additional points    | -           | Distribution Services (M1)   |                 |                |





# BoP and simplified allocation (extract)

| Indicator code | Item EBOPS  | DEFAULT ALLOCATION |    |    |
|----------------|---|--------------------|----|----|
|                |   | M1                 | M2 | M4 |
| SJ             | Other business services   |                    |    |    |
| SJ1            | Research and development services                                   | 75                 |    | 25 |
| SJ2            | Professional and management consulting services                     | 75                 |    | 25 |
| SJ21           | Legal, accounting, management, consulting and public relations      | 75                 |    | 25 |
| SJ22           | Advertising, market research, public opinion polling                | 75                 |    | 25 |
| SJ3            | Technical, trade-related, and other business services               |                    |    |    |
| SJ31           | Architectural, engineering, scientific and other technical services | 75                 |    | 25 |
| SJ311          | Architectural services  | 75                 |    | 25 |
| SJ312          | Engineering services  | 75                 |    | 25 |
| SJ313          | Scientific and other technical services                             | 75                 |    | 25 |
| SJ32           | Waste treatment and de-pollution, agricultural and mining services  |                    | 50 | 50 |
| SJ33           | Operating leasing services  | 100                |    |    |
| SJ34           | Trade-related services  | 100                |    |    |
| SJ35           | Other business services n.i.e.                                      | 75                 |    | 25 |



# BoP and simplified allocation - "enhanced"

Results of individual case studies incorporated: United States, France, Finland, Spain, Colombia, India

| Indicator code | Item EBOPS  | DEFAULT ALLOCATION |    |    | United States |    |    | ... |     |     |
|----------------|---|--------------------|----|----|---------------|----|----|-----|-----|-----|
|                |   | M1                 | M2 | M4 | M1            | M2 | M4 | M1  | M2  | M4  |
| SJ1            | Research and development services                                   | 75                 |    | 25 | 59            |    | 41 | ... | ... | ... |
| SJ2            | Professional and management consulting services                     | 75                 |    | 25 | 77            |    | 23 |     |     |     |
| SJ21           | Legal, accounting, management, consulting and public relations      | 75                 |    | 25 |               |    |    | ... | ... | ... |
| SJ22           | Advertising, market research, public opinion polling                | 75                 |    | 25 | 78            |    | 22 | ... | ... | ... |
| SJ3            | Technical, trade-related, and other business services               |                    |    |    |               |    |    |     |     |     |
| SJ31           | Architectural, engineering, scientific and other technical services | 75                 |    | 25 |               |    |    | ... | ... | ... |
| SJ311          | Architectural services  | 75                 |    | 25 | 80            |    | 20 | ... | ... | ... |
| SJ312          | Engineering services  | 75                 |    | 25 | 59            |    | 41 | ... | ... | ... |
| SJ313          | Scientific and other technical services                             | 75                 |    | 25 |               |    |    | ... | ... | ... |
| SJ32           | Waste treatment and de-pollution, agricultural and mining services  |                    | 50 | 50 |               |    |    | ... | ... | ... |
| SJ33           | Operating leasing services  | 100                |    |    |               |    |    | ... | ... | ... |
| SJ34           | Trade-related services  | 100                |    |    |               |    |    | ... | ... | ... |
| SJ35           | Other business services n.i.e.                                      | 75                 |    | 25 |               |    |    | ... | ... | ... |



# FATS and Mode 3

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## **International supply of services through Mode 3 approximated by FATS variable *sales* (or output)**

### **BUT:**

- ▶ GATS refers to all foreign-controlled enterprises
- ▶ Products vs activities
- ▶ Goods vs services
- ▶ Sales vs output
- ▶ Double-counting of trade flows





# FATS: Reported data (partner world)

| ISIC CODE | WTO CODE | Description                                       | VARIABLE  | IWA | OWA |
|-----------|----------|---|-----------|-----|-----|
| F         | CONST    | Construction                                      | TURNOVER  | 43  | 30  |
| G         | WHOREP   | Turnover - Wholesale and retail trade; repair ... | OUTPUT    | 44  | 32* |
| H         | TPST     | Transport and Storage                             | TURNOVER  | 44  | 33  |
| I         | FOOD     | Accommodation and food services                   | TURNOVER  | 42  | 30  |
| J         | INFCOM   | Information and Communication                     | TURNOVER  | 39  | 28  |
| K         | FIN      | Financial Intermediation                          | TURNOVER* | 31  | 31  |
| L         | REA      | Real estate activities                            | TURNOVER  | 41  | 31  |
| M         | PROF     | Professional, scientific and technical activities | TURNOVER  | 39  | 31  |
| N         | ADMIN    | Administrative and support activities             | TURNOVER  | 39  | 30  |
| P         | EDUC     | Education   | TURNOVER  | 7   | 27  |
| Q         | HEALTH   | Health and social work                            | TURNOVER  | 5   | 26  |
| R         | ARTS     | Arts, entertainment and recreation                | TURNOVER  | 4   | 26  |
| S         | OSERA    | Other service activities                          | TURNOVER  | 8   | 30  |

# FATS - construction of the complete dataset



## **Step 1. Assess initial data availability & derive all possible values from the dataset**

1. Merge existing FATS data: Eurostat, OECD, national sources
2. Exploit mirror data
3. Impute zeroes when FDI stocks are null (Eurostat/IMF CDIS/OECD)

## **Step 2. Develop a complete FATS dataset for countries with (some) available data**

1. Econometric models to back/forecasting and interpolation

## **Step 3. Develop a complete FATS dataset for countries with no available data**

1. Gravity models to predict bilateral sales
2. Derive partner world by summing up the values for all partners

## **Step 4. Exclude exports from total sales**





# STEP 2: example

## Portugal, inward FATS sales (mio USD)

|        |       | 2005   | 2006   | 2007   | 2008   | 2009   | 2010   | 2011   | 2012   | 2013   | 2014   | 2015   | 2016   | 2017   |
|--------|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| CONST  | F     | 1,916  | 1,826  | 2,195  | 4,849  | 4,933  | 5,019  | 4,546  | 2,969  | 2,731  | 2,548  | 1,970  | 1,524  | 1,684  |
| WHOREP | G     | 9,235  | 9,233  | 11,261 | 14,351 | 13,079 | 12,264 | 11,968 | 10,266 | 10,418 | 11,254 | 9,828  | 10,293 | 11,449 |
| TPST   | H     | 2,607  | 3,060  | 3,824  | 4,313  | 3,614  | 4,009  | 4,123  | 3,497  | 4,194  | 4,944  | 4,191  | 4,449  | 5,183  |
| FOOD   | I     | 595    | 756    | 894    | 1,042  | 998    | 922    | 963    | 819    | 820    | 936    | 860    | 973    | 1,118  |
| INFCOM | J     | 3,050  | 3,623  | 4,356  | 5,069  | 4,692  | 4,321  | 4,309  | 3,672  | 3,551  | 3,913  | 6,089  | 6,205  | 6,491  |
| FIN    | K     | 900    | 1,075  | 4,440  | 15,012 | 14,212 | 13,814 | 11,457 | 8,392  | 8,446  | 12,650 | 10,816 | 11,992 | 12,535 |
| REA    | L     | 195    | 884    | 1,053  | 1,011  | 1,171  | 970    | 862    | 729    | 792    | 847    | 832    | 874    | 945    |
| PROF   | M     | 1,430  | 1,639  | 2,087  | 2,647  | 2,375  | 2,277  | 2,124  | 1,903  | 2,224  | 2,391  | 2,058  | 2,133  | 2,483  |
| ADMIN  | N     | 2,209  | 2,567  | 3,204  | 3,893  | 3,845  | 3,556  | 3,727  | 3,334  | 3,261  | 3,571  | 3,013  | 3,381  | 3,898  |
| EDUC   | P     | 33     | 32     | 32     | 33     | 33     | 33     | 32     | 29     | 28     | 31     | 29     | 37     | 41     |
| HEALTH | Q     | 0      | 1      | 2      | 3      | 4      | 6      | 10     | 11     | 14     | 22     | 19     | 32     | 55     |
| ARTS   | R     | 2      | 2      | 4      | 6      | 6      | 6      | 8      | 6      | 5      | 6      | 5      | 10     | 24     |
| OSERA  | S     | 8      | 10     | 15     | 20     | 17     | 23     | 24     | 29     | 15     | 64     | 35     | 56     | 52     |
| TSER   | Total | 22,181 | 24,709 | 33,366 | 52,249 | 48,977 | 47,219 | 44,153 | 35,656 | 36,500 | 43,176 | 39,745 | 41,957 | 45,959 |

REPORTED

MODEL

BACK/FORECASTING



## Step 3: example

### Malaysia, inward FATS sales in 2010 (mio USD)

|              | USA          | GBR          | JPN          | DEU          | SGP          | FRA          | AUS        | CAN        | CHE        | CHN        | ROW | WLD           |
|--------------|--------------|--------------|--------------|--------------|--------------|--------------|------------|------------|------------|------------|-----|---------------|
| CONST F      | 36           | 45           | 56           | 15           | 59           | 41           | 25         | 11         | 9          | 7          | ... | 404           |
| WHOREP G     | 1,690        | 305          | 1,508        | 532          | 322          | 265          | 183        | 143        | 162        | 57         | ... | 6,062         |
| TPST H       | 128          | 139          | 185          | 632          | 82           | 64           | 35         | 14         | 13         | 7          | ... | 1,407         |
| FOOD I       | 54           | 48           | 50           | -            | 12           | 9            | 10         | 4          | 4          | 2          | ... | 216           |
| INFCOM J     | 1,547        | 196          | 839          | 286          | 113          | 115          | 100        | 99         | 64         | 50         | ... | 3,889         |
| FIN K        | 2,061        | 3,314        | 1,111        | 1,237        | 644          | 252          | 402        | 231        | 210        | 319        | ... | 11,376        |
| REA L        | 12           | -            | 15           | 5            | 18           | -            | 6          | 3          | 3          | 0          | ... | 81            |
| PROF M       | 199          | 115          | 139          | 127          | 16           | 389          | 34         | 14         | 18         | 2          | ... | 1,137         |
| ADMIN N      | 73           | 132          | 47           | 21           | 9            | 17           | 16         | 8          | 8          | 0          | ... | 390           |
| EDUC P       | 0            | 0            | 0            | -            | 0            | -            | 0          | 0          | -          | 2          | ... | 16            |
| HEALTH Q     | 0            | -            | 0            | -            | 0            | 0            | 0          | 0          | 0          | 0          | ... | 0             |
| ARTS R       | 0            | -            | 1            | -            | 1            | -            | 0          | 0          | 0          | 0          | ... | 5             |
| OSERA S      | 6            | 16           | 7            | -            | 12           | -            | 1          | 0          | 0          | 6          | ... | 52            |
| <b>Total</b> | <b>5,807</b> | <b>4,310</b> | <b>3,958</b> | <b>2,855</b> | <b>1,289</b> | <b>1,153</b> | <b>811</b> | <b>528</b> | <b>492</b> | <b>452</b> | ... | <b>25,036</b> |



# Step3. Complete FATS dataset for the remaining countries by partner & derive partner world



- ▶ **In the bilateral dataset, fill in time series with back, forecasting and interpolation techniques**
- ▶ **Fit models by services sectors and by flow**

$FAS_{rst} =$

$$\alpha_0 + \beta_1 YEAR_t + \beta_2 \ln(BoP_{rt}) + \beta_3 \ln(gdps_{rt}) + \beta_4 \ln(gdps_{st}) + \beta_5 (\ln(GDPpc_{rt}) - \ln(GDPpc_{st})) \\ + \beta_6 \ln(dist_{rs}) + \beta_7 colony_{rs} + \beta_8 contig_{rs} + \beta_9 comlang_{rs} + \varepsilon_{rst}$$

where  $FAS_{rst}$  describes foreign affiliates sales, host country  $r$  of affiliates in country  $s$  in year  $t$ , and  $\varepsilon_{rst}$  is the error term.

- ▶ **In total, 28 regressions are run (14 sectors  $i$  and 2 flows  $f$ )**
- ▶ **Derive partner world by summing up values for all partner**
- ▶ **About 150 countries**



## Step 4: estimate local sales

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- ▶ Hard data reported by United States, Japan, Canada, Estonia, Zambia (+ some info for IL, IT, ES, SE)
- ▶ Estimates of exports by foreign-owned firms from STEC
  - ▶ DK, AT, BE, CZ, LU, FI, NL
- ▶ Countries clustered for IWA and OWA
- ▶ Other countries?

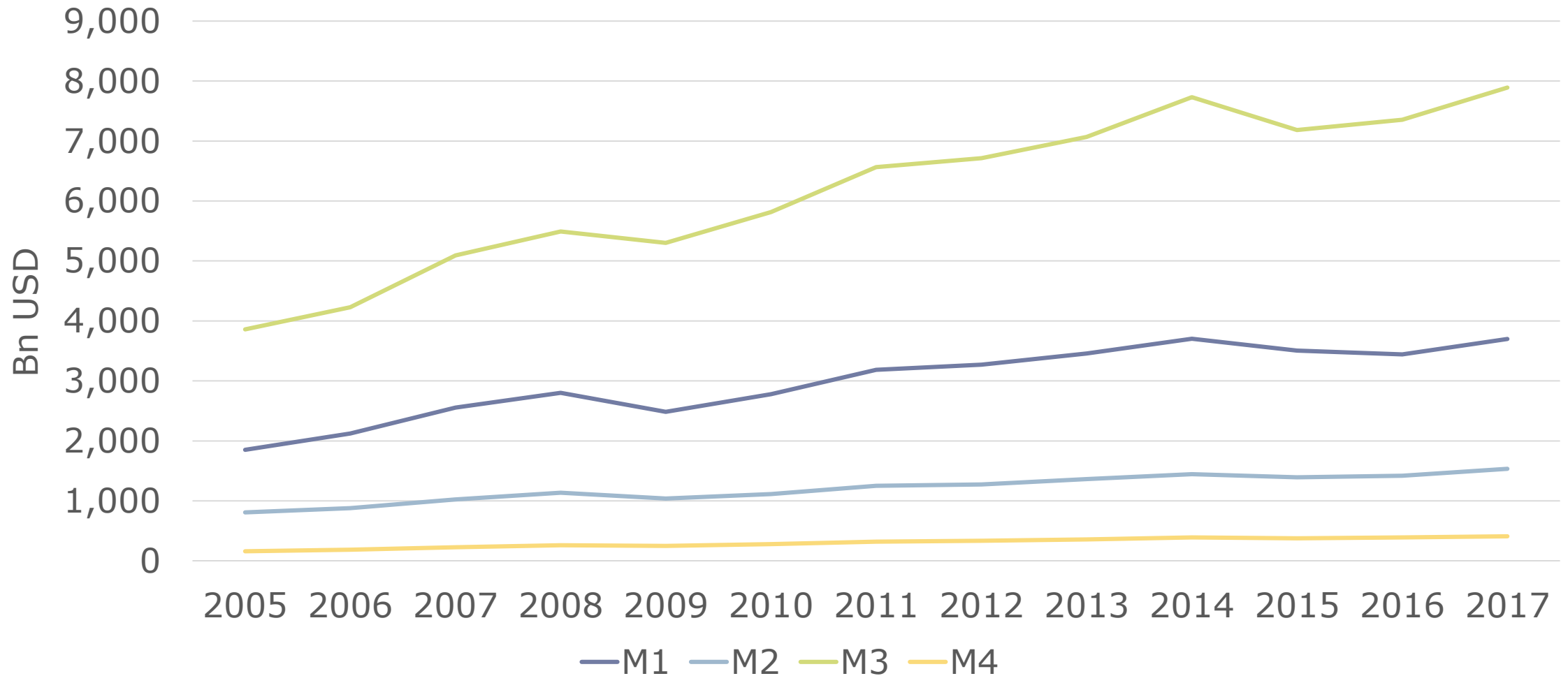




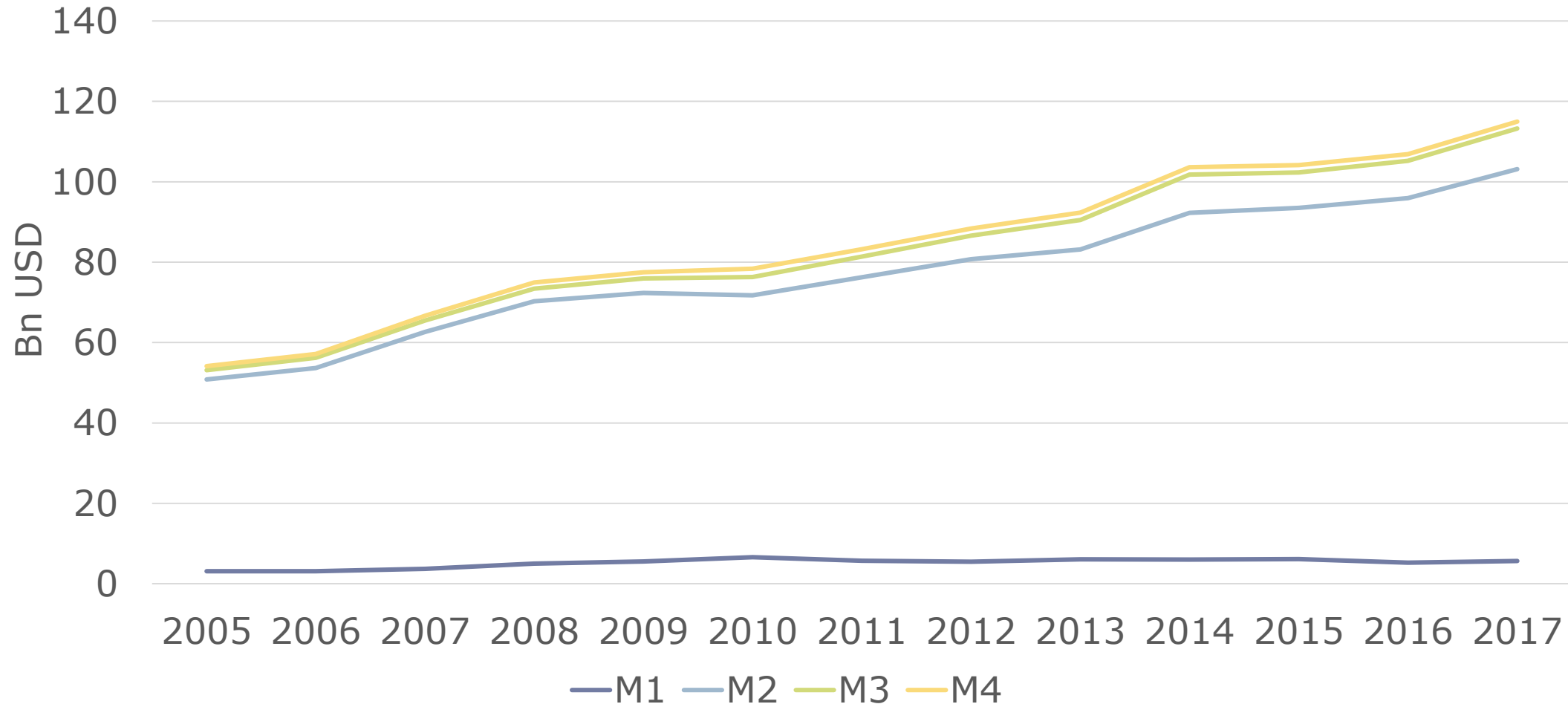
# Bridge table – transformed EBOPS

| <b>Ebops-like code</b> | <b>Description</b>   | <b>ISIC CODE</b> | <b>Isic description</b>  |
|------------------------|--|------------------|--|
| SA                     | Manufacturing services on physical inputs owned by others          |                  |  |
| SB                     | Maintenance and repair services not included elsewhere             |                  |  |
| SC                     | Transport  | H                | Transport and Storage  |
| SDB1SK21               | Health services  | Q                | Human health and social work activities  |
| SDB2SK22               | Education services   | P                | Education  |
| SDASDB3                | Business travel and tourism  | I                | Accommodation and food service activities  |
| SE                     | Construction   | F                | Construction   |
| SFSG                   | Insurance and financial services                                   | K                | Financial and insurance activities   |
| SH                     | Charges for the use of intellectual property n.i.e.                |                  |  |
| SISK1                  | Telecommunications, computer, information and audiovisual services | J                | Information and Communication  |
| SJXSJ34                | Other business services (excluding trade-related)                  | L+M+N            | Real estate, Professional, scientific and technical activities, Administrative and support service activities. |
| SK23                   | Heritage and recreational services                                 | R                | Arts, entertainment and recreation   |
| SK24                   | Other personal services  | S                | Other service activities   |
| SWSJ34                 | Trade-related services (Distribution)                              | G                | Wholesale and retail trade; repair of motor vehicl. and motorcycl.   |

# World trade by mode of supply – total services



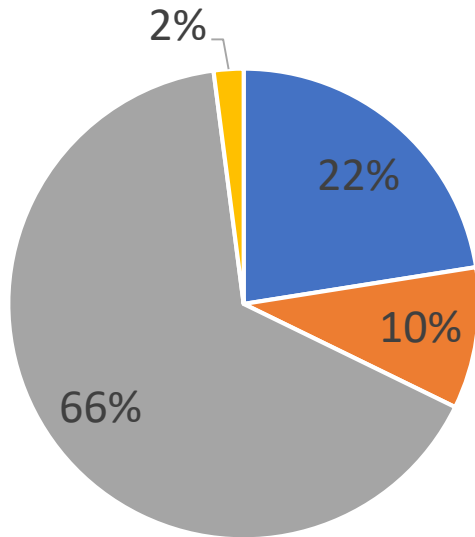
# World trade by mode of supply - education



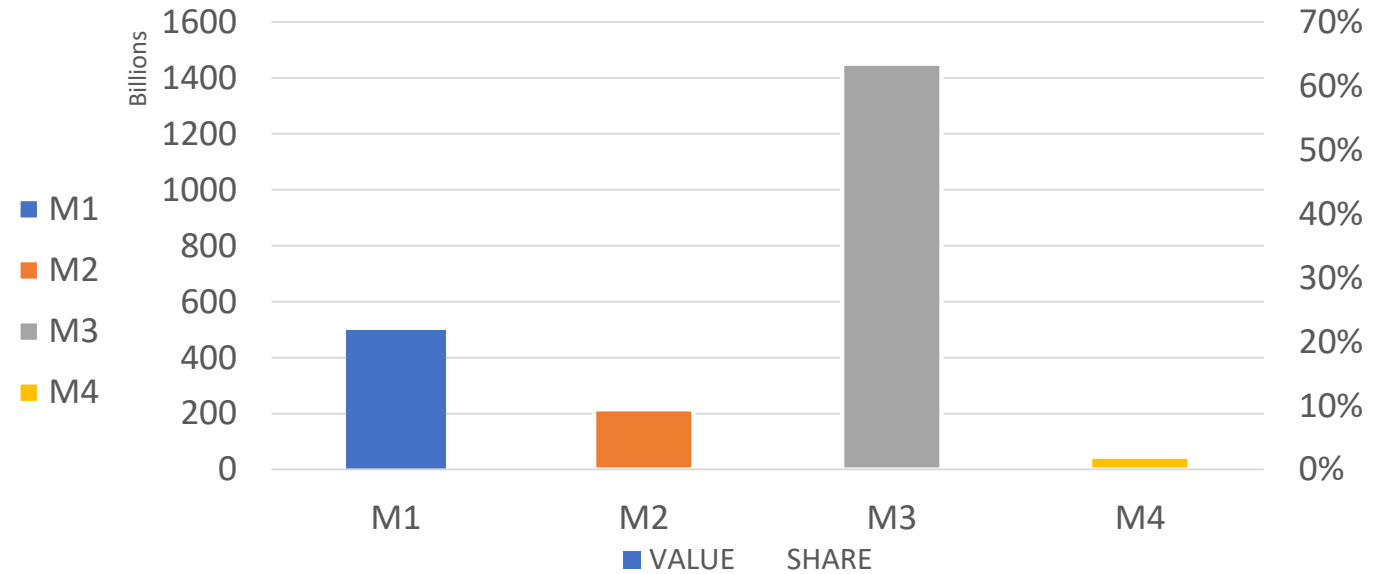


# Trade in services by mode of supply – exports

United States  
Exports of total services by mode in 2016



United States  
Exports of total Services by mode in 2016





# Road ahead...

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## **SHORT TERM**

- ▶ Publish the experimental dataset

## **LONG TERM**

- ▶ Gather feedback on the published dataset
- ▶ Include more country experiences
- ▶ Improve the estimations
- ▶ ...

