Susceptibility of the European electricity sector to climate change.
Supplementary Material

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1. Principal Component Analysis (PCA) Results

Table 1: PCA results: Importance of components.

	Comp. 1	Comp. 2	Comp. 3	Comp. 4	Comp. 5
Standard deviation	1.864	1.709	1.457	1.293	1.008
Proportion of Variance	0.248	0.209	0.152	0.119	0.0725
Cumulative Proportion	0.248	0.457	0.608	0.728	0.800

Table 2: PCA results: Factor loadings.

	Influencing Factor	Comp. 1	Comp. 2	Com. 3	Comp. 4	Comp. 5
1.1	Production and Mean Temperature Slope (Heating)	-0.016	-0.432	-0.027	0.421	-0.072
1.2	Consumption and Mean Temperature Slope (Heating)	0.024	-0.446	-0.101	0.309	0.293
1.3	Production and Mean Temperature Slope (Cooling)	0.460	-0.103	0.114	-0.132	0.062
1.4	Consumption and Mean Temperature Slope (Cooling)	0.465	-0.110	0.118	-0.129	0.038
2.1	Production and Consumption Correlation (Summer)	-0.317	-0.160	0.381	-0.250	0.310
2.2	Production and Consumption Correlation (Winter)	-0.290	-0.222	0.399	-0.255	0.091
2.3	Production and Consumption Discrepancy (Summer)	0.051	-0.244	-0.451	-0.296	0.298
2.4	Production and Consumption Discrepancy (Winter)	0.056	-0.347	-0.457	-0.203	-0.134
3.1	Thermal Production Percent (2011)	0.089	0.061	0.060	0.532	0.499
3.2	Thermal Production Change (2000-2011)	-0.185	-0.424	-0.042	0.005	-0.269
4.1	Projected Temperature Increase (Winter)	0.322	0.188	-0.142	-0.114	-0.021
4.2	Projected Temperature Increase (Summer)	0.180	-0.285	0.322	-0.006	-0.440
5.1	Air Conditioner Projection (2030)	0.287	-0.181	0.199	-0.309	0.388
5.2	Air Conditioner Percent Difference (2005-2030)	-0.348	0.065	-0.278	-0.213	0.164

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2. Actual and Ranked Index Tables

Table 3: Group 1: Production and Consumption and Mean Temperature Slope Values (Actual Values). Source: adapted from European Climate Assessment and Dataset [1] and IEA [2].

Influencing Factor 1.1		Influencing Factor 1.2		Influencing Factor 1.3		Influencing Factor 1.4	
Country	Production (Heating)	Country	Consumption (Heating)	Country	Production (Cooling)	Country	Consumption (Cooling)
CH	0.0031	LU	-0.0014	GR	0.0514	GR	0.0525
AT	-0.0050	IT	-0.0041	ES	0.0154	ES	0.0155
IT	-0.0077	HU	-0.0063	IT	0.0101	HU	0.0131
BE	-0.0096	DE	-0.0082	PT	0.0027	PT	0.0089
PL	-0.0103	NL	-0.0095	AT	0.0000	IT	0.0079
DE	-0.0105	PL	-0.0099	BE	0.0000	AT	0.0000
LU	-0.0108	BE	-0.0103	CH	0.0000	BE	0.0000
NL	-0.0108	AT	-0.0115	CZ	0.0000	CH	0.0000
CZ	-0.0114	GR	-0.0119	DE	0.0000	CZ	0.0000
HU	-0.0126	SK	-0.0126	DK	0.0000	DE	0.0000
SK	-0.0132	CH	-0.0138	FI	0.0000	DK	0.0000
GR	-0.0155	FI	-0.0140	FR	0.0000	FI	0.0000
ES	-0.0166	DK	-0.0154	GB	0.0000	FR	0.0000
SE	-0.0166	CZ	-0.0158	IE	0.0000	GB	0.0000
FI	-0.0167	ES	-0.0174	LU	0.0000	IE	0.0000
IE	-0.0187	IE	-0.0182	NL	0.0000	LU	0.0000
NO	-0.0254	SE	-0.0234	NO	0.0000	NL	0.0000
GB	-0.0274	GB	-0.0261	PL	0.0000	NO	0.0000
FR	-0.0277	NO	-0.027	SE	0.0000	PL	0.0000
DK	-0.0373	FR	-0.0344	SK	0.0000	SE	0.0000
PT	-0.0434	PT	-0.0369	HU	-0.0042	SK	0.0000

Table 4: Group 1: Production and Consumption and Mean Temperature Slope (Ranked Index Values). Source: adapted from European Climate Assessment and Dataset [1] and IEA [2].

Influencing Factor 1.1		Influencing Factor 1.2		Influencing Factor 1.3		Influencing Factor 1.4	
Country	Production (Heating)	Country	Consumption (Heating)	Country	Production (Cooling)	Country	Consumption (Cooling)
CH	0.073	LU	-0.038	GR	1.000	GR	1.000
AT	-0.116	IT	-0.11	ES	0.300	ES	0.295
IT	-0.178	HU	-0.169	IT	0.197	HU	0.249
BE	-0.221	DE	-0.221	PT	0.053	PT	0.169
PL	-0.238	NL	-0.257	AT	0.000	IT	0.150
DE	-0.242	PL	-0.268	BE	0.000	AT	0.000
LU	-0.248	BE	-0.278	CH	0.000	BE	0.000
NL	-0.25	AT	-0.31	CZ	0.000	CH	0.000
CZ	-0.263	GR	-0.323	DE	0.000	CZ	0.000
HU	-0.291	SK	-0.342	DK	0.000	DE	0.000
SK	-0.305	CH	-0.374	FI	0.000	DK	0.000
GR	-0.358	FI	-0.378	FR	0.000	FI	0.000
SE	-0.382	DK	-0.418	GB	0.000	FR	0.000
ES	-0.383	CZ	-0.427	IE	0.000	GB	0.000
FI	-0.386	ES	-0.472	LU	0.000	IE	0.000
IE	-0.432	IE	-0.493	NL	0.000	LU	0.000
NO	-0.585	SE	-0.635	NO	0.000	NL	0.000
GB	-0.632	GB	-0.706	PL	0.000	NO	0.000
FR	-0.64	NO	-0.732	SE	0.000	PL	0.000
DK	-0.861	FR	-0.932	SK	0.000	SE	0.000
PT	-1.000	PT	-1.000	HU	-0.081	SK	0.000

Table 5: Group 2: Production and Consumption Summer and Winter Correlation and Discrepancy (Actual Values). Source: adapted from IEA [2].

Influencing Factor 2.1		Influencing Factor 2.2		Influencing Factor 2.3		Influencing Factor 2.4	
Country	Correlation (Summer)	Country	Correlation (Winter)	Country	Discrepancy (Summer)	Country	Discrepancy (Winter)
SK	-0.301	SK	0.181	LU	0.431	LU	0.480
CH	0.183	CH	0.337	FI	0.826	IT	0.861
SE	0.370	AT	0.477	HU	0.827	AT	0.876
DK	0.391	SE	0.569	NL	0.837	NL	0.889
LU	0.499	DK	0.593	DK	0.841	FI	0.889
NL	0.525	HU	0.694	IT	0.875	CH	0.903
FR	0.554	BE	0.704	PT	0.898	HU	0.912
FI	0.563	NO	0.708	GR	0.910	BE	0.921
NO	0.573	LU	0.733	IE	0.960	PT	0.948
HU	0.639	FI	0.746	BE	0.969	GR	0.970
CZ	0.677	CZ	0.756	GB	0.972	SE	0.972
BE	0.682	PT	0.802	DE	0.979	IE	0.975
AT	0.703	NL	0.825	ES	1.008	GB	0.986
PT	0.811	GR	0.856	SE	1.020	NO	1.006
DE	0.906	FR	0.860	AT	1.028	ES	1.006
IE	0.913	DE	0.867	PL	1.035	DE	1.040
PL	0.940	PL	0.901	SK	1.079	PL	1.053
GR	0.941	IT	0.925	NO	1.107	SK	1.073
GB	0.965	GB	0.964	FR	1.168	FR	1.086
ES	0.973	IE	0.976	CH	1.190	CZ	1.181
IT	0.978	ES	0.992	CZ	1.255	DK	1.191

Table 6: Group 2: Production and Consumption Summer and Winter Correlation and Discrepancy (Ranked Index Values). Source: adapted from IEA [2].

Influencing Factor 2.1		Influencing Factor 2.2		Influencing Factor 2.3		Influencing Factor 2.4	
Country	Correlation (Summer)	Country	Correlation (Winter)	Country	Discrepancy (Summer)	Country	Discrepancy (Winter)
SK	0.307	SK	-0.182	LU	1.000	LU	1.000
CH	-0.187	CH	-0.339	FI	0.306	IT	0.267
SE	-0.378	AT	-0.480	HU	0.304	AT	0.240
DK	-0.400	SE	-0.573	NL	0.286	NL	0.214
LU	-0.510	DK	-0.598	DK	0.279	FI	0.214
NL	-0.537	HU	-0.699	IT	0.220	CH	0.187
FR	-0.567	BE	-0.710	PT	0.180	HU	0.170
FI	-0.576	NO	-0.713	GR	0.158	BE	0.153
NO	-0.586	LU	-0.739	IE	0.071	PT	0.099
HU	-0.653	FI	-0.751	BE	0.054	GR	0.057
CZ	-0.692	CZ	-0.762	GB	0.050	SE	0.055
BE	-0.697	PT	-0.809	DE	0.037	IE	0.048
AT	-0.718	NL	-0.831	ES	-0.031	GB	0.027
PT	-0.829	GR	-0.863	SE	-0.078	NO	-0.030
DE	-0.926	FR	-0.867	AT	-0.109	ES	-0.032
IE	-0.934	DE	-0.874	PL	-0.139	DE	-0.209
PL	-0.961	PL	-0.908	SK	-0.312	PL	-0.279
GR	-0.962	IT	-0.932	NO	-0.421	SK	-0.382
GB	-0.986	GB	-0.971	FR	-0.659	FR	-0.449
ES	-0.994	IE	-0.984	CH	-0.745	CZ	-0.949
IT	-1.000	ES	-1.000	CZ	-1.000	DK	-1.000

Table 7: Group 3: Thermal Electricity Production (Actual Values). Source: adapted from IEA [2].

Influencing Factor 3.1		Influencing Factor 3.2	
Country	Thermal Production Percent (2011)	Country	Thermal Production Percent Difference (2000-2011)
HU	0.975	LU	0.435
PL	0.963	AT	0.151
NL	0.951	SE	0.047
CZ	0.935	CH	0.039
GB	0.932	NO	0.035
BE	0.912	FI	0.030
FR	0.883	FR	0.021
GR	0.860	SK	0.020
SK	0.851	PL	-0.007
DE	0.828	HU	-0.020
FI	0.814	CZ	-0.031
IE	0.812	NL	-0.035
IT	0.751	IT	-0.036
DK	0.707	GB	-0.044
ES	0.704	GR	-0.049
LU	0.673	BE	-0.067
PT	0.577	DE	-0.107
SE	0.494	ES	-0.127
CH	0.461	IE	-0.137
AT	0.440	PT	-0.143
NO	0.039	DK	-0.168

Table 8: Group 3: Thermal Electricity Production Share (Ranked Index Values). Source: adapted from IEA [2].

Influencing Factor 3.1		Influencing Factor 3.2	
Country	Thermal Production Percent (2011)	Country	Thermal Production Percent Difference (2000-2011)
HU	1.000	LU	1.000
PL	0.987	AT	0.347
NL	0.975	SE	0.108
CZ	0.958	CH	0.090
GB	0.956	NO	0.080
BE	0.935	FI	0.069
FR	0.905	FR	0.049
GR	0.881	SK	0.045
SK	0.872	PL	-0.039
DE	0.849	HU	-0.116
FI	0.835	CZ	-0.186
IE	0.833	NL	-0.209
IT	0.770	IT	-0.214
DK	0.724	GB	-0.263
ES	0.722	GR	-0.294
LU	0.690	BE	-0.399
PT	0.592	DE	-0.634
SE	0.506	ES	-0.755
CH	0.473	IE	-0.815
AT	0.451	PT	-0.848
NO	0.040	DK	-1.000

Table 9: Group 4: Scenario A2 Winter and Summer Temperature Increase (°C) (Actual Values). Source: adapted from Mitchell et al. [3].

Influencing Factor 4.1		Influencing Factor 4.2	
Country	Winter Increase	Country	Summer Increase
FI	7.081	ES	4.976
SE	5.761	HU	4.740
NO	5.093	CH	4.737
PL	5.089	AT	4.522
SK	4.698	FR	4.491
CZ	4.469	GR	4.406
HU	4.453	SK	4.402
DK	4.278	IT	4.309
AT	4.153	LU	4.189
DE	4.103	CZ	4.108
CH	3.743	PT	4.056
LU	3.733	BE	3.946
NL	3.674	PL	3.939
BE	3.626	DE	3.886
IT	3.369	FI	3.796
FR	3.307	NL	3.531
GR	3.120	SE	3.530
ES	3.057	DK	3.399
GB	2.981	NO	3.264
PT	2.757	GB	3.088
IE	2.579	IE	2.702

Table 10: Group 4: Scenario A2 Temperature Increase 1961-90 to 2070-99 (Ranked Index Values). Source: adapted from Mitchell et al. [3].

Influencing Factor 4.1		Influencing Factor 4.2	
Country	Winter Increase	Country	Summer Increase
IE	-0.364	ES	1.000
PT	-0.389	HU	0.953
GB	-0.421	CH	0.952
ES	-0.432	AT	0.909
GR	-0.441	FR	0.903
FR	-0.467	GR	0.885
IT	-0.476	SK	0.885
BE	-0.512	IT	0.866
NL	-0.519	LU	0.842
LU	-0.527	CZ	0.826
CH	-0.529	PT	0.815
DE	-0.580	BE	0.793
AT	-0.587	PL	0.792
DK	-0.604	DE	0.781
HU	-0.629	FI	0.763
CZ	-0.631	NL	0.710
SK	-0.663	SE	0.710
PL	-0.719	DK	0.683
NO	-0.719	NO	0.656
SE	-0.814	GB	0.621
FI	-1.000	IE	0.543

Table 11: Group 5: Air Conditioner Prevalence (Per Capita) (Actual Values). Note: No data was available for CH or NO. Source: adapted from Adnot et al. [4].

Influencing Factor 5.1		Influencing Factor 5.2	
Country	Projection (2030)	Country	Percentage Difference (2005-2030)
IT	0.521	FI	3.651
GR	0.491	SE	3.316
SK	0.469	GB	3.189
ES	0.420	AT	3.145
FR	0.250	NL	3.082
NL	0.246	FR	3.061
DK	0.242	DK	3.040
BE	0.227	IE	2.948
LU	0.211	BE	2.766
GB	0.186	LU	2.242
FI	0.166	HU	2.062
HU	0.162	IT	1.956
SE	0.154	SK	1.645
PT	0.146	PL	1.635
IE	0.143	PT	1.501
AT	0.088	ES	1.491
CZ	0.044	DE	1.368
DE	0.042	CZ	1.128
PL	0.015	GR	0.790
CH	-	CH	-
NO	-	NO	-

Table 12: Group 5: Air Conditioner Prevalence (Ranked Index Values). Note: No data was available for CH or NO. Source: adapted from Adnot et al. [4].

Influencing Factor 5.1		Influencing Factor 5.2	
Country	Projection (2030)	Country	Percentage Difference (2005-2030)
IT	1.000	FI	1.000
GR	0.942	SE	0.908
SK	0.901	GB	0.874
ES	0.806	AT	0.862
FR	0.480	NL	0.844
NL	0.472	FR	0.838
DK	0.464	DK	0.833
BE	0.435	IE	0.808
LU	0.404	BE	0.758
GB	0.358	LU	0.614
FI	0.319	HU	0.565
HU	0.310	IT	0.536
SE	0.296	SK	0.451
PT	0.279	PL	0.448
IE	0.274	PT	0.411
AT	0.169	ES	0.408
CZ	0.084	DE	0.375
DE	0.080	CZ	0.309
PL	0.029	GR	0.216
CH	-	CH	-
NO	-	NO	-

3. Additional Results Figures

3.1. Electricity Production and Consumption by Mean Temperature

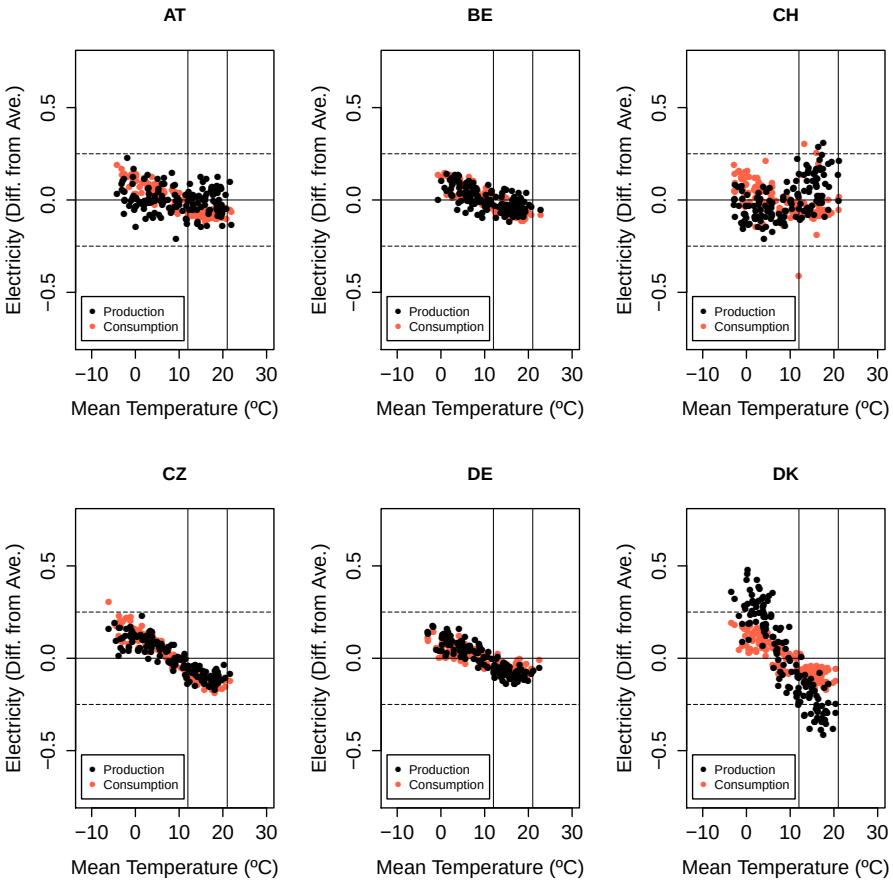

Figure 1: Mean temperature vs. the percent difference of electricity consumption from the annual average, including the heating threshold of 12 °C and above the cooling threshold of 21 °C (1/4). Source: adapted from European Climate Assessment and Dataset [1] and IEA [2].

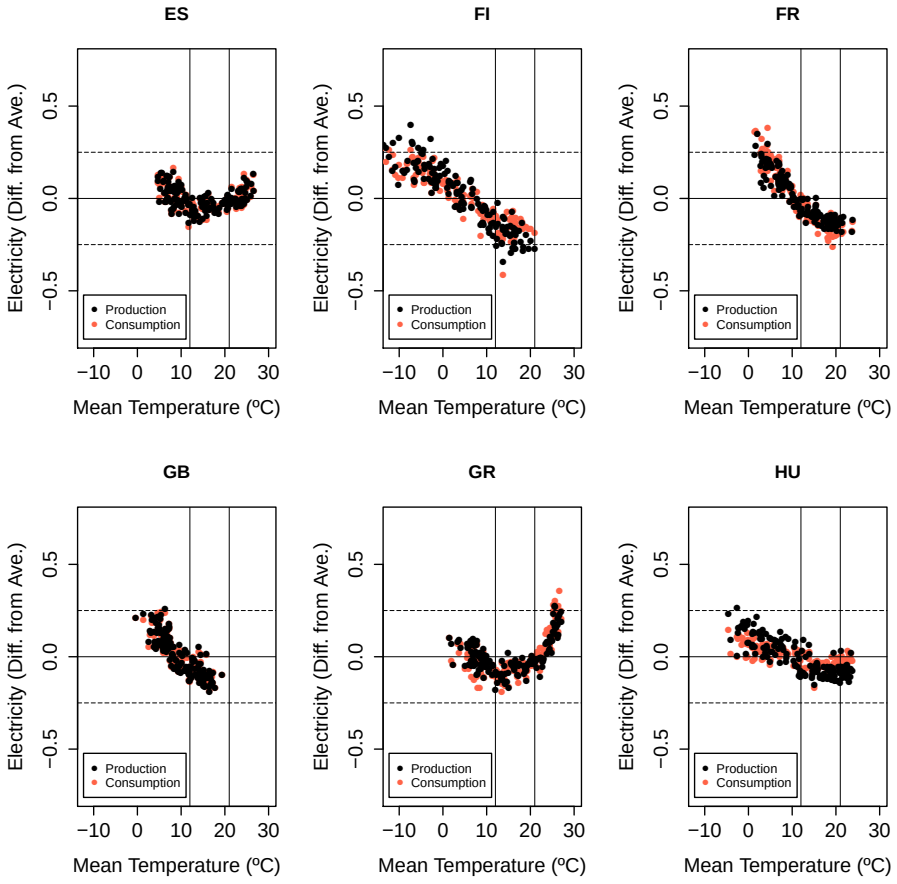

Figure 2: Mean temperature vs. the percent difference of electricity consumption from the annual average, including the heating threshold of 12 °C and above the cooling threshold of 21 °C (2/4). Source: adapted from European Climate Assessment and Dataset [1] and IEA [2].

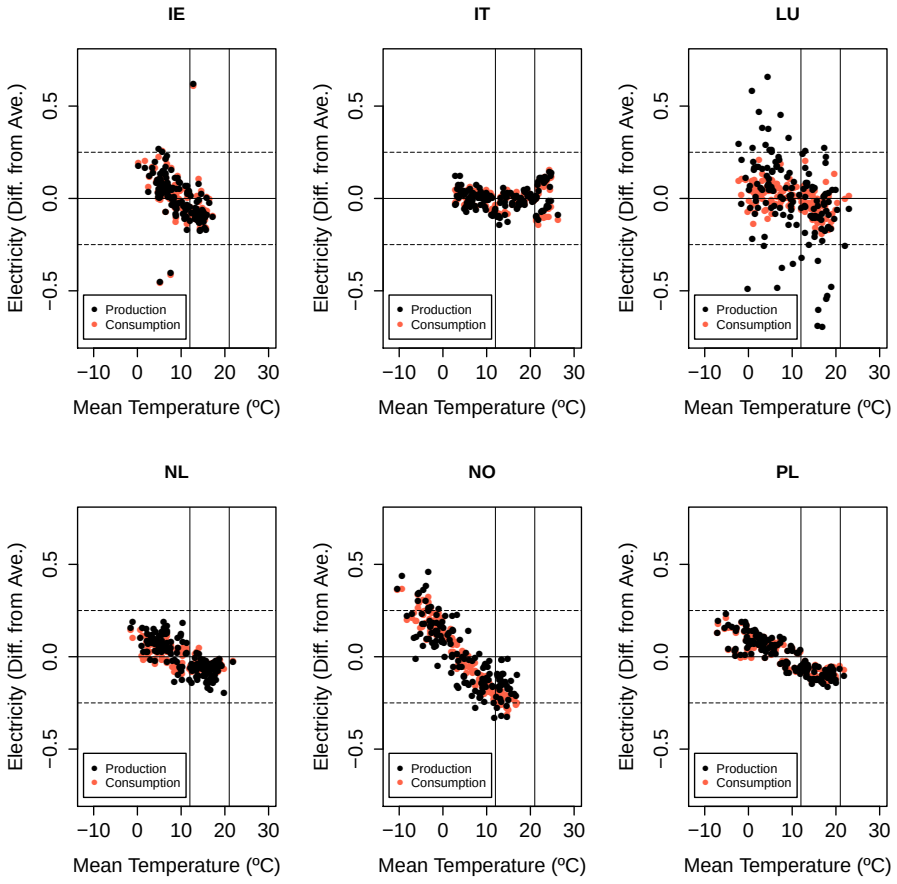

Figure 3: Mean temperature vs. the percent difference of electricity consumption from the annual average, including the heating threshold of 12 °C and above the cooling threshold of 21 °C (3/4). Source: adapted from European Climate Assessment and Dataset [1] and IEA [2].

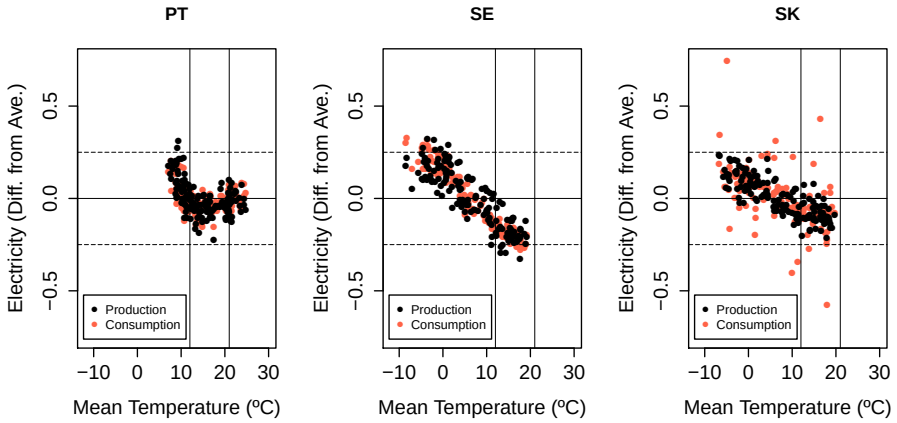

Figure 4: Mean temperature vs. the percent difference of electricity consumption from the annual average, including the heating threshold of 12 °C and above the cooling threshold of 21 °C (4/4). Source: adapted from European Climate Assessment and Dataset [1] and IEA [2].

3.2. *Monthly Electricity Production, Consumption, Imports and Exports Over Time (2000-2011)*

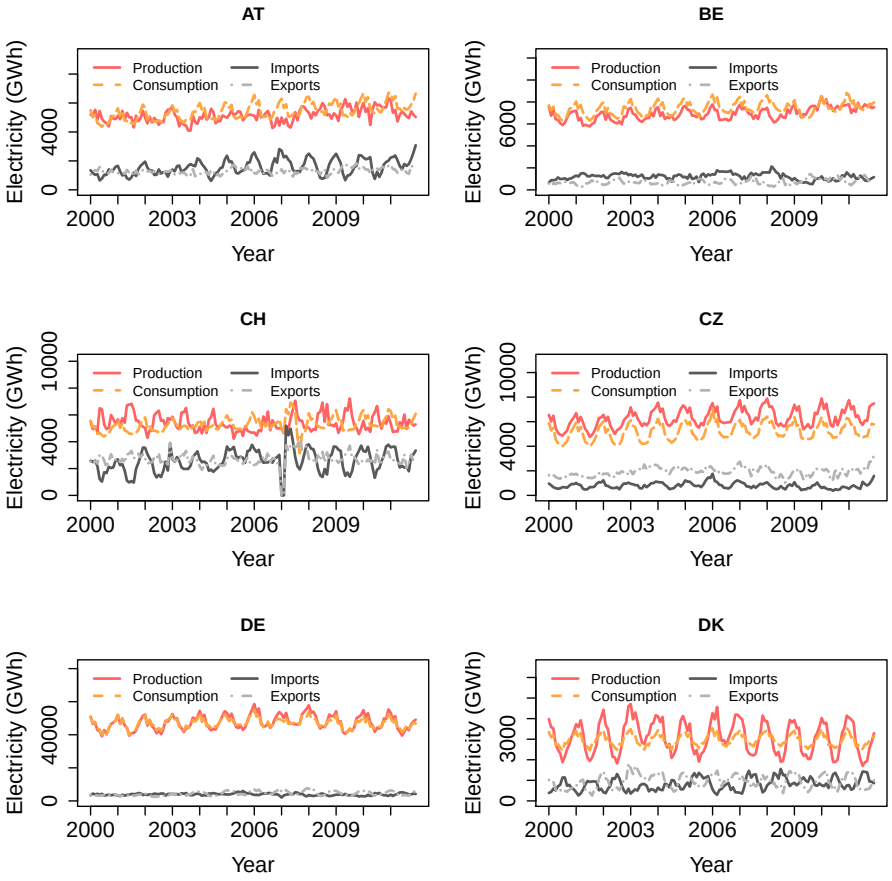

Figure 5: Monthly Electricity Production and Consumption Over Time (2000-2011) (1/4). Source: adapted from IEA [2].

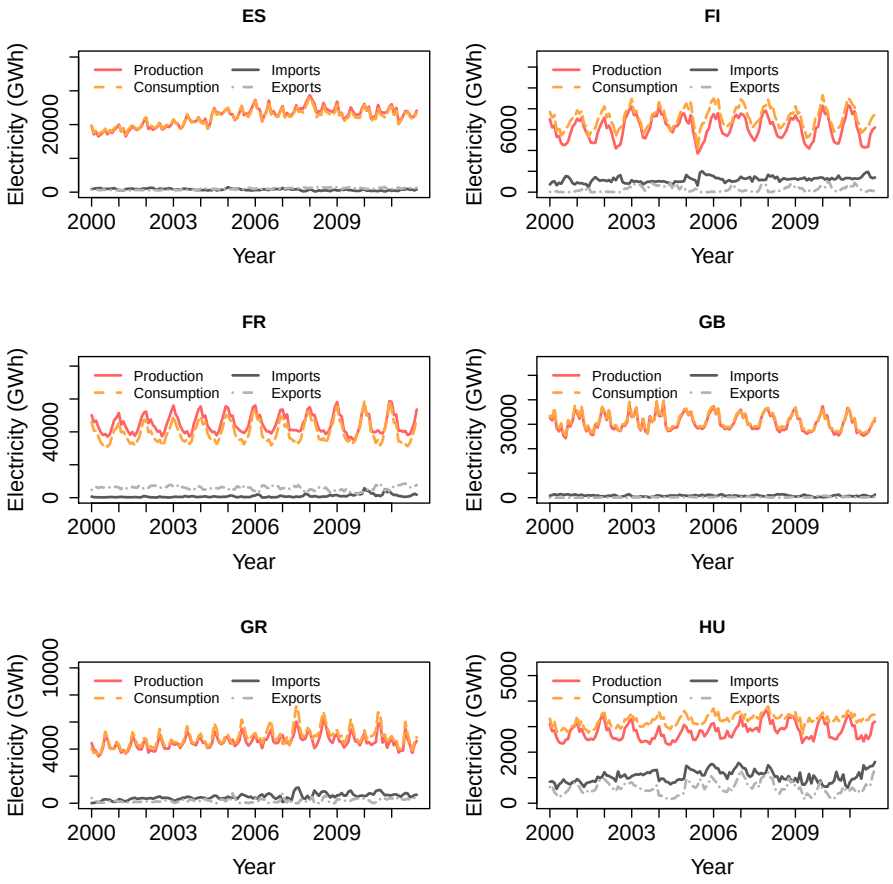

Figure 6: Monthly Electricity Production and Consumption Over Time (2000-2011) (2/4). Source: adapted from IEA [2].

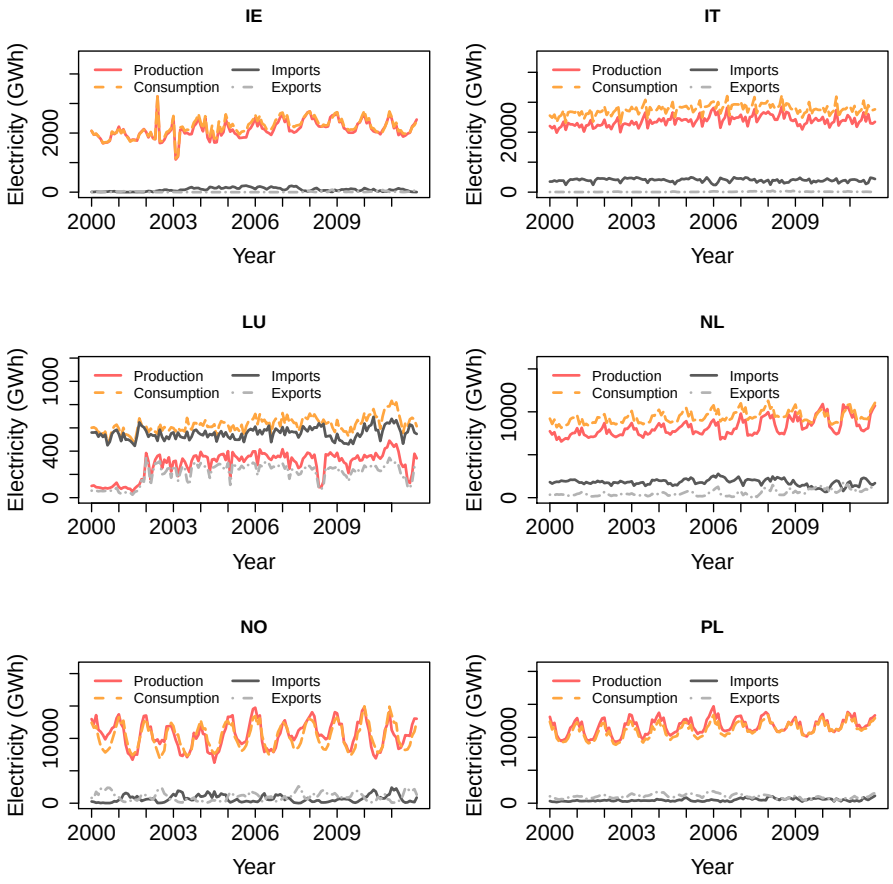

Figure 7: Monthly Electricity Production and Consumption Over Time (2000-2011) (3/4). Source: adapted from IEA [2].

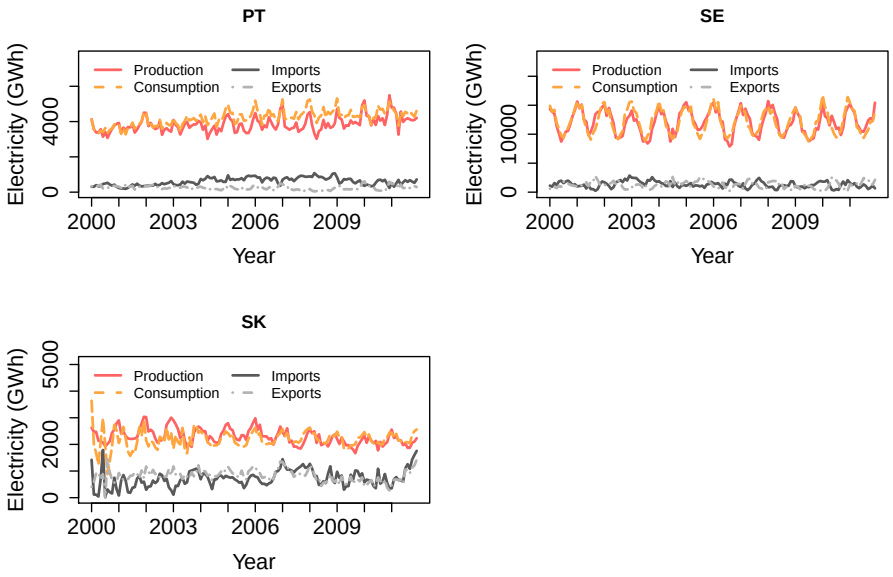

Figure 8: Monthly Electricity Production and Consumption Over Time (2000-2011) (4/4). Source: adapted from IEA [2].

3.3. *Sensitivity Analysis of Influencing Factors*

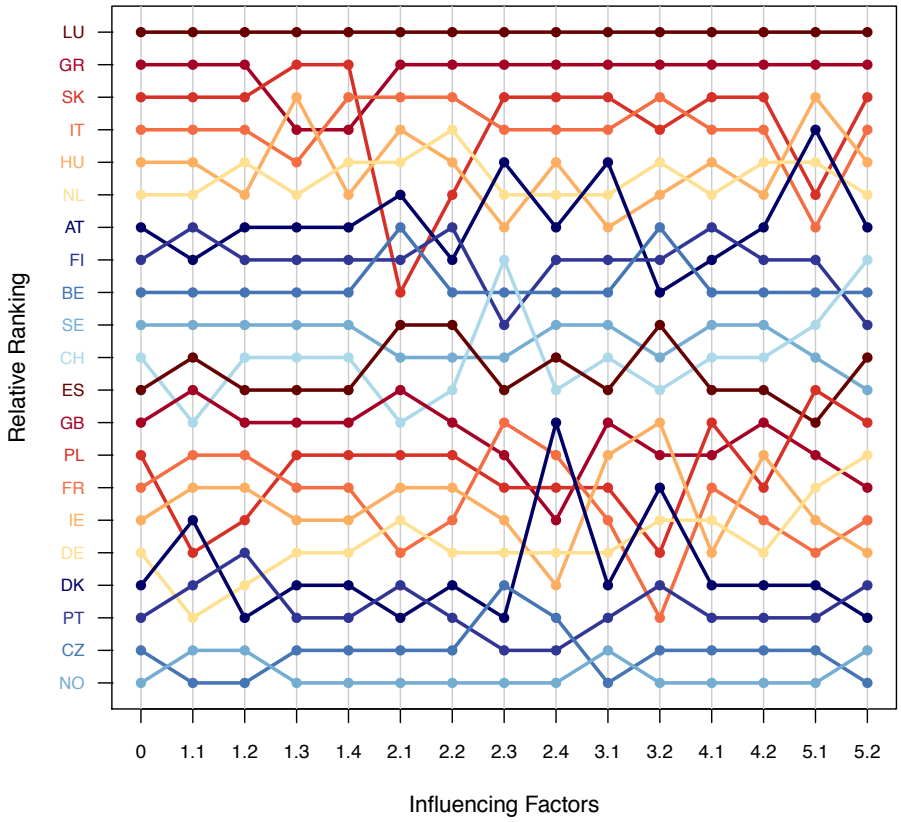

Figure 9: Sensitivity Analysis of Influencing Factors on the Final Index Ranking Chart. Note: Influencing factor 0 represents the original index ranking.

[1] European Climate Assessment and Dataset, E-OBS Gridded Dataset, retrieved: 25/6/2012 (2012).
URL http://eca.knmi.nl/download/ensembles/download.php\#datafiles

[2] IEA, Monthly Electricity Statistics Archives, retrieved: 12/4/2012 (2012).
URL http://www.iea.org/stats/surveys/elec_archives.asp

[3] T. Mitchell, M. Hulme, M. New, Climate data for political areas, Tech. rep., Tyndall Centre (2002).

[4] J. Adnot, L. Grignon-Masse, S. Legendre, D. Marchio, G. Nermond, S. Rahim, P. Riviere, P. Andre, L. Detroux, J. Lebrun, J. L'Hoest, V. Teodorose, J. L. Alexandre, E. Sa, G. Benke, T. Bogner, A. Conroy, R. Hitchin, C. Pout, W. Thorpe, S. Karatasou, Preparatory study on the environmental performance of residential room conditioning appliances (airco and ventilation) - Economic and Market analysis, Tech. rep., The European Commission (2008).