Jobs in global supply chains: a macroeconomic assessment

Christian Viegelahn

(with Takaaki Kizu and Stefan Kühn)

Research Department, International Labour Organization (ILO)*

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*All views expressed in this presentation are those of the authors and do not reflect the views of the ILO.

Background (I)

Different institutions and researchers have recently been coming up with estimates of jobs related to:

- global supply chains (GSCs)
- global value chains (GVCs)
- final/intermediate exports
- final demand for goods/services of a particular sector

Literature:

- European Commission (2015)
- Kizu, Kühn and Viegelahn (Forthcoming); ILO (2015)
- Jiang (2013), Jiang and Milberg (2013)
- Lopez-Gonzales (Forthcoming); OECD, WTO and UNCTAD (2013); OECD, WTO and World Bank (2014)
- Timmer, Los and de Vries (2015)

Background (II)

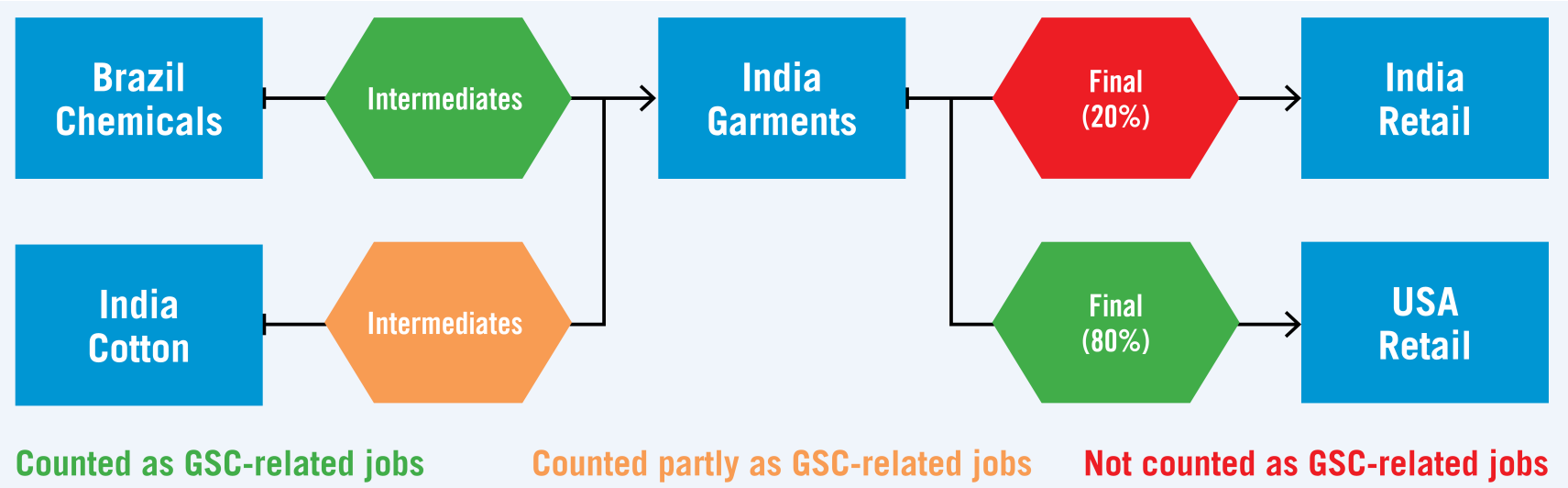
What are GSCs?

[...]*demand-supply relationships that arise from the fragmentation of production across borders, where different tasks of a production process are performed in two or more countries* (ILO, 2015; p. 131)

Which jobs are counted as GSC-related jobs?

GSC-related jobs := *Jobs in a particular country that are linked to global exports to a particular export destination*

Which jobs are counted as GSC-related jobs?



Methodology to estimate GSC-related jobs

Use World Input-Output Database (WIOD) which includes data for 40 countries and 35 sectors in 1995-2011

Procedure:

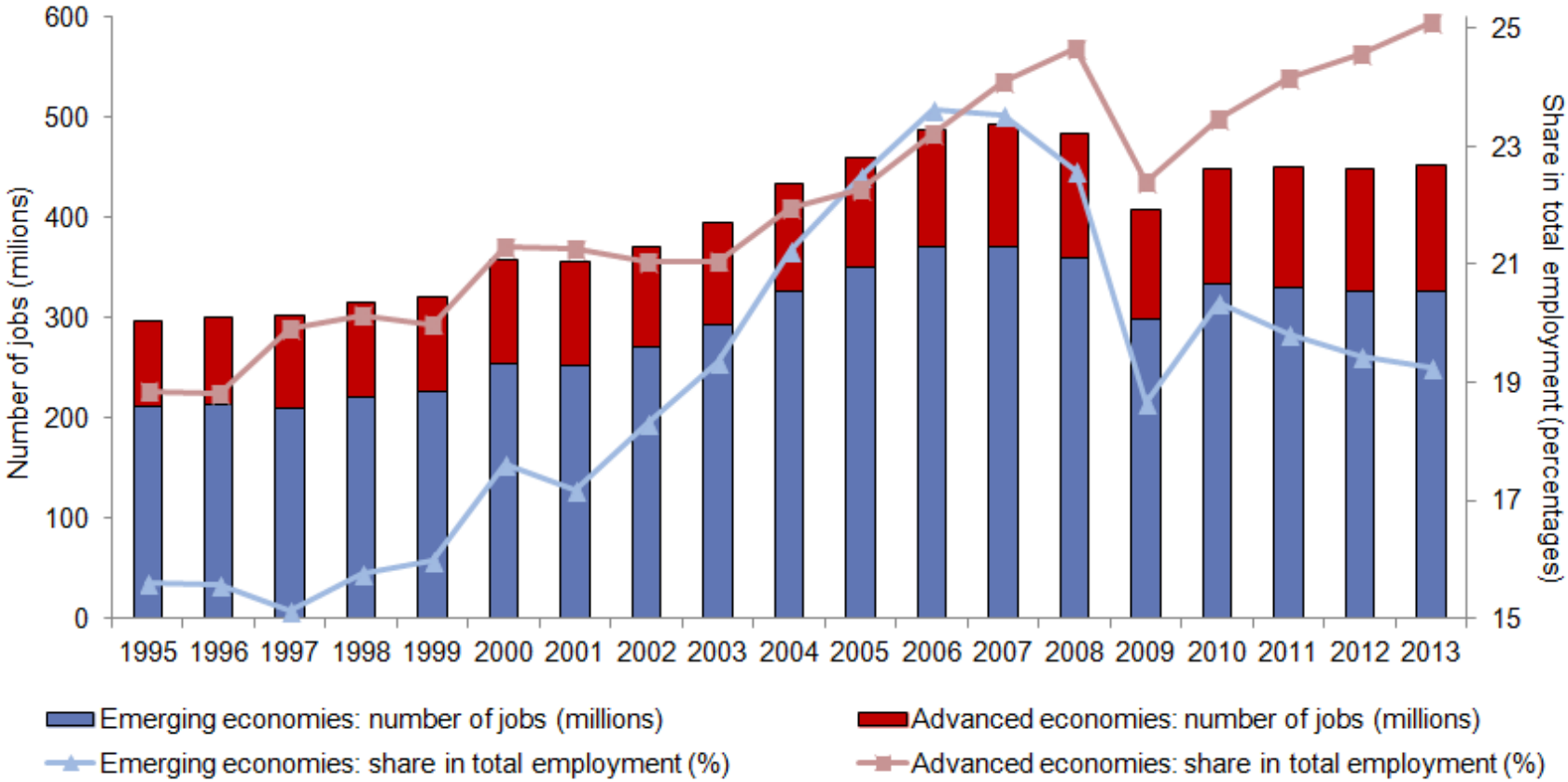
- Derive Leontief inverse matrix that includes output requirements in different sectors/countries to produce one more unit of output demanded in the destination sector/country
- Combine this matrix with information on labour productivity to transform output into labour requirements
- Define demand vector, in our case demand in the destination country for foreign final and intermediate goods and services
- Calculate for 1995-2011 the number of jobs in different sectors/countries required to meet demand in the destination sector/country for 1995-2011
- Estimate for 2012-2013 the number of jobs on the basis of a projection model

This presentation:

- Trends and stylized facts on GSC-related jobs
- Do GSC-related jobs come along with changes in the wage share?
- *(optional)* What are the drivers of GSC-related jobs?

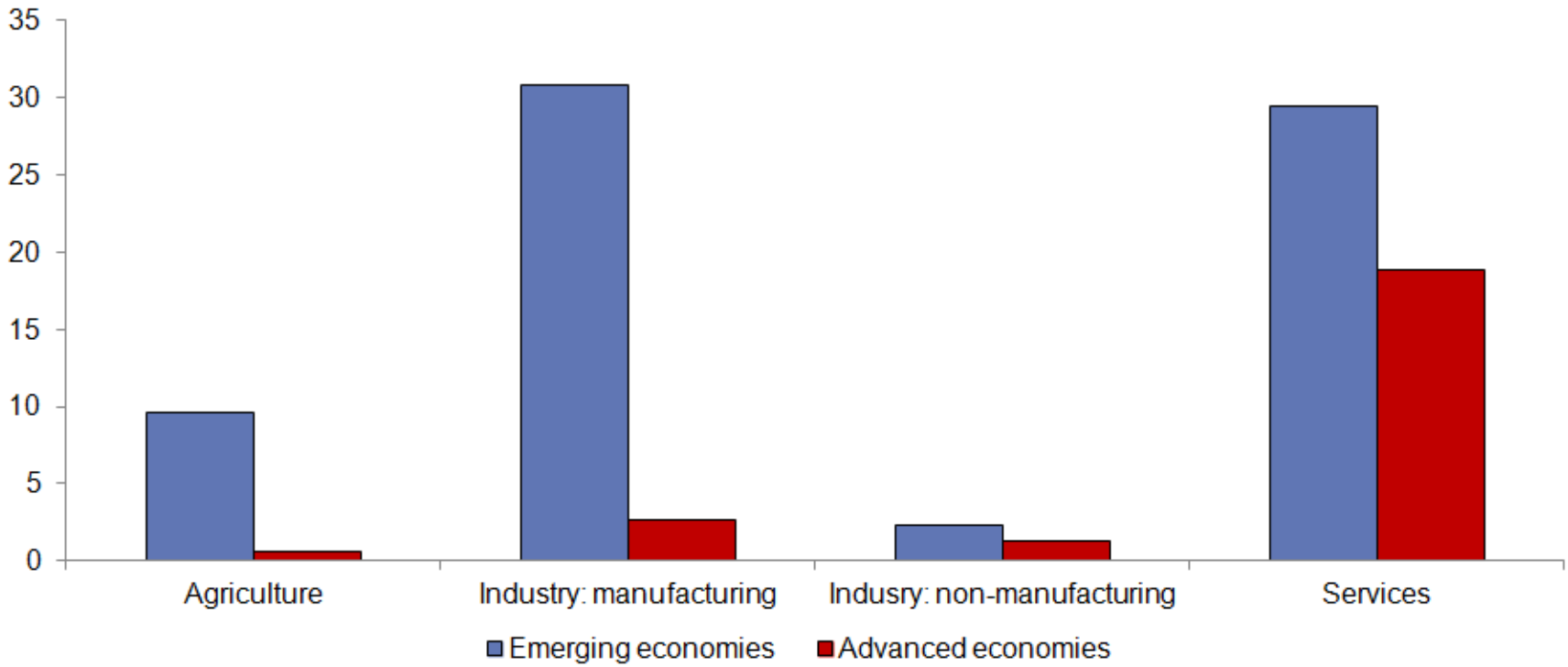
More and more workers are in GSC-related jobs

Number and share of GSC-related jobs, 1995-2013, 40 countries



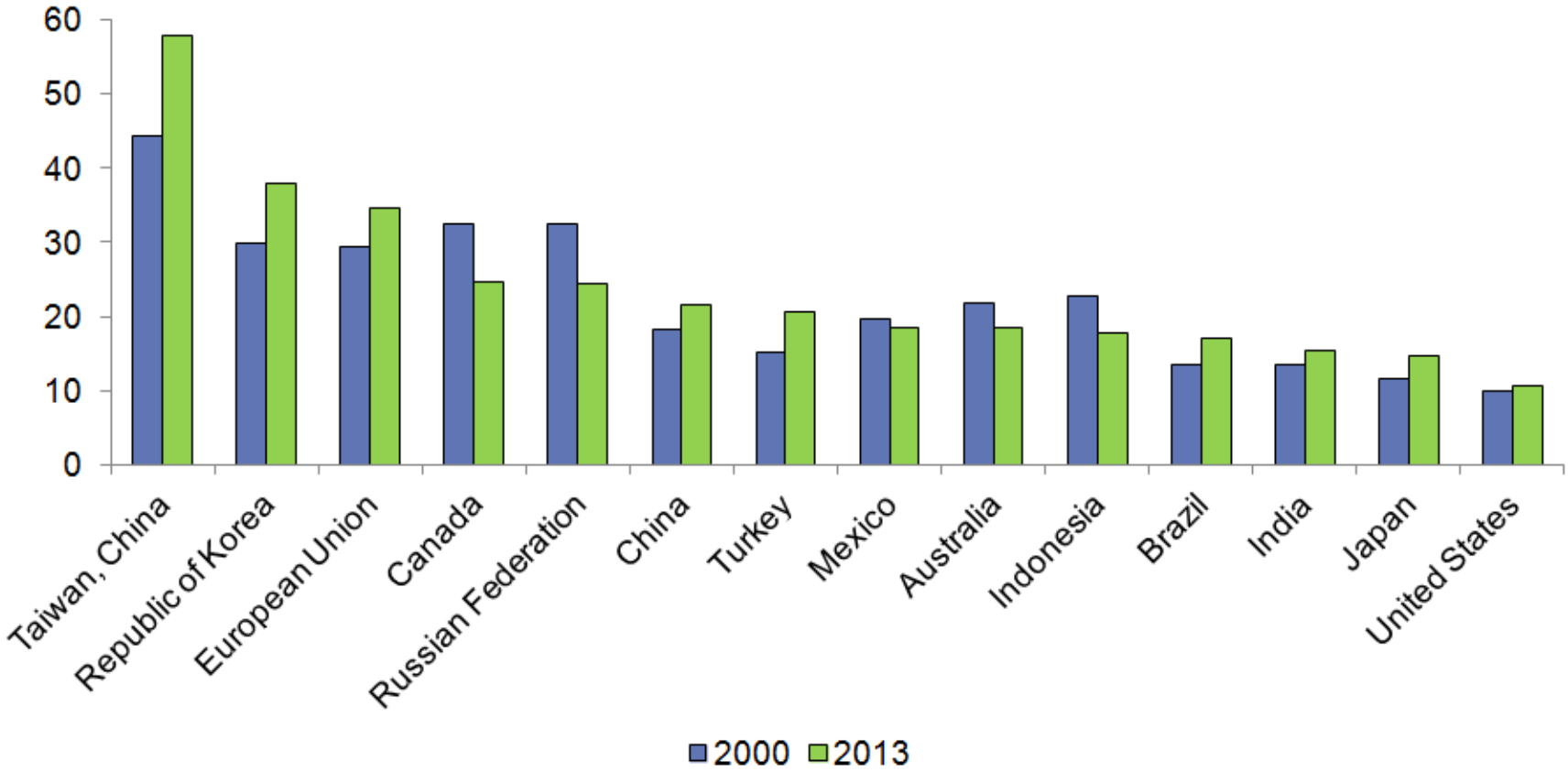
Many of the newly created GSC-related jobs are in services

Change in the number of GSC-related jobs by broad sector (millions), 2000-13



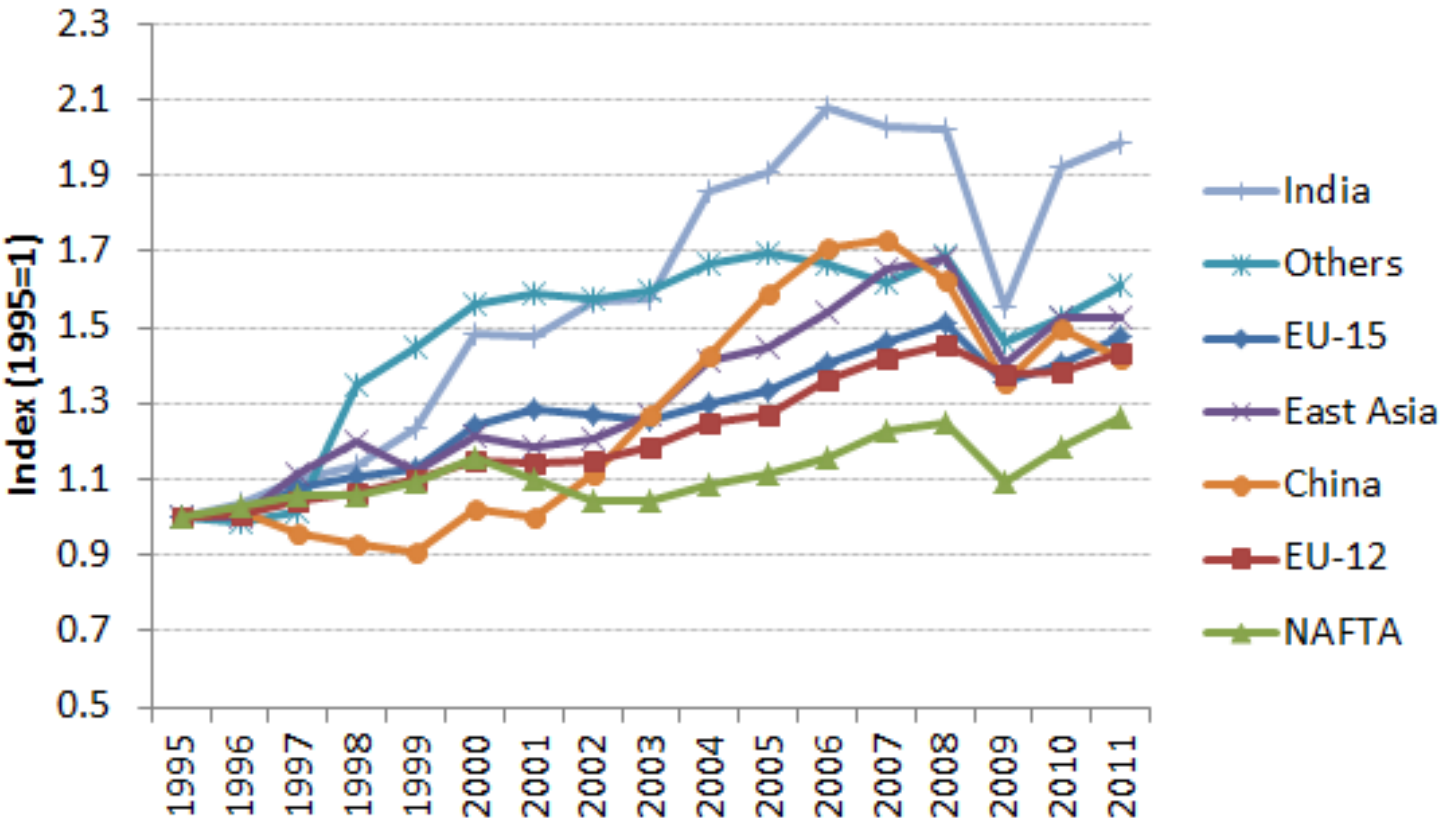
Most countries have seen an increase in GSC-related jobs

Share of GSC-related jobs in total employment (%), 2000 and 2013



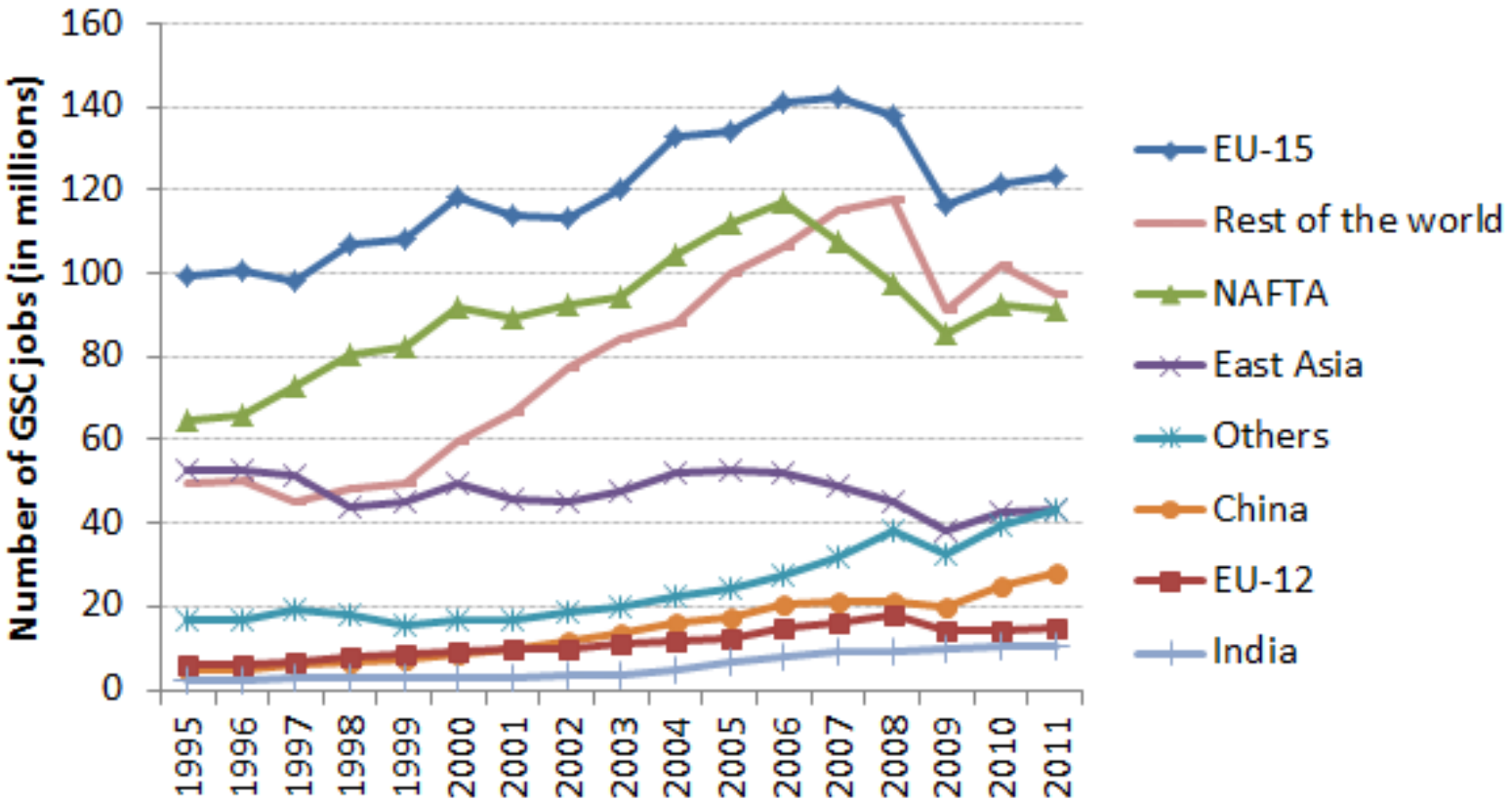
But trends differ widely across countries

Number of GSC-related jobs by country (1995=1), 1995-2011



Exports within and to the EU create a large number of jobs

Number of GSC-related jobs by export destination (millions), 1995-2011



There is a large variation of GSC-related jobs...

Country	Total number of jobs in GSCs (000s)	Most important export destination in terms of jobs	Number of jobs in GSCs related to most important export destination (000s)	Share of jobs in GSCs related to most important export destination (%)
Australia	1934	China	459	23.7
Austria	1885	Germany	382	20.3
Belgium	2283	Germany	284	12.5
Brazil	17207	China	2116	12.3
Bulgaria	1480	Germany	138	9.3
Canada	4372	United States	2178	49.8
China	183265	United States	32563	17.8
Cyprus	80	Greece	8	10.1
Czech Republic	3039	Germany	686	22.6
Denmark	995	Germany	116	11.6
Estonia	292	Finland	41	14.1
Finland	885	China	93	10.5
France	5959	Germany	743	12.5
Germany	16054	United States	1296	8.1
Greece	582	United States	36	6.1
Hungary	2245	Germany	365	16.3
India	75253	United States	16950	22.5
Indonesia	21026	China	2223	10.6
Ireland	957	United States	135	14.1
Italy	6883	Germany	834	12.1
...	...	...	...	...

Notes: Data refer to 2011.

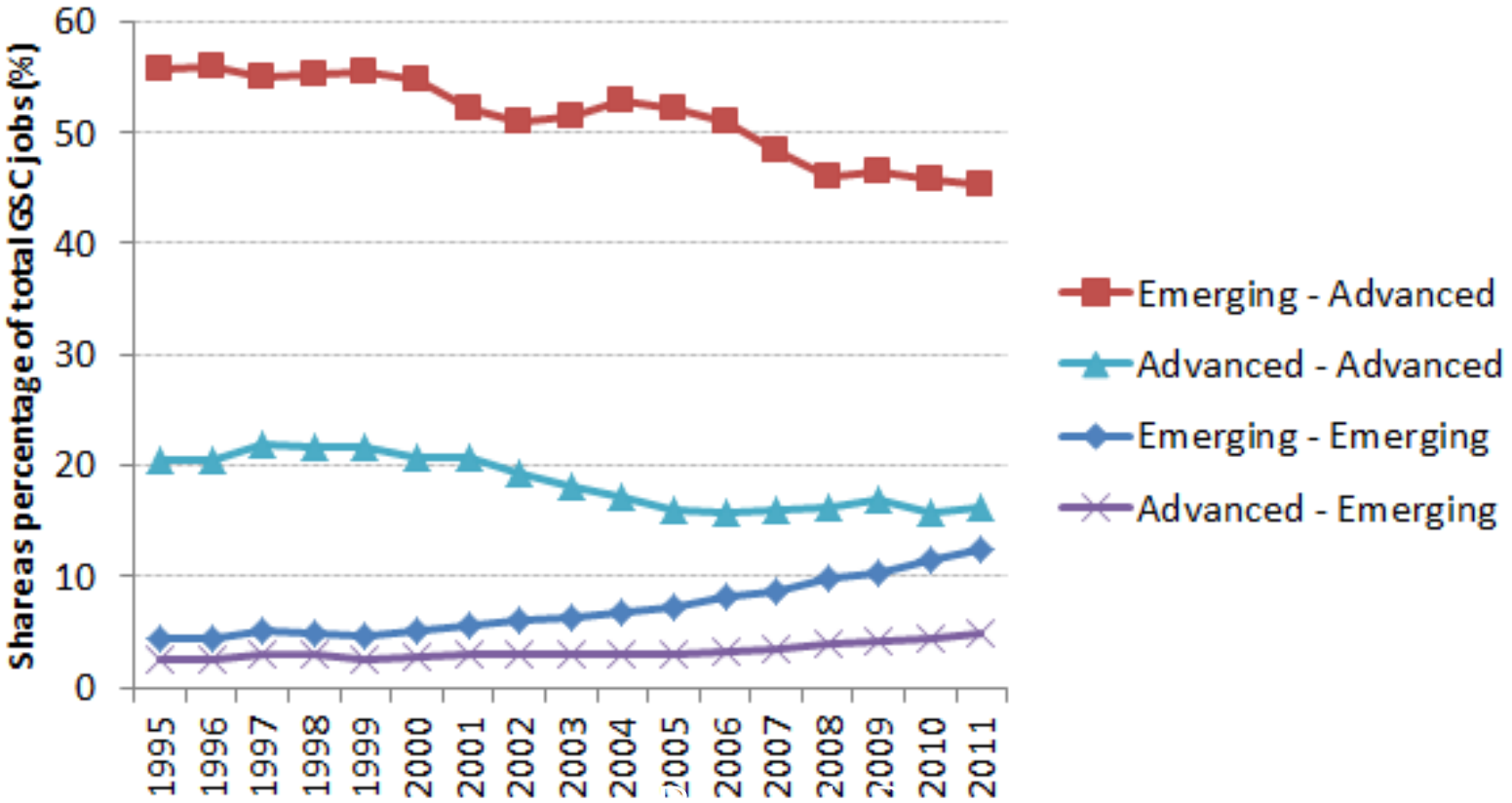
...across countries and destinations

Country	Total number of jobs in GSCs (000s)	Most important export destination in terms of jobs	Number of jobs in GSCs related to most important export destination (000s)	Share of jobs in GSCs related to most important export destination (%)
...	...	...	...	...
Japan	8243	China	1529	18.5
Korea (Rep.)	8694	China	1708	19.6
Latvia	285	Germany	20	6.9
Lithuania	512	Russia	50	9.7
Luxembourg	256	Germany	28	10.8
Malta	87	United Kingdom	10	11.7
Mexico	9904	United States	5421	54.7
Netherlands	4022	Germany	614	15.3
Poland	6097	Germany	1250	20.5
Portugal	1201	Spain	230	19.2
Romania	3220	Germany	361	11.2
Russia	17818	China	1614	9.1
Slovakia	1197	Germany	213	17.8
Slovenia	424	Germany	76	17.8
Spain	4423	France	533	12.1
Sweden	1767	United States	154	8.7
Taiwan (China)	5938	China	1583	26.7
Turkey	4840	Germany	674	13.9
United Kingdom	8436	United States	952	11.3
United States	15219	Canada	1595	10.5

Notes: Data refer to 2011.

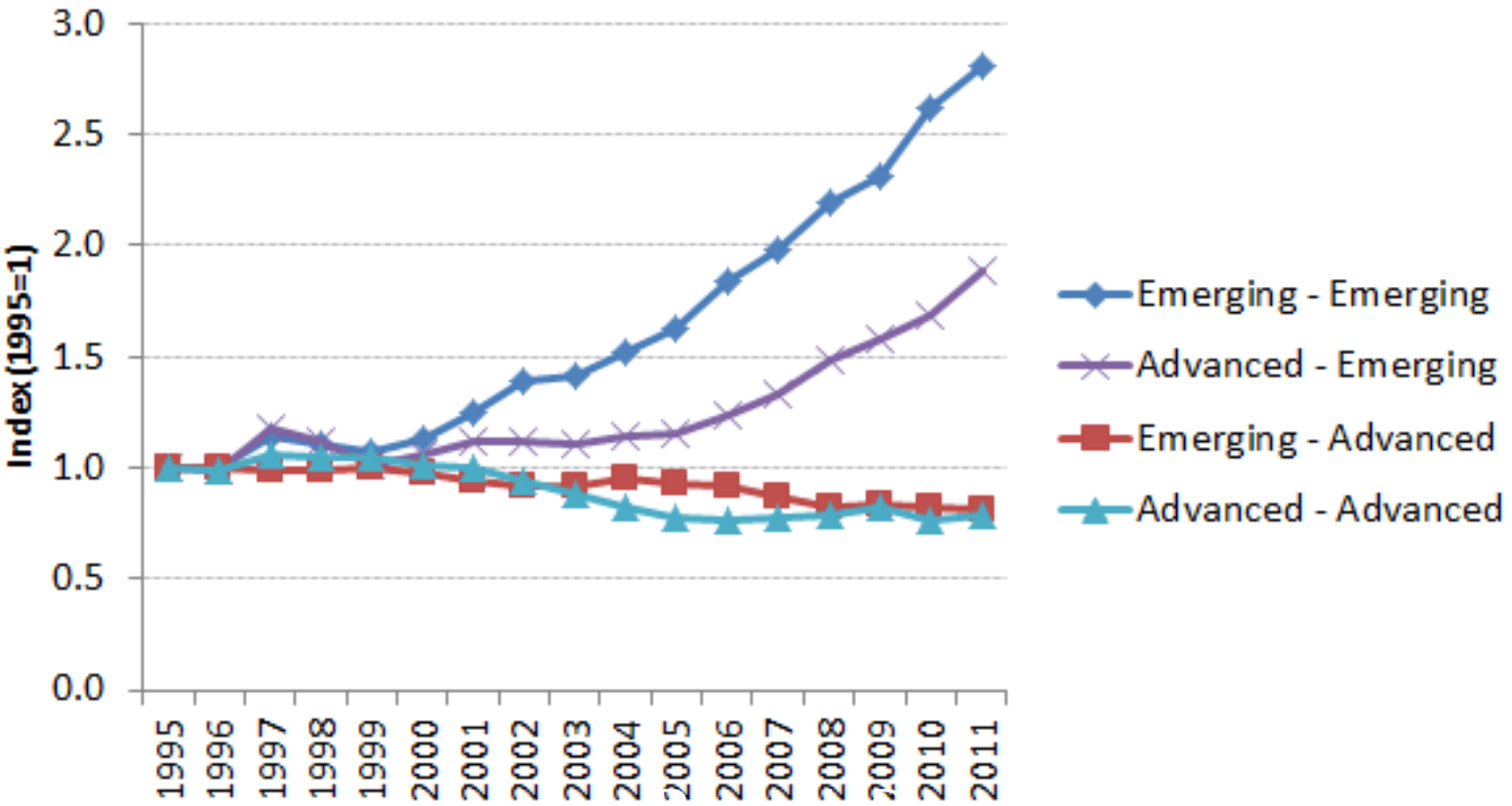
Most GSC-related jobs are in emerging economies and depend on exports to and among advanced economies

GSC jobs linkages between emerging and advanced economies (share in total, %), 1995-2011



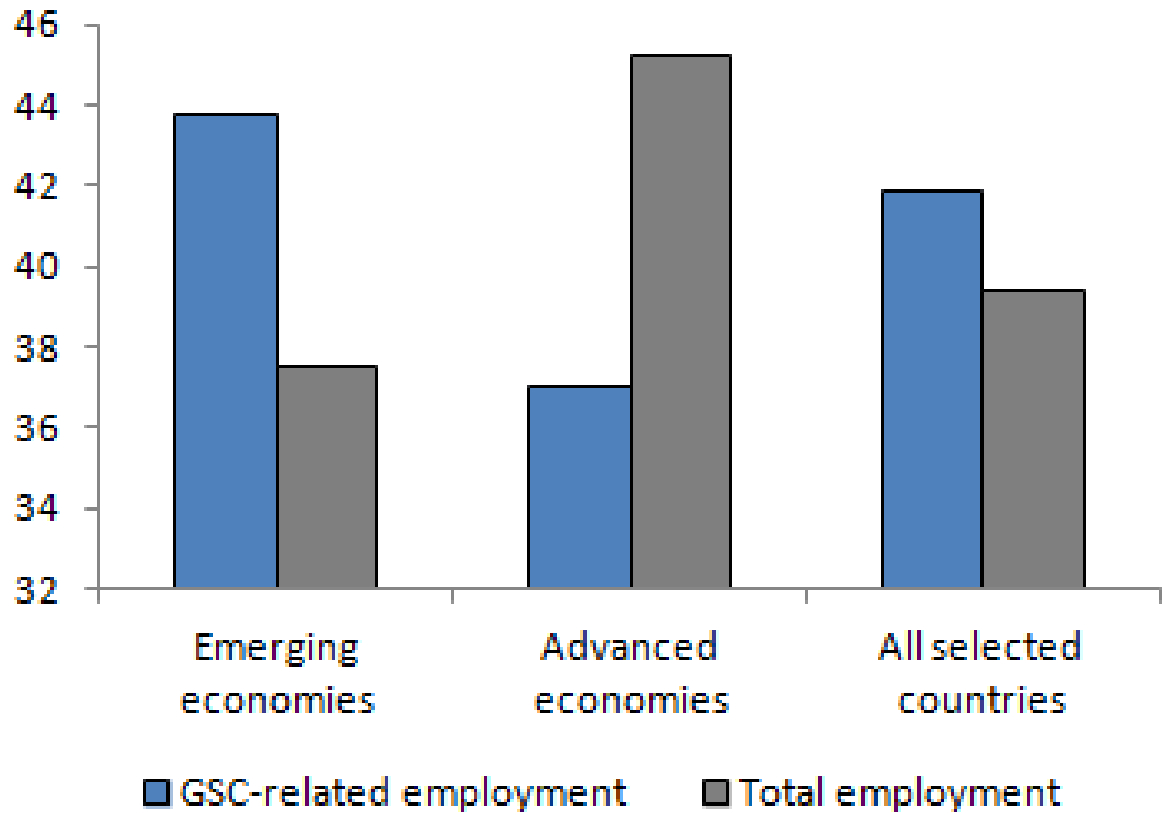
The number of GSC-related jobs created by emerging economies' export demand are on the rise

GSC jobs linkages between emerging and advanced economies (share in total, 1995=1), 1995-2011



Many women work in GSCs

Share of women employed in GSCs and in the total economy (%, 2013)



Estimation methodology and data

OLS panel fixed effects regression:

$$WS_{ist} = \alpha + \beta GSC\_PART_{ist} + \gamma\epsilon_{st} + \delta\epsilon_{it} + \epsilon_{is} + \epsilon_{ist}$$

i: country
s: sector
t: year

WS_{ist}: wage share

GSC_PART_{ist}: GSC forward participation index (=share of exported goods and services used as imported inputs to produce other countries' exports)

Wage share: UNIDO INDSTAT database, World Input-Output Database

GSC forward participation index: OECD Global Value Chain Indicators

Results: GSC forward participation and the wage share

	All countries		Developed		Emerging/ Developing	
	WIOD	INDST	WIOD	INDST	WIOD	INDST
GSC forward participation	-0.023***	-0.026***	-0.031***	-0.027***	-0.010*	-0.018
	(0.006)	(0.007)	(0.008)	(0.008)	(0.005)	(0.015)
Sector-time FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-time FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Within R2	0.20	0.37	0.21	0.37	0.37	0.75
# country-sectors	717	283	594	239	123	44
# observations	3585	940	2970	833	615	107

Estimation methodology: cross-section regressions

Standard OLS regression:

$$\log(Job_{ijt}) = \sum_{m=1}^{M} \beta_{m,t} B_{m,it} + \sum_{n=1}^{N} \gamma_{n,t} C_{n,jt} + \sum_{r=1}^{R} \delta_{r,t} D_{r,ijt} + \sum_{s=1}^{S} \delta'_{s,t} D'_{s,ij} + \alpha + \epsilon_{ijt} \qquad (1)$$

i: country where jobs are located
j: export destination
t: year

Job_{ijt}: number of jobs in country i linked to exports to destination j in year t
$B_{m,it}$: country-specific explanatory variables
$C_{n,jt}$: destination-specific explanatory variables
$D_{r,ijt}$: country-destination-specific (time-varying) explanatory variables
$D'_{s,ij}$: country-destination-specific (non-time-varying) explanatory variable

Data (I)

Labour force (it): ILO, Trends Econometric Models

GDP (PPP) (it, jt): World Bank

Geographic distance (ij): GeoDist dataset (Mayer and Zignago, 2011)

Common official language (ij): GeoDist dataset (Mayer and Zignago, 2011)

Contiguity of borders (ij): GeoDist dataset (Mayer and Zignago, 2011)

GDP growth (it, jt): IMF, World Economic Outlook

Trade openness (it, jt): $=(Exports+Imports)/GDP$, UNCTADstat

Data (II)

EU (ijt): *=1 if country and destination are both EU members*, Information on EU membership

Average applied bilateral import tariff (ijt): WITS Database, World Bank

Number of antidumping measures in force (ijt): Global Antidumping Database (Bown, 2015)

Quality of trade and transport infrastructure (j): *index going from 1 poor to 5 excellent*, Logistics Performance Index, World Bank

Time to import (jt): Doing Business, World Bank

Barriers to services trade (j): Services Trade Restrictions index, World Bank

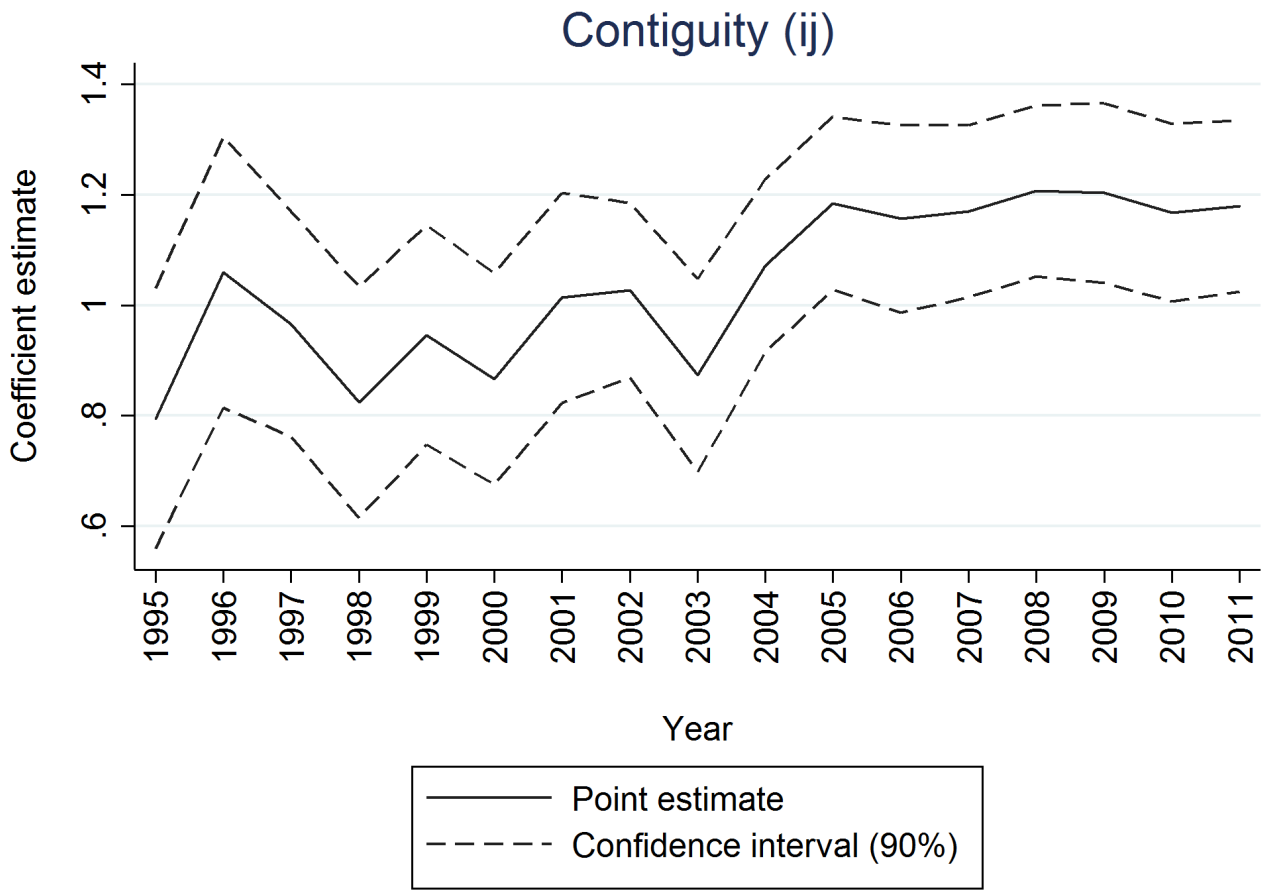
Results: total number of GSC-related jobs, 2011

Dependent variable: Log(GSC jobs)						
	(1)	(2)	(3)	(4)	(5)	(6)
Log(Labour force) (i)	1.179***	1.152***	1.134***	1.144***	1.132***	1.133***
Log(GDP) (i)	-0.045	-0.045	-0.033	-0.038	-0.031	-0.007
Log(GDP) (j)	0.925***	0.970***	0.838***	0.975***	0.837***	0.802***
Trade openness (i)	0.008***	0.008***	0.008***	0.008***	0.008***	0.008***
Trade openness (j)	0.003***	0.003***	0.001**	0.003***	0.001**	0.001
EU (ij)	0.877***	0.536***	0.503***	0.551***	0.503***	0.459***
Common border (ij)	1.193***	1.179***	1.239***	1.219***	1.240***	1.139***
Common language (ij)	0.536***	0.601***	0.443***	0.491***	0.443***	0.430***
Geographic dist. (ij)	-0.069***	-0.067***	-0.081***	-0.073***	-0.081***	-0.080***
Appl. imp. tariff (ij)		-0.065***	-0.029***	-0.041***	-0.029***	-0.023***
Transport infrastr. (j)			0.428***		0.428***	0.427***
Time to import (j)				-0.027***		
No AD measures (ij)					0.000	0.000
Services trade restr. (j)						-0.005**
Constant	Yes	Yes	Yes	Yes	Yes	Yes
R2	0.89	0.90	0.91	0.91	0.91	0.91
No country-destinations	1482	1368	1368	1368	1368	1102

Results: number of GSC-related jobs by broad sector, 2011

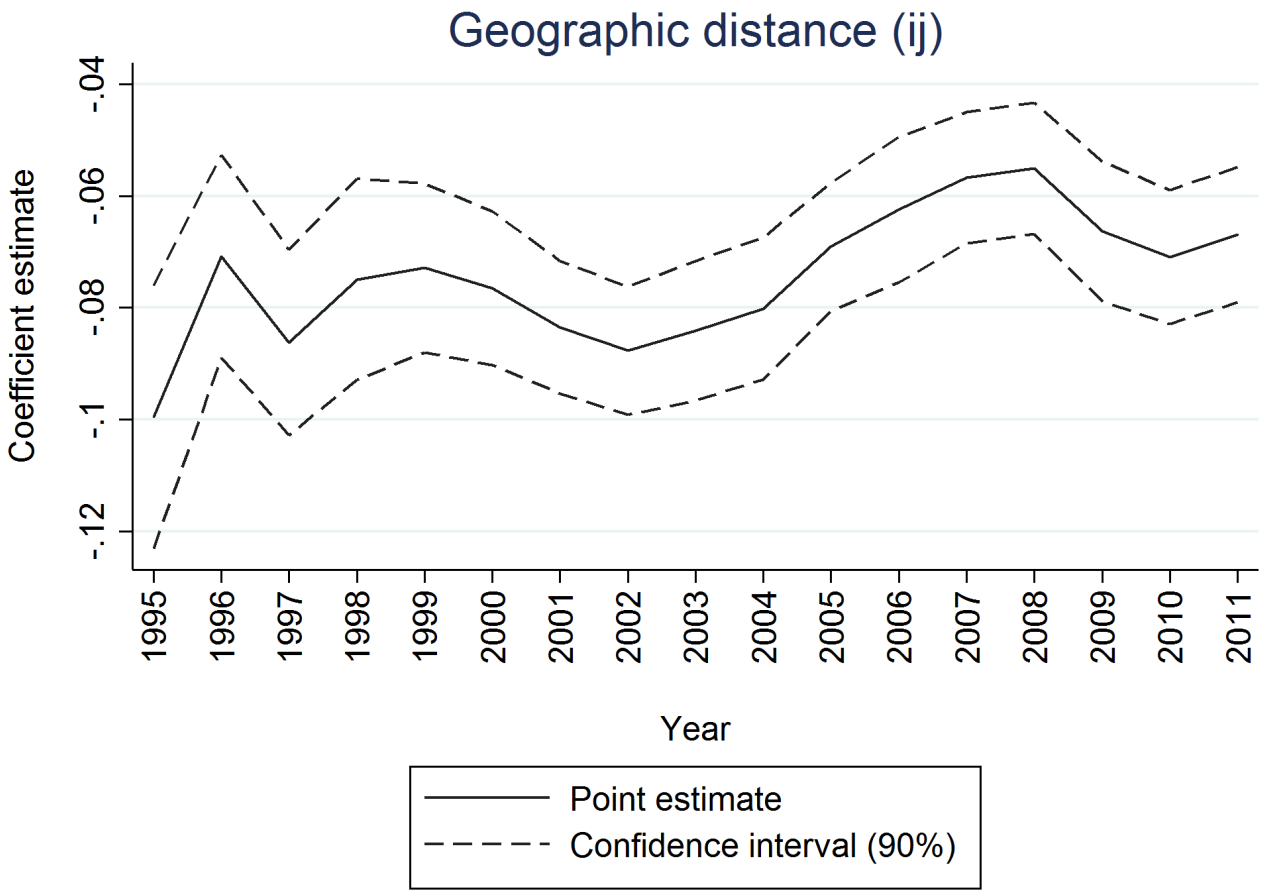
Dependent variable: Log(GSC jobs)						
	(1) Manu-facturing	(2) Services	(3) Agri-culture	(4) Manu-facturing	(5) Services	(6) Agri-culture
Log(Labour force) (i)	1.143***	0.877***	2.542***	1.096***	0.826***	2.474***
Log(GDP) (i)	0.031	0.248***	-1.415***	0.054	0.296***	-1.376***
Log(GDP) (j)	0.952***	0.925***	0.887***	0.883***	0.753***	0.857***
Trade openness (i)	0.008***	0.008***	0.004***	0.008***	0.009***	0.003***
Trade openness (j)	0.001**	0.005***	0.000	-0.000	0.002***	-0.000
EU (ij)	1.098***	0.753***	1.459***	0.731***	0.311***	0.938***
Common border (ij)	1.245***	1.059***	1.678***	1.173***	1.020***	1.584***
Common language (ij)	0.344***	0.639***	0.348***	0.221**	0.521***	0.298**
Geographic dist. (ij)	-0.088***	-0.056***	-0.077***	-0.093***	-0.071***	-0.083***
Appl. imp. tariff (ij)				-0.035***	-0.012	-0.052***
Transport infrastr. (j)				0.314***	0.535***	0.337***
No AD measures (ij)				0.003	0.000	-0.001
Services trade restr. (j)				-0.007**	-0.006**	-0.002
Constant	Yes	Yes	Yes	Yes	Yes	Yes
R2	0.88	0.87	0.85	0.89	0.89	0.86
No. country-destinations	1482	1482	1482	1102	1102	1102

Results: importance of common border, 1995-2011



Note: Coefficients are produced with a regression specified as in column 2 of the first table shown and run for each year in 1995-2011 separately.

Results: importance of geographic distance, 1995-2011



Note: Coefficients are produced with a regression specified as in column 2 of the first table shown and run for each year in 1995-2011 separately.

Conclusion

Estimates of the number of GSC-related jobs have been created for 40 countries that account for around two thirds of the global labour force

Current work:

- Extend country coverage to come closer to a global estimate
- Work on refinement of estimates
- Provide lower- and upper-bound estimates