

Business Forecasting in Developing Countries

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The use of accurate forecasting to inform decision-making processes is essential in every organisation regardless of whether it is based in a developed or a developing country. In this study, we aim to explore the status of business forecasting in developing countries and how it might differ from that in developed countries. By business forecasting, we mean any type of forecasting that is used to inform a decision no matter in which domain of application. Regarding the term “developing countries”, although there are various ways to categorise countries based on development, we are relying on the World Bank classification by income and region (World Bank, 2020a).

Data and method

In order to explore the status of business forecasting in developing countries, we follow the data analysis process depicted in the Figure 1.

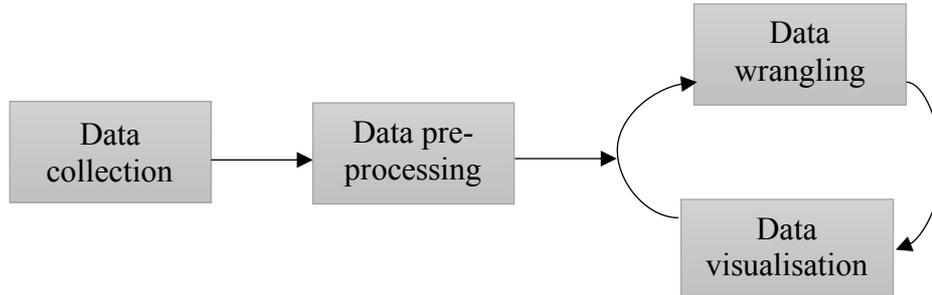


Figure 1 Data analysis process

We first collected data from three different sources:

1. **World Bank data** (World Bank, 2020b): we use country names, their population and classification by income and region based on the World Bank's 2020 regional and income classification of economies (World Bank, 2020c, 2020d).
2. **Scopus**: We use Scopus (www.scopus.com) to collect two datasets related to the number of published documents in the area of forecasting from 2000 to 2019. To create the first dataset, we search for the term “forecast” and its variations, i.e. we search for “forecast*” in the title, abstract and keywords for all types of document published on any subject, and in any language. To create the second dataset, we restrict our search to

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peer reviewed articles published in the: *i) International Journal of Forecasting*, and *ii) Journal of Forecasting*.

Both datasets include the following fields for each document: *i) authors' affiliation*, *ii) country* and *iii) year*. Documents/articles with multiple co-authors from different countries are counted separately for each country of origin.

3. **M competition:** We use two datasets from M4 and M5 competitions that include the number of teams and the country of origin of participants based on IP addresses for M5 and the country of residence of the first author for M4. (We wish to thank Vangelis Spiliotis for providing M-competitions data.)

After collecting the data, we pre-process them to resolve inconsistencies between the name of the countries in the three datasets and deal with any missing values. We then remove documents with undefined countries, such as those that no longer exist e.g. Yugoslavia, and then we turn implicit missing values into explicit ones for the combination of the year and the region/income to get a complete dataset. Finally, we replace missing values with zeros. After that, we join them with the population data and manipulate them to count the total number of documents for Scopus data and teams for M-competition data by income and by region. For the Scopus data, we divide the number by population for each category of income/region and multiply it by 10 million to obtain the number of documents/articles per 10 million of population. Finally, we visualise the result which is presented in the next section

Key findings

In this section, we analyse the collected data to summarise and discuss the status of business forecasting in developing countries.

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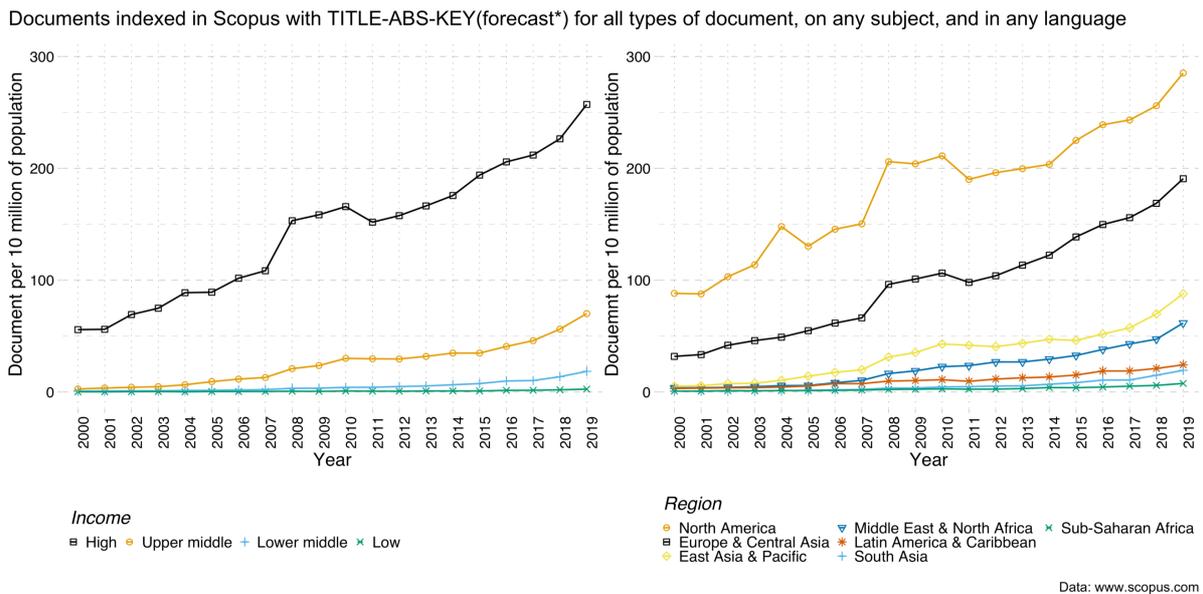


Figure 1 Total number of documents per 10 million of population indexed in Scopus for the term “forecast*” in the title/abstract/keyword

Figure 2 shows the distribution of indexed documents in Scopus from 2000 to 2019 per 10 million of population by income and by region. This figure reveals two key insights. First, we observe a strong incremental trend for virtually every income category and region. However, countries with low and lower middle income and those located in South Asia, Middle East & North Africa, Latin America & Caribbean and Sub-Saharan Africa, still lag substantially in the number of documents published over the last two decades.

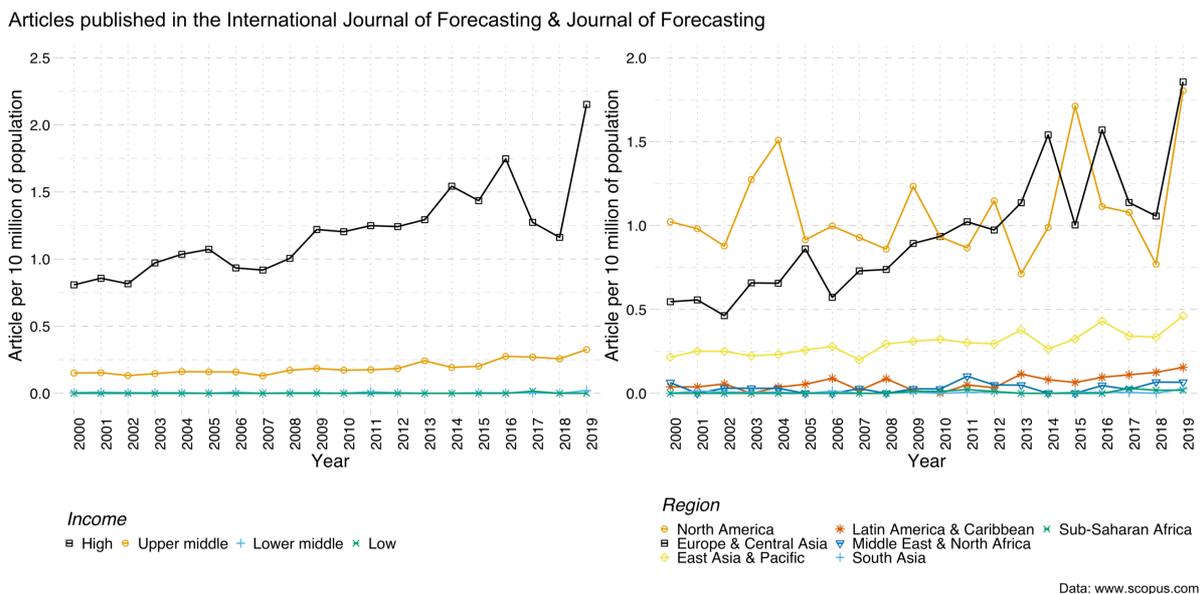


Figure 2 Total number of articles per 10 million of population published in *the International Journal of Forecasting* and *Journal of Forecasting*.

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Figure 3 indicates the distribution of peer reviewed articles published in the *International Journal of Forecasting* and *Journal of Forecasting* from 2000 to 2019 by income and by region. This figure shows that the contribution from low and lower middle-income countries and those located in South Asia, Middle East & North Africa, Latin America & Caribbean and Sub-Saharan Africa is negligible, and has grown little over the last two decades. These patterns are similar to what we found in Figure 2.

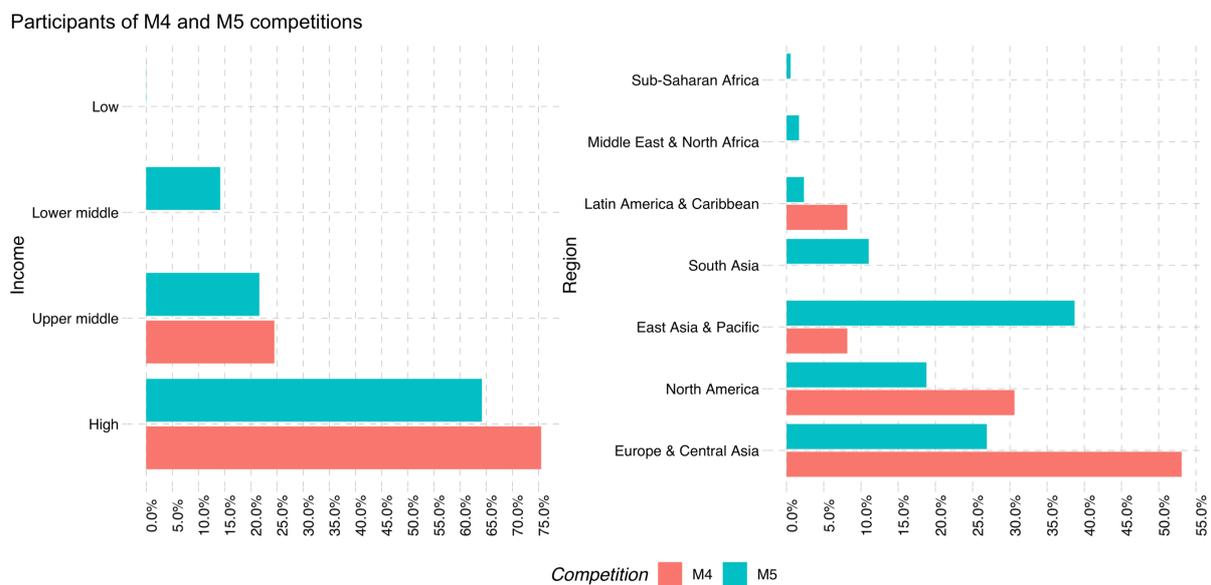


Figure 3 M4 and M5 competitions

Figure 4 explores the percentage of teams that participated in M4 and M5 competitions by income and by region. While there is no team from any low and lower middle-income countries or those located in Sub-Saharan Africa, Middle East & North Africa and South Asia in M4 competition, we observe that those countries participate in M5 competition, which might be due to the fact that it has been hosted on Kaggle. However, we still observe a similar gap discussed in Figure 3 and 4.

By exploring data from three different sources, our analysis produces two main results. First, we find that there is a substantial gap in the area of business forecasting between the developed and developing world. Second, we find that very little progress has been made over the past two decades to reduce this gap. While there is a substantial increment trend for developed countries, a similar pattern remains beyond the expectations for the rest of the World. There is no reason for the status of business forecasting in developing countries to be lower than that in developed countries. We know that there are barriers such as a lack of infrastructure, resources, funds, skills, trained academic and practitioners, access to research, data availability and access to policymakers. However, there are many situations in developing countries where forecasting can be helpful in informing decisions to tackle grand challenges.

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Therefore, in order to advance the current status and help reduce the gap, there is an urgent need from the forecasting community to take concrete actions to enhance the knowledge and the practice of business forecasting in developing countries.

Suggestions to close the gap

In order to improve the status of business forecasting in developing countries, we provide the following suggestions:

- **Increase awareness.** A greater awareness of the benefits of business forecasting is needed to foster more practical use. First, an overall understanding of the forecasting tools and techniques and their links to decision-making processes should be provided. Second, a showcase of how forecasting has been used to inform decisions and evidence for decision makers in various domains is necessary. This could be achieved through training, organising workshops and international conferences in developing countries.
- **Improve access to resources.** The availability of free, open access resources is of great value to many in low and lower middle-income countries who may otherwise not be able to afford resources such as books, journals and software. In the past few years, we have seen the availability of open-source software (R Project, 2020) and free online books (Hyndman & Athanasopoulos, 2020) that facilitate the training and use of forecasting for those in developing countries. These efforts need to be expanded.
- **Promote real problem solving.** A large number of studies fail to address the real problems facing society and its environment. To address this issue, there must be more studies focusing on real problems with clear statements that demonstrate the investigation is driven by real challenges. Moreover, it is important to ensure that business forecasting is integrated as an essential component of decision support systems. This may also help to increase government participation.
- **Establish a forecasting for development network.** Often increasing awareness is not enough to have a lasting impact in developing countries. Establishing an international network that partners academics and researchers in developing countries with mentors or collaborators in developed countries could be highly effective in closing the gap and providing mutual learning benefits.
- **Organise forecasting competitions for developing countries** (Global Innovation Exchange, 2020). Forecasting competitions, and in particular those dedicated to the challenges in developing countries, can help to advance knowledge, foster collaborations between researchers and practitioners in developing and developed countries, and benefit developing countries by providing solutions to challenges.

REFERENCES

To appear in the forthcoming *Business Forecasting: The Emerging Role of Artificial Intelligence and Machine Learning* (Wiley), edited by Gilliland, Tashman, and Sglavo.

Global Innovation Exchange (2020). USAID's Intelligent Forecasting: A Competition to Model Future Contraceptive Use. <https://competitions4dev.org/forecastingprize>

Hyndman, R.J. & Athanasopoulos, G. (2020) *Forecasting: principles and practice*, 3rd edition. OTexts: Melbourne, Australia. OTexts.com/fpp3. Accessed on August 1, 2020.

R Project (2020). The R Project for Statistical Computing. <https://www.r-project.org/>

World Bank (2020a). Country and Lending Groups. <https://bit.ly/2XbCncg>

World Bank (2020b). Population, total. <https://data.worldbank.org/indicator/SP.POP.TOTL>

World Bank (2020c). The World by income. <https://bit.ly/3hRFdLx>

World Bank (2020d). The World by income. <https://bit.ly/2Dk5cwx>