Reaching the world –

Ten years MOOC Econometrics: Methods and Applications

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Summary

Ten years after its launch, the MOOC 'Econometrics: Methods and Applications' has reached 200,000 learners. This note briefly describes what the MOOC is, why it was made, who made it, when and where it has been studied, and who are its learners.

Contents

MOOC – What?

A MOOC is a Massive Open Online Course, which means it is openly available to everyone and it is fully offered online. The MOOC 'Econometrics: Methods and Applications' (henceforth abbreviated as EMA) is the first MOOC developed by Erasmus University Rotterdam and was launched in November 2015.

EMA is meant for (advanced undergraduate) students in economics, finance, business, engineering, and data analysis, as well as for those who work in these fields. It requires some basics of matrices, probability, and statistics, which are reviewed in a 'Building Block' module. Covered topics include simple and multiple regression, model specification and diagnostics, endogeneity, binary choice data, and time series data. Each module has five lectures: Motivation (by a real-world example), Representation (by an econometric model), Estimation (by econometric methods), Evaluation (by econometric and statistical methods), and Application (to a practical example). The EMA learning objectives are that learners

- can translate data into models to make forecasts and to support decision making in a wide variety of fields, ranging from macroeconomics to finance and marketing;
- understand the methods of simple and multiple regression and can apply them in practical application;
- understand and can apply econometric methods for model specification and for dealing with endogenous variables;
- understand and can apply econometric methods for binary choice data and for time series data.

EMA learners study in cohorts that start every four weeks. Apart from viewing videos, they develop hands-on skills by answering in-video quizzes and by making an extensive set of training exercises with video answers. To earn the Coursera Certificate, learners must complete all modules by passing six test exercises and a case project that integrates all modules. Grading is done in a peer-review system, where each submitted work is graded independently by three randomly selected peers and the middle score is the final grade.

Further information on EMA and all its lecture videos and exercises can be found on Coursera[1].

[1] https://www.coursera.org/learn/erasmus-econometrics

MOOC – Why?

The EMA MOOC is based on the textbook 'Econometric Methods with Applications in Business and Economics' (Oxford University Press, 2004)[2]. This book had grown out of half a century of experience in teaching undergraduate econometrics at the Econometric Institute in Rotterdam that was founded in 1956 by Henri Theil with the support of Jan Tinbergen. It presents the 'Rotterdam way' of doing econometrics, where rigorous theory is always motivated by and aimed at solving practical questions. Because it gives a firm understanding of both where econometric methods come from and how they are used in practice, it was quite successful and was adopted by over 200 academic programs all over the world.

Notwithstanding the success of the book, members of the Econometric Institute wanted to solve two shortcomings. First, because the book is rigorous and extensive (787 pages), it was adopted only by (mostly graduate) university programs and by large research institutes. Second, because the book is often too expensive for students in poorer countries, it mainly reached students in Europe, North and South America, South East Asia, and Australia.

The wish to reach both students and lecturers in poorer and more remote countries was the main motivation to make the EMA MOOC. It is much shorter than the book, treats a smaller range of topics in a simpler way, and is freely available to anyone who has access to the internet. Table 1 shows that the MOOC is better spread over the world, with a much larger share for Africa. It reaches nearly all countries, as will be described later in more detail.

Table 1: Spread over continents

Continent	Book adopters		MOOC learners		Coursera
	#	%	#	%	%
Africa	2	1.0	14,060	7.0	8.6
America-North	38	18.7	42,540	21.3	26.9
America-South	28	13.8	13,271	6.6	10.5
Asia	45	22.2	72,529	36.3	37.1
Europe	85	41.9	54,127	27.1	15.6
Oceania	5	2.5	3,473	1.7	1.3
Total	203	100.0	200,000	100.0	100.0

Notes

- 'Book #' is number of academic programs per continent that adopted the book, and 'MOOC #' is number of learners.
- 'Book %' is percentage of all (203) book adopting programs that are from the continent.
- 'MOOC %' and 'Coursera %' is percentage of all learners that are from the continent.

[2] https://doi.org/10.1093/oso/9780199268016.001.0001

MOOC – Who?

The idea for the MOOC came from Philip Hans Franses, and Christiaan Heij coordinated its production. Figure 2 shows who made the MOOC, all of whom present parts of the MOOC:

- Module 1 – Simple Regression — Philip Hans Franses
- Module 2 – Multiple Regression — Christiaan Heij
- Module 3 – Model Specification — Michel van der Wel
- Module 4 – Endogeneity — Dennis Fok
- Module 5 – Binary Choice — Richard Paap
- Module 6 – Time Series — Dick van Dijk
- Building Blocks — Erik Kole
- Solutions of Exercises — Francine Gresnigt & Myrthe van Dieijen

As mentioned before, the material for the MOOC is based on the book 'Econometric Methods with Applications in Business and Economics' written by Christiaan Heij, Paul de Boer (†), Teun Kloek, Philip Hans Franses, and Herman van Dijk (†). Further, the guidance of learners was in the hands of Christiaan Heij until 2022, after which Wendun Wang took over.

Figure 2: From left to right: Richard Paap, Myrthe van Dieijen, Dick van Dijk, Philip Hans Franses, Michel van der Wel, Erik Kole, Francine Gresnigt, Dennis Fok, and Christiaan Heij.

MOOC – When?

Before EMA became available, a successful MOOC on Econometrics did not exist yet. When EMA was launched in November 2015, it immediately attracted many learners who apparently had been waiting for a MOOC in this area.

Figure 4 shows the cumulative number of enrolled learners and the number of new learners per quarter. After its first year, EMA had already 44,000 learners. Later, the number of new learners per quarter was approximately 4,000, until the outbreak of Covid-19 in 2020 that caused large disruptions in the working and personal life of many around the globe. With jobs at risk and online life at home, many felt the need to reconsider their professional life and had time to prepare for a career switch. Of the many MOOCs of Coursera, the ones on business and data science became most popular. As EMA offers knowledge and skills at the intersection of these two areas, it got a boost in 2020 and the number of learners more than doubled compared to 2019. After Covid-19, learner numbers returned to pre-covid levels and declined somewhat since 2025 due to stricter payment policies of Coursera for learners who aspire to get the certificate and need access to test exercises and peer review.

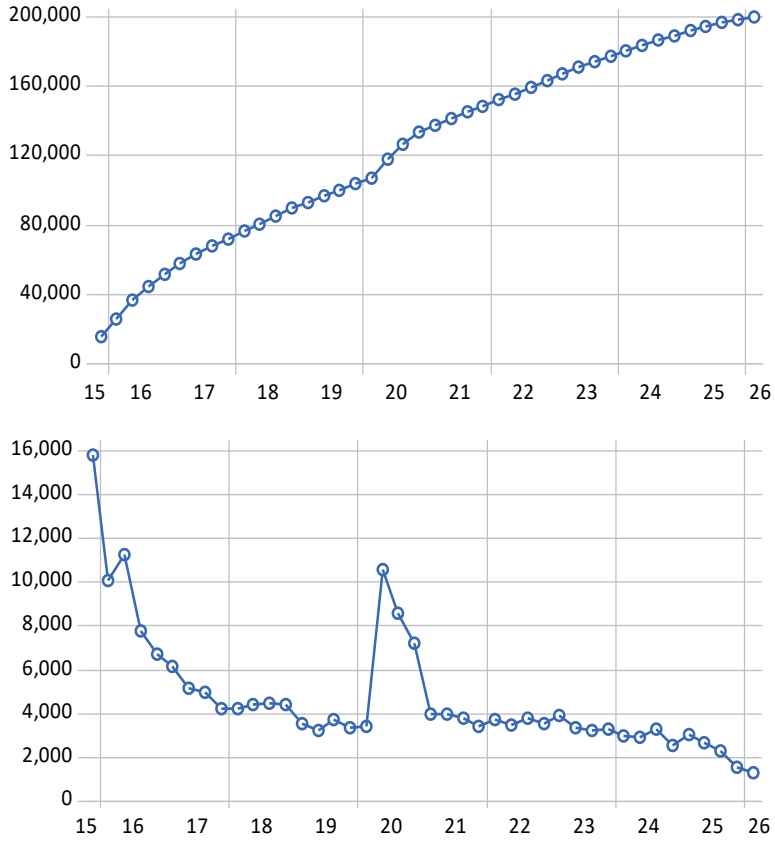

Figure 3: Cumulative learners (top) and quarterly new learners (bottom), from 2015Q4 until 2026Q1.

MOOC – Where?

The world has 193 states that are member of the United Nations. The total number of 'countries' is 250, including 2 non-UN states (Palestinian Territory and Vatican City), 4 other areas (Antarctica, Kosovo, Taiwan, and Western Sahara) and 51 'dependencies' that are not independent states (for example, Falkland Islands, Greenland, Hong Kong, Svalbard).

Table 4 shows that EMA reaches nearly all UN states (the exceptions are North Korea, Nauru, Palau, San Marino, and Tuvalu). In terms of population, countries not reached by the MOOC contain only 0.3% of the world population. The map in Figure 5 shows the reach of the MOOC across the globe. It has clearly fulfilled the motivation of its makers to allow learners all over the world to study their MOOC.

In the Appendix, Table A1 shows the complete list of reached countries and Table A2 has information on the top-25 non-African and top-15 African countries. Not surprisingly, India and the USA have most learners, and in Africa the largest learner groups are from Nigeria, Egypt, and Morocco.

It would of course be of interest to know which learners fully complete the MOOC. Such information is unavailable, apart from the total of approximately 4,500 EMA course completers. This is slightly more than 2% of all learners, which is common for MOOCs. However, a proxy for course completion is payment, and some extra information is available for learners with payment (5.7% of all learners). Table A2 has information on these learners, as will be discussed in the next section on who are the EMA learners.

Table 4: Country reach of MOOC

Type of country	Number	Population (M)	MOOC	% Countries	% Population
United Nations	193	7,791	188	97.4	99.7
Other	57	32	33	57.9	96.9
Total	250	7,823	221	88.4	99.7
African countries	58	1,347	56	96.6	99.9

Notes

- Population is in millions (Wikipedia 2022).
- Other types of countries are other states (2), other areas (4), and dependencies (51).
- Not reached: North Korea (25.7M, 0.3% of world) and 28 very small countries (0.8M, 0.01% of world).

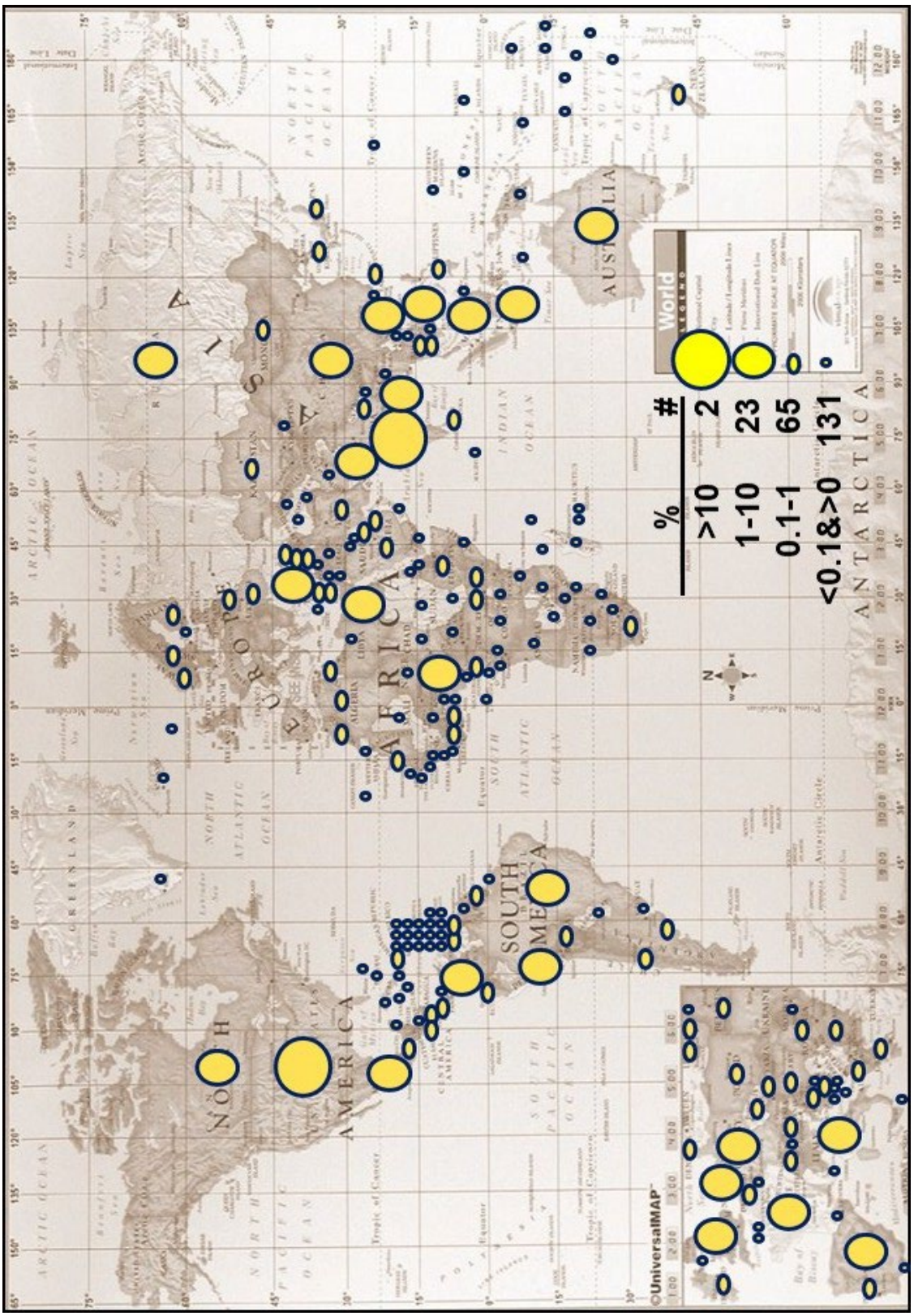

Figure 5: Spread of MOOC over the world (Europe excl. Scandinavia is shown separately at bottom); '%' is percentage of all EMA learners who are in this country; '#' is number of countries with this %.

MOOC – Who?

The Coursera platform has detailed information on the location of enrolled learners, which is derived from their IP address. This information was missing for 2,857 learners (1.4%, some perhaps from North Korea or Vatican City …). Information on age, gender, education level, and employment status is available of all learners only on an aggregate level, whereas this is known on individual level for learners with payment who answer a questionnaire.

Table 6 summarizes the personal background of learners.

Table 6: Personal background of learners

	Coursera	MOOC			
			Learners with payment		
		All learners	Total	Own	Supported
Sample size	197,276,052	199,359	11,401	4,561	7,130
Age					
18-34	45.9	45.5			
35-54	46.9	49.6			
55+	7.2	5.0			
Gender					
Female	40	29	27.0	28.1	26.2
Male	60	71	73.0	71.9	73.8
Education (highest)					
Doctorate degree	3.1	10.0	7.6	10.8	5.9
Master degree	21.5	41.1	38.4	46.3	34.2
Bachelor degree	37.6	32.4	37.6	29.3	42.1
Other	37.8	16.5	16.4	13.6	17.8
Employment					
Full time	47.8	50.3	37.9	63.2	27.9
Part-time	5.9	6.8	6.4	4.1	7.3
Self-employed	7.4	6.8	6.2	9.8	4.8
Unemployed and other	38.9	36.1	49.5	23.0	60.0

Notes

- Table numbers are percentages per group of learners, i.e., per column.
- Sample size is total number of learners, but for Coursera and MOOC all learners the only data are aggregates and for MOOC learners with payment the sample sizes are 6,496 for gender, 5,350 for education, and 2,343 for employment.
- Payment numbers for own and supported add up to more than total as some learners have double payment status.
- No age data are available for learners with payment, and gender percentage for Coursera and MOOC all learners is only known without decimal.

Of the 200,000 enrolled EMA learners, 11,401 (5.7%) are learners with payment of whom more than 60% get financial support. The fraction of supported learners is larger for lower education levels and for unemployed persons, whereas gender has no notable effect.

Table A2 contains more detailed information on learners with payment. On average, learners from African countries differ in the following respects from non-African learners:

- lower reach relative to population size (1.0 vs 2.9 per 100,000);
- higher percentage of learners with payment (7.6% vs 5.6%);
- higher percentage of financial aid (overall 86.x% vs 57.x%).

The lower reach shows opportunities for further improvement in reaching African learners. The higher payment percentage indicates higher learner motivation, and the more frequent financial aid is in line with the intended targeting of support programs.

Conclusion

The Econometric Institute of Erasmus School of Economics at Erasmus University Rotterdam is the only institution in the world having seventy years of experience in offering undergraduate education in econometrics. This experience resulted in a textbook on econometrics in 2004, which in turn provided the basis for the EMA MOOC in 2015.

In the ten years since its launch, EMA has reached 200,000 enrolled learners (and over 750,000 visitors) spread all over the world. Compared to the book, this MOOC is much more successful in reaching learners in poorer and more isolated countries. And it contributes to the strategic goals of Erasmus University Rotterdam, with the following first three priorities[3]:

- *Academic education and research that makes an impact*, with 'Strong focus on creating positive societal impact.' → MOOC teaches econometric methods and data analysis applications for students and practitioners in business and economics.
- *An inspiring and innovative education portfolio*, to 'Reach individuals who may not naturally find their way to university.' → MOOC reaches poor learners in remote areas.
- *Lifelong learning*, to 'meet the needs of practitioners and develop flexible learning pathways.' → MOOC can be studied anytime by anyone wanting to acquire, deepen, or refresh knowledge needed in their current job or for their future profession.

[3] https://www.eur.nl/en/about-university/vision-strategy-2030/strategic-goals-and-priorities

Appendix

Table A1: Countries reached by the MOOC

UN States	M
Afghanistan	●
Albania	●
Algeria	●
Andorra	●
Angola	●
Antigua and Barbuda	●
Argentina	●
Armenia	●
Australia	●
Austria	●
Azerbaijan	●
Bahamas	●
Bahrain	●
Bangladesh	●
Barbados	●
Belarus	●
Belgium	●
Belize	●
Benin	●
Bhutan	●
Bolivia	●
Bosnia and Herzeg.	●
Botswana	●
Brazil	●
Brunei Darussalam	●
Bulgaria	●
Burkina Faso	●
Burundi	●
Cabo Verde	●
Cambodia	●
Cameroon	●
Canada	●
Central African R.	●
Chad	●
Chile	●
China	●
Colombia	●
Comoros	●
Congo	●
Congo (D.R.o.)	●
Costa Rica	●
Côte d'Ivoire	●
Croatia	●
Cuba	●
Cyprus	●
Czech Republic	●
Denmark	●
Djibouti	●
Dominica	●
Dominican Republic	●
Ecuador	●

UN States	M
Egypt	●
El Salvador	●
Equatorial Guinea	●
Eritrea	●
Estonia	●
Eswatini (Swaziland)	●
Ethiopia	●
Fiji	●
Finland	●
France	●
Gabon	●
Gambia	●
Georgia	●
Germany	●
Ghana	●
Greece	●
Grenada	●
Guatemala	●
Guinea	●
Guinea-Bissau	●
Guyana	●
Haiti	●
Honduras	●
Hungary	●
Iceland	●
India	●
Indonesia	●
Iran	●
Iraq	●
Ireland	●
Israel	●
Italy	●
Jamaica	●
Japan	●
Jordan	●
Kazakhstan	●
Kenya	●
Kiribati	●
Korea (D.P.R.o.)	
Korea (R.o.)	●
Kuwait	●
Kyrgyzstan	●
Lao (P.D.R.)	●
Latvia	●
Lebanon	●
Lesotho	●
Liberia	●
Libya	●
Liechtenstein	●
Lithuania	●
Luxembourg	●

UN States	M
Madagascar	●
Malawi	●
Malaysia	●
Maldives	●
Mali	●
Malta	●
Marshall Islands	●
Mauritania	●
Mauritius	●
Mexico	●
Micronesia (F.S.o.)	●
Moldova (R.o.)	●
Monaco	●
Mongolia	●
Montenegro	●
Morocco	●
Mozambique	●
Myanmar	●
Namibia	●
Nauru	
Nepal	●
Netherlands	●
New Zealand	●
Nicaragua	●
Niger	●
Nigeria	●
North Macedonia	●
Norway	●
Oman	●
Pakistan	●
Palau	
Panama	●
Papua New Guinea	●
Paraguay	●
Peru	●
Philippines	●
Poland	●
Portugal	●
Qatar	●
Romania	●
Russian Federation	●
Rwanda	●
Saint Kitts & Nevis	●
Saint Lucia	●
Saint Vincent & G.	●
Samoa	●
San Marino	
Sao Tome & Princ.	●
Saudi Arabia	●
Senegal	●
Serbia	●

UN States	M
Seychelles	●
Sierra Leone	●
Singapore	●
Slovakia	●
Slovenia	●
Solomon Islands	●
Somalia	●
South Africa	●
South Sudan	●
Spain	●
Sri Lanka	●
Sudan	●
Suriname	●
Sweden	●
Switzerland	●
Syria (A.R.)	●
Tajikistan	●
Tanzania (U.R.o.)	●
Thailand	●
Timor-Leste	●
Togo	●
Tonga	●
Trinidad and Tobago	●
Tunisia	●
Turkey	●
Turkmenistan	●
Tuvalu	
Uganda	●
Ukraine	●
United Arab Emirates	●
United Kingdom	●
United States (of A.)	●
Uruguay	●
Uzbekistan	●
Vanuatu	●
Venezuela	●
Viet Nam	●
Yemen	●
Zambia	●
Zimbabwe	●

Non-UN States	M
Vatican City	
Palestinian Territory	●

Other Areas	M
Antarctica	
Kosovo	●
Taiwan	●
Western Sahara	

Dependencies	M
Aland Islands (FI)	●
Am. Samoa (US)	●
Anguilla (GB)	
Aruba (NL)	●
Bermuda (GB)	●
Bonaire, St E. and Saba (NL)	●
Bouvet Island (NO)	
Br. Indian Ocean T. (GB)	
Cayman Islands (GB)	●
Christmas Island (AU)	
Cocos Islands (AU)	
Cook Islands (NZ)	
Curacao (NL)	●
Falkland Islands (GB)	
Faroe Islands (DK)	●
French Guiana (FR)	●
French Polynesia (FR)	●
French South Lands (FR)	
Gibraltar (GB)	●
Greenland (DK)	●
Guadeloupe (FR)	●
Guam (US)	●
Guernsey (GB)	●
Heard and McDonald I. (AU)	
Hong Kong (CN)	●
Isle of Man (GB)	●
Jersey (GB)	●
Macao (CN)	●
Martinique (FR)	●
Mayotte (FR)	●
Montserrat (GB)	●
New Caledonia (FR)	●
Niue (NZ)	
Norfolk Island (AU)	
Northern Mariana I. (US)	●
Pitcairn Island (GB)	
Puerto Rico (US)	●
Reunion (FR)	●
Saint Barthelemy (FR)	
Saint Helena (GB)	
Saint Martin (FR)	
Saint-Pierre and Miq. (FR)	
Sint Maarten (NL)	●
South Georgia (GB)	
Svalbard & Jan Mayen (NO)	
Tokelau (NZ)	
Turks and Caicos I. (GB)	●
U.S. Minor Pacific I. (US)	
Virgin Islands (GB)	●
Virgin Islands (US)	●
Wallis and Futuna (FR)	

Table A2: Top-25 non-African countries and top-15 African countries reached by the MOOC

						Rank		
Country	**Learners**	**% Population**	**Paying**	**% Paying**	**% Support**	**% Population**	**% Paying**	**% Support**
Non-African								
India	32,246	2.3	2,342	7.3	73.3	37	20	28
United States of America	30,257	9.1	1,641	5.4	45.6	8	48	60
United Kingdom	9,358	14.0	530	5.7	37.0	2	45	73
Netherlands	6,393	36.2	420	6.6	29.6	1	27	80
China	5,929	0.4	337	5.7	53.1	70	44	53
Germany	5,850	7.0	354	6.1	62.9	10	33	37
Canada	4,892	12.7	279	5.7	59.0	3	43	42
Mexico	4,678	3.7	386	8.3	76.0	25	14	24
Brazil	4,628	2.2	140	3.0	41.8	39	75	65
France	4,249	6.2	255	6.0	54.0	12	34	50
Pakistan	3,075	1.4	261	8.5	92.6	55	12	8
Australia	2,928	11.3	145	5.0	40.0	5	55	68
Italy	2,859	4.8	150	5.2	40.5	19	50	66
Spain	2,823	6.0	122	4.3	35.8	15	57	75
Singapore	2,798	51.3	143	5.1	54.4	(1)	51	49
Turkey	2,784	3.3	116	4.2	80.2	31	60	19
Hong Kong	2,728	36.9	158	5.8	53.8	(3)	40	52
Colombia	2,626	5.1	82	3.1	72.3	18	74	30
Russian Federation	2,526	1.7	169	6.7	25.1	45	26	82
Viet Nam	2,266	2.3	147	6.5	84.5	38	28	18
Bangladesh	2,258	1.3	127	5.6	93.9	56	46	7
Indonesia	2,171	0.8	116	5.3	72.8	63	49	29
Peru	2,063	6.2	57	2.8	46.6	13	77	59
Korea (Republic of)	1,824	3.5	58	3.2	37.9	28	72	71
Japan	1,729	1.4	65	3.8	40.3	53	65	67
African								
Nigeria	2,130	1.0	202	9.5	90.9	12	6	7
Egypt	2,030	2.0	165	8.1	94.1	6	8	5
Morocco	1,360	3.7	88	6.5	89.0	2	11	9
South Africa	1,231	2.0	50	4.1	56.6	5	17	16
Ghana	933	3.0	60	6.4	90.6	3	13	8
Kenya	732	1.5	29	4.0	62.1	7	18	15
Tunisia	700	6.0	38	5.4	94.9	1	16	4
Ethiopia	634	0.5	62	9.8	96.8	18	3	2
Algeria	472	1.1	27	5.7	100.0	10	15	1
Somalia	438	2.7	125	28.5	95.3	4	1	3
Zambia	252	1.4	24	9.5	75.0	9	4	12
Cameroon	218	0.9	13	6.0	71.4	14	14	13
Uganda	211	0.5	22	10.4	87.0	19	2	10
Ivory Coast	205	0.8	16	7.8	70.6	15	9	14
Rwanda	189	1.5	18	9.5	50.0	8	5	18

Notes

- '% Population' is (×1,000), so learners per 100,000 inhabitants, and 'Rank % Population' is rank for countries with at least 10M inhabitants (this excludes Singapore and Hong Kong that are 1-st and 3-rd in learners per head of population).
- '% Paying' is percentage of learners with payment, and 'Rank % Paying' is rank for countries with at least 10 payments (86 countries, of which 18 are African).
- '% Support' is percentage of paying learners with financial aid, and 'Rank % Support' is rank for countries with at least 10 payments.