

ESS: Lessons from international experience on Large Scale Research Facilities (LSRFs)

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LSRFs are seen as drivers of growth, and regions are competing to host them

LSRF drive growth through two distinct mechanisms:

- A. Investment driver (initial and ongoing funding of the facility translates into local demand.)

- A. Knowledge driver: Science → new knowledge → Innovation giving rise to economic growth

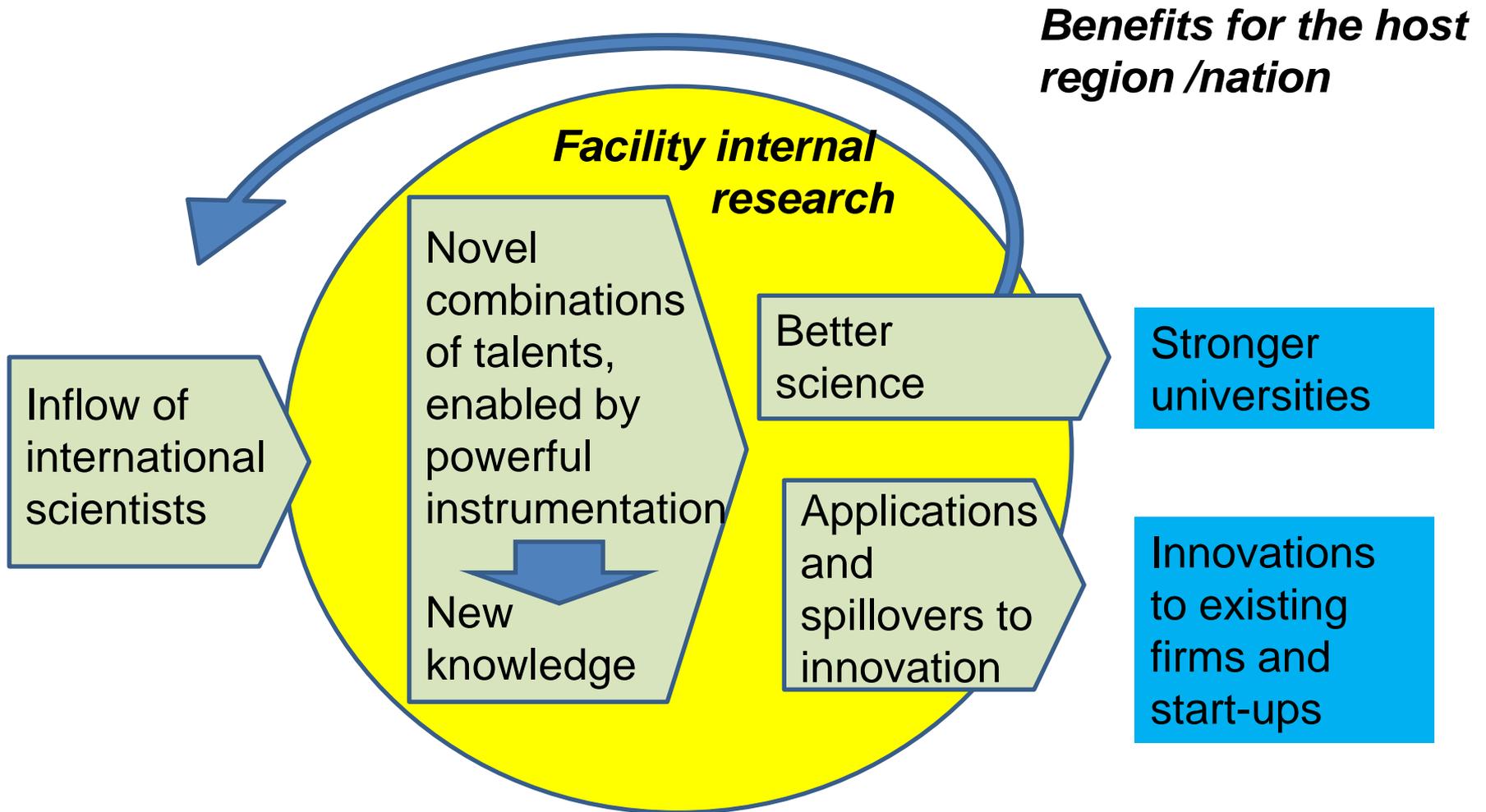
What we know about LRSFs as growth drivers

- Investment driver: Well documented
- Knowledge driver: We know very little,

And we cannot just generalise from economic effects of other knowledge institutions, e.g. Universities (they have a much broader mandate in generating and diffusing new knowledge)

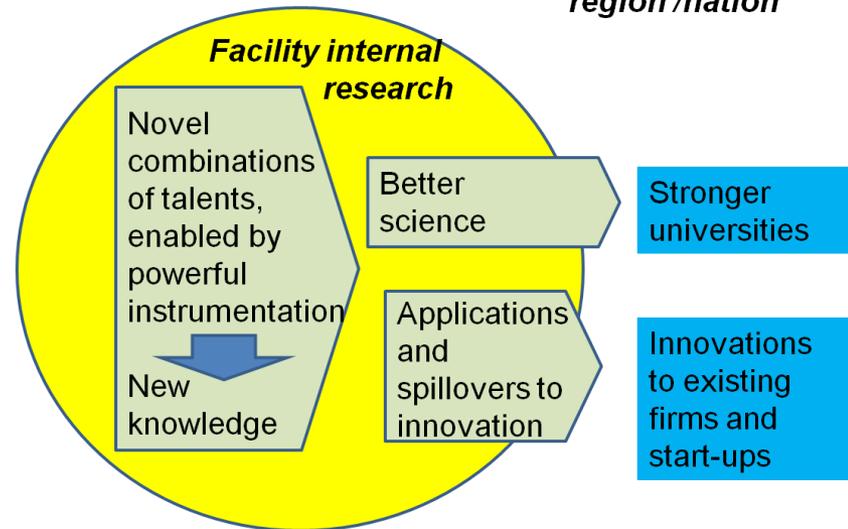
- This presentation is on ***knowledge drivers***, based on novel research on LRSFs carried out here at CBS.
- We need a simple model of LRSFs as knowledge drivers:

A simple model of knowledge drivers of LSRFs



To drive growth all factors in the model matter. But one is particularly critical :

Inflow of international scientists



This presentation examines

1. How the global research community is connected to LSRF research ?
2. What factors offer stronger/weaker connectivity to global research.

Learning for ESS from the closest parallel

We study the closest parallel to ESS: The Neutron Spallation Source at Oak-Ridge*)

European Spallation Surce (rendering)



Oak-Ridge Spallation Neutron Source



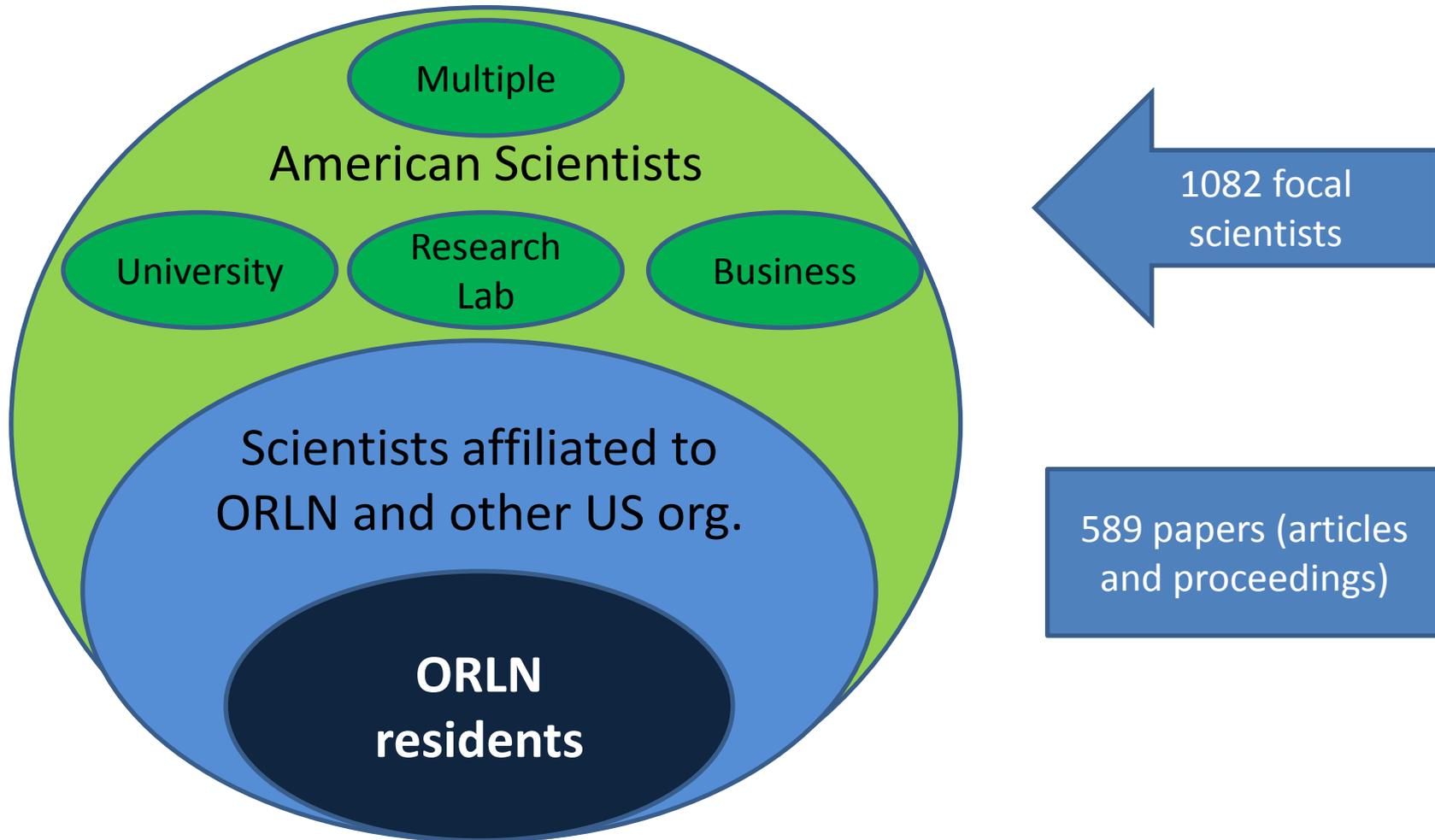
*) “How Large Scale Research Facilities Connect to Global Research”
Giancarlo Lauto and Finn Valentin. fv.ino@cbs.dk

Methodology (1)

- We consider the publications involving OR/NSD staff or resources in 2006-2009
- We compare *the propensity to partner with international colleagues* between scientists affiliated to OR-NSD to those affiliated to other American organizations
- We consider
 - **Collaboration attributes**
 - Institutional: number of collaborators affiliated to an institution of the same type as the focal author
 - Social: the total number of repeated collaborations established by each focal author in projects carried out on OR/NSD-related research
 - **Project attributes**
 - Discipline: Physics, Physics Multidisciplinary, Other fields
 - Positioning along the basic-applied continuum
 - Average year of publication
 - **Individual attributes**
 - Type of affiliation: ORLN, University, Res. Lab, Business, ORLN+, Multiple
 - Scientific prominence; n. of publications; n. of total collaborators.

Methodology (2)

Breakdown of US authors and institutional types



Two types of findings are presented

- 1) Simple descriptive statistics, showing the profiles of global connectivity of SNS research

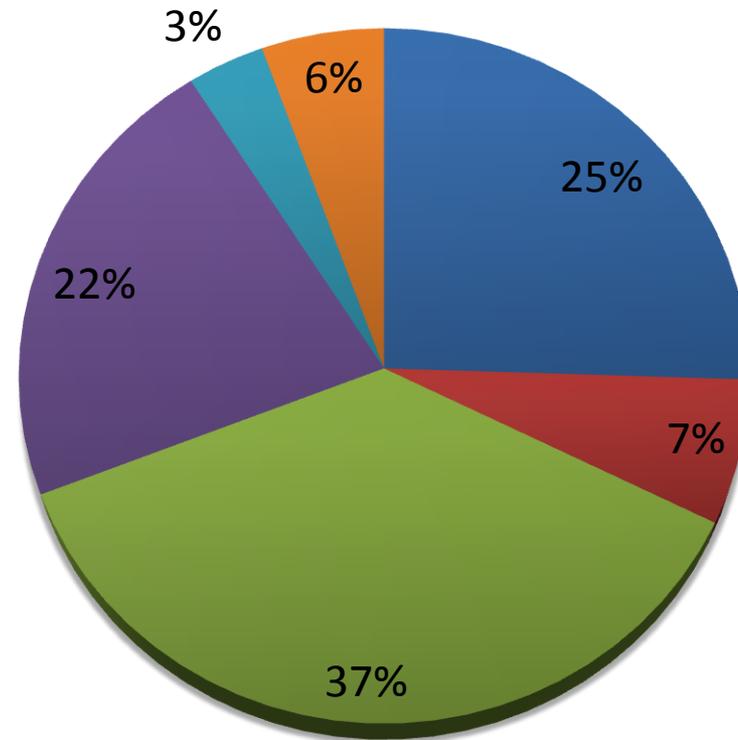
However we observe the first four years of a facility-life of perhaps 40 years., e.g. giving particular emphasis to construction and calibration of new instruments. To maximise ESS-relevant experience we want to “remove” Oak-Ridge specificities as much as possible.

- 2) Therefore, in statistical analysis we model the general propensity of each US scientists doing research at the facility to collaborate internationally

Profile of US scientists working on OR/NSD-related research (1)

Distribution of focal scientists by affiliation

- One quarter of authors is affiliated to ORLN, 7% to ORLN-plus other American organizations



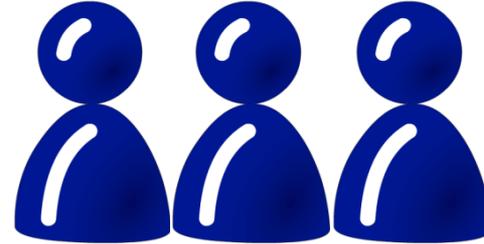
Total number of collaborations found in the 580 papers

16.580

LSRFs are indeed powerful drivers of
research connectivity

Patterns of collaboration (1)

- The 589 focal papers generate a network of 1801 scientists, 719 of which are international – i.e. every 3 focal authors involve 2 foreign partners

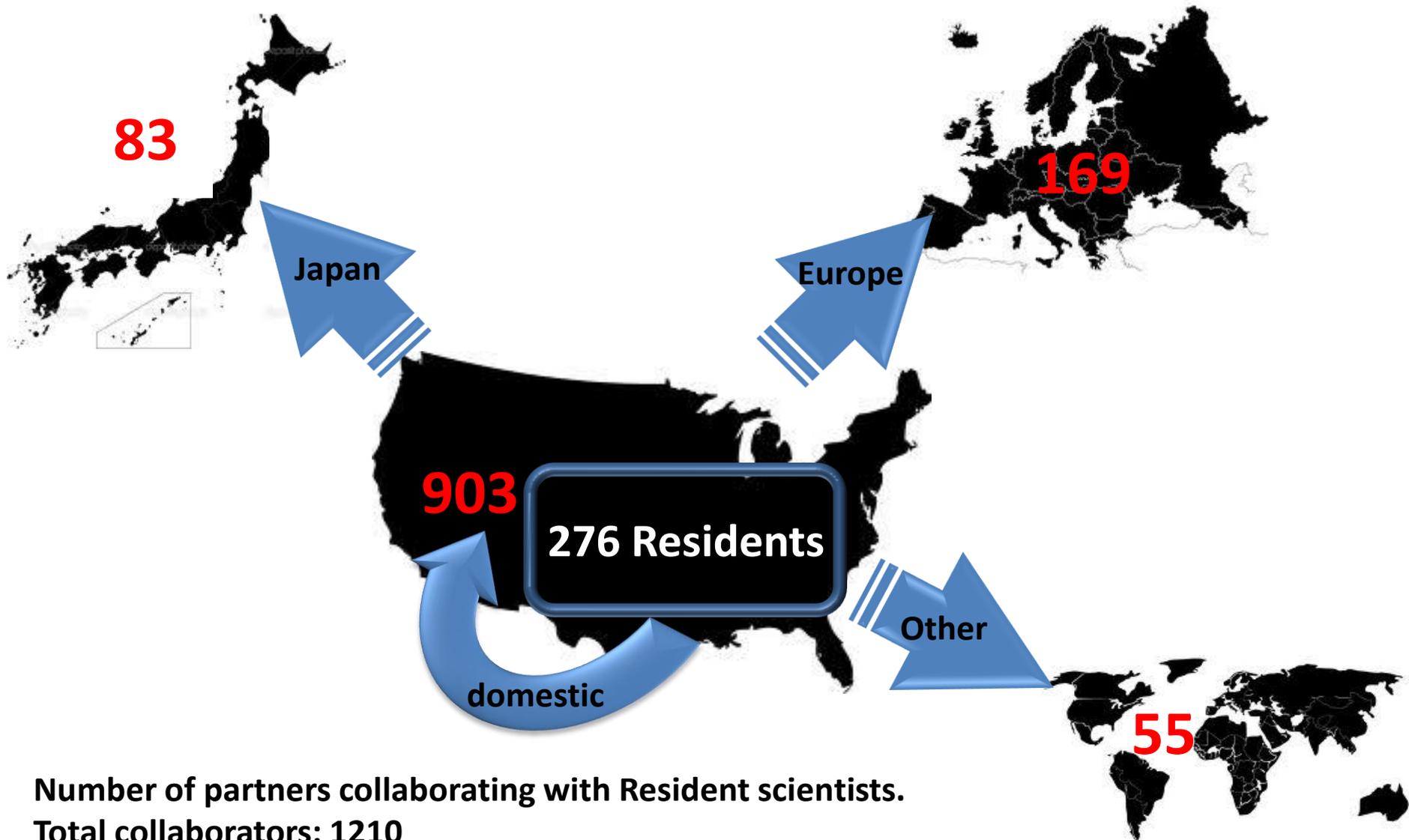


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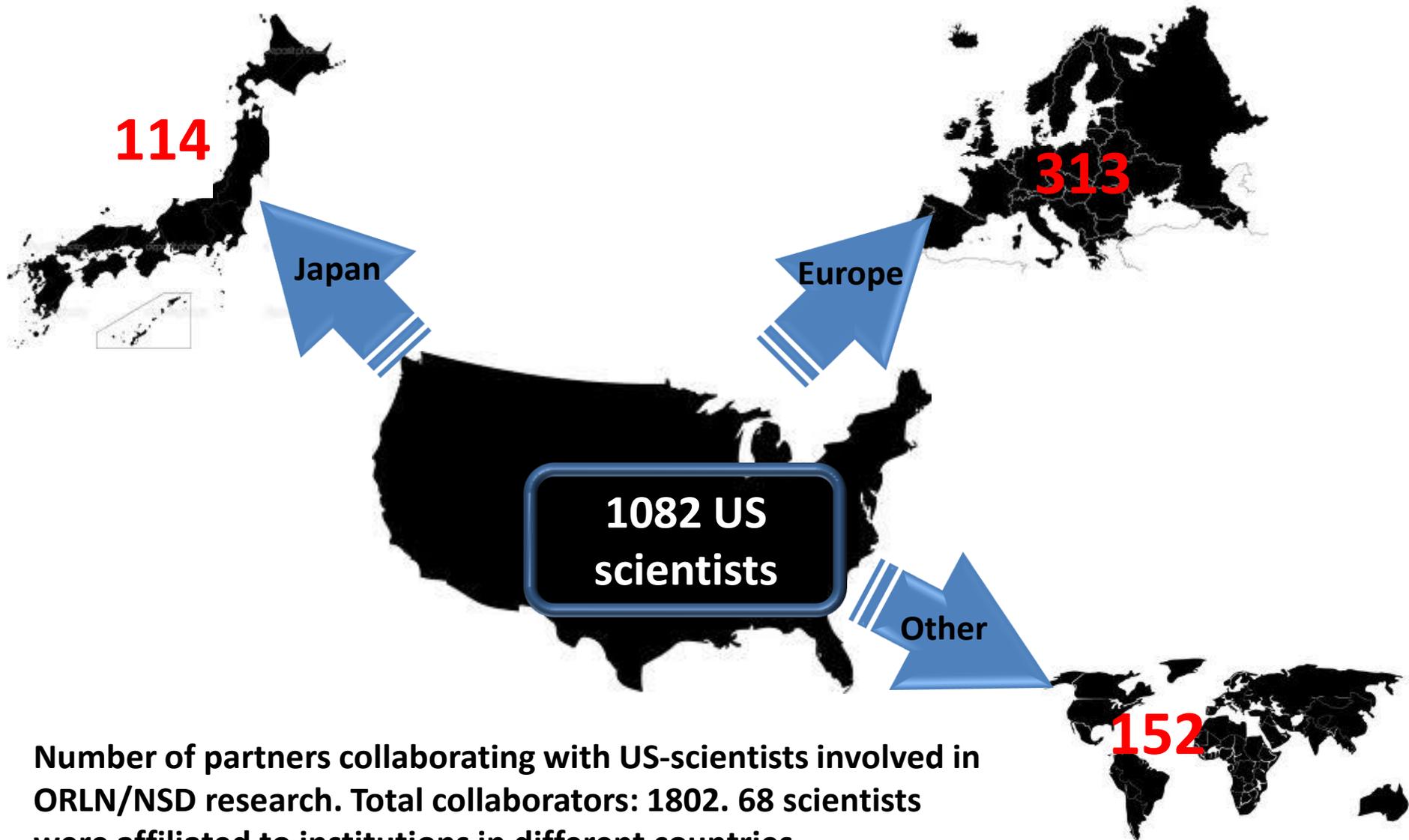
International collaboration of Resident scientists



Number of partners collaborating with Resident scientists.

Total collaborators: 1210

International collaboration of all US scientists with research at NSD

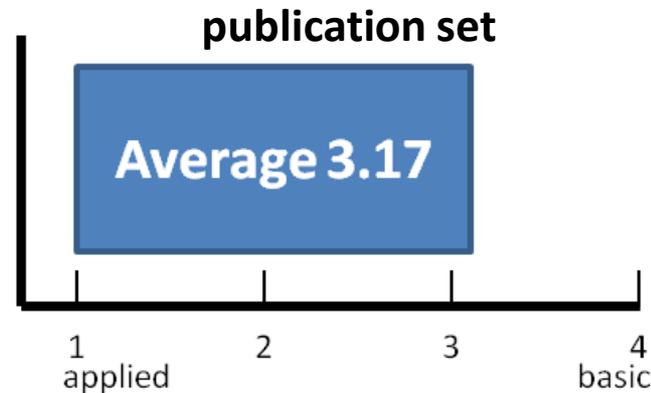


Number of partners collaborating with US-scientists involved in ORLN/NSD research. Total collaborators: 1802. 68 scientists were affiliated to institutions in different countries.

Profile of American scientists working on OR/NDS-related research (2)

- Scientists investigating basic-oriented issues prevail

Average CHI-Level of focal scientists'



- Physics is the most prevalent discipline

Distribution of focal scientists by field

Field	n.	%
Physics specialized	297	27.45
Physics multidisciplinary	445	41.13
Other disciplines	340	31.42

What drives scientists to collaborate internationally?

Direction of effects from regressions.

	Establishment of collaboration	Size of network
Institutional proximity	positive	
Social proximity		Positive
Basic orientation	positive	
Fields (base=Physics)		
Physics + Other	positive	
Other field	positive	
Institution (base=Resident)		
Secondment	positive	
University	positive	
Federal Lab	positive	
Business		
Multiple	strongly positive	

Results of Zero Inflated Negative Binomial Regression of number of international scientists collaborating with US-authors involved in ORNL/NSD-related research (1082 cases).

What the models tell us:

Applied issues, close to technology, are less conducive for global research connectivity:

A two-step pathway:

Maximising global
 research
 connectivity



Basic
 Research



Translation
 into local
 innovation
 and
 technology

I.e. A trade-off between global reach and tech'al relevance. ***Don't overdo the innovation agenda***

What the models tell us (2)

Universities are critically important to reap the potential of global connectivity

Facility-related
research



University
involvement



Global
research
connectivity

The lesson: Get university research deeply involved in LSRF-research. Danish universities should get prepared for this challenge. An important strategic concern for the universities and for the Ministry.

In conclusion

ESS appears to offer the potential of significantly strengthening the global connectivity of the Øresund science and knowledge community.

It provides a platform for attracting precisely the type of brain-workers given priority in the political rhetoric.

Are the politicians delivering on making the region attractive: providing the international schools, the transportation, the taxation etc. allowing us to realise this potential?