



Project Presentation

Group 4

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Introduction

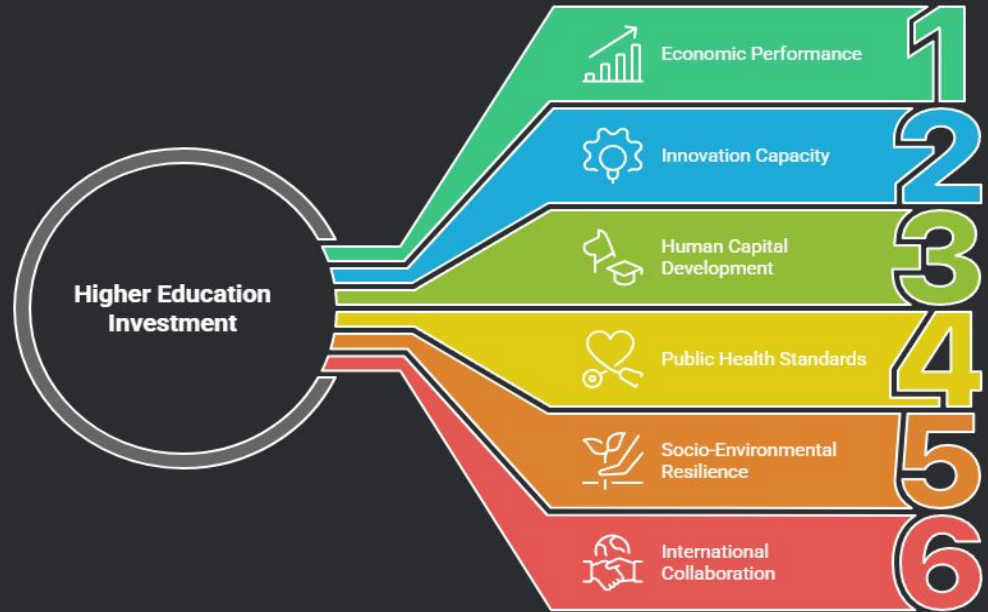
Research Focus

This study explores the relationship between academic excellence (based on 2023 Times Higher Education World University Rankings) and 30 national development indicators (from the World Bank's 2023 WDI).

Objective

- To reveal how investment in higher education correlates with and contributes to broad development outcomes across nations.
- Highlighting both direct impacts and complex interdependencies.

Unveiling Higher Education's Impact on National Growth





Datasets

Dataset 1: Times Higher Education (THE) World University Rankings 2023

Records: 2,345 universities

Variables: 26

Key Fields: Ranking Dimensions: Overall Rank, Teaching, Research, Citations, Industry Income, International Outlook

Scoring Metrics: Overall Score, Teaching Score, Research Score, etc.

Purpose: Enables detailed analysis of university quality, research capabilities, and global competitiveness.

Dataset 2: World Bank – World Development Indicators (WDI) 2023

Records: 7,985

Variables: 5 (Country Name, Country Code, Series Name, Series Code, Value)

Indicators Include:

- Economic: GDP growth, inflation, unemployment, etc.
- Demographic: Population, urbanization, etc.
- Education: Literacy, school enrollment, etc.
- Health: Life expectancy, infant mortality, etc.
- Environment: Carbon emissions, renewable energy use, etc.

Purpose: Assesses national development trends, socioeconomic health, and policy effectiveness.

Original Datasets

World Bank's 2023 World Development Indicators

A		B		C		D		E	
	Country Name	Country Code	Series Name	Series Code					
1	Afghanistan	AFG	GDP per capita (current US\$)	NY.GDP.PCAP.CD	2023 [YR2023]				
2	Afghanistan	AFG	GDP (current US\$)	NY.GDP.MKTP.CD	415.7074				
3	Afghanistan	AFG	Unemployment, total (% of total labor force) (modeled ILO estimate)	SL.UEM.TOTL.ZS	14.386				
4	Afghanistan	AFG	Government expenditure on education, total (% of GDP)	SE.XPD.TOTL.GD.ZS	--				
5	Afghanistan	AFG	Adjusted net national income (current US\$)	NY.ADI.NNTY.CD	--				
6	Afghanistan	AFG	School enrollment, tertiary (% gross)	SE.TER.ENRR	--				
7	Afghanistan	AFG	Pupil-teacher ratio, tertiary	SE.TER.ENRL.TC.ZS	--				
8	Afghanistan	AFG	Researchers in R&D (per million people)	SP.POP.SCI.RD.P6	--				
9	Afghanistan	AFG	Scientific and technical journal articles	P.JRN.ARTC.SJ	--				
10	Afghanistan	AFG	Net migration	SM.POP.NETM	-48958				
11	Afghanistan	AFG	Foreign direct investment, net inflows (% of GDP)	BX.KIT.DINV.WD.GD.ZS	--				
12	Afghanistan	AFG	Gini index	SI.POV.GINI	--				
13	Afghanistan	AFG	Life expectancy at birth, total (years)	SP.DYN.LE00.IN	--				
14	Afghanistan	AFG	Urban population (% of total population)	SP.URB.TOTL.ZS	26.933				
15	Afghanistan	AFG	Carbon dioxide (CO2) emissions excluding LULUCF per capita (t CO2e/capita)	EG.GHC.CO2.PC.CE.ARS	--				
16	Afghanistan	AFG	Renewable energy consumption (% of total final energy consumption)	EG.FEC.FNEW.ZS	--				
17	Afghanistan	AFG	Access to electricity (% of population)	EG.ELC.ACCS.ZS	--				
18	Afghanistan	AFG	Individuals using the Internet (% of population)	IT.NET.USER.ZS	--				
19	Afghanistan	AFG	Mobile cellular subscriptions (per 100 people)	IT.CEL.SETS.P2	--				
20	Afghanistan	AFG	International tourism, number of arrivals	ST.INT.ARVL	--				
21	Afghanistan	AFG	Political Stability and Absence of Violence/Terrorism: Percentile Rank	PV.PER.RNK	1.421801				
22	Afghanistan	AFG	Intentional homicides (per 100,000 people)	VC.IHR.PSRC.P5	--				
23	Afghanistan	AFG	Income share held by highest 10%	SI.DST.10TH.L0	--				
24	Afghanistan	AFG	Energy use (kg of oil equivalent per capita)	EG.USE.PCAP.KG.OE	--				
25	Afghanistan	AFG	Poverty headcount ratio at \$2.15 a day (2017 PPP) (% of population)	SI.POV.DDAY	--				
26	Afghanistan	AFG	Exports of goods and services (% of GDP)	NE.EXP.GNFS.ZS	16.77514				
27	Afghanistan	AFG	Personal remittances, received (% of GDP)	BX.TRF.PWKR.DT.GD.ZS	1.856897				
28	Afghanistan	AFG	High-technology exports (% of manufactured exports)	TX.VAL.TECH.MF.ZS	--				
29	Afghanistan	AFG	Trade in services (% of GDP)	BO.GSR.NSVF.GD.ZS	--				
30	Afghanistan	AFG	School enrollment, tertiary (gross), gender parity index (GPI)	SE.ENR.TERT.FM.ZS	--				
31	Albania	ALB	GDP per capita (current US\$)	NY.GDP.PCAP.CD	8575.171				
32	Albania	ALB	GDP (current US\$)	NY.GDP.MKTP.CD	2.35E+10				
33	Albania	ALB	Unemployment, total (% of total labor force) (modeled ILO estimate)	SL.UEM.TOTL.ZS	11.584				
34	Albania	ALB	Government expenditure on education, total (% of GDP)	SE.XPD.TOTL.GD.ZS	--				
35	Albania	ALB	Adjusted net national income (current US\$)	NY.ADI.NNTY.CD	--				
36	Albania	ALB	School enrollment, tertiary (% gross)	SE.TER.ENRR	64.72935				
37	Albania	ALB	Pupil-teacher ratio, tertiary	SE.TER.ENRL.TC.ZS	--				
38	Albania	ALB	Researchers in R&D (per million people)	SP.POP.SCI.RD.P6	--				
39	Albania	ALB	Scientific and technical journal articles	P.JRN.ARTC.SJ	--				
40	Albania	ALB	Net migration	SM.POP.NETM	-25357				
41	Albania	ALB	Foreign direct investment, net inflows (% of GDP)	BX.KIT.DINV.WD.GD.ZS	6.883977				
42	Albania	ALB	Gini index	SI.POV.GINI	--				
43	Albania	ALB	Life expectancy at birth, total (years)	SP.DYN.LE00.IN	--				
44	Albania	ALB	Urban population (% of total population)	SP.URB.TOTL.IN.ZS	64.603				
45	Albania	ALB	Carbon dioxide (CO2) emissions excluding LULUCF per capita (t CO2e/capita)	EG.GHC.CO2.PC.CE.ARS	--				
46	Albania	ALB	Renewable energy consumption (% of total final energy consumption)	EG.FEC.FNEW.ZS	--				
47	Albania	ALB	Access to electricity (% of population)	EG.ELC.ACCS.ZS	--				
48	Albania	ALB	Individuals using the Internet (% of population)	IT.NET.USER.ZS	81.1356				
49	Albania	ALB	Mobile cellular subscriptions (per 100 people)	IT.CEL.SETS.P2	--				
50	Albania	ALB	International tourism, number of arrivals	ST.INT.ARVL	--				
51	Albania	ALB	Political Stability and Absence of Violence/Terrorism: Percentile Rank	PV.PER.RNK	51.65877				
52	Albania	ALB	Intentional homicides (per 100,000 people)	VC.IHR.PSRC.P5	--				
53	Albania	ALB	Income share held by highest 10%	SI.DST.10TH.L0	--				
54	Albania	ALB	Energy use (kg of oil equivalent per capita)	EG.USE.PCAP.KG.OE	--				
55	Albania	ALB	Poverty headcount ratio at \$2.15 a day (2017 PPP) (% of population)	SI.POV.DDAY	--				
56	Albania	ALB	Exports of goods and services (% of GDP)	NE.EXP.GNFS.ZS	38.66508				
57	Albania	ALB	Personal remittances, received (% of GDP)	BX.TRF.PWKR.DT.GD.ZS	8.64719				

rank	order	name	scores	ov	scores	ov	scores	ov	scores	ov	scores	ov	scores	ov	location	stats	nun	stats	pc_1	stats	Item	aliases	subjects_j	closed	uncredited
1	10	University	96.4	10	92.3	5	90.7	1	99	28	74.9	158	96.2	28	United Kingdom	20.965	10.6	42%	48:52:00	Harvard U	Mathemat	FALSE	FALSE	FALSE	
2	20	Harvard U	95.2	20	94.8	1	99	3	99.3	20	49.5	418	80.5	214	United States	21.887	9.6	25%	50:50:00	Harvard U	Mathemat	FALSE	FALSE	FALSE	
3	30	University	94.8	30	90.9	7	99.5	2	97	61	54.2	335	95.8	34	United Kingdom	20.185	11.3	39%	47:53:00	University Business	13	FALSE	FALSE	FALSE	
4	40	Stanford U	94.8	40	94.2	2	96.7	7	99.8	16	65	232	79.8	223	United States	16.164	7.1	24%	46:54:00	Stanford U	Physics &	FALSE	FALSE	FALSE	
5	50	Massach	94.2	50	90.7	8	93.6	11	99.8	15	90.9	62	89.3	119	United States	11.415	8.2	33%	40:00	Massach	Mathemat	FALSE	FALSE	FALSE	
6	60	California	94.1	60	90.9	6	97	5	97.3	55	89.8	69	83.6	17	United States	2.237	6.2	34%	37:03	California Language	FALSE	FALSE	FALSE		
7	70	Princeton	92.4	70	87.6	12	95.8	8	99.1	25	66	221	80.3	215	United States	8.279	8	23%	46:54:00	Princeton Language	FALSE	FALSE	FALSE		
8	80	University	92.1	80	86.4	14	95.8	9	99	27	76.8	145	78.4	238	United States	40.921	18.4	24%	52:48:00	University Communi	FALSE	FALSE	FALSE		
9	90	Yale Univ	91.4	90	92.6	3	92.7	14	97	66	55	323	70.9	335	United States	13.482	5.9	21%	52:48:00	Yale Univ	Economic	FALSE	FALSE	FALSE	
10	100	Imperial C	90.4	100	82.8	16	90.8	17	96.3	40	59.8	274	97.5	17	United Kingdom	18.543	11.2	61%	47:02	Imperial C	Mathemat	FALSE	FALSE	FALSE	
11	110	Columbia	89.4	110	89.4	10	87.7	21	97.1	57	44.8	569	79.9	219	United States	21.781	4.5	38%		Columbia Politics &	FALSE	FALSE	FALSE		
12	120	ETH Zurich	89.4	120	82.6	17	95.4	10	90.7	135	59.1	279	97.7	14	Switzerland	21.665	14.8	41%	33:07	ETH Zurich	Mathemat	FALSE	FALSE	FALSE	
13	130	The Univ	88.9	130	86.5	13	88.8	19	97.7	49	96.2	303	74.2	283	United States	15.366	6	36%	47:53:00	The Univ	Business	FALSE	FALSE	FALSE	
14	140	University	88.8	140	86	15	88.8	20	97	65	75.8	151	71.5	327	United States	21.453	6.3	23%	53:47:00	University Economic	FALSE	FALSE	FALSE		
15	150	Johns Hog	88.3	150	79.4	21	91.5	15	97	64	89.5	73	75.3	266	United States	17.584	4.7	29%	53:47:00	Johns Hog	Sociology	FALSE	FALSE	FALSE	
16	160	Tsinghua	88.2	160	90.1	9	97.4	4	88	182	100	9	40.3	951	China	38.324	11.6	10%		Tsinghua Economic	FALSE	FALSE	FALSE		
17	170	Peking Un	88.1	170	92.5	4	96.7	6	80.4	308	91.8	60	65	409	China	31.994	10.3	19%		Peking Un	Other Hea	FALSE	FALSE	FALSE	
18	180	University	87.4	180	77.5	25	93.3	12	92.8	113	65.5	225	89.7	115	Canada	77.460	25.8	26%	56:44:00	University Politics &	FALSE	FALSE	FALSE		
19	190	National I	87.1	190	76.4	26	93	13	90.2	148	87	86	94	63	Singapore	32.337	19.8	25%	51:49:00	National I	Other Hea	FALSE	FALSE	FALSE	
20	200	Cornell Un	85.9	200	80.2	20	86.1	22	97.3	56	40.4	905	76.9	252	United States	24.027	10.3	26%	51:49:00	Cornell Un	Other Hea	FALSE	FALSE	FALSE	
21	210	University	85.8	210	80.4	19	88.9	18	95.4	86	58.8	284	65	406	United States	42.434	9.7	16%	56:44:00	University Chemical	FALSE	FALSE	FALSE		
22	220	UCL	85.7	220	74.5	29	85.4	23	97.9	46	44.5	887	96.7	23	United Kingdom	36.780	10.3	60%	59:41:00	UCL	UCL & Archaeol	FALSE	FALSE	FALSE	
23	230	University	82.9	230	79.3	22	84.6	24	93.6	103	44.7	437	59.2	487	United States	45.912	8.2	17%	50:50:00	University Chemistry	FALSE	FALSE	FALSE		
24	240	New York	82.7	240	74.2	30	84	25	95	93	48.6	580	74.7	277	United States	36.337	9.8	42%	57:43:00	New York	Politics &	FALSE	FALSE	FALSE	
25	250	Duke Univ	82.6	250	78.1	23	76.2	37	95.7	83	99.6	17	68	366	United States	16.091	4.2	24%	52:48:00	Duke Univ	Medicine	FALSE	FALSE	FALSE	
26	260	Northwest	82.1	260	71.7	32	80.7	30	97.5	52	85	94	67	382	United States	19.175	13.2	20%	51:49:00	Northwest Computer	FALSE	FALSE	FALSE		
27	270	University	82.1	270	71.6	33	82.8	27	98.9	29	53.9	340	63	438	United States	47.727	10.8	18%	55:45:00	University Psychol	FALSE	FALSE	FALSE		
28	280	Carnegie f	81.1	280	65.4	46	71.8	29	98.7	31	55.2	318	80.1	216	United States	12.405	12.9	47%	44:56:00	Carnegie f	Accounting	FALSE	FALSE	FALSE	
29	290	University	79.8	290	66.9	42	84.5	44	97.1	58	40.9	832	95.6	37	United Kingdom	32.845	11.8	47%	62:38:00	University Computer	FALSE	FALSE	FALSE		

2023 Times Higher Education World University Rankings

Cleaning and Transforming World Development Data

#	A	B	C	D	E
1	Country Name	Country Code	Series Name	Series Code	2023 (1970=100)
2	Afghanistan	AFG	GDP per capita (current US\$)	NY.GDP.PCAP.CD	413.7074
3	Afghanistan	AFG	GDP (current US\$)	NY.GDP.MKTP.CD	1,721+10
4	Afghanistan	AFG	Unemployment, total (% of total labor force) (modeled ILO estimate)	SL.UEM.TOTL.ZS	14.386
5	Afghanistan	AFG	Government expenditure on education, total (% of GDP)	SE.XOV.TOTL.GD.ZS	--
6	Afghanistan	AFG	Adjusted net national income (current US\$)	NY.ADN.NNTY.DZ	--
7	Afghanistan	AFG	School enrollment, tertiary (% gross)	SE.TER.ENRR	--
8	Afghanistan	AFG	Pupil-teacher ratio, tertiary	SE.TER.ENRL.TC.ZS	--
9	Afghanistan	AFG	Researchers in R&D (per million people)	SP.POP.SCIE.RD.P6	--
10	Afghanistan	AFG	Scientific and technical journal articles	IP.JRN.ARTC.SC	--
11	Afghanistan	AFG	Net migration	SM.POP.NETM	-48958
12	Afghanistan	AFG	Foreign direct investment, net inflows (% of GDP)	BX.KLT.DINV.WD.GD.ZS	--
13	Afghanistan	AFG	Gini index	SI.POV.GINI	--
14	Afghanistan	AFG	Life expectancy at birth, total (years)	SP.DYN.LE00.IN	--
15	Afghanistan	AFG	Urban population (% of total population)	SP.URB.TOTL.IN.ZS	26.933
16	Afghanistan	AFG	Carbon dioxide (CO2) emissions excluding LULUCF per capita (t CO2e/capita)	EN.GHS.CO2.PC.CE.ARS	--
17	Afghanistan	AFG	Renewable energy consumption (% of total final energy consumption)	EG.FEC.RNEW.ZS	--
18	Afghanistan	AFG	Access to electricity (% of population)	EG.ELEC.ACCS.ZS	--
19	Afghanistan	AFG	Individuals using the Internet (% of population)	IT.NET.USER.ZS	--
20	Afghanistan	AFG	Mobile cellular subscriptions (per 100 people)	IT.CEL.SETS.P2	--
21	Afghanistan	AFG	International tourism, number of arrivals	ST.INT.ARVL	--
22	Afghanistan	AFG	Political Stability and Absence of Violence/Terrorism: Percentile Rank	PV.PSR.PNK	1.421801
23	Afghanistan	AFG	Intentional homicides (per 100,000 people)	VC.IHR.PSKC.P5	--
24	Afghanistan	AFG	Income share held by highest 10%	SI.DST.10TH.10	--
25	Afghanistan	AFG	Energy use (kg of oil equivalent per capita)	EG.USE.PCAP.KG.OE	--
26	Afghanistan	AFG	Poverty headcount ratio at \$2.15 a day (2017 PPP) (% of population)	SI.POV.DDAY	--
27	Afghanistan	AFG	Exports of goods and services (% of GDP)	NE.EXP.GNFS.ZS	16.7514
28	Afghanistan	AFG	Personal remittances, received (% of GDP)	BK.TRF.PWRK.DT.GD.ZS	1.85887
29	Afghanistan	AFG	High-technology exports (% of manufactured exports)	TX.VAL.TECH.MF.ZS	--
30	Afghanistan	AFG	Trade in services (% of GDP)	BO.GSR.NVSV.GD.ZS	--
31	Afghanistan	AFG	School enrollment, tertiary (gross), gender parity index (GPI)	SE.ENR.TERT.FM.ZS	--
32	Albania	ALB	GDP per capita (current US\$)	NY.GDP.PCAP.CD	8375.171
33	Albania	ALB	GDP (current US\$)	NY.GDP.MKTP.CD	2,331+10
34	Albania	ALB	Unemployment, total (% of total labor force) (modeled ILO estimate)	SL.UEM.TOTL.ZS	13.584
35	Albania	ALB	Government expenditure on education, total (% of GDP)	SE.XPD.TOTL.GD.ZS	--
36	Albania	ALB	Adjusted net national income (current US\$)	NY.ADN.NNTY.DZ	--
37	Albania	ALB	School enrollment, tertiary (% gross)	SE.TER.ENRR	64.72935
38	Albania	ALB	Pupil-teacher ratio, tertiary	SE.TER.ENRL.TC.ZS	--
39	Albania	ALB	Researchers in R&D (per million people)	SP.POP.SCIE.RD.P6	--
40	Albania	ALB	Scientific and technical journal articles	IP.JRN.ARTC.SC	--
41	Albania	ALB	Net migration	SM.POP.NETM	-25257
42	Albania	ALB	Foreign direct investment, net inflows (% of GDP)	BX.KLT.DINV.WD.GD.ZS	6.883977
43	Albania	ALB	Gini index	SI.POV.GINI	--
44	Albania	ALB	Life expectancy at birth, total (years)	SP.DYN.LE00.IN	--
45	Albania	ALB	Urban population (% of total population)	SP.URB.TOTL.IN.ZS	64.603
46	Albania	ALB	Carbon dioxide (CO2) emissions excluding LULUCF per capita (t CO2e/capita)	EN.GHS.CO2.PC.CE.ARS	--
47	Albania	ALB	Renewable energy consumption (% of total final energy consumption)	EG.FEC.RNEW.ZS	--
48	Albania	ALB	Access to electricity (% of population)	EG.ELEC.ACCS.ZS	--
49	Albania	ALB	Individuals using the Internet (% of population)	IT.NET.USER.ZS	83.1356
50	Albania	ALB	Mobile cellular subscriptions (per 100 people)	IT.CEL.SETS.P2	--
51	Albania	ALB	International tourism, number of arrivals	ST.INT.ARVL	--
52	Albania	ALB	Political Stability and Absence of Violence/Terrorism: Percentile Rank	PV.PSR.PNK	53.55877
53	Albania	ALB	Intentional homicides (per 100,000 people)	VC.IHR.PSKC.P5	--
54	Albania	ALB	Income share held by highest 10%	SI.DST.10TH.10	--
55	Albania	ALB	Energy use (kg of oil equivalent per capita)	EG.USE.PCAP.KG.OE	--
56	Albania	ALB	Poverty headcount ratio at \$2.15 a day (2017 PPP) (% of population)	SI.POV.DDAY	--
57	Albania	ALB	Exports of goods and services (% of GDP)	NE.EXP.GNFS.ZS	38.66508
58	Albania	ALB	Personal remittances, received (% of GDP)	BK.TRF.PWRK.DT.GD.ZS	8.64719

	A	B	C	D	E	F	G	H	I	J	K	L
1	Country Name	Exports of Foreign di	GDP (curr	GDP per c	High-tech	Net migra	Personal r	Political S	Trade in s	Unemploy	Urban popu	
2	Afghanistan	16.77514	1.467841	1.72E+10	415.7074	9.262435	-48958	1.856897	1.421801	17.22205	14.386	26.933
3	Africa Eas	24.34834	1.76009	1.25E+12	1659.515	3.86731	-989975	1.669203	48.81517	10.44419	7.59107	38.4249
4	Africa We	34.03676	0.836211	7.99E+11	1568.724	9.262435	327673	4.116092	48.81517	17.22205	3.379122	49.71118
5	Albania	38.66508	6.883977	2.35E+10	8575.171	9.262435	-25357	8.64719	51.65877	44.98144	11.584	64.603
6	Algeria	23.61954	0.490973	2.48E+11	5364.028	9.262435	-25963	0.754198	23.22275	5.045603	11.814	75.268
7	American	34.03676	1.467841	8.38E+10	7820.232	9.262435	-1159	1.873572	91.94313	17.22205	5.297	87.235
8	Andorra	34.03676	1.467841	3.79E+09	46812.45	21.43463	1061	1.177727	98.5782	17.22205	5.297	87.774
9	Angola	40.85678	-2.49884	8.48E+10	2308.16	9.262435	-995	0.014225	32.22749	10.23149	14.62	68.688
10	Antigua ar	34.03676	14.7853	2.03E+09	21787.1	0	0	1.720093	80.56872	82.50374	5.297	24.332
11	Arab Worl	49.2355	1.948913	3.51E+12	7292.21	12.25396	482824	1.819126	48.81517	17.78791	9.905098	59.44385
12	Argentina	12.74925	3.694019	6.46E+11	14187.48	5.449594	4133	0.156281	41.70616	5.980267	6.178	92.463
13	Armenia	59.45209	2.409579	2.41E+10	8053.011	21.10513	75000	6.027483	17.06161	37.61576	8.586	63.739
14	Aruba	88.34379	2.506331	3.65E+09	33984.79	6.868008	147	1.033762	97.63033	17.22205	5.297	44.254
15	Australia	26.79924	1.880806	1.73E+12	64820.91	25.25828	140232	0.099922	79.62085	9.596558	3.667	86.617
16	Austria	59.46457	0.571628	5.12E+11	56033.57	15.92327	4819	0.637538	71.56398	34.14172	5.243	59.53
17	Azerbaijan	49.04537	0.349433	7.24E+10	7125.909	4.172245	-84122	2.643608	18.00948	20.59966	5.636	57.577

1. Replaces all occurrences of " " with NaN to standardize missing values.
2. Pivots the DataFrame so each row represents a country and each column represents an indicator for the year 2023.
3. Removes columns with more than 50% missing values to retain only informative data.
4. Converts all columns (except "Country Name") to numeric type, coercing invalid entries to NaN.
5. Drops columns that contain only NaN values, as they provide no usable information.
6. Fills the remaining missing values with the median of each respective column to ensure completeness for further analysis or modeling.

Cleaning and Transforming World University Rankings

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	
rank_order	rank	name	scores_ov	scores_ov	te_scores	te_scores	re_scores	re_scores	ci_scores	ci_scores	in_scores	in_scores	in_scores	in_scores	in_scores	in_scores	location	stats_nurr	stats_stu	stats_pc	stats_pc	stats_pc	stats_pc	stats_pc	stats_pc
1	10	1 University	96.4	10	92.3	5	99.7	1	99	28	74.9	158	96.2	28	United Kingdom	20965	10.6	42%	48:52:00	University Account	FALSE	FALSE	FALSE	FALSE	
2	20	2 Harvard U	95.2	20	94.8	1	99	3	99.3	20	49.5	418	80.5	214	United States	21887	9.6	25%	50:50:00	Harvard U Mathemat	FALSE	FALSE	FALSE	FALSE	
3	30	3 University	94.8	30	90.9	7	99.5	2	97	61	54.2	335	95.8	34	United Kingdom	20185	11.3	39%	47:53:00	University Business	FALSE	FALSE	FALSE	FALSE	
4	40	4 Stanford L	94.8	40	94.2	2	96.7	7	99.8	16	65	232	79.8	223	United States	16164	7.1	24%	46:54:00	Stanford L Physics &	FALSE	FALSE	FALSE	FALSE	
5	50	5 Massachu	94.2	50	90.7	8	93.6	11	99.8	15	90.9	62	89.3	119	United States	11415	8.2	33%	40:10:00	Massachu Mathemat	FALSE	FALSE	FALSE	FALSE	
6	60	6 California	94.1	60	90.9	6	97	5	97.3	55	89.8	69	83.6	176	United States	2237	6.2	34%	37:03:00	California Language	FALSE	FALSE	FALSE	FALSE	
7	70	7 Princeton	92.4	70	87.6	12	95.9	8	99.1	25	96	221	80.3	215	United States	8279	8	22%	46:54:00	Princeton Language	FALSE	FALSE	FALSE	FALSE	
8	80	8 University	92.1	80	86.4	14	95.8	9	99	27	76.8	145	78.4	238	United States	40921	18.4	24%	52:48:00	University Communi	FALSE	FALSE	FALSE	FALSE	
9	90	9 Yale Univ	91.4	90	92.6	3	92.7	14	97	66	55	323	70.9	335	United States	13482	5.9	21%	52:48:00	Yale Univ Economic	FALSE	FALSE	FALSE	FALSE	
10	100	10 Imperial C	90.4	100	82.8	16	90.8	17	96.3	40	59.8	274	97.5	17	United Kingdom	18545	11.2	61%	40:10:00	Imperial C Mechanic	FALSE	FALSE	FALSE	FALSE	
11	110	11 Columbia	89.4	110	89.4	10	87.7	21	97.1	57	44.8	569	79.9	219	United States	21781	4.5	38%		Columbia Politics &	FALSE	FALSE	FALSE	FALSE	
12	120	12 ETH Zurich	89.4	120	82.6	17	95.4	10	90.7	135	59.1	279	97.7	14	Switzerland	21665	14.8	41%	39:16:00	ETH Zurich Mathemat	FALSE	FALSE	FALSE	FALSE	
13	130	13 The Univ	88.9	130	86.5	13	88.8	19	97.7	49	56.2	303	74.2	283	United States	15366	6	36%	47:53:00	The Univ Business	FALSE	FALSE	FALSE	FALSE	
14	140	14 University	88.8	140	86	15	88.8	20	97	65	75.8	151	71.5	327	United States	21453	6.3	23%	53:47:00	University Economic	FALSE	FALSE	FALSE	FALSE	
15	150	15 Johns Ho	88.3	150	79.4	21	91.5	15	97	64	89.5	73	75.3	266	United States	17584	4.7	29%	53:47:00	Johns Ho Sociology	FALSE	FALSE	FALSE	FALSE	
16	160	16 Tsinghua	88.2	160	90.1	9	97.4	4	88	182	100	9	40.3	951	China	38324	11.6	10%		Tsinghua Economic	FALSE	FALSE	FALSE	FALSE	
17	170	17 Peking Un	88.1	170	92.5	4	96.7	6	80.4	308	91.8	60	65	409	China	31994	10.3	19%		Peking Un Other Hea	FALSE	FALSE	FALSE	FALSE	
18	180	18 University	87.4	180	77.3	25	93.3	12	92.8	113	65.5	225	89.7	115	Canada	77468	25.8	26%	56:44:00	University Politics &	FALSE	FALSE	FALSE	FALSE	
19	190	19 National I	87.1	190	76.4	26	90	13	90.2	148	87	86	94	63	Singapore	32337	19.8	25%	51:49:00	National I Other Hea	FALSE	FALSE	FALSE	FALSE	
20	200	20 Cornell U	85.9	200	80.2	20	86.1	22	97.3	56	40.4	905	76.9	252	United States	24027	10.3	26%	51:49:00	Cornell U Other Hea	FALSE	FALSE	FALSE	FALSE	
21	210	21 University	85.8	210	80.4	19	88.9	18	95.4	86	58.8	284	65	406	United States	42434	9.7	16%	56:44:00	University Chemist	FALSE	FALSE	FALSE	FALSE	
22	220	22 UCL	85.7	220	74.5	29	85.4	23	97.9	46	44.5	587	96.7	23	United Kingdom	36790	10.3	60%	59:11:00	UCL UK Archaeolog	FALSE	FALSE	FALSE	FALSE	
23	230	23 University	82.9	230	79.3	22	84.6	24	93.6	103	48.7	437	59.2	497	United States	45912	8.2	17%	50:50:00	University Chemistry	FALSE	FALSE	FALSE	FALSE	
24	240	24 New York	82.6	240	74.2	30	84	25	95	93	44.6	580	74.7	277	United States	36337	9.8	42%	57:43:00	New York Politics &	FALSE	FALSE	FALSE	FALSE	
25	250	25 Duke Univ	82.6	250	78.1	23	76.2	37	95.7	83	99.6	17	68	366	United States	16091	4.2	24%	52:48:00	Duke Univ Medicine	FALSE	FALSE	FALSE	FALSE	
26	260	26 Northwest	82.1	260	71.7	32	80.7	30	97.5	52	85	94	67	382	United States	19175	13.2	20%	51:46:00	Northwest Computer	FALSE	FALSE	FALSE	FALSE	
27	270	27 University	82.1	270	71.6	33	82.8	27	98.9	29	53.9	340	63	438	United States	47727	10.8	18%	55:45:00	University Psycholog	FALSE	FALSE	FALSE	FALSE	
28	280	28 Carnegie T	81.1	280	65.4	46	81.8	31	98.7	31	55.2	318	80.1	216	United States	14305	12.9	47%	44:56:00	Carnegie T Account	FALSE	FALSE	FALSE	FALSE	
29	290	29 University	79.8	290	66.9	42	74.5	44	97.1	58	40.9	952	95.6	37	United Kingdom	32845	11.8	47%	62:38:00	University Computer	FALSE	FALSE	FALSE	FALSE	

1. Drops unnecessary columns such as aliases, subjects_offered, closed, and unaccredited.
2. Cleans the stats_pc_intl_students column by converting percentage strings (e.g., "42%") into decimal values (e.g., 0.42), replacing invalid entries with NaN.
3. Processes the stats_female_male_ratio column by splitting gender ratios (e.g., "48 : 52") into two new decimal columns: female_ratio and male_ratio.
4. Cleans the stats_number_students column by removing commas and converting valid entries to floats, replacing invalid entries with NaN.
5. Converts all columns starting with scores_ or stats_ to numeric values, coercing invalid entries to NaN.
6. Cleans the rank column by removing any equals signs and converting the values to numeric.
7. Removes duplicate rows from the dataset.
8. Drops any column with more than 50% missing values.
9. Fills the remaining missing values in numeric columns using the column median.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
	rank_order	name	scores_ov	scores_te	scores_re	scores_ci	scores_in	scores_in	scores_in	location	stats_n	stats_stu	stats_pc	f	male	ratio			
1	10	University	10	92.3	5	99.7	1	99	28	74.9	158	96.2	28	United Kingdom	20965	10.6	42%	0.48	0.52
2	20	Harvard U	20	94.8	1	99	3	99.3	20	49.5	418	80.5	214	United States	21887	9.6	25%	0.45	0.55
3	30	University	30	90.9	7	99.5	2	97	61	54.2	335	95.8	34	United Kingdom	20185	11.3	39%	0.47	0.53
4	40	Stanford U	40	94.2	2	96.7	7	99.8	16	65	232	79.8	223	United States	16164	7.1	24%	0.46	0.54
5	50	Massachu	50	90.7	8	93.6	11	99.8	15	90.9	62	89.3	119	United States	11415	8.2	33%	0.4	0.6
6	60	California	60	90.9	6	97	5	97.3	55	89.8	69	83.6	176	United States	2237	6.2	34%	0.37	0.63
7	70	Princeton	70	87.6	12	95.9	8	99.1	25	96	221	80.3	215	United States	8279	8	22%	0.46	0.54
8	80	University	80	86.4	14	95.8	9	99	27	76.8	145	78.4	238	United States	40921	18.4	24%	0.52	0.48
9	90	Yale Univ	90	92.6	3	92.7	14	97	66	55	323	70.9	335	United States	13482	5.9	21%	0.52	0.48
10	100	Imperial C	100	82.8	16	90.8	17	96.3	40	59.8	274	97.5	17	United Kingdom	18545	11.2	61%	0.4	0.6
11	110	Columbia	110	89.4	10	87.7	21	97.1	57	44.8	569	79.9	219	United States	21781	4.5	38%	0.53	0.47
12	120	ETH Zurich	120	82.6	17	95.4	10	90.7	135	59.1	279	97.7	14	Switzerland	21665	14.8	41%	0.33	0.67
13	130	The Univ	130	86.5	13	88.8	19	97.7	49	56.2	303	74.2	283	United States	15366	6	36%	0.47	0.53
14	140	University	140	86	15	88.8	20	97	65	75.8	151	71.5	327	United States	21453	6.3	23%	0.53	0.47
15	150	Johns Hop	150	79.4	21	91.5	15	97	64	89.5	73	75.3	266	United States	17584	4.7	29%	0.53	0.47
16	160	Tsinghua	160	90.1	9	97.4	4	88	182	100	9	40.3	951	China	38324	11.6	10%	0.53	0.47
17	170	Peking Un	170	92.5	4	96.7	6	80.4	308	91.8	60	65	409	China	31994	10.3	0.19	0.53	0.47
18	180	University	180	77.3	25	93.3	12	92.8	113	65.5	225	89.7	115	Canada	77468	25.8	0.26	0.56	0.44
19	190	National U	190	76.4	26	93	13	90.2	148	87	86	94	63	Singapore	32337	19.8	0.25	0.51	0.49
20	200	Cornell U	200	80.2	20	86.1	22	97.3	56	40.4	905	76.9	252	United States	24027	10.3	0.26	0.51	0.49
21	210	University	210	80.4	19	88.9	18	95.4	86	58.8	284	65	406	United States	42434	9.7	0.16	0.56	0.44
22	220	UCL	220	74.5	29	85.4	23	97.9	46	44.5	587	96.7	23	United Kingdom	36790	10.3	0.6	0.59	0.41
23	230	University	230	79.3	22	84.6	24	93.6	103	48.7	437	59.2	497	United States	45912	8.2	0.17	0.5	0.5

Merge Datasets

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD
1	rank_order	name	score	score	score	score	score	score	score	score	score	score	score	score	score	score	score	score	score	Exports of Foreign di	GDP (curr	GDP per c	High-tech	Net migra	Personal i	Political S	Trade in s	Unemploy	Urban pop	
2	10	University	10	92.3	5	99.7	1	99	28	74.9	158	96.2	28	20965	10.6	0.42	0.48	0.52	United Kingdom	31.66268	-2.64546	3.38E+12	49463.86	28.89171	445523	0.132706	62.08531	28.0709	4.055	84.642
3	20	Harvard U	20	94.8	1	99	3	99.3	20	49.5	418	80.5	214	21887	9.6	0.25	0.5	0.5	United States	11.01151	1.258207	2.77E+13	82769.41	21.84599	1322668	0.027903	47.39336	6.40239	3.625	83.298
4	30	University	30	90.9	7	99.5	2	97	61	54.2	335	95.8	34	20185	11.3	0.39	0.47	0.53	United Kingdom	31.66268	-2.64546	3.38E+12	49463.86	28.89171	445523	0.132706	62.08531	28.0709	4.055	84.642
5	40	Stanford U	40	94.2	2	96.7	7	99.8	16	65	232	79.8	223	16164	7.1	0.24	0.46	0.54	United States	11.01151	1.258207	2.77E+13	82769.41	21.84599	1322668	0.027903	47.39336	6.40239	3.625	83.298
6	50	Massachu	50	90.7	8	93.6	11	99.8	15	90.9	62	89.3	119	11415	8.2	0.33	0.4	0.6	United States	11.01151	1.258207	2.77E+13	82769.41	21.84599	1322668	0.027903	47.39336	6.40239	3.625	83.298
7	60	California	60	90.7	6	97	5	97.3	55	89.8	69	83.6	176	2237	6.2	0.34	0.37	0.63	United States	11.01151	1.258207	2.77E+13	82769.41	21.84599	1322668	0.027903	47.39336	6.40239	3.625	83.298
8	70	Princeton	70	87.6	12	95.9	8	99.1	25	66	221	80.3	215	8279	8	0.23	0.46	0.54	United States	11.01151	1.258207	2.77E+13	82769.41	21.84599	1322668	0.027903	47.39336	6.40239	3.625	83.298
9	80	University	80	86.4	14	95.8	9	99	27	76.8	145	78.4	238	40921	18.4	0.24	0.52	0.48	United States	11.01151	1.258207	2.77E+13	82769.41	21.84599	1322668	0.027903	47.39336	6.40239	3.625	83.298
10	90	Yale Univ	90	92.6	3	92.7	14	97	66	55	323	70.9	335	13482	5.9	0.21	0.52	0.48	United States	11.01151	1.258207	2.77E+13	82769.41	21.84599	1322668	0.027903	47.39336	6.40239	3.625	83.298
11	100	Imperial C	100	82.8	16	90.8	17	98.3	40	59.8	274	97.5	17	18545	11.2	0.61	0.4	0.6	United Kingdom	31.66268	-2.64546	3.38E+12	49463.86	28.89171	445523	0.132706	62.08531	28.0709	4.055	84.642
12	110	Columbia	110	89.4	10	87.7	21	97.1	57	44.8	569	79.9	219	21781	4.5	0.38	0.53	0.47	United States	11.01151	1.258207	2.77E+13	82769.41	21.84599	1322668	0.027903	47.39336	6.40239	3.625	83.298
13	120	ETH Zurich	120	82.6	17	95.4	10	90.7	135	59.1	279	97.7	14	21665	14.8	0.41	0.33	0.67	Switzerland	75.32687	-5.94811	8.85E+11	99564.71	29.33403	45098	0.387772	88.6256	40.41597	4.05	74.202
14	130	The Univei	130	86.5	13	88.8	19	97.7	49	56.2	303	74.2	283	15366	6	0.36	0.47	0.53	United States	11.01151	1.258207	2.77E+13	82769.41	21.84599	1322668	0.027903	47.39336	6.40239	3.625	83.298
15	140	University	140	86	15	88.8	20	97	65	75.8	151	71.5	327	21453	6.3	0.23	0.53	0.47	United States	11.01151	1.258207	2.77E+13	82769.41	21.84599	1322668	0.027903	47.39336	6.40239	3.625	83.298
16	150	Johns Hop	150	79.4	21	91.5	15	97	64	89.5	73	75.3	266	17584	4.7	0.29	0.53	0.47	United States	11.01151	1.258207	2.77E+13	82769.41	21.84599	1322668	0.027903	47.39336	6.40239	3.625	83.298
17	160	Tsinghua	160	90.1	9	97.4	4	88	182	100	9	40.3	951	38324	11.6	0.1	0.53	0.47	China	19.74307	0.240114	1.78E+13	12614.06	26.56821	-567724	0.163589	25.11848	4.899992	4.67	64.57
18	170	Peking Un	170	92.5	4	96.7	6	80.4	308	91.8	60	65	409	31994	10.3	0.19	0.53	0.47	China	19.74307	0.240114	1.78E+13	12614.06	26.56821	-567724	0.163589	25.11848	4.899992	4.67	64.57
19	180	University	180	77.3	25	93.3	12	92.8	113	65.5	225	89.7	115	77468	25.8	0.26	0.56	0.44	Canada	33.3693	2.228511	2.14E+12	53431.19	15.18774	433842	0.039543	76.30331	13.99614	5.366	81.862
20	190	National U	190	76.4	26	93	13	90.2	148	87	86	94	63	32337	19.8	0.25	0.51	0.49	Singapore	174.3001	34.94852	5.01E+11	84734.26	56.13838	26996	0	97.15639	124.3549	3.472	100
21	200	Cornell Un	200	80.2	20	86.1	22	97.3	56	40.4	905	76.9	252	24027	10.3	0.26	0.51	0.49	United States	11.01151	1.258207	2.77E+13	82769.41	21.84599	1322668	0.027903	47.39336	6.40239	3.625	83.298
22	210	University	210	80.4	19	88.9	18	95.4	86	58.8	284	65	406	42434	9.7	0.16	0.56	0.44	United States	11.01151	1.258207	2.77E+13	82769.41	21.84599	1322668	0.027903	47.39336	6.40239	3.625	83.298
23	220	UCL	220	74.5	29	85.4	23	97.9	46	44.5	587	96.7	23	36790	10.3	0.6	0.59	0.41	United Kingdom	31.66268	-2.64546	3.38E+12	49463.86	28.89171	445523	0.132706	62.08531	28.0709	4.055	84.642
24	230	University	230	79.3	22	84.6	24	93.6	103	48.7	437	59.2	497	45912	8.2	0.17	0.5	0.5	United States	11.01151	1.258207	2.77E+13	82769.41	21.84599	1322668	0.027903	47.39336	6.40239	3.625	83.298
25	240	New York	240	74.2	30	84	25	95	93	44.6	580	74.7	277	36337	9.8	0.42	0.57	0.43	United States	11.01151	1.258207	2.77E+13	82769.41	21.84599	1322668	0.027903	47.39336	6.40239	3.625	83.298
26	250	Duke Univ	250	78.1	23	76.2	37	95.7	83	99.6	17	68	366	16091	4.2	0.24	0.52	0.48	United States	11.01151	1.258207	2.77E+13	82769.41	21.84599	1322668	0.027903	47.39336	6.40239	3.625	83.298
27	260	Northwest	260	71.7	32	80.7	30	97.5	52	85	94	67	382	19175	13.2	0.2	0.51	0.49	United States	11.01151	1.258207	2.77E+13	82769.41	21.84599	1322668	0.027903	47.39336	6.40239	3.625	83.298
28	270	University	270	71.6	33	82.8	27	98.9	29	53.9	340	63	438	47727	10.8	0.18	0.55	0.45	United States	11.01151	1.258207	2.77E+13	82769.41	21.84599	1322668	0.027903	47.39336	6.40239	3.625	83.298
29	280	Carnegie T	280	65.4	46	81.8	29	98.7	31	55.2	318	80.1	216	14305	12.9	0.47	0.44	0.56	United States	11.01151	1.258207	2.77E+13	82769.41	21.84599	1322668	0.027903	47.39336	6.40239	3.625	83.298
30	290	University	290	66.9	42	74.5	44	97.1	58	40.9	852	95.6	67	32845	11.8	0.47	0.62	0.38	United Kingdom	31.66268	-2.64546	3.38E+12	49463.86	28.89171	445523	0.132706	62.08531	28.0709	4.055	84.642
31	300	Technical	300	69.8	34	82.2	28	84.5	241	100	8	77.7	241	33960	40.6	0.36	0.37	0.63	Germany	43.40235	0.431215	4.53E+12	54343.23	17.8509	609553	0.464962	66.35071	21.11559	3.045	77.765
32	310	University	310	65.6	45	74.1	46	92.4	115	60.6	268	98.7	8	18087	18.2	0.43	0.54	0.46	Hong Kong SAR, C	176.7599	29.17691	3.81E+11	50531.74	72.31549	-3427	0.111952	69.66824	46.71757	3.931	100

1. Loads cleaned university rankings and indicator datasets.
2. Creates a mapping from location in rankings to Country Name in indicators using fuzzy matching.
3. Applies manual corrections for commonly mismatched or ambiguous country names.
4. Adds a standardized country name column location_std to the rankings data.
5. Merges the two datasets using the standardized country names.
6. Drops the original country name columns and renames location_std to country.



Tools

Tool	Primary Role	Strengths	Limitations
Pandas(with Matplotlib, Seaborn, and SciPy)	Back-end: Data Cleaning & Preparation Front-end: Visualization & Presentation	<ul style="list-style-type: none">- Fine-grained control over data- Scalable & efficient- Fully transparent & reproducible	<ul style="list-style-type: none">- Requires coding (Python)- Steep learning curve- Limited visualization capabilities
Tableau	Front-end: Visualization & Presentation	<ul style="list-style-type: none">- User-friendly interface- Interactive & dynamic charts- Great for geospatial data	<ul style="list-style-type: none">- Limited data transformation- Not ideal for deep wrangling

Data Analysis & Results

Pandas with Matplotlib, Seaborn, and SciPy

```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from scipy.stats import linregress

df = pd.read_csv('merged_university_indicators.csv')

df = df.dropna(subset=['scores_overall_rank', 'scores_research'])

correlation = df['scores_overall_rank'].corr(df['scores_research'])
print(f'Correlation coefficient between university rank and research output: {correlation:.2f}')

sns.set(style='whitegrid')

fig = plt.figure(figsize=(18, 6))

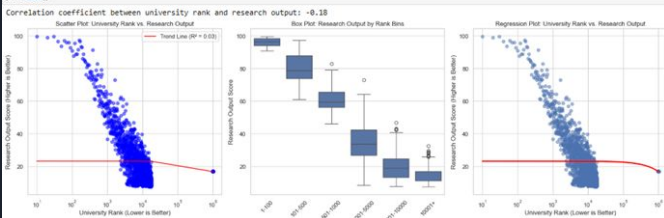
plt.subplot(1, 3, 1)
plt.scatter(df['scores_overall_rank'], df['scores_research'], alpha=0.5, color='blue')
slope, intercept, r_value, p_value, std_err = linregress(df['scores_overall_rank'], df['scores_research'])
line = intercept + slope * df['scores_overall_rank']
plt.plot(df['scores_overall_rank'], line, color='red', label=f'Trend Line (R² = {r_value**2:.2f})')
plt.xscale('log') # Logarithmic scale for x-axis due to wide range of ranks
plt.xlabel('University Rank (Lower is Better)')
plt.ylabel('Research Output Score (Higher is Better)')
plt.title('Scatter Plot: University Rank vs. Research Output')
plt.legend()

df['rank_bin'] = pd.cut(df['scores_overall_rank'],
                        bins=[0, 100, 500, 1000, 5000, 10000],
                        labels=['1-100', '101-500', '501-1000', '1001-5000', '5001-10000', '10001+'])

plt.subplot(1, 3, 2)
sns.boxplot(x='rank_bin', y='scores_research', data=df)
plt.xticks(rotation=45)
plt.xlabel('University Rank Bins')
plt.ylabel('Research Output Score')
plt.title('Box Plot: Research Output by Rank Bins')

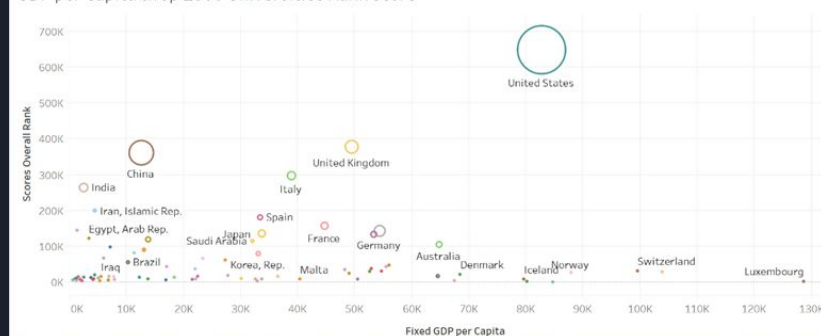
plt.subplot(1, 3, 3)
sns.regplot(x='scores_overall_rank', y='scores_research', data=df, scatter_kws={'alpha':0.5, 'line_kws':{'color':'red'}})
plt.xscale('log') # Logarithmic scale for x-axis
plt.xlabel('University Rank (Lower is Better)')
plt.ylabel('Research Output Score (Higher is Better)')
plt.title('Regression Plot: University Rank vs. Research Output')

plt.tight_layout()
plt.show()
```

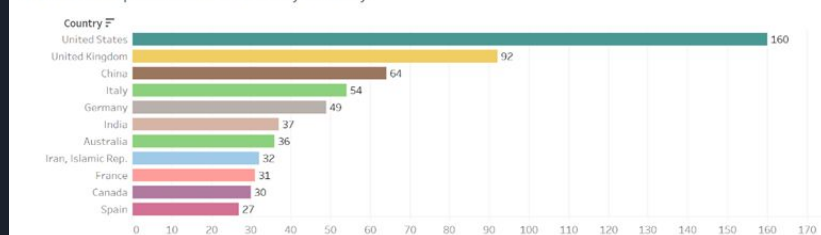


Tableau

GDP per Capita & Top 1000 Universities Rank Score



Number of Top 1000 Universities by Country



Data Analysis & Results

No.	Question	Conclusion and Key Findings
1	Is university ranking positively correlated with a country's economic level?	There is a clear positive correlation. Wealthier countries generally have more and better-ranked universities, but factors like economic size and population are also influential.
2	Does institutional resource availability relate to a university's global competitiveness?	Strongly correlated. Universities with higher research investment, higher citation scores, and lower student-to-staff ratios have greater global competitiveness. Conversely, universities in resource-constrained countries are less globally competitive.
3	Does a country's export dependence relate to its universities' global competitiveness?	Slight negative correlation. Countries more dependent on exports tend to have slightly better-ranked universities, but this trend is weak, suggesting other factors (like education policies, funding, and institutional support) have a larger impact.
4	Does gender balance in enrollment relate to university performance?	Universities with balanced gender enrollment appear more frequently among top-ranked institutions. Female-dominant universities also perform relatively well, while male-dominant universities are fewer and ranked lower.
5	Do political stability and social security impact a university's global competitiveness?	Higher political stability correlates with better and more consistent university rankings. Countries with medium or low stability show greater variability and generally lower competitiveness.



Data Analysis & Results

No.	Question	Conclusion and Key Findings
6	Does university ranking reflect unemployment rate in a country?	Weak correlation. University ranking does not strongly reflect a country's unemployment rate, suggesting other economic and social factors are more influential on employment.
7	Is university ranking positively correlated with research output?	Positive but weak correlation. Higher-ranked universities typically have higher research output, but other factors like funding and faculty quality significantly influence research success.
8	Do countries with higher-ranked universities attract and retain more skilled talent?	Slight negative correlation (better-ranked universities tend to attract more skilled talent), but overall weak. Talent attraction depends more significantly on economic opportunities, political stability, and quality of life.
9	Do top-ranking universities contribute to a country's environmental sustainability?	Slight negative correlation between university rankings and high-tech exports as a proxy for sustainability contributions. However, correlation is weak, and more direct sustainability indicators are needed for a stronger conclusion.
10	Do top universities contribute to the growth of the service sector?	Weak negative correlation. The number of top-ranked universities doesn't strongly correlate with the size of a country's service sector. Factors such as economic structure, trade policies, and historical service focus play more significant roles.

Implications

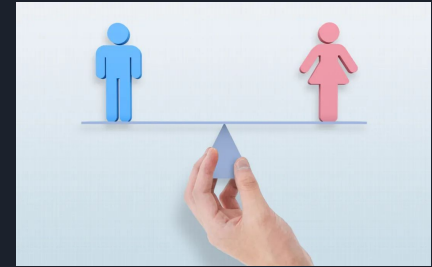
Economic Development & Higher Education

- Higher GDP correlates with better-ranked universities.
- Strategic investments in education significantly enhance global competitiveness, especially in emerging economies.



Institutional Resources & University Quality

- Improved resource allocation (research funding, low student-staff ratios) boosts university rankings.
- Policymakers should prioritize investment in educational infrastructure and research capabilities.



Social Stability & Inclusion

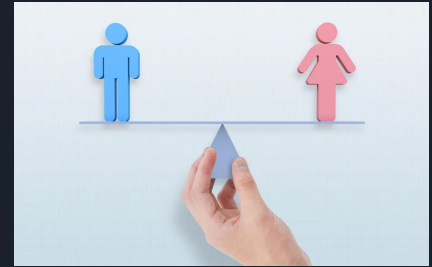
- Political stability leads to consistent academic performance.
- Gender-balanced enrollment is positively related to higher university rankings.



Implications

Broader Development Impact

- Weak correlation between university rankings and indicators like unemployment, export dependence, environmental sustainability, and service-sector growth.
- Higher education's benefits need coordinated macroeconomic policies to maximize societal impact.



Limitations

5. Weak Correlations

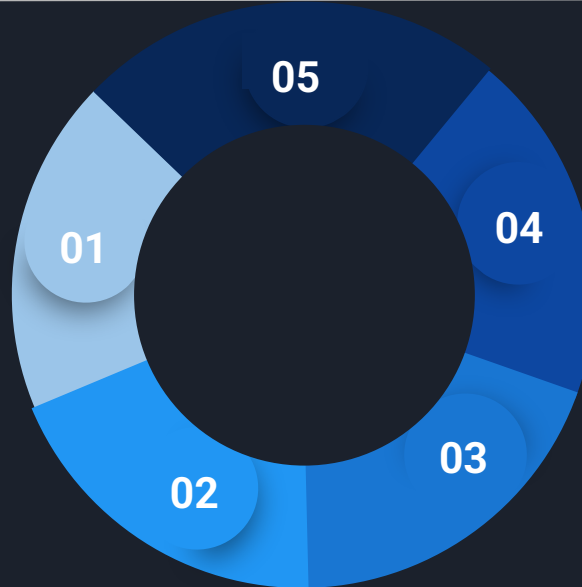
Some variables showed negligible links to rankings.

1. Scope & Data Constraints

Limited manuscript length/
data availability

2. Data Cleaning & Sample Bias

potential selection bias
especially for underrepresented
regions



4. Proxy Variables & Conceptual Gaps

Used imperfect proxies;
Missing granular metrics

3. Technical & Visualization Limits

Native visualization limited ;
Supplemental tools inconsistencies;
Tableau only used for dashboards.



Summary



1. University rankings closely align with a country's economic development, R&D investment & institutional resources, reflecting higher education's role as a marker of national competitiveness.
2. Political stability & gender equality are critical to sustaining higher education excellence
3. Top universities show limited direct influence on talent attraction, sustainability & service-sector growth

Recommendations

1. Integrate education policies with national economic strategies.
2. Bridge the gap between academic excellence and societal needs.
3. Reform rankings to include sustainability and social impact metrics.

The background is a dark navy blue. In the top-left corner, there are two overlapping geometric shapes: a blue parallelogram and a light green parallelogram. In the top-right corner, there is a grey, 3D-rendered circuit board pattern. In the bottom-left corner, there is a circular inset showing a detailed, high-magnification view of a printed circuit board (PCB) with various electronic components and traces.

Thank you



Reference

Times Higher Education. (2022). *World University Rankings 2023: methodology*. Retrieved from <https://www.timeshighereducation.com/world-university-rankings/world-university-rankings-2023-methodology>

World Bank. (2025). *World Development Indicators*. Retrieved from <https://databank.worldbank.org/source/world-development-indicators#>