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Multinational life satisfaction, perceived inequality and energy affordability

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Supplementary Information

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Supplementary Table 1. Survey information and income group

Country name	Survey method	Survey period		GNI per capita*	Income level
Australia	Internet	2016/2/10	2016/2/22	60,360	High
Brazil	Internet	2015/7/23	2015/7/26	10,100	Low
Canada	Internet	2016/9/1	2016/9/13	47,460	High
Chile	Internet	2015/7/24	2015/7/28	14,270	High
China	Internet	2016/1/12	2016/2/29	7,950	Low
Colombia	Internet	2015/7/24	2015/7/27	7,130	Low
Czech	Internet	2017/3/8	2017/3/16	18,250	High
Egypt	Interview	2015/9/14	2015/10/27	3,310	Low
France	Internet	2016/8/26	2016/9/7	40,730	High
Germany	Internet	2016/8/26	2016/9/7	45,790	High
Greece	Internet	2016/8/31	2016/9/12	20,360	High
Hungary	Internet	2017/3/8	2017/3/15	12,960	High
India	Internet	2015/7/25	2015/8/11	1,600	Low
Indonesia	Internet	2015/7/18	2015/7/23	3,430	Low
Italy	Internet	2016/8/29	2016/9/10	32,970	High
Japan	Internet	2015/7/14	2015/8/5	38,880	High
Kazakhstan	Interview	2015/8/25	2015/9/24	11,420	Low
Malaysia	Internet	2015/7/23	2015/7/29	10,450	Low
Mexico	Internet	2015/7/24	2015/7/27	9,860	Low
Mongolia	Interview	2015/8/19	2015/9/3	3,850	Low
Myanmar	Interview	2015/7/6	2015/8/10	1,190	Low
Netherlands	Internet	2016/8/29	2016/9/10	49,030	High
Philippines	Internet	2015/7/15	2015/7/22	3,520	Low
Poland	Internet	2017/3/8	2017/3/17	13,340	High
Romania	Internet	2017/3/8	2017/3/18	9,530	Low
Russia	Internet	2015/8/31	2015/9/14	11,760	Low
Singapore	Internet	2015/7/15	2015/7/21	54,020	High
South Africa	Internet	2015/7/15	2015/7/23	6,070	Low
Spain	Internet	2016/8/26	2016/9/7	28,420	High
Sri Lanka	Interview	2017/3/9	2017/3/30	3,760	Low
Sweden	Internet	2016/8/31	2016/9/12	57,880	High
Thailand	Internet	2015/7/18	2015/7/23	5,710	Low
Turkey	Internet	2017/3/7	2017/3/20	12,000	Low
United Kingdom	Internet	2016/8/16	2016/8/28	43,720	High
United States	Internet	2016/8/16	2016/8/28	56,300	High
Venezuela	Internet	2015/7/24	2015/8/5	12,780**	Low
Vietnam	Internet	2015/7/18	2015/7/28	1,950	Low

* GNI per capita is calculated using the World Bank Atlas method (current US\$) in 2015.

** Using 2014 data as 2015 data is not available from the World Development Indicators.

Supplementary Table 2. Statistics for each country

Country	Sample size	Satisfaction	Income level	Economic gap	Health condition	Energy affordability
Australia	2,029	3.803	2.617	2.706	3.763	2.449
Brazil	2,298	3.610	2.599	3.762	4.072	3.554
Canada	1,333	3.845	2.707	3.014	3.752	2.589
Chile	1,192	4.076	2.867	3.776	4.032	3.947
China	20,744	3.790	2.882	3.582	3.900	2.763
Colombia	1,115	4.300	2.875	3.812	4.307	3.942
Czech	1,400	3.707	2.476	2.972	3.546	3.134
Egypt	1,016	3.656	3.177	3.555	3.610	2.622
France	2,138	3.713	2.767	3.160	3.726	2.829
Germany	3,165	3.860	2.607	2.990	3.508	2.898
Greece	1,382	3.423	2.514	3.522	4.142	3.643
Hungary	1,354	3.688	2.306	3.707	3.552	3.958
India	6,700	4.112	3.233	3.716	4.170	3.110
Indonesia	2,412	3.997	2.987	3.572	4.086	3.410
Italy	2,106	3.355	2.673	3.295	3.789	3.323
Japan	11,167	3.236	2.599	2.675	3.438	2.463
Kazakhstan	1,000	3.971	3.059	3.124	3.896	2.997
Malaysia	1,106	3.593	2.744	3.333	3.899	3.250
Mexico	1,678	4.262	2.853	3.752	4.280	3.941
Mongolia	500	4.036	2.848	3.370	3.598	3.882
Myanmar	1,083	3.388	2.486	3.162	3.638	2.293
Netherlands	1,371	3.937	2.681	2.953	3.470	2.451
Philippines	1,686	3.958	2.910	3.561	4.084	3.458
Poland	2,227	3.731	2.563	3.394	3.594	3.139
Romania	1,386	3.846	2.771	3.733	3.638	3.408
Russia	2,221	3.571	2.534	3.703	3.531	2.910
Singapore	587	3.630	2.763	2.957	3.763	2.606
South Africa	1,123	3.801	2.809	3.496	4.154	3.248
Spain	2,116	3.927	2.785	3.426	3.834	3.075
Sri Lanka	500	4.246	2.924	2.013	3.822	2.850
Sweden	1,330	3.842	2.780	3.202	3.690	2.219
Thailand	1,127	3.870	2.914	3.466	3.730	3.666
Turkey	2,120	3.629	2.816	4.122	3.889	3.566
United	2,993	3.736	2.521	2.873	3.656	2.468
United States	10,683	3.911	2.761	3.079	3.843	2.976
Venezuela	827	4.220	2.603	3.663	4.245	3.412
Vietnam	1,741	3.482	3.126	3.221	3.685	3.260
Total	100,956	3.759	2.781	3.308	3.811	2.968

Supplementary Table 3. Description of questionnaire and variables

Variables	Question and response choices
Life satisfaction	How satisfied are you compared to people in your local community? 1. Completely dissatisfied, 2. Slightly dissatisfied, 3. Neither, 4. Slightly satisfied, 5. Completely satisfied
Income level	Which income group do you feel that you belong within your country? 1. Lower, 2. Lower middle, 3. Middle, 4. Upper middle, 5. Upper
Economic gap	Please select an item that appropriately describes your point of view about Inequality in local community. 0. Do not know, 1. Does not exist, 2. Not so large, 3. Average, 4. Slightly large, 5. Very large
Health condition	All in all, how would you describe your state of health? 1. Very poor, 2. Poor, 3. Neither, 4. Good, 5. Very good
Energy affordability	What is average share of energy bill (including charge for electricity/gas/water/ kerosene/gasoline) out of your monthly household income? 0. Do not know, 1. Do not use at all, 2. 1-9%, 3. 10-19%, 4. 20-29%, 5. 30-39%, 6. 40-49%, 7 50% and above

Note: Do not use at all represents respondents who did not purchase any energy type

Supplementary Table 4. Regression Model Parameters

4.1 Logistic Regression Model

Survey Question	Model	Dependent Variables	Independent Variables	Control Variables	Dummy Variables
Life Satisfaction	1-1	Completely Satisfied=1, Other=0	① Income Level ② Energy Affordability ③ Cross Term (① x ②)	④ Heating Degree Days ⑤ Cooling Degree Days ⑥ GDP per Capita ⑦ HALE ⑧ Health Expenditure (%GDP)	⑨ Latin America
	1-2	Completely Dissatisfied=1, Other=0			⑩ Africa
Health Condition	2-1	Very Good=1, Other=0			⑪ Eastern Asia
	2-2	Poor/Very Poor=1, Other=0			⑫ South Eastern Asia
Economic Gap	3-1	Does not Exist/Not so Large=1, Other=0			⑬ Central Asia
	3-2	Very Large=1, Other=0			⑭ Western Europe
					⑮ Eastern Europe
					⑯ Northern America

4.2 Ordered Logistic Regression Model

Survey Question	Model	Dependent Variables	Independent Variables	Control Variables	Dummy Variables
Life Satisfaction	4	Completely Dissatisfied ~ Completely Satisfied (1~5)	① Income Level ② Energy Affordability ③ Cross Term (① x ②)	④ Heating Degree Days ⑤ Cooling Degree Days ⑥ GDP per Capita ⑦ HALE ⑧ Health Expenditure (%GDP)	⑨ Latin America
Health Condition	5	Very Poor ~ Very Good (1~5)			⑩ Africa
Economic Gap	6	Does not Exist ~ Very Large (1~5)			⑪ Eastern Asia
					⑫ South Eastern Asia
					⑬ Central Asia
					⑭ Western Europe
					⑮ Eastern Europe
					⑯ Northern America

Supplementary Table 5. Regression Analysis Summary

5.1 Model 1-1

Life Satisfaction Dependent variable Completely satisfied =1, other =0					No of Obs	90,569
					LR chi2(16)	9,883
					Prob>chi2	0
					log likelihood	-42,735
					Pseudo R2	0.1036
	Coef.	Std. err.	z	P> z	[95% conf. interval]	
Income level	0.63	0.03	23.64	0.00	0.58	0.69
Energy affordability	-0.02	0.02	-0.95	0.34	-0.07	0.02
Cross term	0.01	0.01	1.12	0.26	-0.01	0.02
HDDs	-0.00	0.00	-1.10	0.27	-0.00	0.00
CDDs	-0.00	0.00	-2.51	0.01	-0.00	-0.00
GDP per capita	0.00	0.00	12.34	0.00	0.00	0.00
HALE	-0.11	0.01	-21.16	0.00	-0.12	-0.10
Health expenditure	-0.19	0.01	-21.79	0.00	-0.21	-0.17
Latin America	0.34	0.09	3.69	0.00	0.16	0.51
Africa	-1.25	0.11	-11.33	0.00	-1.46	-1.03
Eastern Asia	-0.97	0.09	-10.35	0.00	-1.16	-0.79
Southeast Asia	-1.38	0.09	-14.85	0.00	-1.56	-1.20
Central Asia	-1.09	0.09	-11.46	0.00	-1.27	-0.90
Western Europe	0.27	0.08	3.29	0.00	0.11	0.43
Eastern Europe	-1.02	0.10	-10.09	0.00	-1.21	-0.82
Northern America	1.16	0.10	11.58	0.00	0.96	1.36
_cons	6.03	0.40	15.08	0.00	5.25	6.81

5.2 Model 1-2

Life Satisfaction Dependent variable Completely dissatisfied =1, other =0 =1, other =0					No of Obs	90,569
					LR chi2(16)	2,597
					Prob>chi2	0
					log likelihood	-7,958
					Pseudo R2	0.1403
	Coef.	Std. err.	z	P> z	[95% conf. interval]	
Income level	-1.35	0.08	-17.56	0.00	-1.50	-1.20
Energy affordability	0.07	0.04	1.79	0.07	-0.01	0.15
Cross term	0.05	0.02	2.62	0.01	0.01	0.09
HDDs	0.00	0.00	0.99	0.32	-0.00	0.00
CDDs	0.00	0.00	3.35	0.00	0.00	0.00
GDP per capita	-0.00	0.00	-0.33	0.74	-0.00	0.00
HALE	0.11	0.02	7.27	0.00	0.08	0.14
Health expenditure	0.13	0.03	5.04	0.00	0.08	0.18
Latin America	0.13	0.25	0.54	0.59	-0.36	0.62
Africa	2.53	0.26	9.58	0.00	2.01	3.05
Eastern Asia	0.15	0.25	0.60	0.55	-0.33	0.63
Southeast Asia	0.43	0.24	1.80	0.07	-0.04	0.90
Central Asia	1.51	0.25	6.10	0.00	1.02	2.00
Western Europe	0.23	0.24	0.98	0.33	-0.23	0.69
Eastern Europe	0.55	0.28	2.00	0.05	0.01	1.09
Northern America	-0.42	0.30	-1.39	0.16	-1.01	0.17
_cons	-10.79	1.12	-9.66	0.00	-12.98	-8.60

5.3 Model 2-1

Health Condition Dependent variable Very good =1, other =0					No of Obs	90,569
					LR chi2(16)	6,246
					Prob>chi2	0
					log likelihood	-42,551
					Pseudo R2	0.0684
	Coef.	Std. err.	z	P> z	[95% conf. interval]	
Income level	0.43	0.03	15.86	0.00	0.37	0.48
Energy affordability	-0.12	0.02	-5.22	0.00	-0.17	-0.08
Cross term	0.05	0.01	6.83	0.00	0.03	0.06
HDDs	-0.00	0.00	-7.51	0.00	-0.00	-0.00
CDDs	-0.00	0.00	-1.44	0.15	-0.00	0.00
GDP per capita	-0.00	0.00	-1.93	0.05	-0.00	0.00
HALE	-0.02	0.01	-3.93	0.00	-0.03	-0.01
Health expenditure	-0.02	0.01	-1.99	0.05	-0.03	-0.00
Latin America	0.50	0.10	5.20	0.00	0.31	0.68
Africa	-0.25	0.11	-2.24	0.03	-0.46	-0.03
Eastern Asia	-0.16	0.10	-1.68	0.09	-0.35	0.03
Southeast Asia	-0.70	0.10	-7.22	0.00	-0.89	-0.51
Central Asia	-0.24	0.10	-2.47	0.01	-0.43	-0.05
Western Europe	-0.05	0.09	-0.53	0.59	-0.22	0.13
Eastern Europe	-0.74	0.11	-6.93	0.00	-0.95	-0.53
Northern America	0.40	0.11	3.69	0.00	0.19	0.61
_cons	-0.51	0.40	-1.28	0.20	-1.30	0.27

5.4 Model 2-2

Health Condition Dependent variable Poor or Very poor =1, other =0					No of Obs	90,569
					LR chi2(16)	6,925
					Prob>chi2	0
					log likelihood	-23,437
					Pseudo R2	0.1287
	Coef.	Std. err.	z	P> z	[95% conf. interval]	
Income level	-0.74	0.04	-19.15	0.00	-0.82	-0.66
Energy affordability	0.10	0.02	4.25	0.00	0.06	0.15
Cross term	-0.02	0.01	-1.67	0.10	-0.04	0.00
HDDs	0.00	0.00	4.85	0.00	0.00	0.00
CDDs	0.00	0.00	3.66	0.00	0.00	0.00
GDP per capita	0.00	0.00	1.57	0.12	0.00	0.00
HALE	0.11	0.01	13.08	0.00	0.09	0.13
Health expenditure	0.19	0.01	14.48	0.00	0.16	0.21
Latin America	0.36	0.13	2.70	0.01	0.10	0.62
Africa	1.90	0.16	11.95	0.00	1.59	2.21
Eastern Asia	0.23	0.13	1.83	0.07	-0.02	0.48
Southeast Asia	1.16	0.13	8.99	0.00	0.91	1.42
Central Asia	1.32	0.13	9.99	0.00	1.06	1.58
Western Europe	-0.12	0.12	-1.03	0.31	-0.36	0.11
Eastern Europe	1.25	0.14	8.99	0.00	0.98	1.52
Northern America	-1.08	0.15	-6.97	0.00	-1.38	-0.77
_cons	-10.86	0.62	-17.60	0.00	-12.06	-9.65

5.5 Model 3-1

Economic Gap					No of Obs	72,506
Dependent variable					LR chi2(16)	3,770
Very large =1, other =0					Prob>chi2	0
(No answer, do not know answers are excluded)					log likelihood	-30,449
					Pseudo R2	0.0583
	Coef.	Std. err.	z	P> z	[95% conf. interval]	
Income level	-0.22	0.03	-6.68	0.00	-0.28	-0.15
Energy affordability	0.04	0.02	1.65	0.10	-0.01	0.09
Cross term	0.04	0.01	4.50	0.00	0.02	0.05
HDDs	0.00	0.00	-0.68	0.50	0.00	0.00
CDDs	0.00	0.00	-4.72	0.00	0.00	0.00
GDP per capita	0.00	0.00	-7.62	0.00	0.00	0.00
HALE	-0.05	0.01	-6.93	0.00	-0.06	-0.03
Health expenditure	-0.07	0.01	-6.39	0.00	-0.09	-0.05
Latin America	0.06	0.14	0.43	0.67	-0.21	0.33
Africa	-0.14	0.15	-0.89	0.37	-0.44	0.16
Eastern Asia	-0.84	0.14	-6.00	0.00	-1.11	-0.56
Southeast Asia	-0.80	0.14	-5.83	0.00	-1.07	-0.53
Central Asia	-0.05	0.14	-0.40	0.69	-0.32	0.21
Western Europe	-0.19	0.13	-1.54	0.12	-0.44	0.05
Eastern Europe	-0.70	0.14	-4.85	0.00	-0.98	-0.42
Northern America	0.85	0.14	5.98	0.00	0.57	1.12
_cons	3.02	0.49	6.15	0.00	2.05	3.98

5.6 Model 3-2

Economic Gap					No of Obs	72,506
Dependent variable					LR chi2(16)	1,601
Does not exist, Not so large =1, other =0					Prob>chi2	0
(No answer, do not know answers are excluded)					log likelihood	-25,808
					Pseudo R2	0.0301
	Coef.	Std. err.	z	P> z	[95% conf. interval]	
Income level	0.17	0.04	4.60	0.00	0.10	0.24
Energy affordability	0.05	0.03	1.52	0.13	-0.01	0.10
Cross term	-0.04	0.01	-4.18	0.00	-0.06	-0.02
HDDs	0.00	0.00	6.85	0.00	0.00	0.00
CDDs	0.00	0.00	6.17	0.00	0.00	0.00
GDP per capita	0.00	0.00	1.60	0.11	0.00	0.00
HALE	0.04	0.01	5.64	0.00	0.03	0.06
Health expenditure	0.14	0.01	12.38	0.00	0.12	0.17
Latin America	-0.06	0.12	-0.51	0.61	-0.29	0.17
Africa	0.37	0.15	2.53	0.01	0.08	0.65
Eastern Asia	-0.18	0.12	-1.57	0.12	-0.41	0.05
Southeast Asia	0.38	0.12	3.25	0.00	0.15	0.61
Central Asia	-0.16	0.12	-1.32	0.19	-0.39	0.08
Western Europe	-0.65	0.11	-6.04	0.00	-0.86	-0.44
Eastern Europe	-0.78	0.13	-6.00	0.00	-1.03	-0.52
Northern America	-1.38	0.14	-10.07	0.00	-1.65	-1.11
_cons	-7.00	0.57	-12.22	0.00	-8.12	-5.88

5.7 Model 4

Life Satisfaction Dependent variable 1. Completely dissatisfied to 5. Completely satisfied					No of Obs	90,569
					LR chi2(16)	16,251
					Prob>chi2	0
					log likelihood	-109,510
					Pseudo R2	0.0691
	Coef.	Std. err.	z	P> z	[95% conf. interval]	
Income level	0.66	0.02	34.30	0.00	0.62	0.70
Energy affordability	-0.12	0.02	-7.94	0.00	-0.15	-0.09
Cross term	0.03	0.01	6.20	0.00	0.02	0.04
HDDs	0.00	0.00	15.76	0.00	0.00	0.00
CDDs	0.00	0.00	-3.71	0.00	0.00	0.00
GDP per capita	0.00	0.00	0.39	0.69	0.00	0.00
HALE	-0.07	0.00	-18.50	0.00	-0.08	-0.07
Health expenditure	-0.17	0.01	-26.48	0.00	-0.19	-0.16
Latin America	0.63	0.07	8.86	0.00	0.49	0.77
Africa	-0.81	0.08	-9.57	0.00	-0.97	-0.64
Eastern Asia	-0.30	0.07	-4.20	0.00	-0.44	-0.16
Southeast Asia	-0.96	0.07	-13.60	0.00	-1.09	-0.82
Central Asia	-0.59	0.07	-8.30	0.00	-0.73	-0.45
Western Europe	0.43	0.07	6.37	0.00	0.30	0.56
Eastern Europe	-0.09	0.08	-1.21	0.23	-0.24	0.06
Northern America	1.28	0.08	15.62	0.00	1.12	1.45

5.8 Model 5

Health Condition Dependent variable 1. Very poor to 5. Very good					No of Obs	90,569
					LR chi2(16)	13,503
					Prob>chi2	0
					log likelihood	-103,116
					Pseudo R2	0.0615
	Coef.	Std. err.	z	P> z	[95% conf. interval]	
Income level	0.55	0.02	28.35	0.00	0.51	0.59
Energy affordability	-0.14	0.02	-8.96	0.00	-0.17	-0.11
Cross term	0.04	0.01	7.71	0.00	0.03	0.05
HDDs	0.00	0.00	-3.70	0.00	0.00	0.00
CDDs	0.00	0.00	-14.22	0.00	0.00	0.00
GDP per capita	0.00	0.00	-5.60	0.00	0.00	0.00
HALE	-0.04	0.00	-10.23	0.00	-0.05	-0.03
Health expenditure	-0.08	0.01	-12.27	0.00	-0.09	-0.07
Latin America	0.29	0.07	4.10	0.00	0.15	0.43
Africa	-0.91	0.08	-10.75	0.00	-1.08	-0.74
Eastern Asia	-0.42	0.07	-5.90	0.00	-0.56	-0.28
Southeast Asia	-0.98	0.07	-13.90	0.00	-1.12	-0.84
Central Asia	-0.55	0.07	-7.76	0.00	-0.69	-0.41
Western Europe	0.11	0.07	1.67	0.09	-0.02	0.24
Eastern Europe	-0.62	0.08	-8.06	0.00	-0.76	-0.47
Northern America	0.88	0.08	10.80	0.00	0.72	1.04

5.9 Model 6

Economic Gap					No of Obs	72,506
Dependent variable					LR chi2(16)	5,836
1.Does not exist to 5. Very large					Prob>chi2	0
(No answer, do not know answers are excluded)					log likelihood	-92,830
					Pseudo R2	0.0305
	Coef.	Std. err.	z	P> z	[95% conf. interval]	
Income level	-0.15	0.02	-6.62	0.00	-0.19	-0.10
Energy affordability	0.00	0.02	0.07	0.94	-0.03	0.04
Cross term	0.03	0.01	5.59	0.00	0.02	0.05
HDDs	0.00	0.00	-7.67	0.00	0.00	0.00
CDDs	0.00	0.00	-6.50	0.00	0.00	0.00
GDP per capita	0.00	0.00	-8.59	0.00	0.00	0.00
HALE	-0.04	0.00	-9.56	0.00	-0.05	-0.03
Health expenditure	-0.12	0.01	-16.48	0.00	-0.13	-0.10
Latin America	0.27	0.08	3.51	0.00	0.12	0.41
Africa	-0.08	0.09	-0.81	0.42	-0.26	0.11
Eastern Asia	-0.09	0.08	-1.23	0.22	-0.24	0.06
Southeast Asia	-0.59	0.08	-7.78	0.00	-0.73	-0.44
Central Asia	0.12	0.08	1.60	0.11	-0.03	0.27
Western Europe	0.27	0.07	3.81	0.00	0.13	0.41
Eastern Europe	-0.05	0.08	-0.61	0.54	-0.21	0.11
Northern America	1.11	0.09	12.70	0.00	0.94	1.28