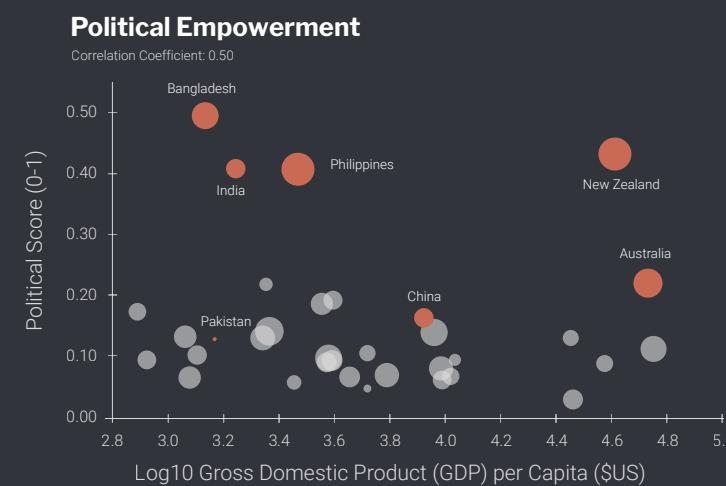
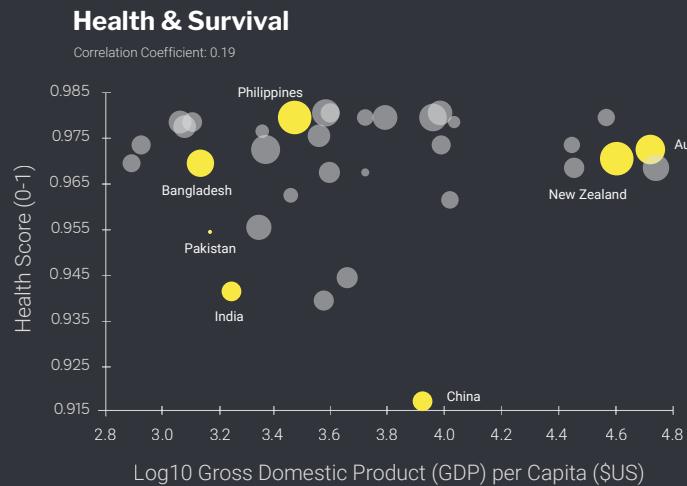


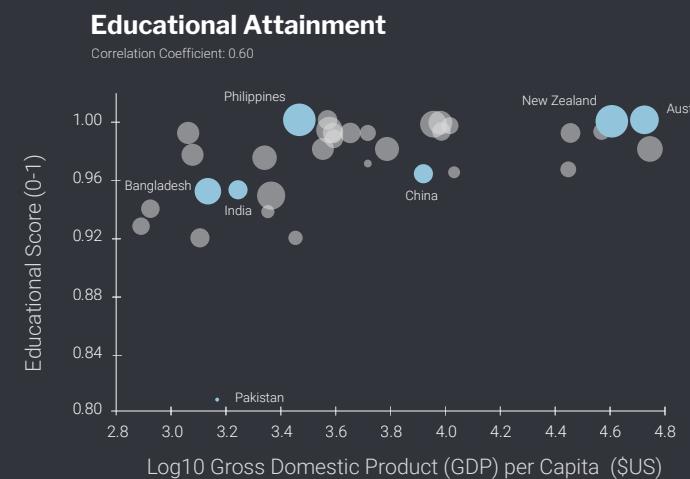
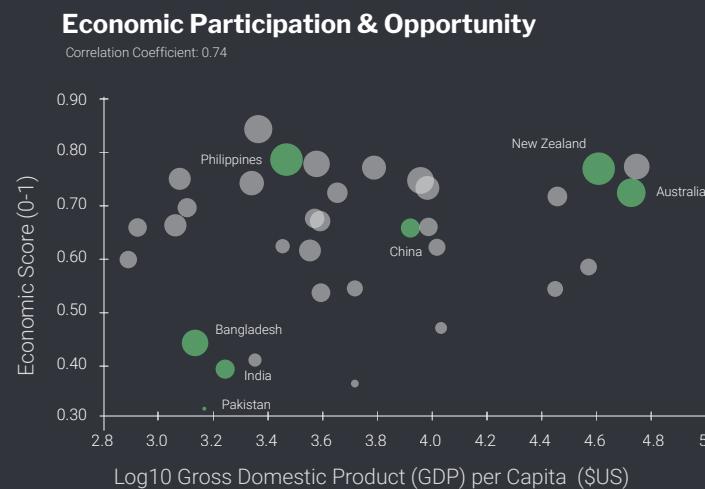
Dollars aren't a girls best friend

Advancing women's equality in work and society represents one of the most sizeable economic opportunities in the world. If the empowerment of women is critical to economic futures, the Asia Pacific region presents a paradox: wealth has an interestingly low affect on gender parity. The World Economic Forum measures the gender gap through a combination of four distinct pillars, each bearing different weight to the overall rank and showing that most countries have some way to parity.

The Philippines is the second highest ranked in the region despite a relatively low wealth context. Pakistan is similar in wealth and population size. Commonwealth countries Australia and New Zealand are next in rank, both on the upper end of the economic spectrum. Bangladesh and India exhibit populations many times that of Australia and New Zealand with far less wealth, performing as well or better in some gender indicators. China's total wealth & population dwarf the region, however this does not translate into better outcomes for women.



8 Bubble size = rank of countries according to Gender Parity Index



Health

Measures the difference between men's and women's health outcomes through the sex ratio at birth and healthy life expectancy.

Political

Measures political decision making through ratio of women/men in ministerial and parliamentary positions. The region has a clear divide on this indicator and is the differentiator between high and low ranked.

Economic

Measures the gaps in work participation, remuneration and advancement. Performing well in this indicator has the highest effect on overall GEI rank.

Education

Captures the gap between men and women's access to education, measuring ratios in education levels and literacy. All but one country perform well on this indicator, suggesting education is not the key to parity.

Developing sustainable economies through Gender Parity in the Asia Pacific

DECO3100 - Assessment Two, Static visualisation

Benjamin Fleming (bfle6726), Nathan Judges (njud0858), Bethany Koulyras (bkou2095)

Advancing womens equality in work and society represents one of the most sizeable economic opportunities in the world. Trying to grow without enabling the full potential of women is like fighting with one hand tied behind ones back.

Our prior visualisation questioned how the Philippines is leading the pack in Asia's gender equality battle. We aimed to build upon this visualisation by choosing sustainable development indicators around gender empowerment and through exploration of gender based data in the Asia Pacific region.

We aimed to begin the exploration as wide as possible, and each chose a separate gender related indicator to base broad data finding on. This was to gather as much data as possible and discover the intersections of various factors on women's empowerment. To select the indicators we utilised three of the pillars used by the World Economic Forum's Gender Gap Report methodology to index gender parity. The following is the indicators each member collected data for and the data sets each found to explore:

Goal 5. **Achieve gender equality and empower all women and girls**

All data sets sourced from The World Bank (1960 - 2018)

Benjie - Political

Indicators and datasets:

- Proportion of seats held by women in national parliaments (%)
- Proportion of women in ministerial level positions (%)

Bethany - Economic

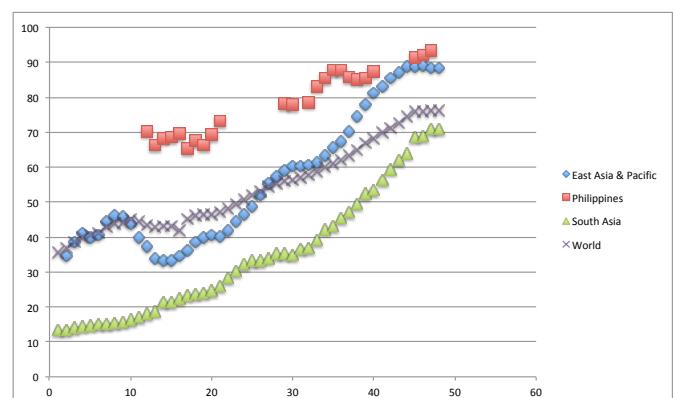
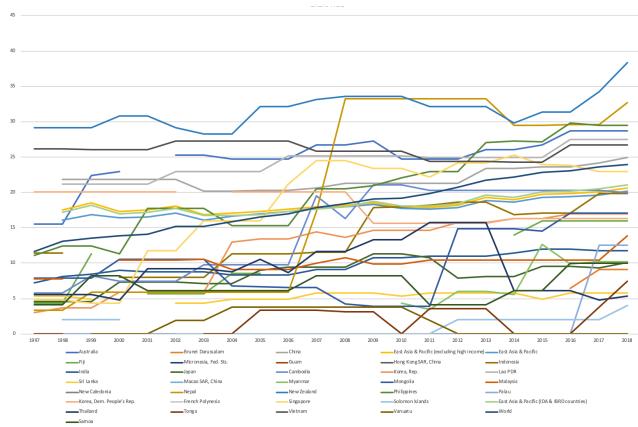
Indicators:

- Firms with a female top manager (% of firms)
- Firms with female participation in ownership
- Employment in agriculture (% male/female)
- Employment in industry (% male/female)
- Employment in services (% male/female)
- Employers (% male/female)
- Female professional and technical workers (% of total)
- Female share of employment in senior and middle management (%)
- Labour force participation rate (% male/female)

Nathan - Education

- Labour force participation rate, basic education (% female) (The World Bank 1960 - 2018)
- Labour force participation rate, intermediate education (% female)
- Labour force participation rate, advanced education (% female)
- Unemployment rate, basic education (% female)
- Unemployment rate, intermediate education (% female)
- Unemployment rate, advanced education (% female)

As all of the data sets were downloaded from the same source, our initial analysis shared similarities. Each data set was global, so the Asia Pacific was first filtered - there were also gaps spanning 1991 - 1996 in most of the data sets, requiring their removal (could not ascertain why this gap existed). The data also needed to be cleaned as it had a lot of repeated and not useful information (country codes, indicator title on each row). We generated charts comparing the change over time for all the indicators downloaded so that we could quickly see any apparent trends across indicators, regions or time periods.



L: Proportion of seats held by women in national parliaments across Asia (%) R: Secondary school female enrolment rate in Asia (% of total)

Our preliminary data finding and chart generation meant we had many graphs to compare, however from initial discussion and comparison we couldn't find any meaningful correlations in what we'd produced. We were wary of simply producing a data set into a visualisation, we wanted to find and display something worth visualising that showed an audience something notable about the state of gender in Asia.

As our initial focus was on the Phillipines and how it was excelling - we were looking for data that showed areas it was doing well comparatively to worser performing countries. This was difficult to ascertain from the data we'd collected - it performed well in some indicators like Women in Managerial Positions - but just comparing this to another indicator like Women in Parliament showed that they were doing well in the data, but was still just correlating factors but didn't justify any cause-effect relationship. We performed a lot of scholarly research to check for such justification but this also left no explanation.

We decided to expand our thinking and further research the state of gender in Asia more holistically, searching for factors that may show interesting relationships. After further research and sifting of current datasets we brainstormed multiple new variables to examine:

- Mapping the Philippines economic change pre and post Magna Carta (sweeping gender reform across all levels of policy in 2009)

- GDP per capita growth remained inline with rest of Asia pre/post reform, global financial crisis warped data

- Agricultural employment vs advanced education levels

- No correlation when viewed across countries - country context and job availability likely responsible for stark differences (i.e Nepal vs Phillipines in high educated service jobs)

- Education levels vs rank in Gender Parity Index (GPI)

- Mostly all countries exhibit high levels of female education, suggesting tertiary education levels may not be central to empowerment

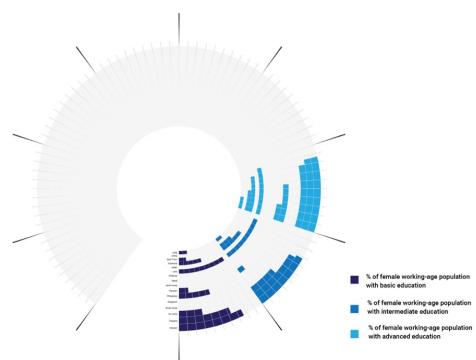
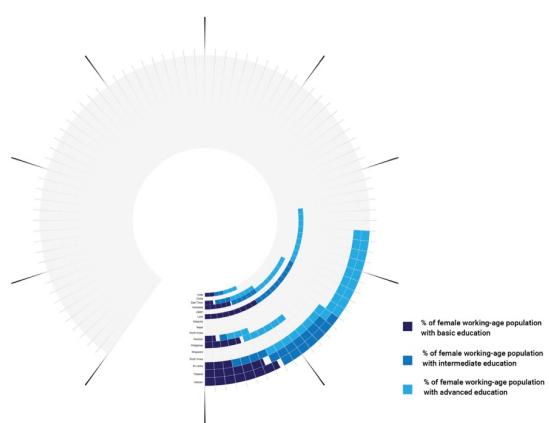
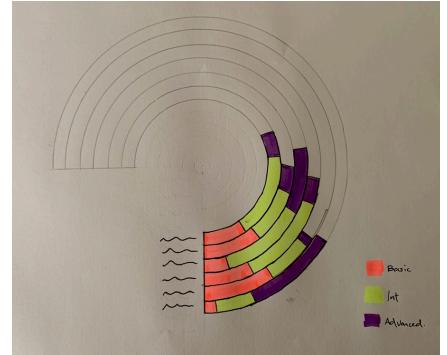
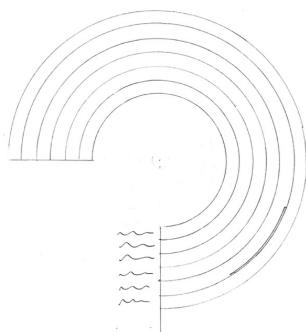
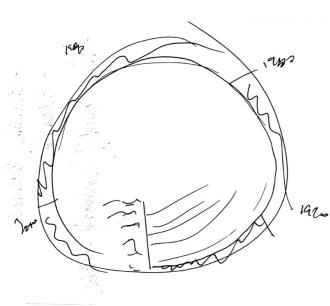
- Women in Parliament and affect on unemployment

- No notable correlation when viewed across countries

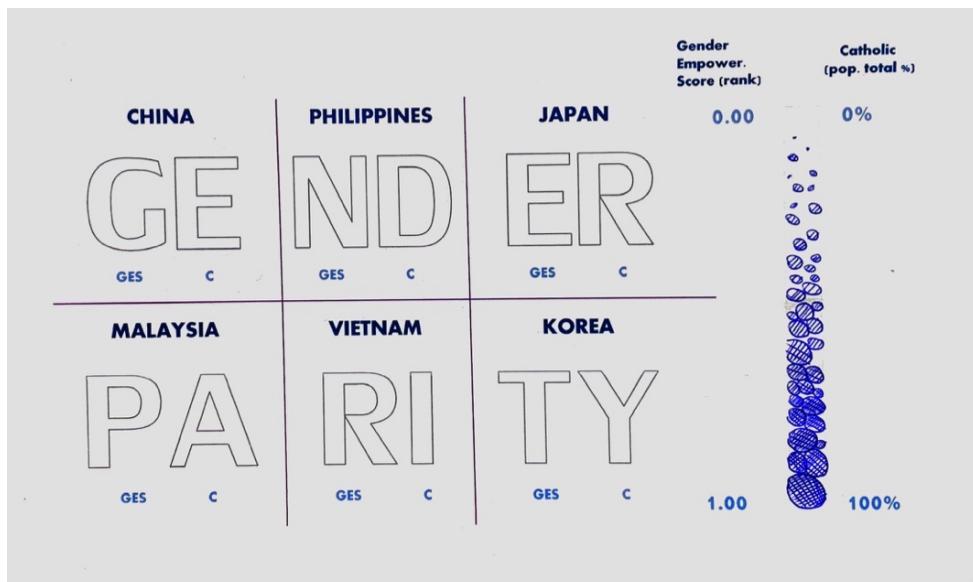
- Religions affect on womens empowerment

- The Philippines has incredibly high rates of Catholicism for the region (93 million in Philippines, 137 million total Catholics in South East Asia region). Pakistan is also incredibly religious yet far further down the GPI rank, other countries exhibit varying levels of religiosity across multiple sects - couldn't confirm this relationship.

We each chose one of the new data sets to explore and sketched out initial ideas based on our new analysis.



Comparing female working education levels across varying countries.



Testing displaying the correlation between Catholicism and Gender empowerment score.

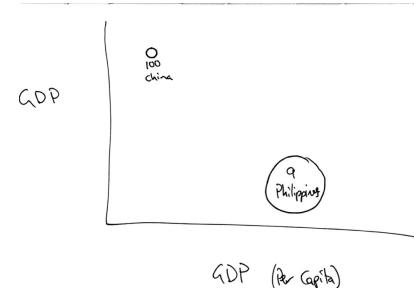
We still were not happy with the message of the visualisation as a whole – the data wasn't telling a story visually. This round of exploration did surface an interesting facet – the non correlation between GDP and gender parity. Paradoxically the Philippines was the highest performing Asian country on the Gender Empowerment Index yet had a relatively low GDP. We felt that many would share our assumption that countries with higher GDP's and overall living conditions would be better faring for women. When posing the question "do you think wealthier countries have better gender equality?" to our peers – the answer was resoundingly yes.

We sourced datasets from the World Bank for GDP – specifically total GDP and GDP per capita. The World Economic Forum does not make the raw data for the annual Gender Gap Report publicly available, so we pulled the data from the PDF report and input it into a spreadsheet.

RawGraphs was used to quickly iterate and explore the data sets visually as Excel charts had limited functionality in testing new work on chart types. Upon first iteration with RawGraphs, it was apparent the data needed to be manipulated.

- The GDP values in their raw form blew out the axis and created far reaching outliers, making it difficult to read the graph.
- A logarithmic scale was employed to adjust the scale to prevent outliers (i.e China's GDP was greater than the entirety of Asia combined which felt important to include as opposed to just removing it).
- The mean, median and quartiles were also calculated for the economic datasets to see if they affected what the data was telling us but it didn't have any impact.
- Looked at GDP over three, five, and ten years and calculated the rate of change as a percentage – we thought that we would see a positive correlation between Gender Empowerment Index (GEI) and GDP growth, using conditional formatting and reordering across variables to identify trends. Interestingly, median countries with higher GEI's had positive GDP growth, yet rich countries with poorer GEI's were shielded from such change.
- Calculated the correlation co-efficient and statistical deviation to more precisely identify the statistical correlation between different gender indicator variables affect on GDP.

- Assessed GDP growth compared across multiple gender indicators (Agricultural employment, years with a Female head of State).
- Countries that did not feature in the GEI were removed from the data as this score was the most comprehensive indicator of parity.



- When using a scatter plot – we wanted to add a layer to the standard graph type by varying the point sizes. The GEI Rank did not display correctly when raw rank used. It was inverted to display correctly.
- Wary of the representation of the rankings when displayed as the area of the data points, we calculated the correct sizes to ensure [rawgraphs.io](#) was using the correct calculation.

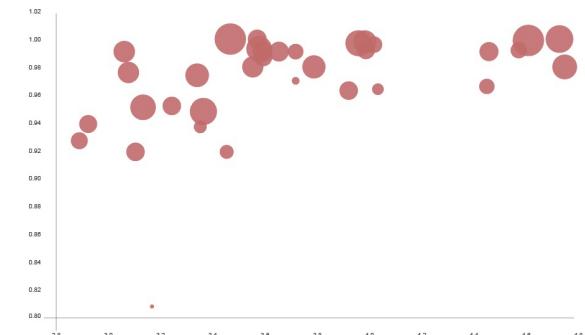
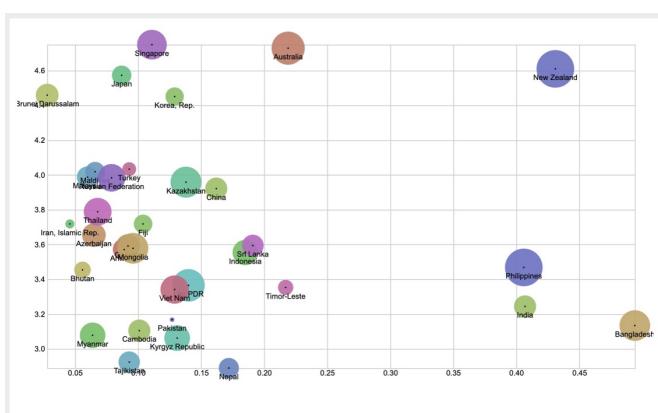
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y		
1	Country Name	GDP Per Capita	GDP Total	GPI - Score	GPI - Rank	Years with Fei Inverse Rank	Log GDP-PC	log GDP	Agriculture	Parliament	Middle/Senior	Intermediate	Legal Score	GDP Growth	change gdp	log gdp change	change 12-17	log10	percentage change 10	change 12-17	log10	percentage 5					
2	New Zealand	474965.576	20583283854.71	0.791	9	11	4.6732668	11.13356	4.478	94.2	57	0.8644511	1656887784	10.21934	2330188935	9.367441	0.20	913720857.2	8.962497	0.08							
3	Philippines	2988.953	31359526375.66	0.79	10	15.8	134	3.475519	11.09637	16.545	29.5	51.5	45	5.059747	870629173	9.3919825	4.7156811	11.67344	0.36	-2.39991+11	-11.3424	-0.17					
4	Australia	51799.938	132421072479.07	0.731	35	3	109	4.730782	12.1217	1.635	28.7	46	0.34888	1.15382E+11	11.06214	7697448455	9.896347	0.19	-28936143607	-10.46144	-0.71						
5	Bangladesh	1516.513	249723862487.36	0.719	47	23.6	97	3.180846	11.39746	60.458	20.3	10.74	28.4256	25	6.164763	28308674487	10.45192	1.70112E+11	11.23073	0.68	1.16368E+11	11.106583	0.47				
6	Kazakhstan	9030.384	162886867811.69	0.713	52	0	92	3.955706	11.21189	17.192	27.1	39	2.694172	25065847748	10.40838	-119665245.6	-8.07775	-0.05	-4920406557	-9.840132	-0.57						
7	Mongolia	3717.473	1143635875.93	0.713	53	0	91	3.570248	10.58518	28.046	42.5	50.795	44.9155	3.3	0.867101	10.07193	10.10034	792158057	8.847767	0.28							
8	Iran	2407.365	10553026950.69	0.707	64	0	93	3.570248	10.58518	28.046	27.5	50.07	44.9155	3.3	0.867101	10.07193	10.10034	3.871589E+11	11.16089	0.30							
9	Singapore	57764.297	233907234412.34	0.702	65	0	79	4.761283	11.1042	0.055	23	34.49	28	5.326782	141.4335452	10.150955	1656152156	9.2191	0.33	1089192019	9.037104	0.22					
10	Vietnam	2342.244	233779865815.68	0.698	69	0	75	3.369632	11.49892	42.369	26.7	27.4	79.5869	29	5.755878	1850363680	10.16726	4908468419	9.690946	0.33	-7651360505	-8.883739	-0.05				
11	Russian Federation	10743.097	15752415962.85	0.696	71	0	73	4.031129	12.19798	5.008	41.31	61.7987	24	1.43075	2.92797E+11	11.46657	5.83322E+11	11.76591	0.57	97669107431	9.089796	0.10					
12	Thailand	6595.004	4553026950.69	0.694	75	2.8	69	3.819215	11.6588	30.261	4.8	18	3.650983	43547518153	10.5388	1.39971E+12	12.14604	0.54	7.7118E+11	11.188828	0.30						
13	Myanmar	1256.661	6706874552.38	0.691	83	1.2	61	3.099218	10.2652	48.296	10.2	35.56	35.6444	6	5.787695	3812560821	9.581217	1.04313E+11	11.07158	0.23	-1.44841E+11	-11.16089	-0.32				
14	Indonesia	3846.864	101559017516.50	0.691	84	3.2	60	3.585107	12.0067	29.346	19.8	27.46	52.9908	29	3.923073	832852238	10.29025	3.56872E+11	11.55251	0.07	-1.33108E+12	-12.1242	-0.27				
15	Kyrgyz Republic	1219.824	7564778885.04	0.691	85	1.7	59	3.08629	9.878795	27.714	39.2	36.21	2.5262	751646770.2	8.8797514	5880732006	10.76334	0.36	-4511705102	10.65429	-0.28						
16	Maldives	400.005	480926950.69	0.691	94	0.3	48.65506	10.58518	41.65	16	32	40.677	70.3488	10.7114	176237005	9.23439	0.50	559597040.5	11.16089	0.30							
17	Tajikistan	802.051	6716449581.03	0.678	95	0	49	2.93066	9.854009	69.289	19	5.36906	193771456	8.28279	13517337660	10.13094	0.63	810576289	9.905687	0.37							
18	Armenia	3936.798	1153459063.83	0.677	97	0	47	3.595143	10.60268	38.965	18.1	28.71	50.2007	7.29332	99054547.8	8.995835	4.080721	11.61074	0.27	3.07944E+11	11.148847	0.20					
19	Azerbaijan	4131.618	4074779227.97	0.676	98	0	46	3.63162	10.6103	43.371	16.8	34.49	36	-0.96182	2880273281	9.459434	16360124498	10.10141	0.75	6661737366	9.823558	0.40					
20	Cambodia	1384.423	22158202950.64	0.676	99	0	45	3.141269	10.45533	26.193	20.3	30	5.473813	2141647149	9.33071	5000695712	10.74042	0.63	1892796608	10.27699	0.22						
21	China	8826.994	12237702093735.00	0.674	100	3.5	44	3.945813	13.0877	20.497	24.2	36	3.630967	12.01983	10.19205	2997162566	9.47671	0.62	1.7109674	11.23073	0.21						
22	Maldives Darussalam	2802.059	1578240951.04	0.673	101	0	44	4.652056	10.58518	9.0	9.1	60.3463	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000				
23	Malaysia	9951.544	334712029510.74	0.67	104	0	40	3.89789	11.97931	6.545	10.4	17	17.32	37.443674	12.77572778	10.25424	4.810851	451490302.2	8.654648	1.21106711	11.08337	0.39	26711067.6	8.423669	0.00		
24	India	11511.093	4665846072.03	0.669	106	0	38	4.047317	9.681732	2.441	5.9	17	3.653642	30.0353	8.489019	1.43906512	11.15814	0.44	3233551729	10.52158	0.10						
25	Sri Lanka	4073.737	87357205923.12	0.669	109	13	35	3.609993	10.9413	29.72	5.8	27.58	16	2.147556	5569785900	9.745839	6853675047	10.83592	0.33	29659951703	10.47217	0.14					
26	Nepal	849.011	2488026950.69	0.664	111	1.7	32	2.928913	10.9586	82.834	29.6	40	6.71925	3649344498	9.567573	1.5946611	11.18346	0.50	805619764	10.90616	0.26						
27	Japan	38426.091	4872136455075.59	0.657	114	1.0	30	4.584649	12.68772	3.022	9.3	13.19	37	3.623674	12.7573274	10.164265	2.71367962	11.21547	0.52	6350115739	10.8028	0.20					
28	Korea, Rep.	2972.059	1578240951.04	0.657	118	4.7	26	4.72778	11.88532	4.6	17	12.32	37	3.623674	12.7573274	10.164265	2.71367962	11.21547	0.52	6350115739	10.8028	0.20					
29	Samoa	3130.234	2526847911.34	0.658	120	0	30	3.865577	9.802778	65.295	8.5	17	3.653642	30.0353	8.489019	1.43906512	11.15814	0.44	3233551729	10.52158	0.10						
30	Fiji	5580.389	506212076743.43	0.658	125	0	19	3.747364	9.704254	38.776	16	30	3.027147	38898452.9	8.590041	1.923615	11.28411	0.42	5774458716	10.761551	0.13						
31	Timor-Leste	2279.253	29346209958.68	0.658	128	0	16	3.355793	9.470502	28.16	32.3	28	3.63039	4691173361	9.98282	632860577	10.79932	0.48	-486620091.1	-8.687172	-0.07						
32	Turkey	10546.153	85154929635.43	0.652	131	2.7	13	4.023093	11.9302	28.794	14.6	15.01	37.7434	19	5.801115	-12172431433	7.36209958	7.867002	0.02	-3716370000	-9.57012	-1.26					
33	Iran, Islamic Rep.	5593.854	454012768723.59	0.583	140	0	4	3.747711	11.5707	21.239	5.9	19.04	7	2.632737	3503608898	10.54452	1.7577911	11.14497	0.21	-22432882993	-10.35089	-0.03					
34	Pakistan	1547.853	304951818494.07	0.546	143	4.7	1	3.18973	11.48423	72.811	20.6	14	3.655196	26297180756	10.41991	1.4636511	11.16544	0.65	67958683895	10.83225	0.30						
35	Maldives	20.000	480926950.69	0.546	143	4.7	1	3.18973	11.48423	72.811	20.6	14	3.655196	26297180756	10.41991	1.4636511	11.16544	0.65	67958683895	10.83225	0.30						
36																											
37																											
38																											
39	Mean	11071.267	86345673710.678	0.678	89.647	3.335	54.353	3.719	11.028	31.054	18.091	30.462	49.323	28.261	3.403	63247553332.388	9.834	407583585560.911	10.078	0.427	8587613397.241	2.991	0.02				
40	Median	4065.511	1843695303.203	0.677	97.500	0.000	46.500	3.609	11.263	28.477	11.305	30.355	28.000	3.653	4691173360.500	9.843	6328665976.500	10.800	0.462	1534282826.000	9.167	0.117					
41	Standard Deviation	15495.37	2.3105E+12	0.046613	33.62618	6.121838	33.62618	2.352775	1.002407	23.49374	8.218433	13.34878	13.00611	12.68577	3.10927	1.9056E+11	11.026829	1.486421	12.370745	0.207407319	7.0178E+11	10.03501	0.359526				
42	Q1	2295.001	1.2866																								

This exploratory data analysis through Excel and rapid visual graph iterations allowed us to select the story to display. Through the testing of all the variables and different sources, we were able to cull the uninteresting and remove the spurious or just wrong statistically (i.e a lot of our early graphs had GDP as opposed to GDP per capita, an important factor considering population density differences in the region).

It was decided that a scatter plot would be the best way to tell the story - it allowed us to display two ascending numerical scales coupled with a static rank for circle size in the one chart. We had been using just the rank from the Gender Gap report to display differences across Asia between GDP per capita. Instead of displaying just the rank - it was far more interesting to break down the pillars used to create the rank (Health, Economic, Political, Education) in a small multiples visualisation coupled with the overall rank, as it showed the affect of each intersection of data on the overall rank whilst also showing the affect of a countries wealth factors.

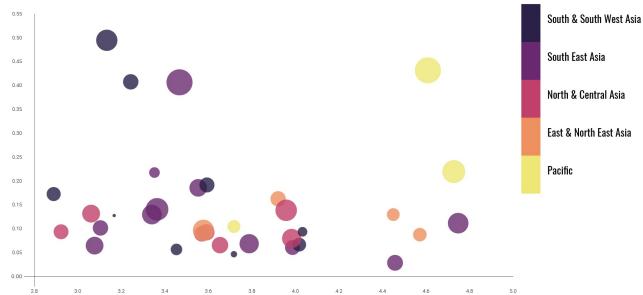
Our data was consolidated into a final sheet to then generate in Raw Graphs.

Country	Global Rank	Global Score	Economic Score	Education Score	Health Score	Political Score	GDP Per Capita	Inverse Rank	Log GDP Per Capita
Armenia	99	0.675	0.672	1.000	0.939	0.089	3720.159061	47	3.571
Australia	40	0.727	0.720	1.000	0.972	0.219	53419.34386	106	4.728
Azerbaijan	94	0.680	0.720	0.991	0.944	0.065	4504.222474	52	3.654
Bangladesh	56	0.713	0.439	0.951	0.969	0.494	1361.817101	90	3.134
Bhutan	122	0.639	0.620	0.919	0.962	0.056	2842.870617	24	3.454
Brunei Darussalam	98	0.675	0.713	0.991	0.968	0.028	28732.63124	48	4.458
Cambodia	101	0.672	0.692	0.919	0.978	0.101	1272.506732	45	3.105
China	101	0.674	0.654	0.963	0.917	0.162	8337.824862	45	3.921
Fiji	116	0.654	0.541	0.991	0.979	0.104	5225.453142	31	3.718
Georgia	94	0.679	0.667	0.991	0.967	0.092	3895.90423	52	3.591
India	101	0.672	0.390	0.952	0.941	0.407	1755.203188	45	3.244
Indonesia	86	0.688	0.612	0.980	0.975	0.185	3583.899338	60	3.554
Iran, Islamic Rep.	140	0.586	0.363	0.970	0.967	0.046	5225.08764	6	3.718
Japan	112	0.660	0.581	0.992	0.979	0.087	37322.72788	34	4.572
Kazakhstan	54	0.714	0.743	0.997	0.979	0.138	9085.33254	92	3.958
Korea, Rep.	116	0.652	0.540	0.966	0.973	0.129	28152.05417	30	4.450
Kyrgyz Republic	84	0.690	0.659	0.991	0.978	0.131	1153.857799	62	3.062
Lao PDR	44	0.725	0.839	0.948	0.972	0.140	2318.500908	102	3.365
Malaysia	104	0.671	0.656	0.992	0.973	0.060	9707.291949	42	3.987
Maldives	111	0.660	0.618	0.996	0.961	0.066	10430.61898	35	4.018
Mongolia	56	0.711	0.774	0.993	0.980	0.096	3786.533438	90	3.578
Myanmar	86	0.691	0.746	0.976	0.977	0.064	1197.252285	61	3.078
Nepal	109	0.665	0.595	0.927	0.969	0.172	775.7182777	37	2.890
New Zealand	8	0.791	0.765	0.999	0.970	0.431	40640.63863	138	4.609
Pakistan	145	0.551	0.316	0.808	0.954	0.127	1472.925627	1	3.168
Philippines	8	0.792	0.782	1.000	0.979	0.406	2939.401659	138	3.468
Russian Federation	74	0.696	0.729	0.998	0.980	0.079	9616.24969	72	3.983
Singapore	62	0.707	0.769	0.980	0.968	0.111	55966.09588	84	4.748
Sri Lanka	103	0.673	0.533	0.987	0.980	0.191	3925.200616	43	3.594
Tajikistan	104	0.665	0.655	0.939	0.973	0.093	838.6078444	42	2.924
Thailand	73	0.698	0.767	0.980	0.979	0.068	6140.23076	73	3.788
Timor-Leste	126	0.634	0.407	0.937	0.976	0.217	2255.983131	20	3.353
Turkey	130	0.625	0.467	0.964	0.978	0.093	10797.89396	16	4.033
Viet Nam	70	0.699	0.738	0.974	0.955	0.129	2192.687052	76	3.341
Correlation Coefficient		0.744588418	0.596101826	0.190699052	0.502536543				

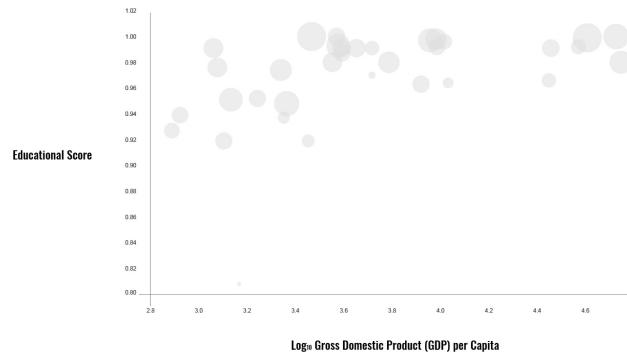


L: The first of the final round of raw graphs generation

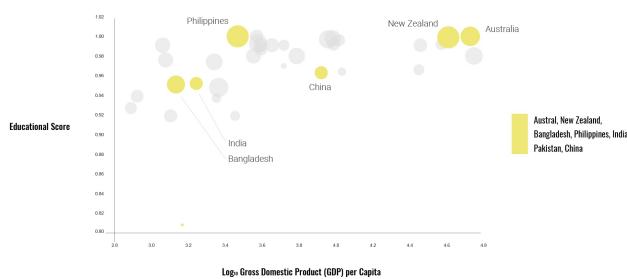
R: Beginning to bring the RawGraph to final form in Illustrator



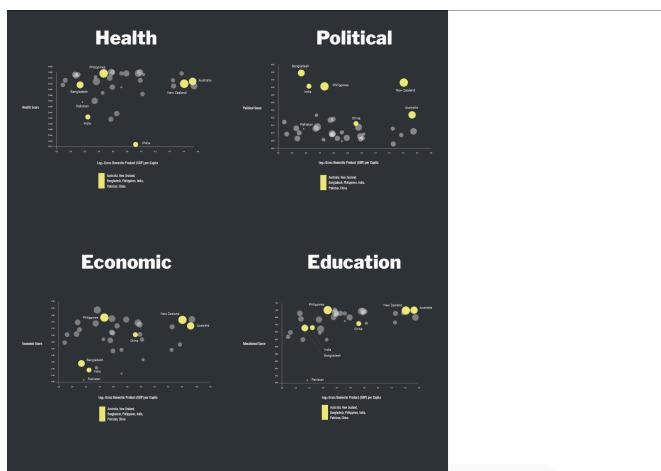
To add colour and distinction to the graph we decided to try and split up the countries by regions to help identify any clusters within the data. We found that this made the graphs too messy and quite difficult to extract any meaningful information.



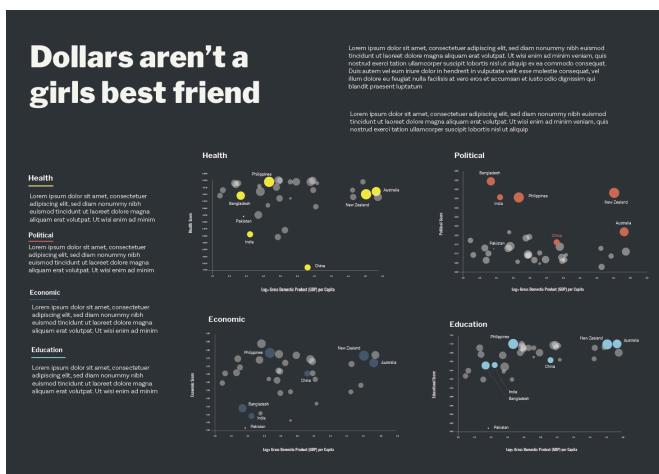
Simplifying the graphs, the opacity was reduced to help distinguish countries that formed tight clusters with major overlaps. This solved the issue of easily identifying clusters without overpowering the graph with excess colours.



Adding colour to highlight standout countries within the sample group helps the data explain the story we are trying to convey more effectively. The countries highlighted were chosen because of either their individuality or because they possess a standout factor compared to the rest of the sample group.

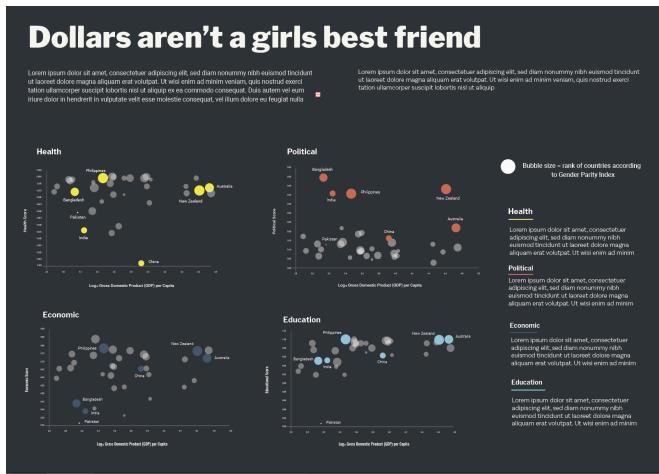


Making the background dark increased the distinction between the highlighted and non-highlighted countries and allowed us to maintain the visual aesthetic that was presented in our earlier project.



Adding the text, headings and other page elements we need to navigate the ratios of the graph size compared with how much content we needed to fully explain the data correctly.

We adopted the same fonts and colour palettes from our narrative video so that our project was visually cohesive across all elements. Libre Franklin was chosen for headers as it was both clean and serious, with sufficient punch to the message. Roboto was chosen for the body as it has high legibility at small sizes - perfect for graphs.



Finally we repositioned the graphs to the left-hand side of the page to help the visual flow of the document as it would be read from left to right and we wanted the data visualisations to be the focal point of the final design.

