

## Supplementary 2

### 1 Fixed and Random Effects

In this section I report more results for the Fixed and Random Effects of the population model for the remaining predictive models for the indices: Health Monitoring (Tables 2 and 3), Health Resources (Tables 4 and 5), Mask Policies (Tables 6 and 7), School Restrictions (Tables 8 and 9), Social Distancing (Tables 10 and 11), and again, Business Restrictions (Tables 12 and 13). Table 1 shows the AIC and BIC results from the comparison between lag=1,2,3 for the mlvar models.

It is interesting to note that for all the models, in the **Fixed Effects**, the intercept has a very high *p-value*, so the constant effect that is found is not significant.

Instead, the lowest *p-value* is always associated to the Policy Intensity Index at time  $t - 1$ , and that is consistent with the fact that we do not expect the policy to change drastically from one week to another, so indeed the value of  $I(t)$  will be for sure influenced by the value of  $I(t - 1)$ , and the value of the coefficients for all the models are positive and higher than the other coefficients.

Other significant coefficients, thus with a *p-value*  $< 0.05$ , are the one for  $newCases(t - 1)$  ( $p = 0.044$ ) for Health Resources, meaning that a strong indicator for making decision in that context is the simple trend of the infections;  $admHosp(t - 1)$  ( $p = 0.035$ ) and  $deaths(t - 1)$  ( $p = 0.04$ ) have a significant coefficient for Social Distancing. In Business Restrictions, there are low *p-values* associated to  $admICU(t - 1)$  ( $p = 0.024$ ) and  $deaths(t - 1)$ , ( $p = 0.004$ ).

Health Monitoring has the coefficients for  $deaths(t - 1)$  with  $p = 0.118$ , and Mask Policies  $newCases(t - 1)$  with  $p = 0.076$ , while School Restrictions does not show any coefficient with a significant *p-value*.

In all the cases, the coefficients have values close to zero.

About the **Random Effects** results, there is an interesting feature on which to focus: for some variables, there is no random effects variability between the individuals. For example, in Mask Policies, the variable  $deaths(t - 1)$  is considered with the same influence for all the countries, as well as  $newCases(t - 1)$ ,  $admHosp(t - 1)$ ,  $admICU(t - 1)$  for School Restrictions and Social Distancing;  $newCases(t - 1)$  and  $admHosp(t - 1)$  for Business Restrictions. The indices Health Monitoring and Health Resources show inter-individual variability for all the variables at  $t - 1$ .

$I(t)$ mlvar model	Business Restrictions		Health Monitoring		Health Resources		Mask Policies		School Restrictions		Social Distancing	
	AIC	BIC	AIC	BIC	AIC	BIC	AIC	BIC	AIC	BIC	AIC	BIC
lag 1	<b>-44.9</b>	<b>21.5</b>	<b>-938.2</b>	<b>-871.7</b>	<b>-707.7</b>	<b>-641.1</b>	<b>-204.7</b>	<b>-138.1</b>	<b>-9.3</b>	<b>57.1</b>	<b>-282.7</b>	<b>-216.2</b>
lag 2	162.5	228.6	-587.9	-521.7	-269.9	-203.8	157.5	223.6	151.0	217.1	28.1	94.2
lag 3	179.5	245.2	-315.9	-250.2	-118.2	-52.5	262.2	327.9	111.2	176.9	162.0	227.7

**Table 1.** Lag comparison for  $I(t)$  mlvar models between lag = 1, 2, 3. Lowest AIC and BIC detect the best model between the three performed.

Fixed Effects $HM(t) \sim$			
Parameter	value	SE	p-value
Intercept	0.015	0.519	0.932
$I(t-1)$	0.688	0.358	3.92e-04
$newCases(t-1)$	-0.017	5.659e-02	0.458
$admHosp(t-1)$	-0.0502	0.129	0.335
$admICU(t-1)$	0.082	0.246	0.332
$deaths(t-1)$	0.024	0.032	0.118

**Table 2.** Fixed effects of the population model for the **Health Monitoring** considered as Policy Intensity Index

Random Effects $HM(t) \sim$						
ID	Intercept	$I_{t-1}$	$newCases_{t-1}$	$admHosp_{t-1}$	$admICU_{t-1}$	$deaths_{t-1}$
Spain	0.254	0.323	-0.134	-0.312	0.677	0.045
France	0.822	0.218	0.026	0.015	-0.091	0.029
Netherlands	-0.281	0.014	0.021	0.027	-0.073	-2.01e-02
Latvia	0.277	0.029	0.009	0.045	-0.081	7.39e-05
Slovenia	-0.538	-0.034	0.0133	0.043	-0.072	-2.44e-02
Greece	-0.932	0.02	0.017	0.051	-0.092	-1.34e-02
Ireland	0.550	-0.532	0.019	0.042	-0.107	-1.49e-02
Cyprus	0.096	-0.011	0.012	0.048	-0.083	-2.23e-03
Estonia	-0.247	-0.027	0.016	0.04	-0.079	3.93e-05

**Table 3.** Random effects of the population model for the **Health Monitoring** considered as Policy Intensity Index

Fixed Effects $HR(t) \sim$			
Parameter	value	SE	p-value
Intercept	0.007	0.332	0.950
$I(t-1)$	0.771	0.207	$\sim 0$
$newCases(t-1)$	-0.037	0.035	0.044
$admHosp(t-1)$	-0.019	0.150	0.754
$admICU(t-1)$	0.062	0.241	0.461
$deaths(t-1)$	-0.007	0.049	0.767

**Table 4.** Fixed effects of the population model for the **Health Resources** considered as Policy Intensity Index

<b>Random Effects <math>HR(t) \sim</math></b>						
<b>ID</b>	<b>Intercept</b>	$I_{t-1}$	$newCases_{t-1}$	$admHosp_{t-1}$	$admICU_{t-1}$	$deaths_{t-1}$
<i>Spain</i>	0.143	0.172	-0.049	-0.337	0.571	0.084
<i>France</i>	0.059	-0.076	-0.027	-0.047	0.101	-0.036
<i>Netherlands</i>	0.155	0.073	0.021	0.070	-0.051	-0.037
<i>Latvia</i>	0.578	0.219	-0.001	0.003	-0.043	0.007
<i>Slovenia</i>	-0.203	-0.420	0.023	0.014	-0.044	0.005
<i>Greece</i>	-0.614	0.115	0.004	0.041	-0.070	0.0001
<i>Ireland</i>	0.307	-0.127	0.019	0.122	-0.353	-0.028
<i>Cyprus</i>	-0.191	-0.005	0.011	0.053	-0.044	0.002
<i>Estonia</i>	-0.234	0.048	-0.003	0.079	-0.064	0.002

**Table 5.** Random effects of the population model for the **Health Resources** considered as Policy Intensity Index

<b>Fixed Effects <math>MP(t) \sim</math></b>			
<b>Parameter</b>	<b>value</b>	<b>SE</b>	<b>p-value</b>
<i>Intercept</i>	0.008	0.528	0.966
$I(t-1)$	0.951	0.066	$\sim 0$
$newCases(t-1)$	0.021	3.38e-06	0.283
$admHosp(t-1)$	0.075	1.44e-01	0.299
$admICU(t-1)$	-0.119	1.55e-01	0.076
$deaths(t-1)$	0.003	0	0.798

**Table 6.** Fixed effects of the population model for the **Mask Policies** considered as Policy Intensity Index

<b>Random Effects <math>MP(t) \sim</math></b>						
<b>ID</b>	<b>Intercept</b>	$I_{t-1}$	$newCases_{t-1}$	$admHosp_{t-1}$	$admICU_{t-1}$	$deaths_{t-1}$
<i>Spain</i>	0.414	0.002	-2.52e-10	-0.092	0.075	0
<i>France</i>	0.997	0.014	-1.27e-10	-0.068	0.062	0
<i>Netherlands</i>	0.205	-0.091	5.07e-10	0.089	0.029	0
<i>Latvia</i>	-0.110	0.092	1.28e-10	0.289	-0.359	0
<i>Slovenia</i>	-0.851	-0.001	-3.92e-11	-0.021	0.048	0
<i>Greece</i>	-0.684	-0.0003	-2.14e-11	-0.016	0.026	0
<i>Ireland</i>	0.225	-0.010	-8.18e-11	-0.077	-0.011	0
<i>Cyprus</i>	-0.002	-0.001	-5.13e-11	-0.023	0.035	0
<i>Estonia</i>	-0.194	-0.004	-6.29e-11	-0.079	0.093	0

**Table 7.** Random effects of the population model for the **Mask Policies** considered as Policy Intensity Index

<b>Fixed Effects <math>SR(t) \sim</math></b>			
<b>Parameter</b>	<b>value</b>	<b>SE</b>	<b>p-value</b>
<i>Intercept</i>	0.009	0.645	0.965
$I(t-1)$	0.765	0.139	$\sim 0$
$newCases(t-1)$	-0.006	0	0.739
$admHosp(t-1)$	0.002	0	0.954
$admICU(t-1)$	-0.001	0	0.973
$deaths(t-1)$	0.004	6.44e-06	0.735

**Table 8.** Fixed effects of the population model for the **School Restrictions** considered as Policy Intensity Index

<b>Random Effects <math>SR(t) \sim</math></b>						
<b>ID</b>	<b>Intercept</b>	$I_{t-1}$	$newCases_{t-1}$	$admHosp_{t-1}$	$admICU_{t-1}$	$deaths_{t-1}$
<i>Spain</i>	0.531	1.70e-01	0	0	0	2.29e-09
<i>France</i>	0.754	4.50e-02	0	0	0	-1.01e-09
<i>Netherlands</i>	0.784	9.47e-02	0	0	0	2.16e-10
<i>Latvia</i>	0.367	-1.53e-01	0	0	0	9.015e-11
<i>Slovenia</i>	-1.027	-1.35e-01	0	0	0	-1.68e-09
<i>Greece</i>	-0.784	1.07e-01	0	0	0	-3.32e-11
<i>Ireland</i>	0.211	4.17e-02	0	0	0	1.30e-10
<i>Cyprus</i>	-0.239	-8.41e-05	0	0	0	1.41e-11
<i>Estonia</i>	-0.597	-1.70e-01	0	0	0	-1.50e-11

**Table 9.** Random effects of the population model for the **School Restrictions** considered as Policy Intensity Index

<b>Fixed Effects <math>SD(t) \sim</math></b>			
<b>Parameter</b>	<b>value</b>	<b>SE</b>	<b>p-value</b>
<i>Intercept</i>	-0.007	0.754	0.977
$I(t-1)$	0.787	0.161	$\sim 0$
$newCases(t-1)$	-0.018	0	0.178
$admHosp(t-1)$	0.059	0	0.035
$admICU(t-1)$	-0.012	0	0.653
$deaths(t-1)$	-0.071	0.083	0.040

**Table 10.** Fixed effects of the population model for the **Social Distancing** considered as Policy Intensity Index

<b>Random Effects <math>SD(t) \sim</math></b>						
<b>ID</b>	<b>Intercept</b>	$I_{t-1}$	$newCases_{t-1}$	$admHosp_{t-1}$	$admICU_{t-1}$	$deaths_{t-1}$
<i>Spain</i>	0.564	0.168	0	0	0	0.078
<i>France</i>	0.866	-0.180	0	0	0	0.051
<i>Netherlands</i>	0.366	0.157	0	0	0	-0.049
<i>Latvia</i>	0.106	0.147	0	0	0	-0.027
<i>Slovenia</i>	-0.786	-0.078	0	0	0	0.063
<i>Greece</i>	-1.507	0.009	0	0	0	0.018
<i>Ireland</i>	0.312	-0.036	0	0	0	-0.169
<i>Cyprus</i>	-0.634	0.044	0	0	0	0.025
<i>Estonia</i>	0.712	-0.231	0	0	0	0.009

**Table 11.** Random effects of the population model for the **Social Distancing** considered as Policy Intensity Index

<b>Fixed Effects <math>BR(t) \sim</math></b>			
<b>Parameter</b>	<b>value</b>	<b>SE</b>	<b>p-value</b>
<i>Intercept</i>	0.033	0.536	0.855
$I(t-1)$	0.712	0.083	0.000
$newCases(t-1)$	-0.036	0.019	0.060
$admHosp(t-1)$	-0.011	0.051	0.836
$admICU(t-1)$	0.115	0.051	0.024
$deaths(t-1)$	-0.121	0.042	0.004

**Table 12.** Fixed effects of the population model for the Business Restriction considered as Policy Intensity Index

**Random Effects  $BR(t) \sim$**

<b>ID</b>	<b>Intercept</b>	$I_{t-1}$	$newCases_{t-1}$	$admHosp_{t-1}$	$admICU_{t-1}$	$deaths_{t-1}$
<i>Spain</i>	0.003	0.196	0	0	0.065	0.066
<i>France</i>	-0.052	-0.096	0	0	0.0382	-0.108
<i>Netherlands</i>	-0.468	-0.054	0	0	0.080	-0.072
<i>Latvia</i>	0.773	-0.032	0	0	-0.025	0.007
<i>Slovenia</i>	0.190	-0.469	0	0	-0.057	0.109
<i>Greece</i>	-1.092	0.140	0	0	-0.0003	0.031
<i>Ireland</i>	0.619	0.182	0	0	-0.048	-0.064
<i>Cyprus</i>	-0.251	0.002	0	0	0.002	0.009
<i>Estonia</i>	0.280	0.133	0	0	-0.055	0.021

**Table 13.** Random effects of the population model for the Business Restriction considered as Policy Intensity Index