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Mobility and economic activity around the world during the Covid-19 crisis

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Abstract

This paper traces the relationship between quarterly estimates of economic activity and people's mobility during the Covid-19 crisis in a sample of 53 economies. Over time, the estimates of elasticity of value added with respect to mobility have been declining, to around 20 percent at the start of 2021, attesting to the gradual adjustment of global economic activity to social distancing. Yet this adjustment appears to be modest, with economic recovery driven primarily by greater mobility. The analysis relies on country-specific estimates of potential economic growth consistent with normal mobility. The paper also proposes a simple approach to combining various aspects of mobility in a single index using country-specific weights. Out-of-sample forecasts of growth derived from mobility estimates perform well relative to random walk, medium-term potential growth and other benchmarks.

Keywords: economic growth, nowcasting, Covid-19, mobility index

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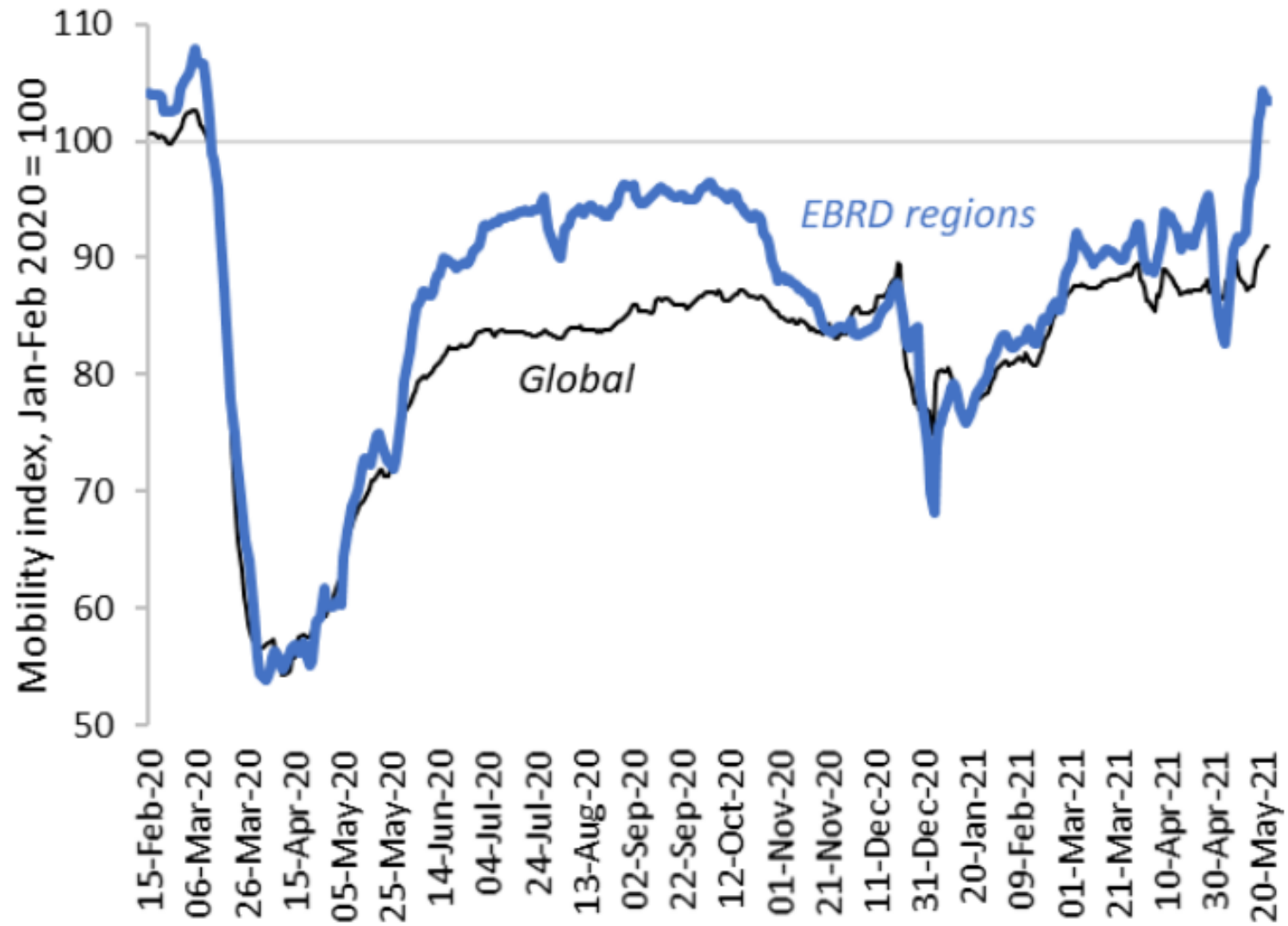
The value of the mobility index can be averaged across a quarter (assuming that mobility index averaged 100 in the last quarter of 2019 and the first weeks of 2020 for the purpose of the subsequent analysis). The log-difference in value added of economy i between quarter $t - 1$ and quarter t (equivalent to the logarithmic transformation of the quarterly seasonally adjusted rate of economic growth, $\ln(1 + y_{it})$ relative to that economy's potential quarterly rate of growth, $\ln(1 + \hat{y}_i)$) is then assumed to be a linear function of the log-difference in mobility index, $\ln M_{it} - \ln M_{i,t-1}$.

$$\ln(1 + y_{it}) - \ln(1 + \hat{y}_i) = \alpha_i + \beta[\ln M_{it} - \ln M_{i,t-1}] + \delta_t \quad (3)$$

This equation can be estimated as a cross-section in each quarter or as a fixed-effect model on several quarters of data (with quarter fixed effects δ_t).

The model is evaluated on a sample of 53 economies for which data on quarterly seasonally adjusted rates of growth is available in a timely manner. These include most advanced economies as well as emerging markets such as Argentina, India or Russia. We use data from the last quarter of 2019 onward. Growth rates are expressed in quarter-on-quarter (non-annualized) terms. Mobility indices are provided by Google Analytics. They cover most economies in the world with the exception of countries where Google has limited or no presence (notably China).

Figure 1: Global mobility index, daily values



Sources: Authors' calculations based on Google Analytics.

Table 2: Weights assigned to mobility sub-indices

Country	Recreation	Groceries	Transit	Work
Argentina	0.203	0.335	0.222	0.240
Austria	0.160	0.372	0.207	0.260
Australia	0.248	0.367	0.172	0.213
Belgium	0.167	0.410	0.198	0.225
Brazil	0.187	0.407	0.186	0.220
Bulgaria	0.169	0.364	0.184	0.283
Canada	0.209	0.364	0.203	0.224
Chile	0.218	0.293	0.221	0.268
Colombia	0.242	0.295	0.226	0.238
Czech Republic	0.142	0.403	0.191	0.265
Denmark	0.172	0.501	0.152	0.175
Estonia	0.183	0.369	0.212	0.236
Finland	0.177	0.428	0.178	0.217
France	0.192	0.336	0.203	0.269
Germany	0.159	0.398	0.194	0.249
Greece	0.156	0.408	0.187	0.249
Hungary	0.184	0.351	0.206	0.259
India	0.216	0.270	0.244	0.271
Indonesia	0.227	0.359	0.172	0.242
Ireland	0.163	0.436	0.194	0.206
Israel	0.168	0.354	0.224	0.254
Italy	0.185	0.323	0.220	0.273
Japan	0.185	0.507	0.138	0.170
Kazakhstan	0.224	0.301	0.217	0.259
Kenya	0.232	0.286	0.222	0.260
Latvia	0.209	0.354	0.200	0.236
Lithuania	0.200	0.313	0.209	0.278
South Africa	0.222	0.327	0.215	0.236
Spain	0.195	0.315	0.220	0.270
Sweden	0.198	0.452	0.172	0.177
Switzerland	0.139	0.437	0.198	0.227
Thailand	0.175	0.356	0.169	0.301
Turkey	0.204	0.343	0.204	0.248
Ukraine	0.197	0.328	0.213	0.262
United Kingdom	0.178	0.375	0.222	0.225
United States	0.201	0.386	0.198	0.215

Table 4: Cross-country estimates of elasticity of value added with respect to mobility

<i>Dep. var: Log-change in value added</i>	Data from Q1 up to				
	Q1	Q2	Q3	Q4	Q1 2021
Mobility index, log difference	0.380*** (0.048)	0.199*** (0.038)	0.244*** (0.046)	0.206*** (0.034)	0.202*** (0.033)
R^2	0.444	0.854	0.889	0.872	0.866
R^2 between	0.444	0.599	0.280	0.154	0.193
Observations	53	106	159	211	253

Source: Authors' calculations.

Note: Robust standard errors in parentheses. ***, **, * denote statistical significance at the 1%, 5% and 10% levels, respectively. Estimated by fixed effects with time dummies included. The dependent variable is the change in logarithm of value added.

Table 5: Cross-country estimates of elasticity of value added with respect to mobility

<i>Dep. var: Log-change in value added</i>	Emerging markets		Advanced economies	
	Full panel	Last 3 quarters	Full panel	Last 3 quarters
Mobility index, log difference	0.208*** (0.054)	0.149** (0.063)	0.237*** (0.031)	0.188*** (0.041)
R^2	0.843	0.683	0.911	0.795
R^2 between	0.084	0.179	0.360	0.623
Observations	118	66	135	81

Source: Authors' calculations.

Note: Robust standard errors in parentheses. ***, **, * denote statistical significance at the 1%, 5% and 10% levels, respectively. Estimated by fixed effects with time dummies included. The dependent variable is the change in logarithm of value added.

Table 6: Country-specific estimates of elasticity of value added with respect to mobility used in nowcasting

Country	Q1 2020	Q2 2020	Q3 2020	Q4 2020	Q1 2021
Argentina	0.40	0.40	0.24	0.30	0.29
Australia	0.40	0.40	0.23	0.27	0.26
Austria	0.40	0.38	0.33	0.34	0.31
Belgium	0.40	0.39	0.29	0.34	0.32
Brazil	0.40	0.40	0.25	0.29	0.27
Bulgaria	0.40	0.35	0.36	0.28	0.24
Chile	0.40	0.35	0.23	0.24	0.23
Colombia	0.40	0.38	0.20	0.24	0.22
Czech Republic	0.40	0.40	0.36	0.38	0.25
Denmark	0.40	0.37	0.36	0.38	0.32
Estonia	0.40	0.37	0.32	0.23	0.20
Finland	0.40	0.37	0.22	0.24	0.22
France	0.40	0.40	0.25	0.31	0.30
Germany	0.40	0.39	0.36	0.37	0.31
Greece	0.40	0.35	0.36	0.27	0.18
Romania	0.40	0.36	0.32	0.26	0.24
Russia	0.40	0.35	0.16	0.18	0.17
Serbia	0.40	0.37	0.19	0.20	0.19
Singapore	0.40	0.37	0.27	0.28	0.27
Slovak Republic	0.40	0.40	0.22	0.31	0.27
Slovenia	0.40	0.40	0.28	0.32	0.26
South Africa	0.40	0.37	0.26	0.29	0.27
Spain	0.40	0.39	0.27	0.29	0.28
Sweden	0.40	0.38	0.36	0.38	0.37
Switzerland	0.40	0.38	0.32	0.33	0.30
Thailand	0.40	0.39	0.33	0.34	0.31
Turkey	0.40	0.36	0.25	0.28	0.27
Ukraine	0.40	0.37	0.36	0.32	0.30
United Kingdom	0.40	0.40	0.27	0.32	0.30
United States	0.40	0.40	0.28	0.35	0.33
Total	0.40	0.38	0.28	0.30	0.27

Table 8: Out-of-sample growth forecasts

Country	Q1 2020	Q2 2020	Q3 2020	Q4 2020	Q1 2021	RMSE ratio	RMSE ratio (RW)
Argentina	-2.95	-18.93	5.95	5.67	1.90	0.41	0.24
Australia	0.21	-9.41	2.17	2.67	0.04	0.36	0.22
Austria	-3.29	-9.38	8.47	-5.57	-1.14	0.27	0.14
Belgium	-3.20	-10.54	7.30	-1.70	1.38	0.31	0.17
Brazil	-1.50	-10.37	6.36	4.20	-1.50	0.19	0.11
Bulgaria	-2.65	-5.59	8.20	-1.77	-0.42	0.76	0.43
Chile	-1.80	-20.50	4.28	7.83	0.77	0.62	0.33
Colombia	-2.71	-23.15	7.63	8.01	-0.47	0.52	0.32
Czech R.	-2.11	-2.84	6.27	-6.04	-1.11	0.83	0.49
Denmark	-2.07	-1.86	3.72	-2.10	-4.74	0.73	0.42
Estonia	-1.90	-4.54	7.03	-1.15	-1.43	0.95	0.64
Romania	-2.10	-10.18	10.41	-2.01	0.48	0.70	0.42
Russia	0.58	-8.80	4.14	-0.87	-0.98	2.31	1.64
Serbia	-1.80	-18.36	11.95	0.34	0.13	0.99	0.55
Singapore	-1.38	-14.03	8.65	2.72	0.92	0.11	0.06
Slovak R.	-3.19	-8.39	6.36	-4.98	-3.23	0.55	0.32
Slovenia	-3.75	-8.97	7.75	-8.49	0.72	0.58	0.32
South Africa	-1.13	-18.02	9.59	4.41	-1.70	0.23	0.12
Spain	-4.73	-17.72	13.16	0.50	-1.58	0.15	0.08
Sweden	-0.51	-2.68	2.16	-2.63	-2.05	0.75	0.40
Switzerland	-2.55	-6.07	5.23	-1.79	-1.58	0.36	0.20
Thailand	-1.33	-7.35	5.53	1.01	0.25	0.21	0.12
Turkey	-0.83	-13.04	10.22	-1.41	-1.19	0.40	0.21
Ukraine	-1.22	-6.75	8.26	-2.01	-3.10	0.36	0.19
UK	-1.99	-19.75	9.94	-0.36	-4.69	0.28	0.15
US	-0.93	-8.63	3.24	-0.36	-0.77	0.42	0.23
Average	-2.11	-11.32	7.64	-0.11	-0.99	0.54	0.32