International scientific collaborations and the Chinese Belt and Road Initiative (BRI). A bibliometric assessment of the research component of BRI geopolitical strategy

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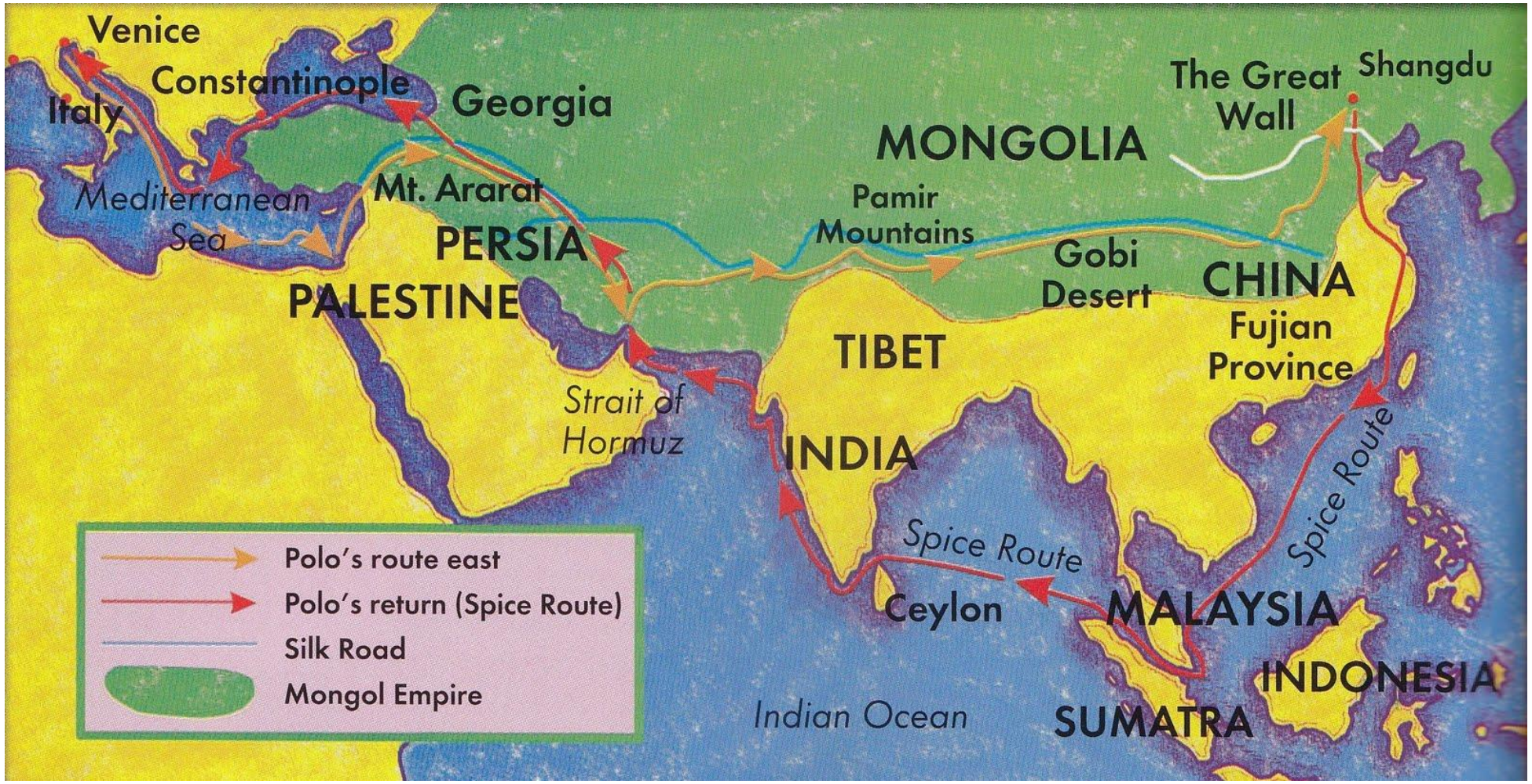
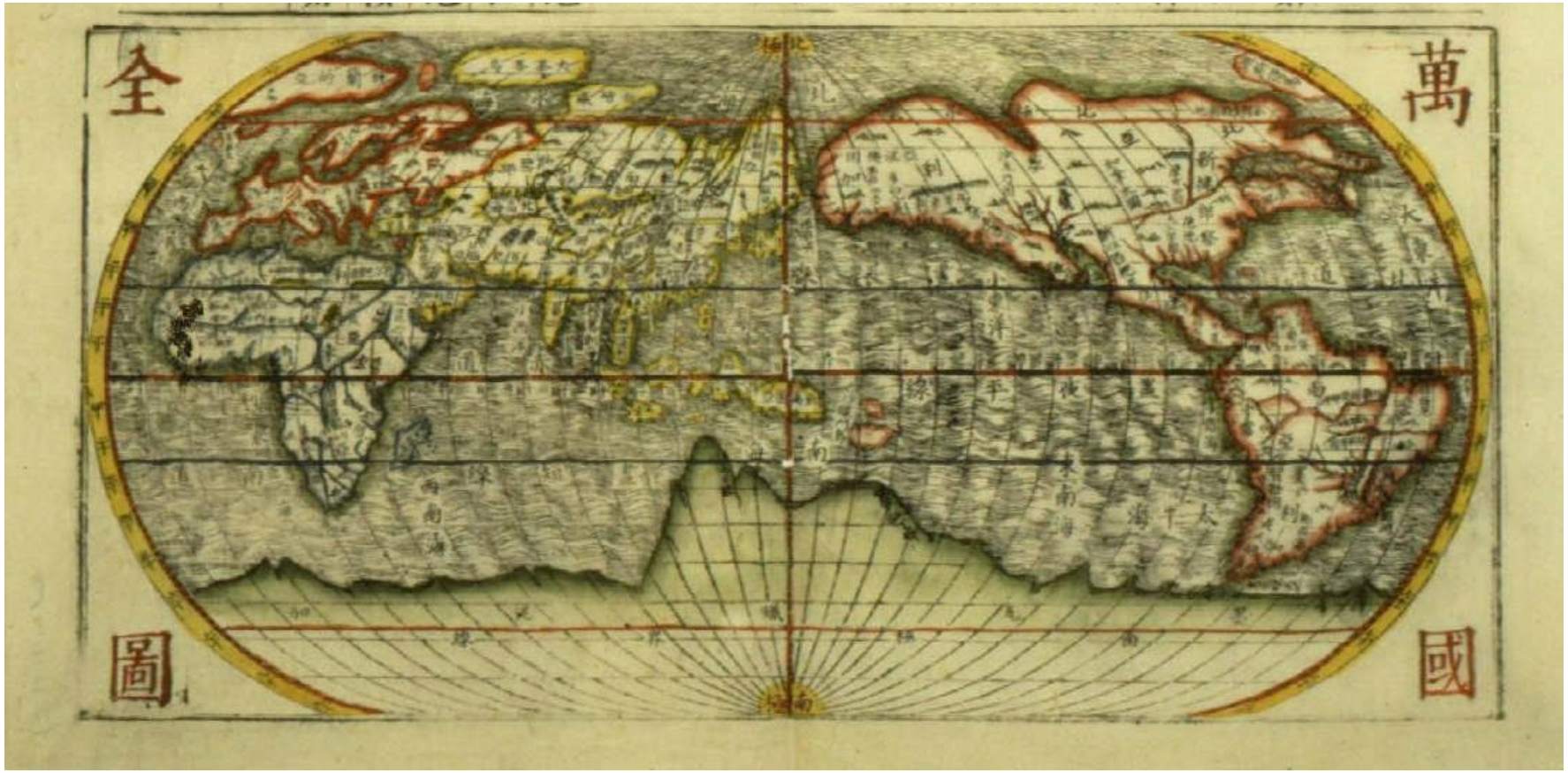
What the presentation is about

- Geopolitics and China is nothing new: some context
- What co-authorships are and why they should matter
- Some general descriptive statistics about Australasia and World
- Data analysis
  - Time series (aggregated)
  - Influence of research (microdata)
    - Within world main countries
    - For mid and small Australasian countries
- Limitations
- Conclusions

Geography is mostly political, sometimes



西泰* ’s 大瀛全圖: your position in the world is to be stipulated



* aka 利玛窦, or “Matteo Ricci”

Some context

- China is not a novelty; it’s a coming back instead
- Geopolitical strategy of BRI is to overcome American thalassocracy in Eurasia, re-establishing a sort of (mostly) land-path *pax mongolica*.
- Implicit assumption is that some in-between countries may swap dominant country of reference
- Reality is far from simple categories
- BRI just begun, although Chinese growth as a global player dates decades ago by now

What co-authorships are

- Collaborations (co-auths) are spontaneous
- Not necessarily they are between equal partners
  - The stronger is likely to choose the weaker, but if it does so it is because in a specific case the weaker is not weak and may give a sound contribution
- Collaborations are not only dyads, they are multiple
- Statistics have grown exponentially
- Co-auths are arguably a reflection of:
  - Size and space (distance)
  - Inputs factors (resources)
  - Geopolitical constraints (either in favouring and avoiding)

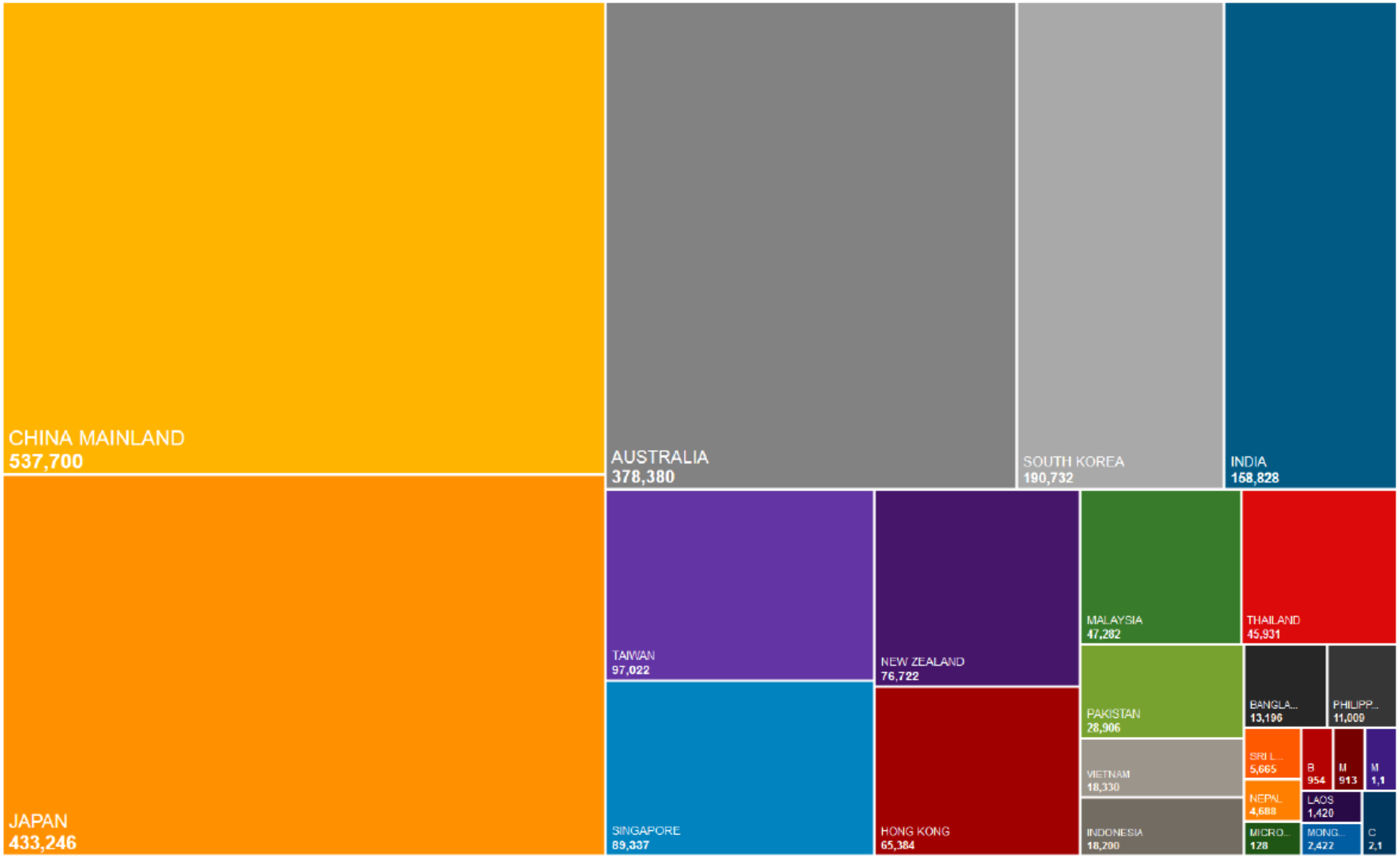
Why co-auths may be relevant?

- To check who is who in global science
- To check if a big player is gaining some dominant role in the global web of collaborations

- In this case it is relevant to understand if China is gaining the role of main partner for many “minor” or “medium” countries, if compared to other “big” players.

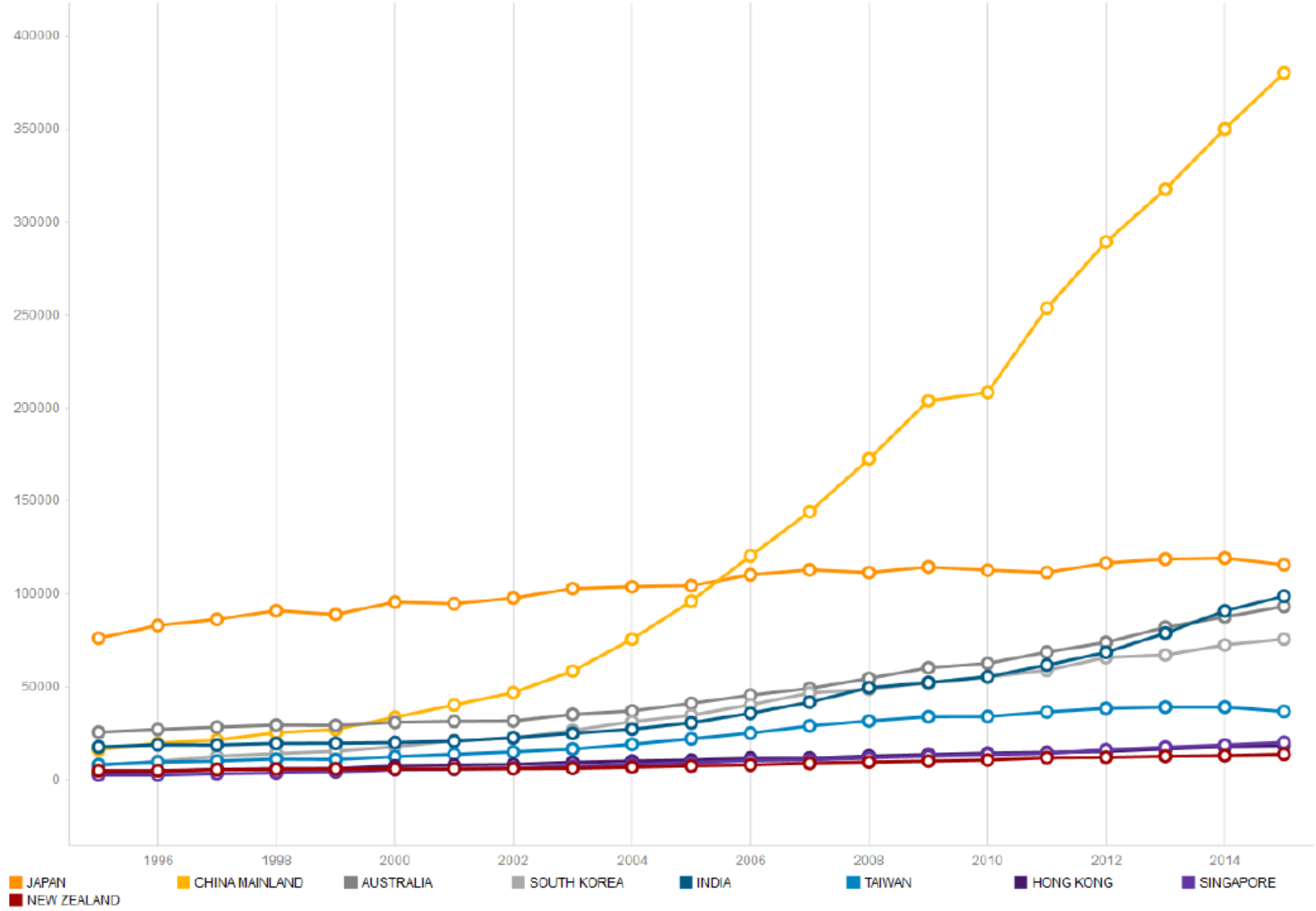
Data from InCites Web of Science

Treemap



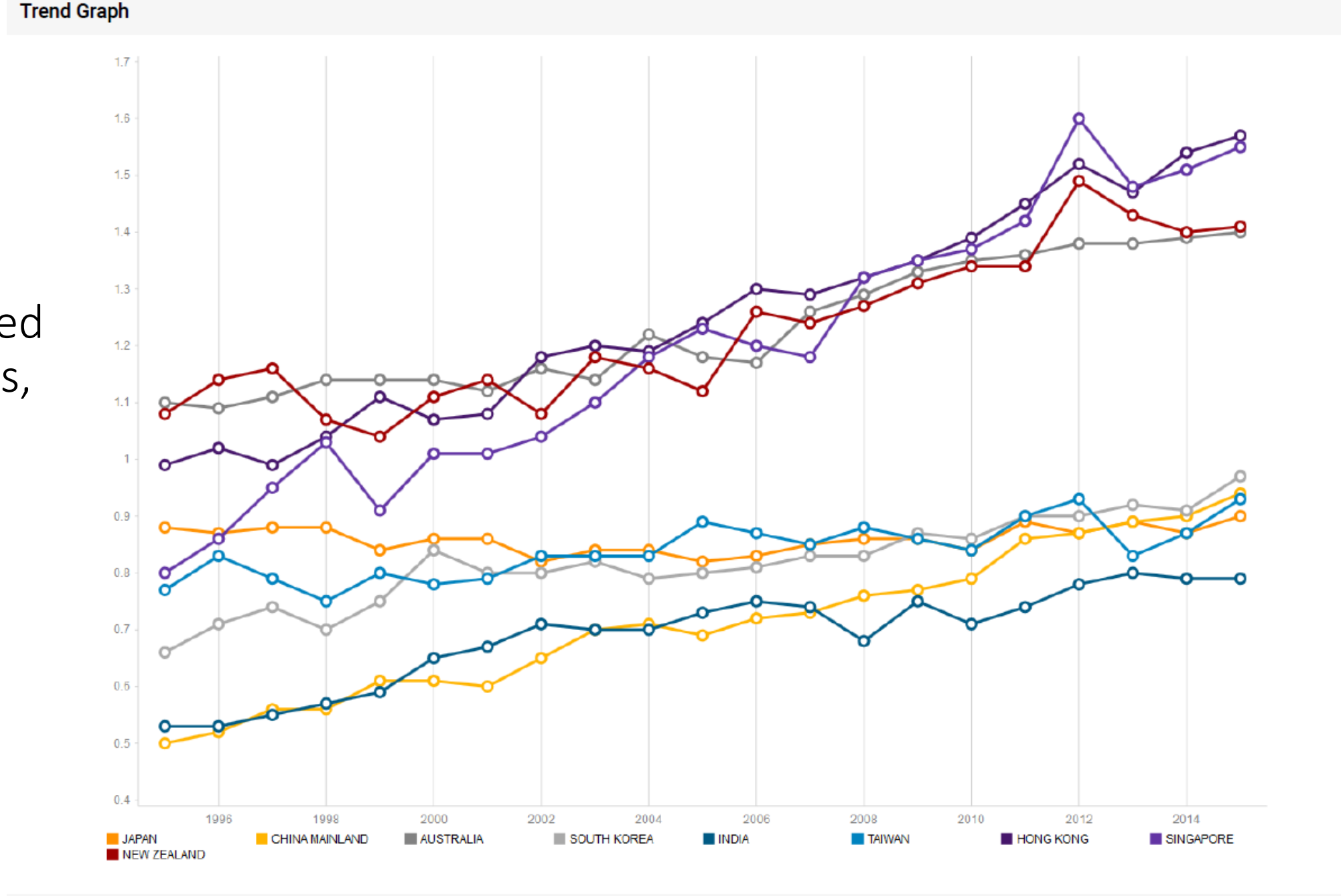
Indicators: Web of Science Documents. **Location:** Asia Pacific. **Location Type:** Country/region. **Collaborations with Locations:** Asia Pacific. **Time Period:** 1995-2015.
InCites dataset updated Oct 4, 2018. Includes Web of Science content indexed through Jul 31, 2018. Export Date: Oct 15, 2018.

Trend Graph

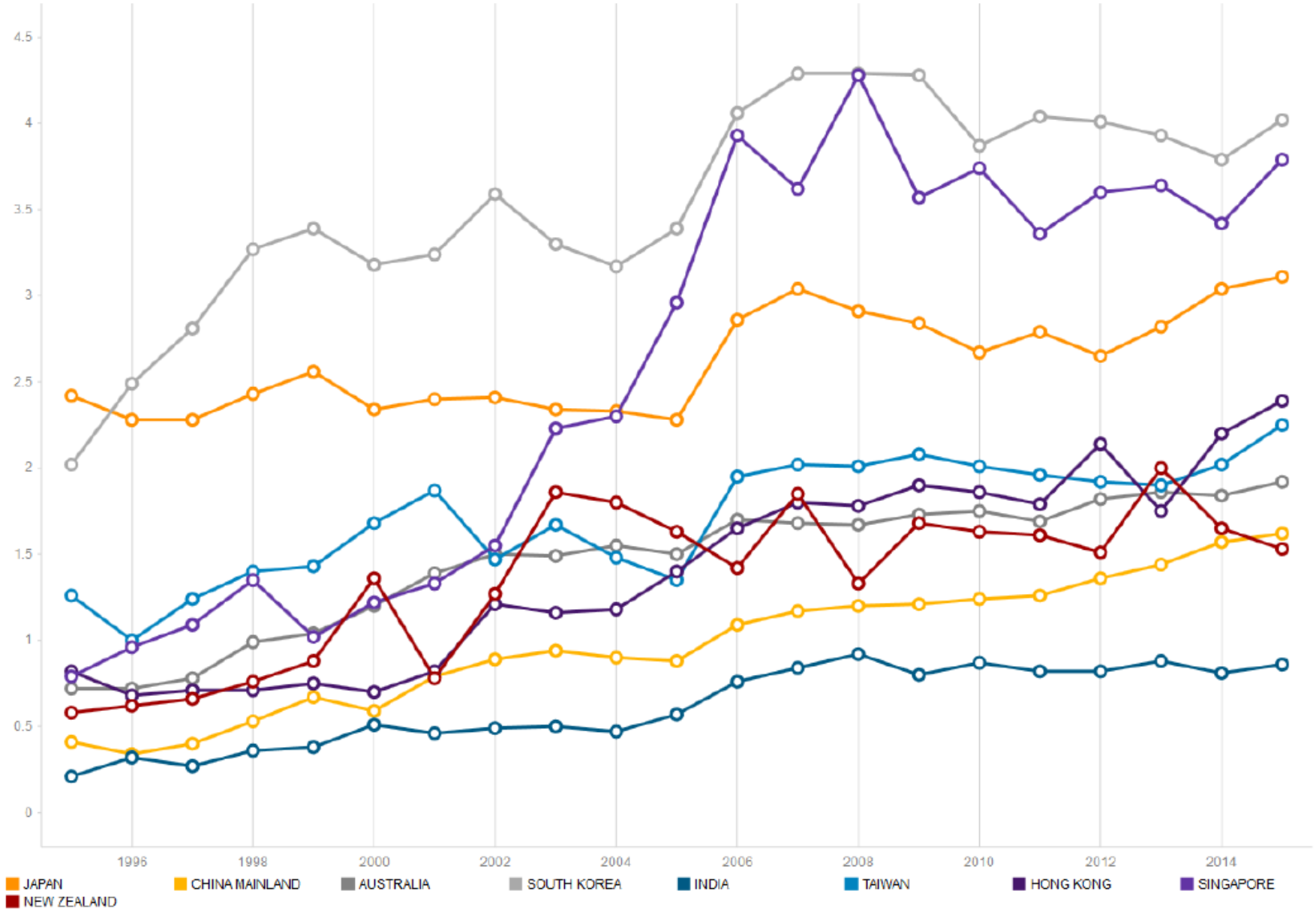


Indicators: Web of Science Documents. **Location:** Asia Pacific. **Location Type:** Country/region. **Time Period:** 1995-2015.
InCites dataset updated Oct 4, 2018. Includes Web of Science content indexed through Jul 31, 2018. Export Date: Oct 15, 2018.

Influence of research within Australasian countries expressed by major countries, time series

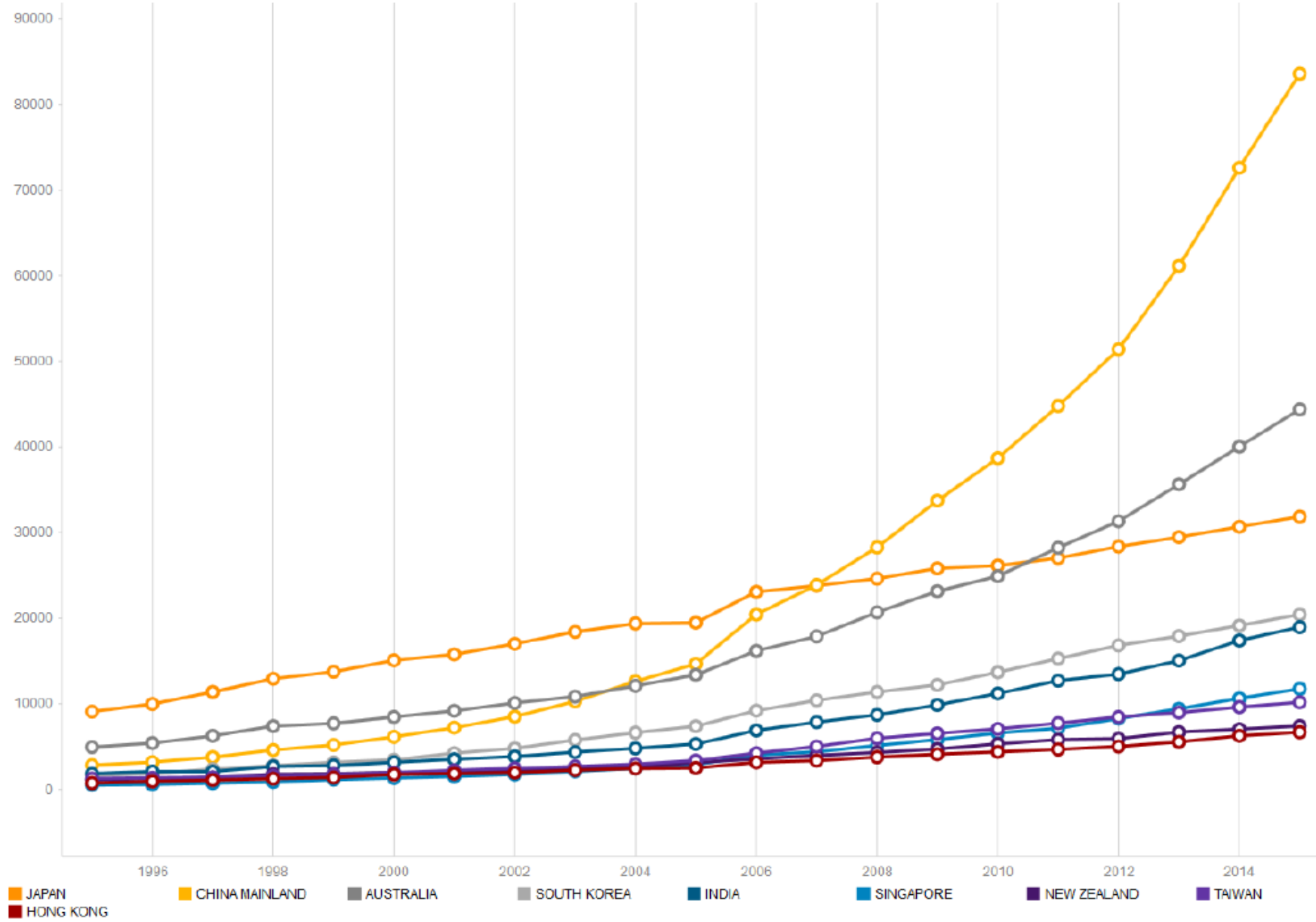


Trend Graph



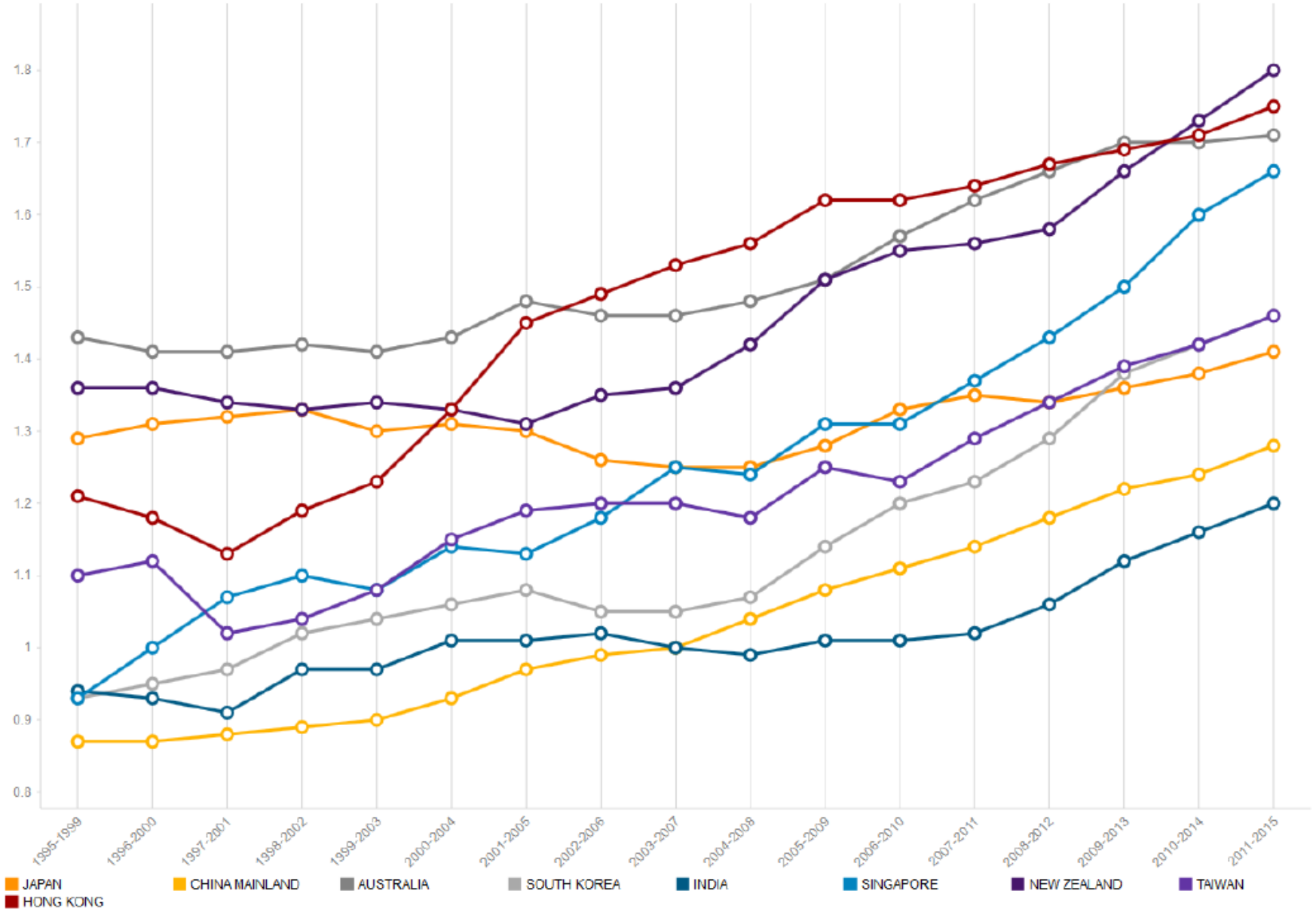
Indicators: % Industry Collaborations. **Location:** Asia Pacific. **Location Type:** Country/region. **Time Period:** 1995-2015.
InCites dataset updated Oct 4, 2018. Includes Web of Science content indexed through Jul 31, 2018. Export Date: Oct 16, 2018.

Trend Graph



Indicators: Web of Science Documents. **Location:** Asia Pacific. **Location Type:** Country/region. **Collaborations with Locations:** Asia Pacific. **Time Period:** 1995-2015.
InCites dataset updated Oct 4, 2018. Includes Web of Science content indexed through Jul 31, 2018. Export Date: Oct 15, 2018.

5-Year Trend Graph



Indicators: Category Normalized Citation Impact. **Location:** Asia Pacific. **Location Type:** Country/region. **Collaborations with Locations:** Asia Pacific. **Time Period:** 1995-2015.
InCites dataset updated Oct 4, 2018. Includes Web of Science content indexed through Jul 31, 2018. Export Date: Oct 15, 2018.

ARIMA time series regression. What may predict increase of co-authored publications over time?

Testing domestic expenditure in R&D and Foreign Direct Investment at parity of number of co-authoring countries

Country	Domestic RD/GDP	FDI (inflow+outflow)	Av No of coll	sigma
CN	-1988.445	1.92e-07***	65764.38	3505.906***
US	-135515.2***	6.94e-08***	398809.4***	2750.918***
JP	20822.25***	7.20e-08***	3813.136	646.9547***
SG	5311.533***	1.21e-07***	10250.04***	371.8015***
HK	13941.92***	3.39e-08***	3263.422	414.0604***
IN	-10354.15**	1.36e-07***	23068.41***	639.4648***
KR	5714.08	1.36e-07	3883.486	625.3746***
AU	-5033.641	9.20e-08	96736.27***	2208.171***
NZ	16105.58***	1.17e-07	8061.292***	533.9756***
EU	69892.57	2.13e-09	124767	2825.381***
TW		n.a.		

Which country is more successful to co-author with (comprehensive set of co-authored publications within listed countries)?

```
. reg CNCI US CN AU JP EU28 HK TW SG IN KR NZ RU no_coll

 Source |       SS           df       MS      Number of obs   = 2,840,104
-------------+----------------------------------   F(13, 2840090)  =   3002.32
       Model |  606128.329        13  46625.2561   Prob > F        =    0.0000
    Residual |  44105853.9 2,840,090  15.5297381   R-squared       =    0.0136
-------------+----------------------------------   Adj R-squared   =    0.0136
       Total |  44711982.3 2,840,103  15.7430848   Root MSE        =    3.9408

------------------------------------------------------------------------------
        CNCI |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          US |   .5515467   .0080427    68.58   0.000     .5357832    .5673101
          CN |   .0569947   .0071238     8.00   0.000     .0430323    .0709571
          AU |   .3931525   .0083033    47.35   0.000     .3768784    .4094267
          JP |   .0461935   .0077844     5.93   0.000     .0309364    .0614506
        EU28 |   .4004002   .0074266    53.91   0.000     .3858444     .414956
          HK |   .6350275   .0104611    60.70   0.000     .6145242    .6555308
          TW |   .2765863   .0089064    31.05   0.000       .25913    .2940425
          SG |    .581829   .0106675    54.54   0.000     .5609211    .6027368
          IN |  -.1273829   .0112732   -11.30   0.000     -.149478   -.1052879
          KR |   .0208981    .010114     2.07   0.039     .0010751    .0407211
          NZ |   .4803377   .0112914    42.54   0.000     .4582068    .5024685
          RU |  -.2510281   .0433338    -5.79   0.000    -.3359607   -.1660954
     no_coll |   .3093487   .0044395    69.68   0.000     .3006475      .31805
       _cons |   .1605732   .0080425    19.97   0.000     .1448101    .1763363
------------------------------------------------------------------------------
```

Which country is more successful to co-author with (only Australasian countries)?

Source	SS	df	MS	Number of obs	=	391,771
				F(13, 391757)	=	964.31
Model	103607.272	13	7969.79013	Prob > F	=	0.0000
Residual	3237770.62	391,757	8.26474222	R-squared	=	0.0310
				Adj R-squared	=	0.0310
Total	3341377.89	391,770	8.52892741	Root MSE	=	2.8748

CNCI	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
US	.3947881	.0367861	10.73	0.000	.3226885	.4668878
CN	-.1344342	.030526	-4.40	0.000	-.1942643	-.074604
AU	-.0112408	.0273817	-0.41	0.681	-.0649082	.0424266
JP	-.3457045	.0228989	-15.10	0.000	-.3905857	-.3008234
EU28	.0339264	.0183234	1.85	0.064	-.0019869	.0698398
HK	.7616097	.0547888	13.90	0.000	.6542253	.868994
TW	-.0097932	.051009	-0.19	0.848	-.1097692	.0901828
SG	.1372932	.0446383	3.08	0.002	.0498034	.224783
IN	-.3589074	.0352981	-10.17	0.000	-.4280907	-.2897241
KR	-.3312496	.034776	-9.53	0.000	-.3994096	-.2630897
NZ	.6027503	.0619032	9.74	0.000	.481422	.7240787
RU	-.9347497	.1093023	-8.55	0.000	-1.148979	-.7205205
no_coll	.4195214	.011618	36.11	0.000	.3967506	.4422923
_cons	.2585019	.0127607	20.26	0.000	.2334913	.2835125

Limitations and further steps

- TNHE ought to be investigated by institution also
- Scientific outputs by collaboration with industry may be better predicted by RD or FDI resources.
- FDI would be by far more interesting if data were available in adjacent format (i.e. pairs of X_i-X_j)
- TNHE has still to unleash much if its potential, if last year is 2015

Conclusions

- China has emerged as a global power in science production, but:
  - China was starting from scratch
  - China is not alone, some other countries are still big
    - Unclear relationship between mainland and “satellites” (TW, HK, MO)
  - Asian geography of science is mostly split by size
  - Infrastructure BRI geography is different from scientometric geography
  - China still has a margin to cover in terms of influence (will it be able to?)
    - China has increased a lot in terms of number of publications with smaller countries, not necessarily in its respective influence.

- FDIs appear as a good tough weak predictor in establishing international co-authored publications

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