International MPI Survey

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Background

❖ MPI Usage Study Projects

  ❖ Questionnaire survey for **MPI users**

    D. Bernholdt, S. Bohem, G. Bosilca, M. Gorentla Venkata, R. Grant, T. Naughton, H. Pritchard, M. Schulz, and G. Vallee.,"A Survey of MPI Usage in the U.S. Exascale Computing Project."

  ❖ Static analysis of **MPI programs**

    I. Laguna, R. Marshall, K. Mohror, M. Ruefenacht, A. Skjellum, and N. Sultana, "A large-scale study of mpi usage in open-source hpc applications," in *Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis*, ser. SC '19. New York, NY, USA: Association for Computing Machinery, 2019.

  ❖ Runtime analysis of **MPI jobs**

    S. Chunduri, S. Parker, P. Balaji, K. Harms, and K. Kumaran, "Characterization of mpi usage on a production supercomputer," in *Proceedings of the International Conference for High Performance Computing, Networking, Storage, and Analysis*, ser. SC '18. IEEE Press, 2018.

❖ Need of Complementary Quetionnaire Survey

  ❖ Larger scale

    ❖ Statistically precise, deeper analysis

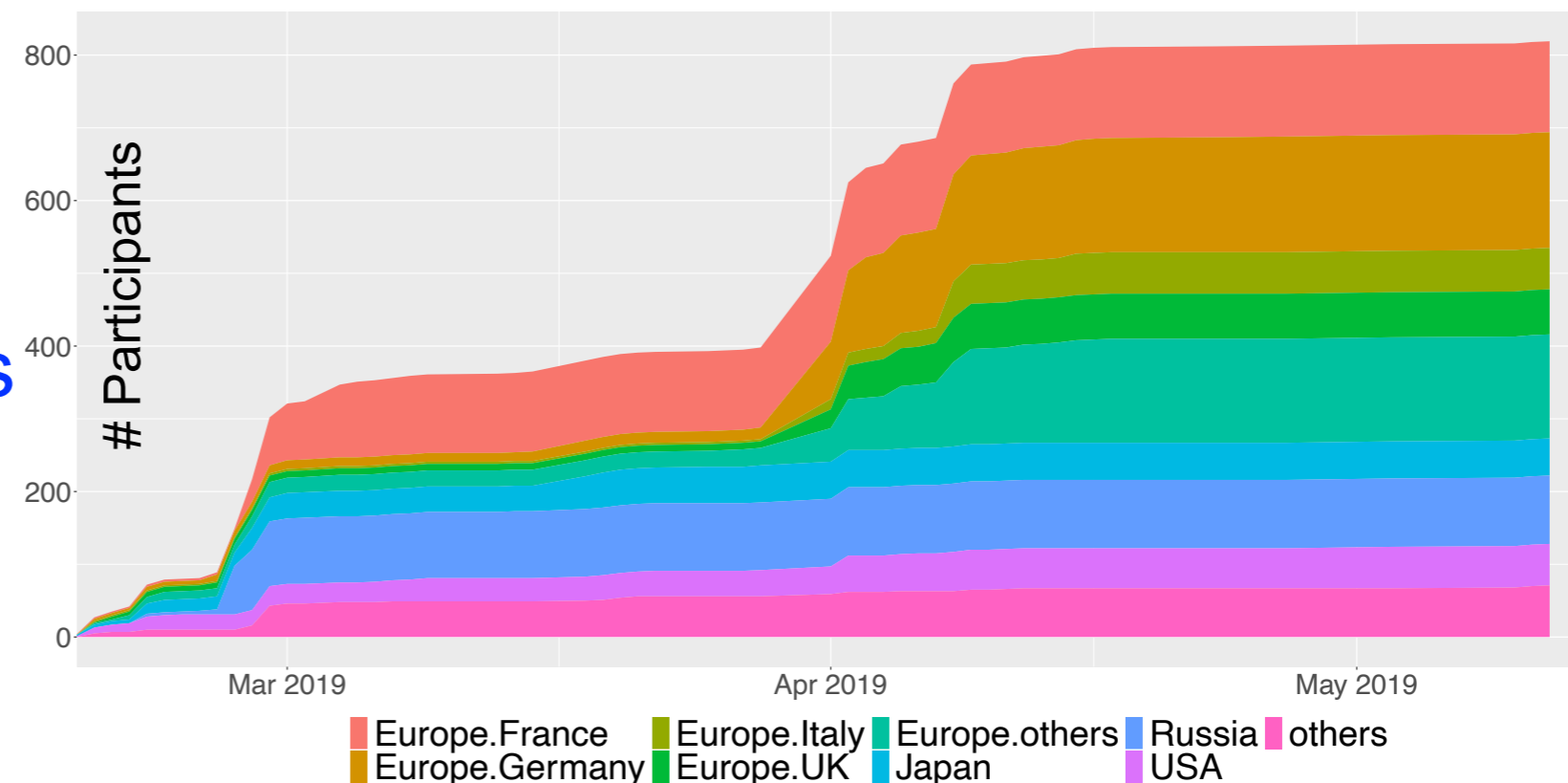 ❖ Wide spectrum of MPI users (novice to expert)

  ❖ World-wide

    ❖ Reveal regional differences

International MPI Survey

- ❖ Easy-to-answer
  - ❖ The number of questions is only 30
    - ❖ suggested by Prof. S. Pool and I. Ahmed (JLESC observers)
- ❖ Online
  - ❖ Made by Google Forms and Microsoft Forms
  - ❖ Distributed by using mailing-lists (e.g., hpc-announce)
- ❖ Started Feb. 2019

- ❖ Now
  - ❖ 851 Participants
  - ❖ 42 Countries/Regions

Legend: Europe.France, Europe.Germany, Europe.Italy, Europe.UK, Europe.others, Japan, Russia, USA, others
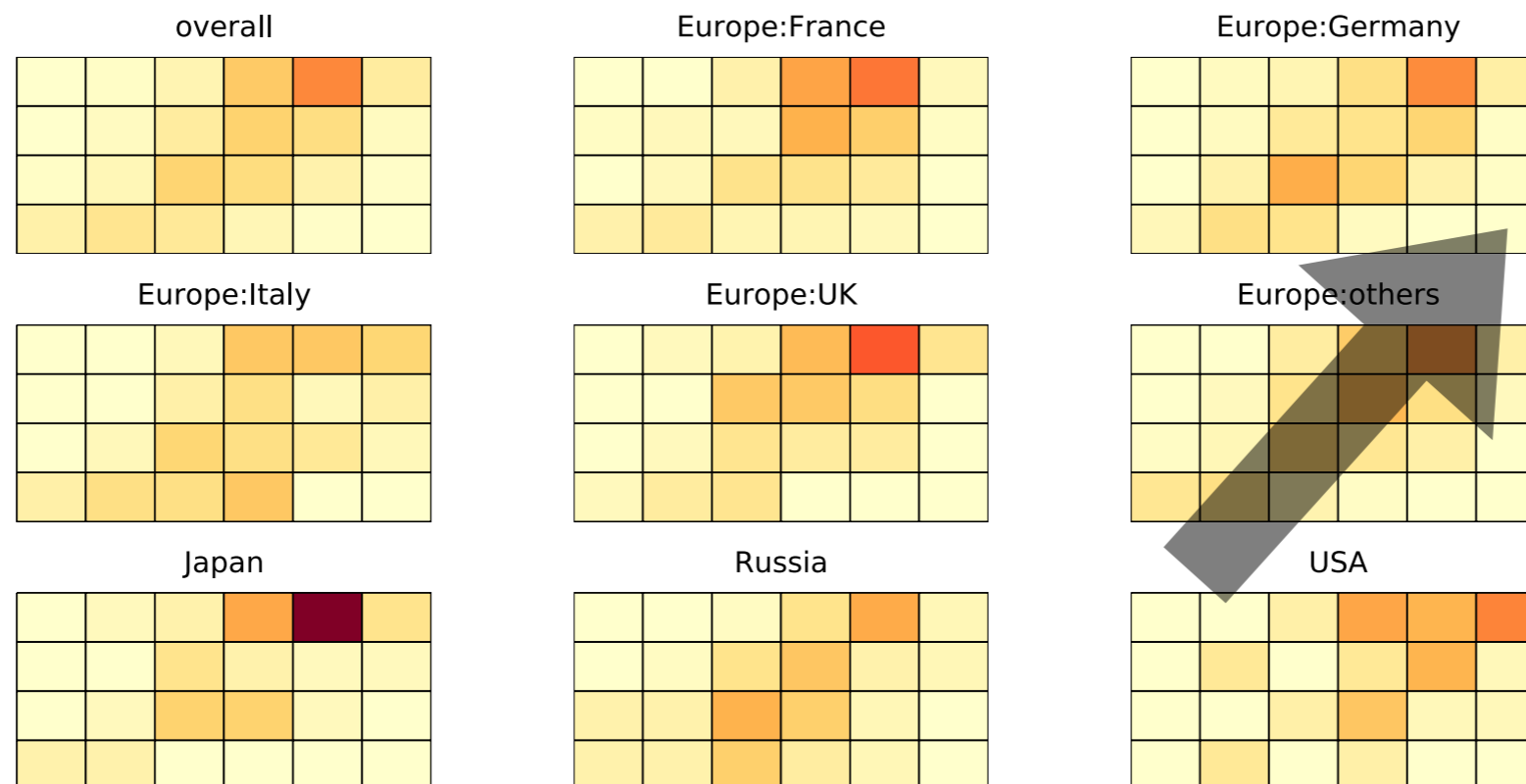
MPI Experience and Skill

❖ It takes 5-10 years to master MPI

Cross-tab:
- Rate your MPI programming skill. Choose one in the range of 1 to 6. [Low- High]
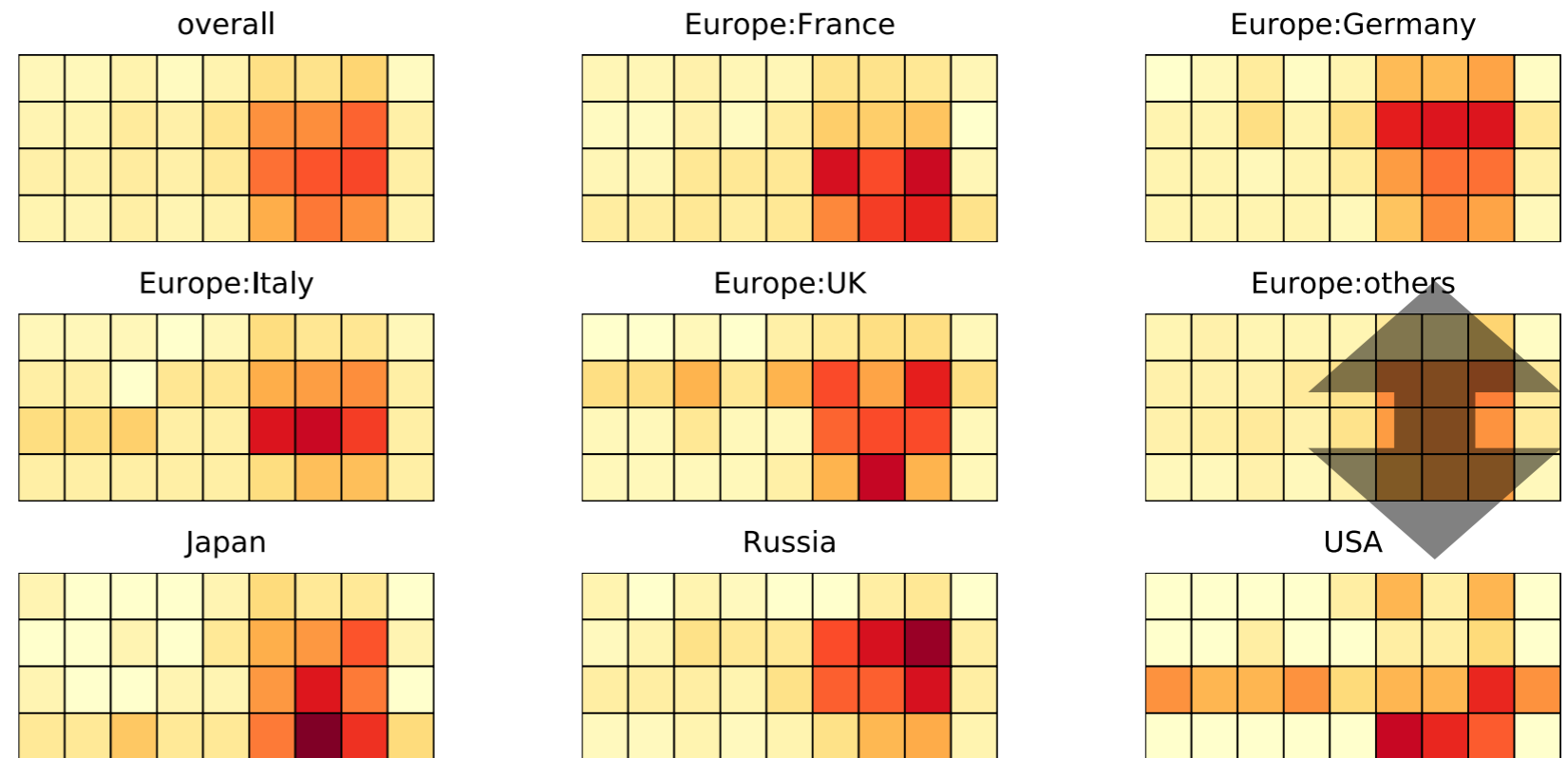- How long have you been writing MPI programs?

MPI Skill and Unknown Features

❖ It's natural to think that as skills increase, unknown functions will diminish. ====>>>> NOT TRUE

❖ Unknown features are independent of MPI skill

Cross-tab:
- Which MPI features have you never heard of?
- Rate your MPI programming skill. Choose one in the range of 1 to 6. [Low- High]


overall

Europe:France

Europe:Germany

Europe:Italy

Europe:UK

Europe:others

Japan

Russia

USA

Q3:MPI Skill	Point-to-point	Collectives	Communicator	Datatypes	One-sided	Dyn. process	Persistent	PMPI	with OpenMP
2	0	0.32	0.63	0.95	1.3	1.6	1.9	2.2	2.5
3	2.9	3.2	3.5	3.8	4.1	4.4	4.8	5.1	5.4
4	5.7	6	6.3	6.7	7	7.3	7.6	7.9	8.2
5	8.6	8.9	9.2	9.5	9.8	10	10	11	11

Q16*:Unknown MPI Features

What are your obstacles to mastering MPI? *(multiple)*
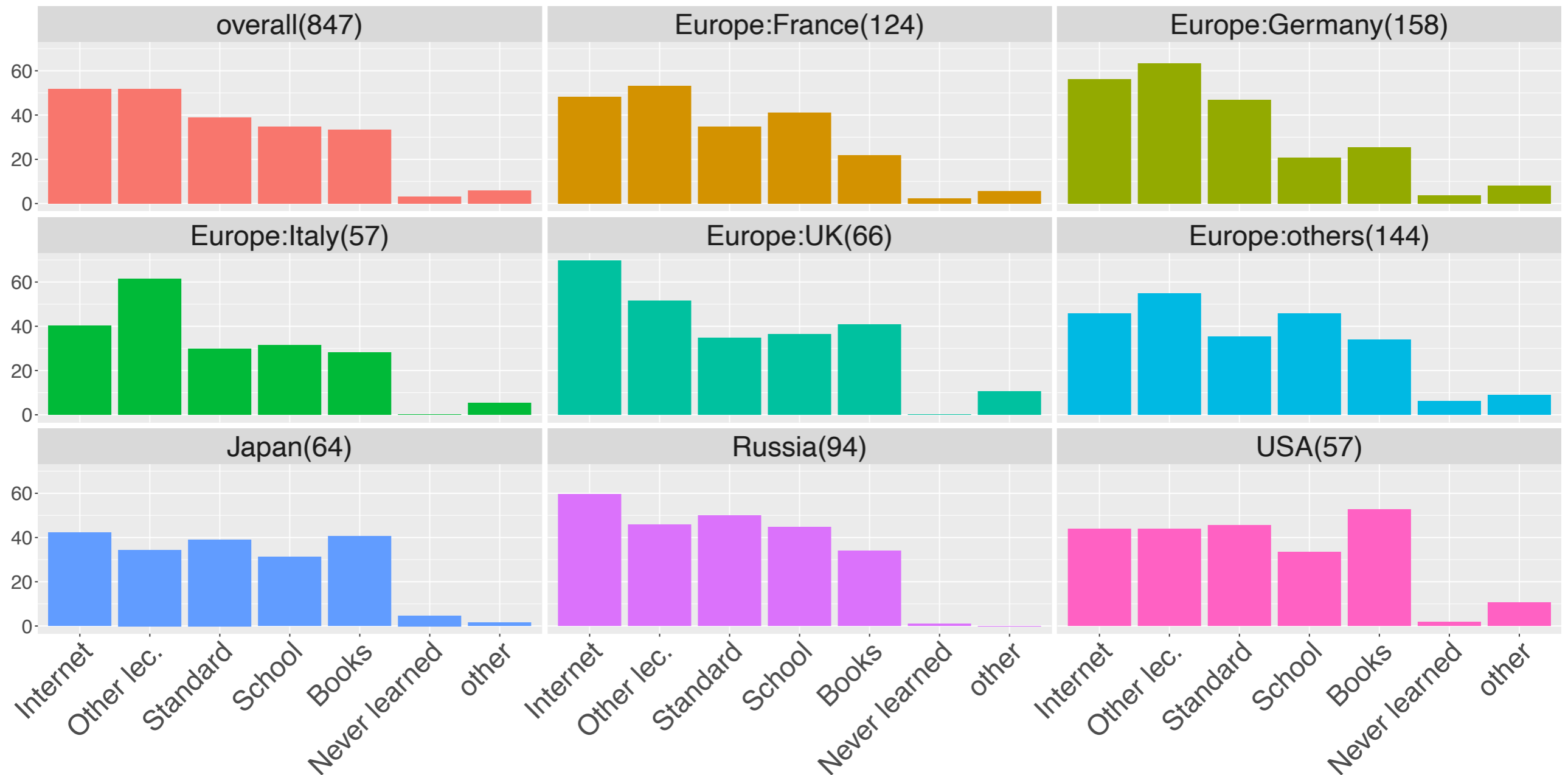
❖ Take a look at the 'other' answers (largest number of other answers)
  ❖ No Time
  ❖ Reading MPI programs
  ❖ Need of supplementary (online/hypertext) documentations
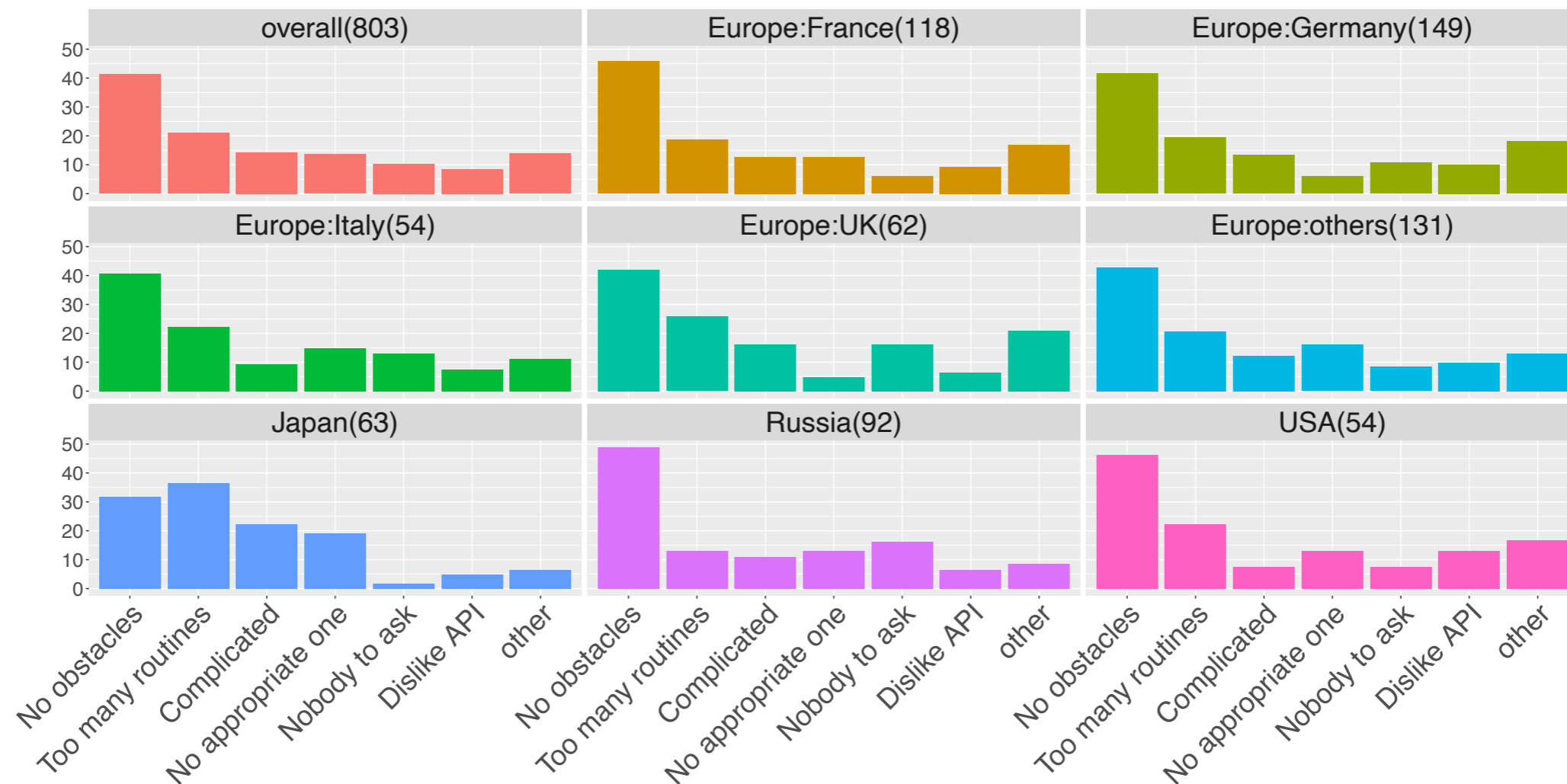
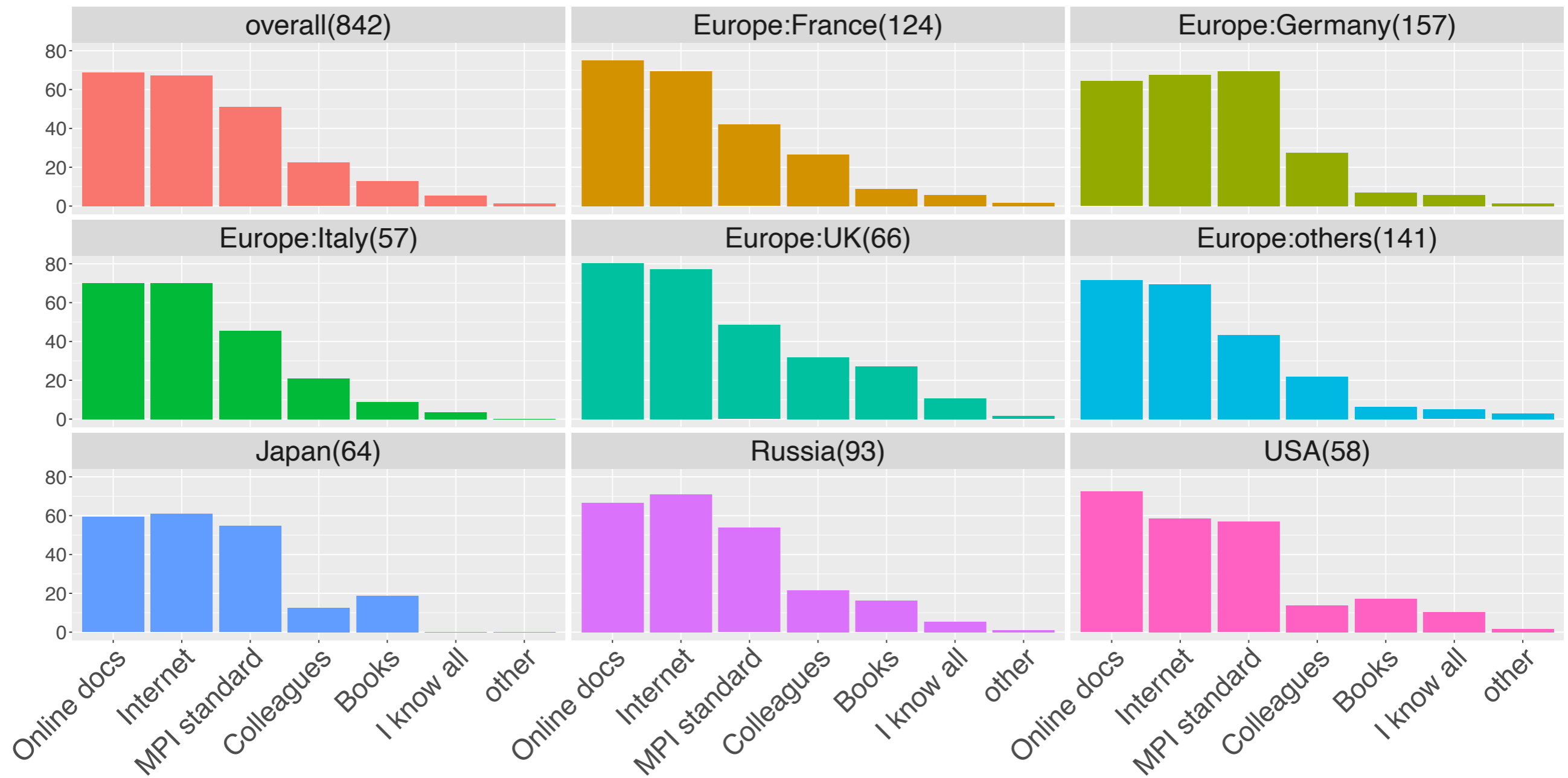# How did you learn MPI? *(multiple)*

- ❖ Self-study (Internet, MPI standard, Books)
- ❖ Lecture (Lectures)

How do you check MPI specifications when you are writing MPI programs? *(multiple)*

❖ Online doc (+ Internet) is the most common
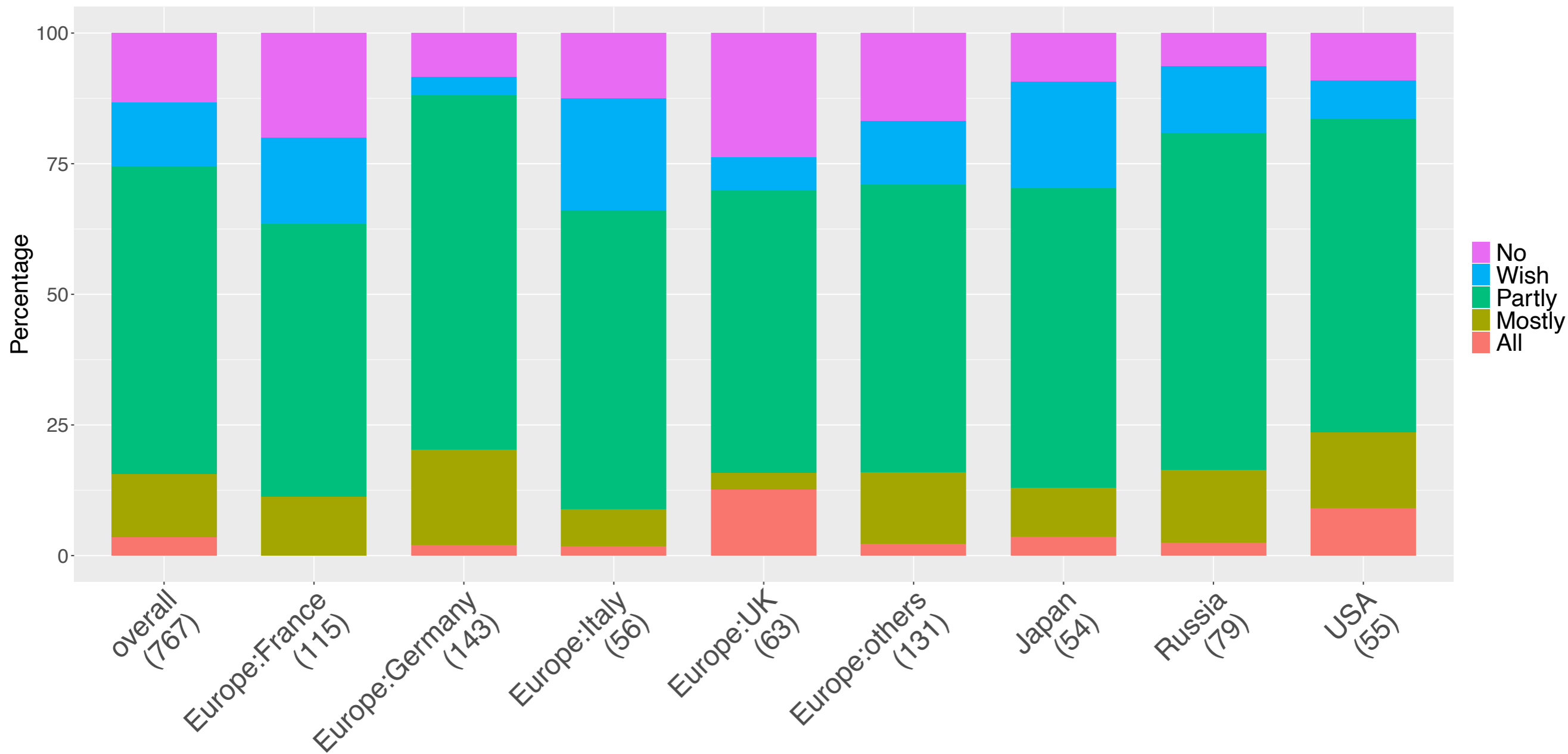
❖ Reading MPI standard is also popular

Have you ever read the MPI standard specification document?

(single)

❖ Most people read the MPI standard partly
    ❖ Read it for checking

Research Papers

1) A. Hori, G. Bosilca, E. Jeannot, T. Ogura, and Y. Ishikawa, *Is japanese hpc another galapagos? - interim report of mpi international survey -*. Tech. Rep. 34, Information Processing Society of Japan, SIGHPC, Jul 2019.

2) A. Hori, T. Ogura, B. Gerofi, J. Yin, Y. Ishikawa, G. Bosilca, E. Jeannot, *A Report of MPI International Survey*, Poster, EuroMPI/USA 2020 — will be presented on Sep. 24

3) A. Hori, G. Bosilca, E. Jeannot, B. Gerofi, J. Yin, T. Ogura, and Y. Ishikawa, *MPI International Survey Report*, ExaMPI workshop in SC20 — submitted

Current Status

Country	# Answers
Germany	159
France	125
Russia	94
UK	67
Japan	64
USA	58
Italy	57
Switzerland	40
Korea, South	27
Austria	26
China	16
Sweden	15
Spain	14
India	12
Poland	10
Netherlands	8
Brazil	6
Denmark	6
Czech Republic	5
Luxembourg	5
Canada	4
Finland	3
Argentina	3
Australia	3
Taiwan	2
Serbia	2
Pakistan	2
Egypt	2
Greece	2
Belgium	2
Tunisia	1
Peru	1
Singapore	1
Norway	1
Mexico	1
Denmark, Austria	1
Croatia	1
Portugal	1
Estonia	1
Saudi Arabia	1
UAE	1
Ukraine	1
42 countries	851 answers

- ❖ Large disparity from Top500 (June 2020)
  - ❖ Especially
    - ❖ China, USA, Japan
- ❖ Narrow the Gap
- ❖ Not closed yet

Top500 (June 2020) System Perf. Share

#	Country	[%]
1	USA	28.2
2	China	25.6
3	Japan	23.9
4	Italy	4.0
5	France	3.6
6	Germany	3.1
7	UK	1.4
8	Canada	1.3
9	Netherlands	1.1
10	Switzerland	1.1

Our Survey

#	Country	#Ans	[%]
1	Germany	159	18.7
2	France	125	14.7
3	Russia	94	11.1
4	UK	67	7.9
5	Japan	64	7.5
6	USA	58	6.8
7	Italy	57	6.6
8	Switzerland	40	5.8
9	South Korea	27	3.2
10	Austria	26	3.1
11	China (+Taiwan)	18	2.1

42 countries, 851 participants

Need Help

❖ Distributing Questionnaire

❖ Analyzing Data

❖ Writing Report