Mobility, economic activity and nowcasting

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Outline and Results
(*Gamtkitsulashvili and Plekhanov, 2021, Applied Economic Letters*)

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Mobility and economic activity during the Covid-19 crisis:

- The unprecedented restrictions on **people's movements** during the Covid-19 crisis
- **Google Community Mobility Reports** reflect well the driving force of the downturn - widespread social distancing, whether mandated by regulations or voluntary
- Evidence from around the world on the strong and persistent relationship between mobility and economic activity:
  - **A 10% drop in mobility is associated, on average, with a 2 percentage point lower GDP growth**
- Economic forecasts based on mobility perform well

Can be added to nowcasting in normal times:

- Together with higher-frequency indicators published with a shorter lag:
  - Exports, Imports, Industrial Production, Equity prices, Oil, Metals, Food prices, PMI
- Use principal component analysis

Mobility and economic activity during Covid-19 crisis

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Mobility is expected to have high predictive power for tracking the Covid-19 downturn and recovery

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- **… however, challenges using the mobility indices:**
- Normal levels of mobility may correspond to different rates of growth in different economies
- The lack of baseline makes it difficult to calibrate mobility indices for use in forecasting
- Mobility patterns (work vs recreation) differ from economy to economy

- **Proposed solutions:**
- Estimate country-specific potential quarterly growth compatible with “normal" mobility
- Look at log-deviations of growth from its potential
- Derive a single mobility index, using sub-index weights inversely proportional to observed variability of each component (less weight given to noisier measures)
- Estimate elasticity of growth with respect to mobility
- Country-specific estimates of elasticity of growth with respect to mobility based on a combination of a country's own experience and an average experience of other countries (Stein, 1956) – used in nowcasting

The model is estimated on a panel of quarter-on-quarter growth rates for 53 economies

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- Log-difference between growth rate of economy *i* in quarter *t* and its potential growth is assumed to be a linear function of the log-difference in mobility index between quarters *t* and *t - 1*

$$ln(1 + y_{it}) - ln(1 + \hat{y}_i) = \alpha_i + \beta_i[lnM_{it} - lnM_{i,t-1}]$$

- Estimates for each cross-section
- Fixed-effect estimates from panels of up to four quarters, with quarter effects
- Sample of 53 economies and quarter-on-quarter data for 2020-2021
- Q4 2019 mobility assumed equal to 100 for all economies

Sources: IMF, UN Comtrade, World Bank via CEIC and authors' calculations.

View then: **Mobility** in the EBRD regions collapsed in April and to a lesser extent in Dec. 2020 – view then

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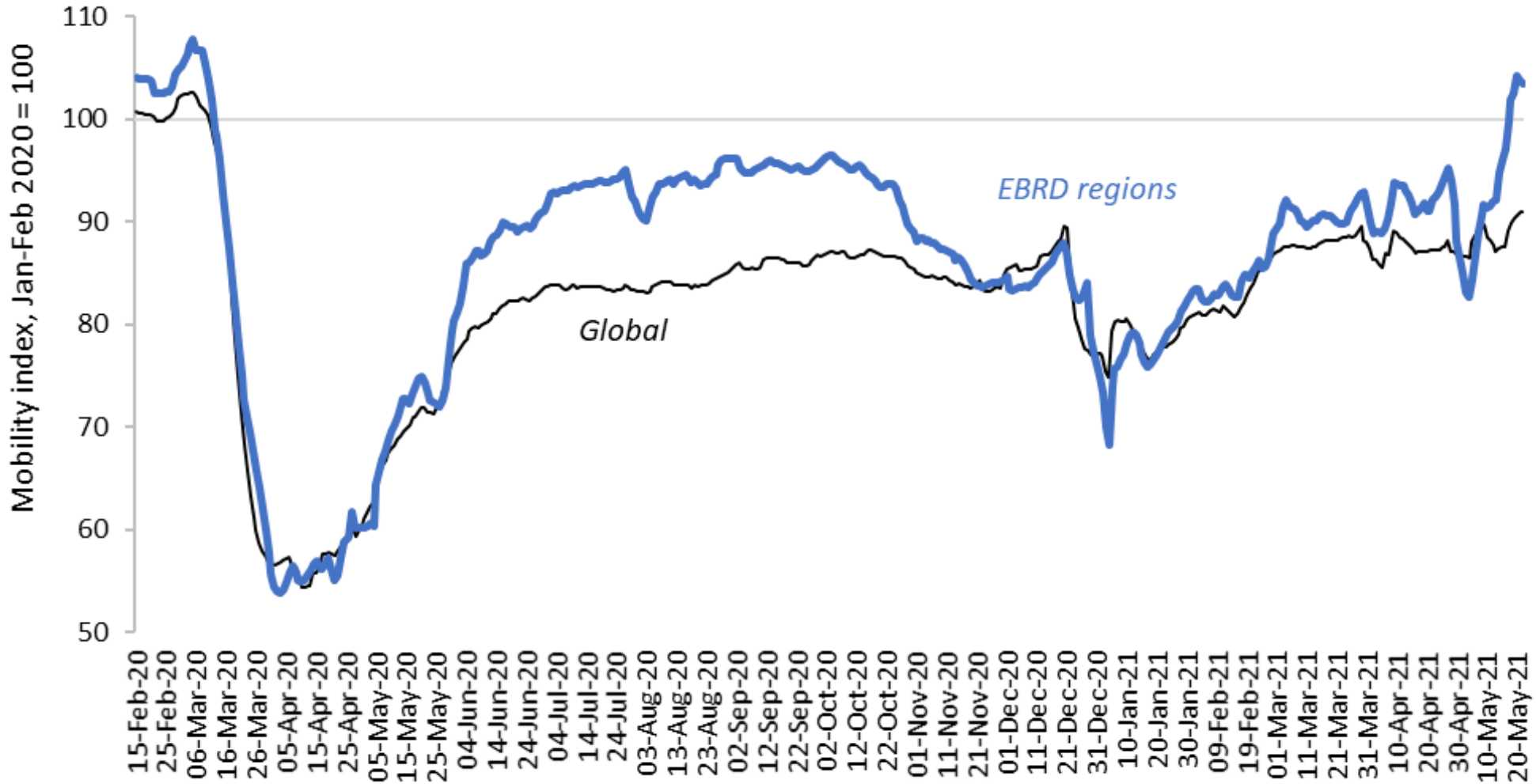

Sources: Google mobility and authors' calculations. Weighted average of trips to work places, recreation, grocery stores and transit station with country-specific weights (inversely proportional to variability of each measure). 7-day moving averages. Mobility is aggregated across economies using weights based on GDP at purchasing power parity.

View now

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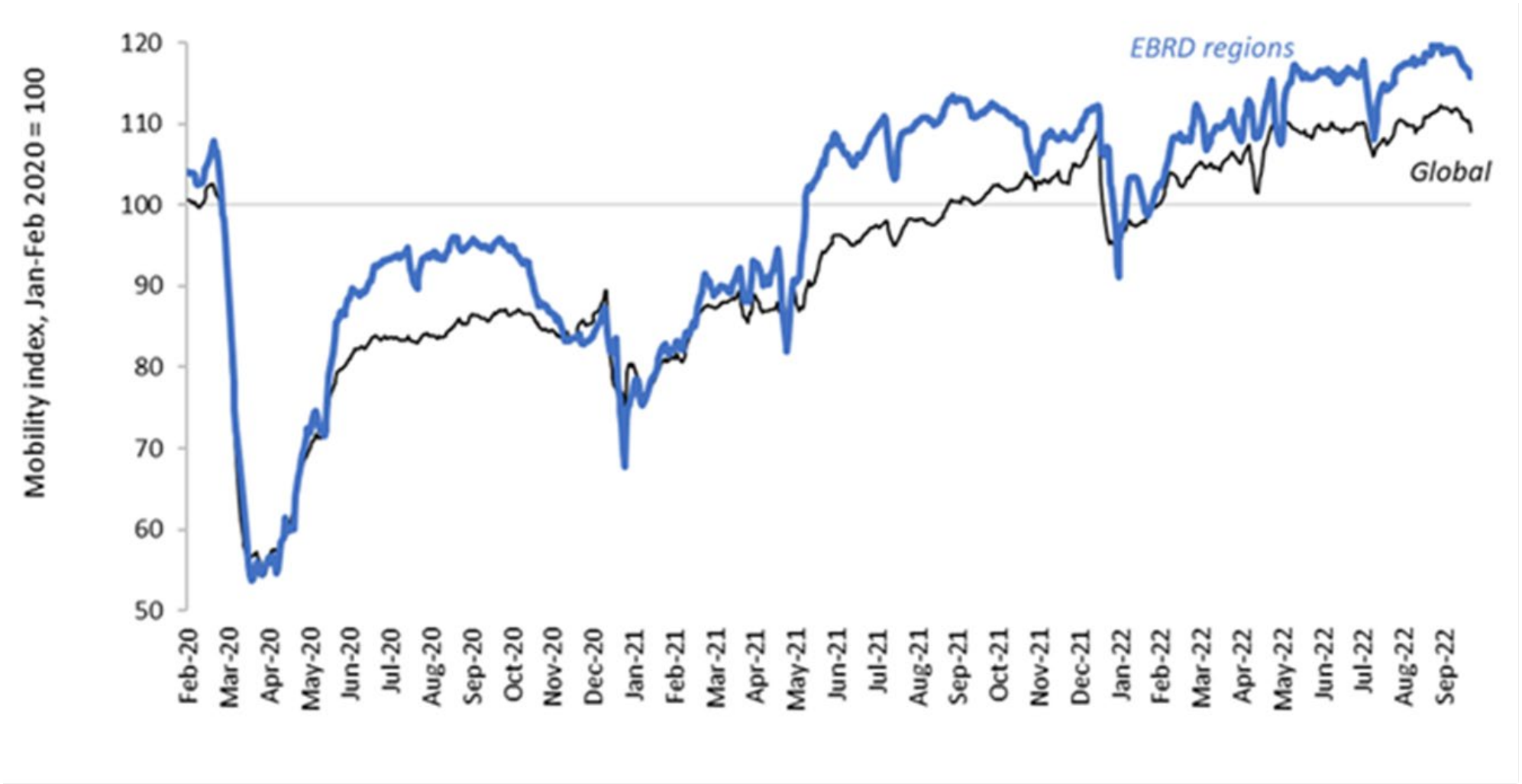

Sources: Google mobility and authors' calculations. Weighted average of trips to work places, recreation, grocery stores and transit station with country-specific weights (inversely proportional to variability of each measure). 7-day moving averages. Mobility is aggregated across economies using weights based on GDP at purchasing power parity.

Some cyclical differences may have become structural

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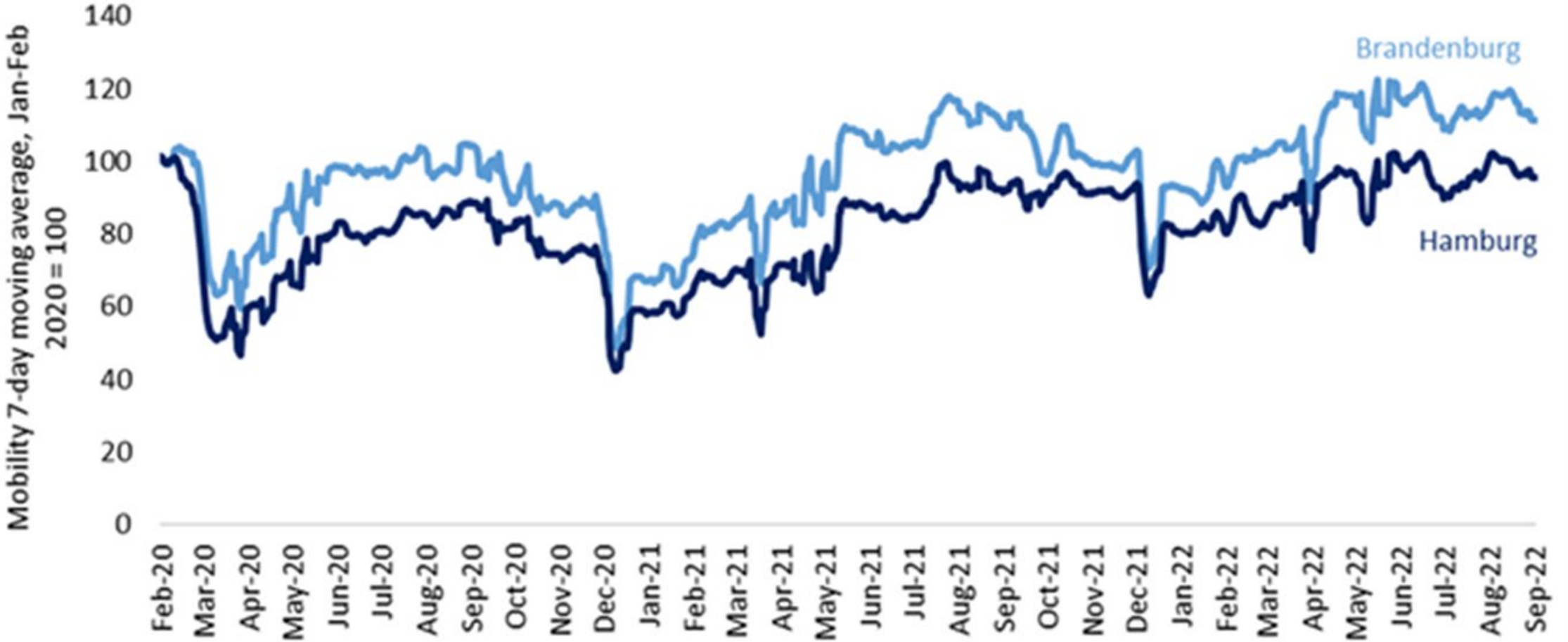
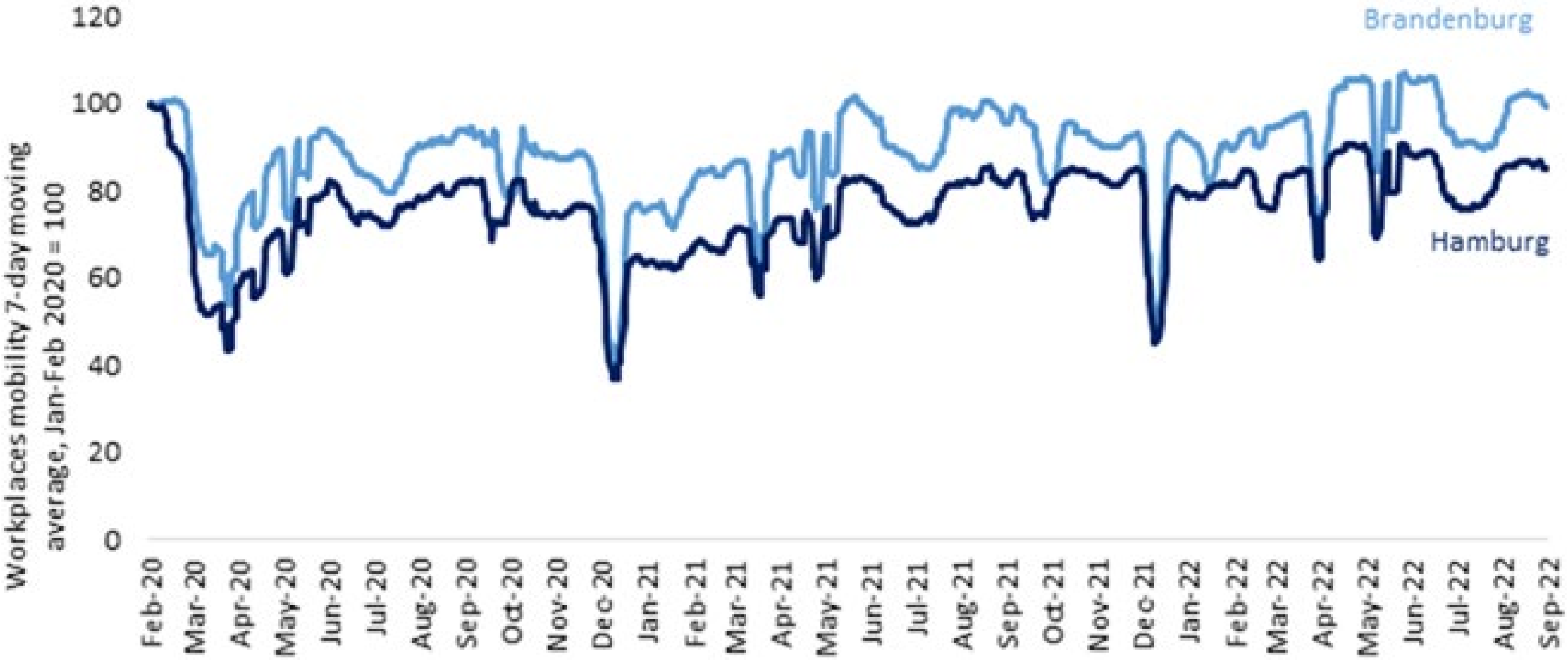


Sources: Google mobility and authors' calculations. Notes: Weighted average of trips to work places, recreation, grocery stores and transit station with country-specific weights (inversely proportional to variability of each measure). 7-day moving averages.

As work-from-home patterns vary



Sources: Google mobility and authors' calculations. Notes: Trips to work places. 7-day moving averages.

A 10% drop in mobility translates into an approximately 2% drop in GDP growth

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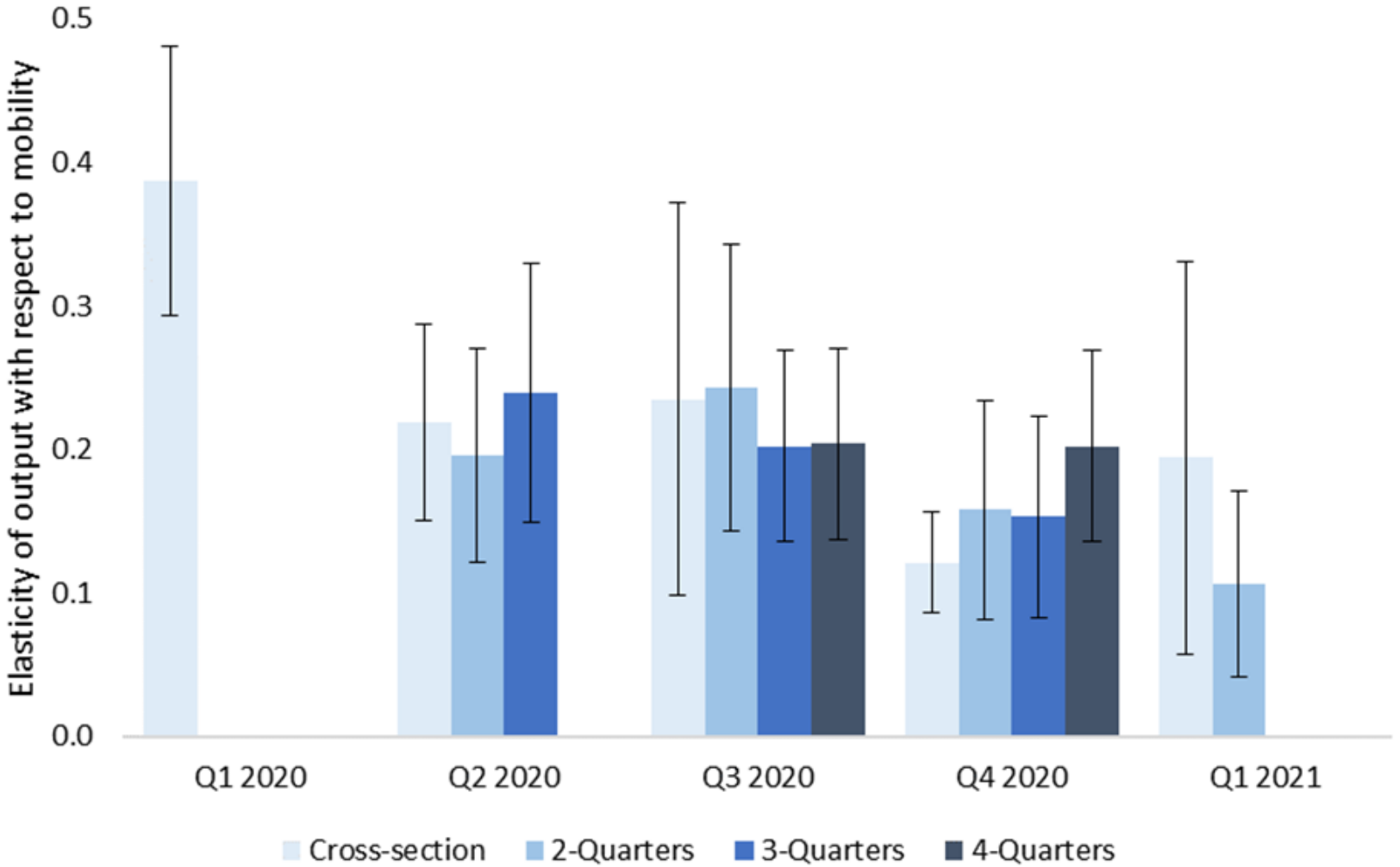
Estimates of elasticity of value added with respect to mobility have been declining but slowly

Most of decline at the start of the crisis: Q1 cross-section (40%) consistent with initial view that 40% of activity relies on close contact (The Economist, March 2020; IMF blog March 2020)

The elasticities do not vary systematically across advanced economies and EMs



Sources: Google Analytics, IMF, national authorities and authors' calculations. Based on a global sample of 53 economies.
Q1 2021 based on a subset of about 40 per cent of economies in the sample with available data.

Stronger economic performance later in the pandemic can be attributed to recovering mobility (but not fully)

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Adaptation to social distancing played a smaller role in delivering stronger growth outcomes

Mobility-based nowcasts perform better than random walk and other naive forecasts

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Changes in mobility can explain up to 89% of the variation in quarterly growth in 2020

Relatively strong performance in 50 out of 53 economies

Country	Q1 2020	Q2 2020	Q3 2020	Q4 2020	All
Mobility-based	1.50	4.55	4.56	3.38	3.73
Random walk	3.38	10.47	22.78	10.03	13.77
Potential growth	3.24	12.81	10.32	2.63	7.75
Reversion to the trend	3.24	15.61	9.25	7.44	10.06
Reversion to the pre-crisis level	2.66	14.10	6.82	4.61	8.43

Source: Authors' calculations.

Note: Root mean square error of forecasts made out-of-sample based on mobility data available at the end of each quarter or 16 March 2021 in the case of Q1 2021. Potential growth assumes a constant rate of growth equal to the estimated medium-term potential rate. Reversion to the trend assumes regaining pre-crisis level of output, adjusted by the potential rate of growth. Reversion to the pre-crisis level assumes regaining the level of output observed in the last quarter of 2019.

Sources: Google Analytics, IMF, national authorities and authors' calculations. Notes: Based on a global sample of 53 economies. Q1 2021 based on a subset of about 40 per cent of economies in the sample with available data.

Out-of-sample growth forecasts

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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
Finland	-1.79	-6.43	4.04	-0.68	-0.60	0.50	0.31
France	-4.33	-13.53	10.91	-3.45	0.28	0.37	0.20
Germany	-1.81	-6.29	6.70	-3.13	-3.49	0.44	0.24
Greece	-3.02	-4.13	9.15	-5.56	-1.31	1.11	0.66
Hungary	-1.32	-7.62	9.22	-3.09	-0.43	0.50	0.27
India	-2.09	-18.11	12.71	9.22	3.51	0.40	0.22
Indonesia	-0.39	-10.59	4.84	1.46	-0.52	0.56	0.36
Ireland	-1.98	-13.52	5.28	-0.13	-2.97	1.13	0.73
Israel	-2.56	-7.00	3.99	-1.18	-1.50	0.53	0.29
Italy	-6.83	-12.63	13.12	-2.42	-0.78	0.16	0.09
Japan	-0.21	-4.12	2.63	1.56	-2.25	0.54	0.33
Kazakhstan	0.20	-9.68	5.29	2.00	-0.34	0.60	0.37
Kenya	0.04	-10.04	7.04	4.87	1.42	0.21	0.11
Latvia	-0.87	-3.95	6.93	-5.84	-2.87	0.83	0.48
Lithuania	-2.26	-5.01	9.60	-3.92	-2.41	0.70	0.37

Note: based on mobility data available at the end of each quarter or 16 March 2021 in the case of Q1 2021. RMSE ratio is the ratio of root mean square error of the forecast relative to that of potential growth assumed in every quarter or random walk.

Out-of-sample growth forecasts

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Country	Q1 2020	Q2 2020	Q3 2020	Q4 2020	Q1 2021	RMSE ratio	RMSE ratio (RW)
Luxembourg	-3.96	-13.68	7.60	-0.59	-1.03	0.66	0.39
Malaysia	-3.21	-14.28	14.00	-2.88	-1.40	0.25	0.13
Malta	-2.20	-10.46	9.76	-0.23	-0.41	0.38	0.22
Mexico	-0.30	-15.32	6.03	4.26	-0.57	0.35	0.19
Morocco	-3.31	-23.51	13.37	3.77	1.25	0.58	0.34
Netherlands	-2.09	-6.59	4.64	-2.95	-2.02	0.44	0.24
New Zealand	-0.78	-14.89	7.30	2.63	-0.71	0.63	0.38
Norway	-2.26	-2.21	3.75	-2.22	-2.39	0.63	0.36
Peru	-4.04	-32.24	14.47	8.15	-1.77	0.47	0.27
Philippines	-3.75	-25.73	7.79	4.89	1.92	0.64	0.42
Poland	-2.39	-7.15	10.61	-3.56	-0.01	0.44	0.23
Portugal	-3.69	-15.39	10.19	-0.82	-6.07	0.20	0.11
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

Note: based on mobility data available at the end of each quarter or 16 March 2021 in the case of Q1 2021. RMSE ratio is the ratio of root mean square error of the forecast relative to that of potential growth assumed in every quarter or random walk.

View then: Nowcasts suggest output recovering in Q2 2021 to Q4 2019 levels

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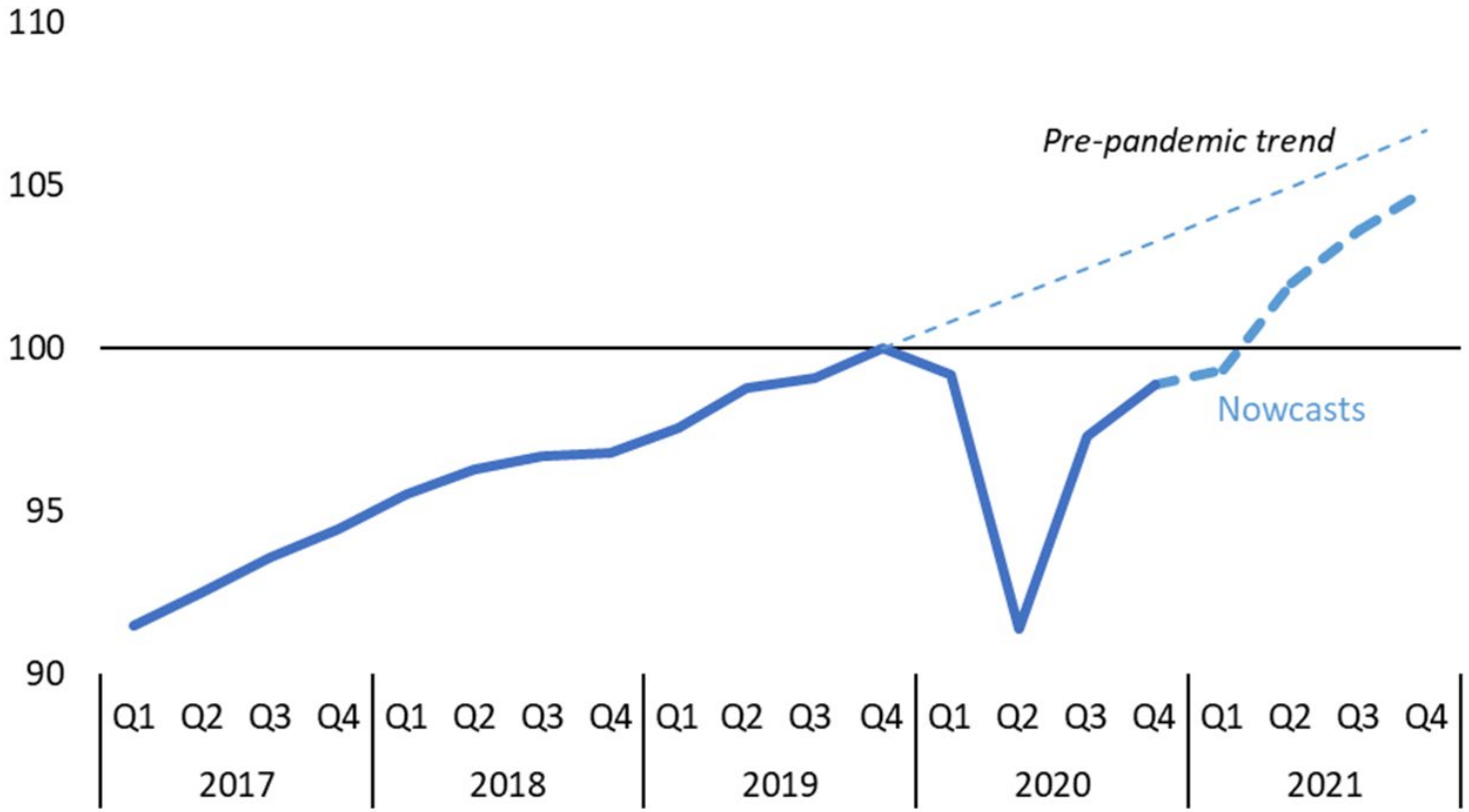
Real GDP index for the EBRD regions (Q4 2019 = 100)



Sources: CEIC, national authorities and EBRD nowcasts. Notes: EBRD regions average constructed using GDP at purchasing power parity weights. 2021 Q3 and Q4 estimates based on September 2020 REP projections.

View now (*Regional Economic Prospects* Sep 2022)

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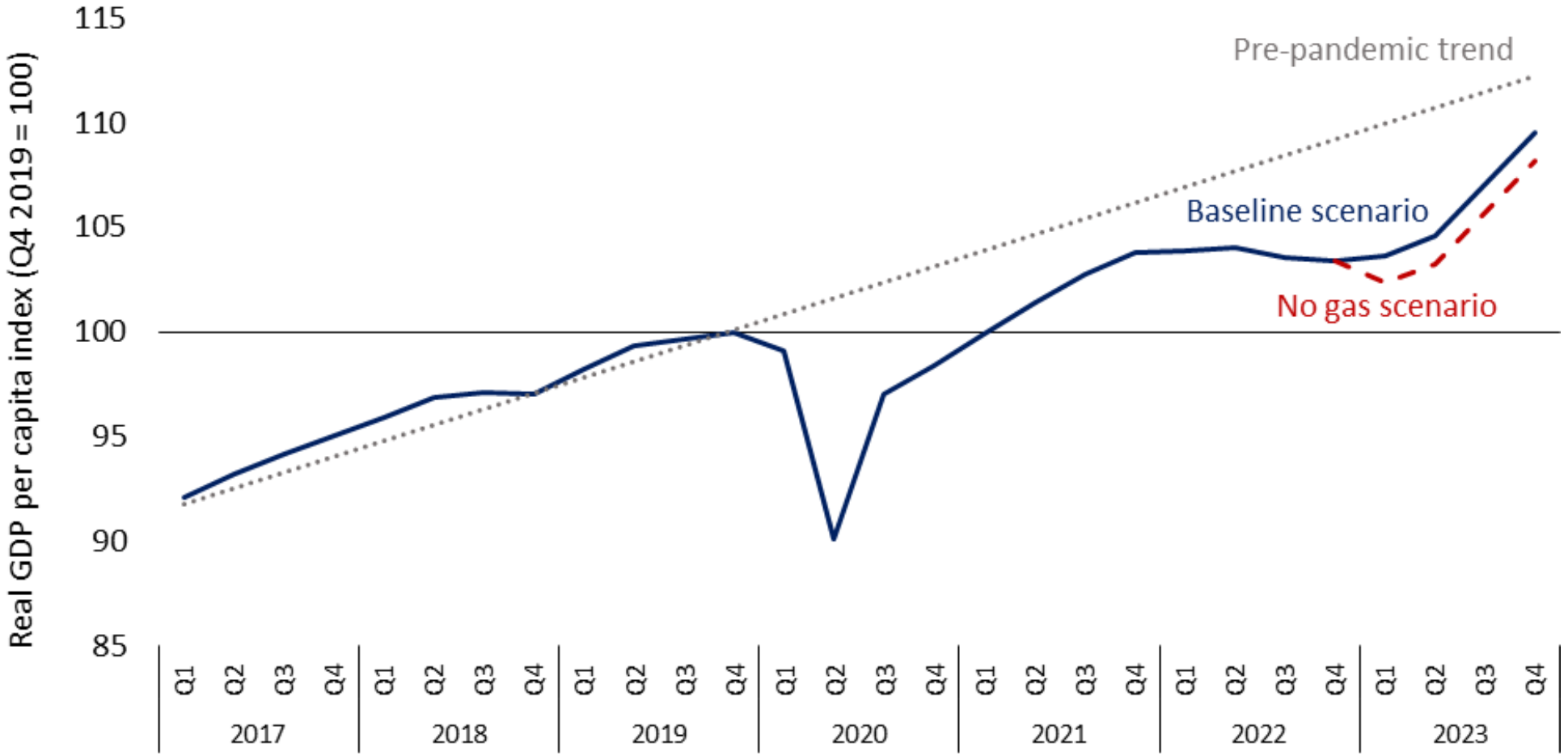

Sources: National authorities via CEIC and EBRD forecasts.
Notes: EBRD average based on the values of gross domestic product in 2020 in current USD from the IMF.

Nowcasting in “normal” times

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Nowcasting in “normal” times

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Finding strong driver of economic activity

Credit card spending would be a good source (eg Mastercard (processer) or Barclays (major point-of-sale provider)

Failing that, principal component approach

Nowcasting: estimating the present, the recent past (prior to data releases) and forecasting near future

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Returning to conventional nowcasting when recovering mobility stops being the main driver of growth...

Challenge:

GDP comes in quarterly frequency

GDP is published with significant lag (up to 14 weeks)

Idea:

Exploiting higher-frequency indicators published with a short lag

Performance may give an early picture of quarterly real GDP performance in region

Timely indicator of economic developments in the EBRD region (flash vs. later)

Models:

Bridge equations (i.e. Baffigi, Golinelli and Parigi 2004)

Mixed-Data sampling (i.e. Ghysels et al. 2004)

Mixed-frequency VAR (i.e. Mariono and Murasawa 2010)

Factor model with Principal Components (Stock and Watson 2002a, 2002b, Ruenstler et al. 2009)

Dynamic Factor Models (i.e. Giannone, Reichlin and Small 2008)

Principal Components Analysis: Circumventing the problem of dimensionality

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Approach

Orthogonal transformation from a set of observations into linearly uncorrelated variables

The first principal component captures the largest possible variance

The following principal components capture the highest variance possible under the constraint that it is orthogonal to the preceding component

+ Circumvents the problem of dimensionality

- Interpretation of Principal Components is difficult

Input data: over 150 time series of global and country-specific monthly (lead) variables

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Merchandise and Industrial Production data

Given that majority of countries in region are open and that industry represents a considerable share of total value added
For all countries, where available
Maximum publication lag 8 weeks

Global variables

Imports from the EU, US and China
Commodity prices for oil, metals and agricultural products (importance for production process and exports)

Financial market and sentiment data

FX index for the region
Manufacturing PMIs for Czech R., Euro Area, Greece, Poland, Russia, Turkey, US, UK

Data handling

To handle ragged edges: quarterly averaging

Time span: Q2 2009 – present

Future extensions: mobility, credit card spending, etc.

Model: A two-step estimator of EBRD regions

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For country i:

1) Screen for variables that reflected growth trends in country i in the past

Out of large pool of potential time series, we keep only those that show a strong and contemporaneous relationship with country GDP

2) Distil common trends in this subsample of data using PCA

Transform data to zero mean and unit variance (Z scores)

$$X_t = \Lambda \mathrm{F_t} + \epsilon_t$$

3) Model selection

$$y_{t+h}^h = \alpha_t + \beta_h(L)\widehat{F_t} + \epsilon_{t+h}^h$$

With h forecasts of up to 3 quarters
k principal components
m-1 lags of principal components
Run 2 different model specifications and compare RMSEs on full sample

Potential predictor pools, selection based on BIC
1) DI: m=1 and k<=6
2) DI lag: m<=2 and k<=6

4) Rerun out of sample regressions based on selected country model (3), predict nowcast of y_{T+h}^h.

In normal times, nowcasts outperformed comparators for current quarter and close future – but lose predictive power over time

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Pre-2020 evaluations

0) Nowcast (current quarter)

RMSE

	Country model	Aggregate model	AR(1)	Linear trend	random walk
EBRD	0.3	0.4	0.6	0.4	0.7
CEB	0.2	0.3	0.3	0.5	0.4
EEC	1.1	1.0	1.6	1.4	1.7
SEE	0.4	0.4	0.6	0.4	0.9
CA	0.8	0.7	1.0	0.8	1.0
SEMED	0.8	0.5	1.1	1.3	2.6

1) Forecast one quarter ahead

RMSE

	Country model	Aggregate model	AR(1)	Linear trend	random walk
EBRD	0.5	0.3	0.6	0.5	0.6
CEB	0.3	0.2	0.4	0.5	0.5
EEC	1.0	1.1	1.5	1.4	2.1
SEE	0.4	0.5	0.6	0.3	0.9
CA	0.7	0.8	1.1	0.9	1.0
SEMED	1.2	1.0	1.2	1.3	2.6

2) Forecast two quarters ahead

RMSE

	Country model	Aggregate model	AR(1)	Linear trend	random walk
EBRD	0.5	0.4	0.6	0.5	0.6
CEB	0.4	0.4	0.4	0.6	0.4
EEC	1.4	1.4	1.5	1.4	2.6
SEE	0.3	0.5	0.5	0.3	0.7
CA	0.8	0.8	1.1	0.8	1.6
SEMED	1.2	0.9	1.3	1.4	1.8

3) Forecast three quarters ahead

RMSE

	Country model	Aggregate model	AR(1)	Linear trend	random walk
EBRD	0.5	0.5	0.6	0.4	0.7
CEB	0.2	0.4	0.4	0.7	0.5
EEC	1.5	1.5	1.5	1.6	2.0
SEE	0.3	0.5	0.6	0.3	0.6
CA	1.0	1.0	1.0	0.8	1.6
SEMED	2.2	1.8	1.3	1.3	1.9

Sources: Authors' calculations.

Principal Component 1 captures global demand; FX and commodities feature in PC2 and PC3

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Global variables with strongest correlation with principal component 1 - 3

Row	PC1_1st	PC1_1st_c	PC1_2nd	PC1_2	PC2_1st	PC2_1	PC2_2nd	PC2_2r	PC3_1st	PC3_1st_c	PC3_2nd	PC3_2n
EBRD	**Imports_us**	**0.8**	**Imports_CN**	**0.7**	**FX**	**0.5**	**oil**	**-0.3**	**United_States_Manufacturing**	**-0.5**	**FX**	**0.5**
hrv	Global_Manufacturing	0.8	Imports_us	0.8	msci_em	0.6	metals	0.5	Imports_eu	0.3	agriculture	0.3
est	Imports_us	0.6	Imports_CN	0.5	Global_Manufacturing	0.9	Euro_Zone_Manufacturing	0.9	msci_em	0.2	Global_Manufacturing	0.2
hun	Imports_CN	0.3	Imports_us	0.3	FX EBRD vs. USD	0.5	Imports_us	-0.3	Global_Manufacturing	-0.7	metals	-0.6
lat	Global_Manufacturing	0.9	Euro_Zone_Manufacturing	0.8	msci_em	-0.5	metals	-0.3	Imports_CN	-0.5	FX EBRD vs. USD	0.4
lit	agriculture	0.5	metals	0.4	United_States_Manufacturing	0.6	metals	0.6	agriculture	0.4	United_States_Manufacturing	-0.2
pol	Imports_us	0.5	Imports_eu	0.5	metals	0.7	Global_Manufacturing	0.6	Imports_eu	-0.3	Euro_Zone_Manufacturing	-0.2
svk	Imports_us	0.8	Imports_CN	0.7	Global_Manufacturing	0.7	metals	0.6	FX EBRD vs. USD	-0.4	oil	0.4
svn	Imports_eu	0.8	Imports_us	0.5	United_States_Manufacturing	-0.3	Imports_CN	-0.2	Euro_Zone_Manufacturing	0.1	Imports_eu	-0.1
alb	Imports_CN	0.7	Imports_us	0.5	Imports_us	0.5	msci_em	0.5	agriculture	0.2	metals	0.2
bih	Imports_CN	0.5	Imports_us	0.4	Imports_us	0.6	oil	0.6	FX EBRD vs. USD	0.7	oil	-0.7
bgr	Imports_eu	0.4	Imports_us	0.4	msci_em	0.5	metals	0.5	Global_Manufacturing	-0.3	Imports_CN	-0.2
cyp	Imports_eu	0.6	Imports_us	0.4	agriculture	-0.5	msci_em	-0.3	FX EBRD vs. USD	0.3	Imports_eu	0.3
fyr	Imports_eu	0.4	Euro_Zone_Manufacturing	0.4	agriculture	0.4	msci_em	0.4	Imports_us	-0.5	FX EBRD vs. USD	0.4
gre	Imports_us	0.7	Imports_CN	0.6	metals	-0.6	msci_em	-0.5	Euro_Zone_Manufacturing	-0.2	Imports_eu	-0.2
mne	Imports_CN	0.7	Imports_us	0.5	FX EBRD vs. USD	0.4	Imports_CN	-0.4	Global_Manufacturing	-0.5	United_States_Manufacturing	-0.5
rom	Imports_us	0.7	Imports_CN	0.6	FX EBRD vs. USD	0.7	oil	-0.6	Imports_us	-0.3	msci_em	0.3
srb	msci_em	-0.4	Imports_CN	0.2	Imports_eu	0.7	Imports_us	0.5	msci_em	0.7	FX EBRD vs. USD	-0.7
arm	Global_Manufacturing	0.7	Imports_CN	0.7	FX EBRD vs. USD	0.4	msci_em	-0.4	United_States_Manufacturing	-0.5	Imports_us	-0.4
aze	Imports_us	0.6	Imports_CN	0.6	msci_em	-0.6	metals	-0.4	Imports_eu	0.4	Euro_Zone_Manufacturing	0.4
blr	Imports_us	0.9	Imports_CN	0.7	Global_Manufacturing	-0.5	metals	-0.5	Imports_eu	-0.3	FX EBRD vs. USD	-0.3
geo	Imports_CN	0.5	Imports_eu	0.4	Imports_us	-0.3	agriculture	-0.3	agriculture	0.5	Euro_Zone_Manufacturing	0.4
mdv	Imports_us	0.7	Imports_CN	0.6	Global_Manufacturing	0.6	metals	0.6	Imports_eu	0.4	FX EBRD vs. USD	0.2
ukr	Imports_CN	0.8	Imports_us	0.8	FX EBRD vs. USD	0.7	msci_em	-0.5	FX EBRD vs. USD	0.3	Imports_us	0.3
tur	Imports_us	0.7	Imports_CN	0.7	Global_Manufacturing	0.7	Euro_Zone_Manufacturing	0.6	FX EBRD vs. USD	-0.4	Euro_Zone_Manufacturing	-0.4
rus	Imports_us	0.9	Imports_CN	0.7	FX EBRD vs. USD	-0.6	United_States_Manufacturing	0.4	msci_em	-0.4	oil	-0.4
kaz	Imports_us	0.8	Imports_CN	0.7	FX EBRD vs. USD	-0.6	msci_em	0.6	Global_Manufacturing	-0.4	United_States_Manufacturing	-0.3
kgz	Imports_us	0.5	Imports_eu	0.4	Imports_CN	0.3	Global_Manufacturing	0.2	metals	0.6	FX EBRD vs. USD	-0.5
mon	Imports_us	-0.2	Imports_eu	0.2	Imports_us	0.6	Imports_eu	0.6	agriculture	0.5	Global_Manufacturing	-0.4
tjk	metals	0.7	Imports_us	0.7	FX EBRD vs. USD	0.6	Imports_eu	0.5	oil	0.7	agriculture	0.4
egy	Imports_CN	0.5	Imports_us	0.5	oil	0.4	Imports_eu	0.4	Imports_us	0.3	Imports_eu	0.3
jor	Imports_us	0.8	United_States_Manufacturing	0.7	Imports_eu	-0.5	FX EBRD vs. USD	-0.5	Euro_Zone_Manufacturing	0.4	msci_em	0.3
mar	Imports_us	0.4	Imports_CN	0.4	msci_em	0.4	metals	0.3	FX EBRD vs. USD	-0.4	oil	0.4
tun	Imports_CN	0.8	Imports_us	0.6	FX EBRD vs. USD	-0.5	msci_em	0.5	agriculture	-0.4	oil	-0.4
CEB	Imports_us	0.5	Imports_eu	0.5	Global_Manufacturing	0.8	metals	0.7	agriculture	-0.2	FX EBRD vs. USD	-0.2
SEE	Imports_us	0.7	Imports_CN	0.6	FX EBRD vs. USD	0.5	msci_em	-0.4	Imports_CN	0.6	United_States_Manufacturing	0.6
EEC	Imports_us	0.9	Imports_CN	0.8	msci_em	-0.5	FX EBRD vs. USD	0.5	Global_Manufacturing	-0.6	agriculture	0.5
CA	Imports_us	0.9	Imports_CN	0.7	FX EBRD vs. USD	-0.7	msci_em	0.5	Global_Manufacturing	0.3	United_States_Manufacturing	0.3
SEMED	Imports_us	0.5	Imports_CN	0.5	Imports_us	0.5	Imports_eu	0.4	Imports_CN	0.4	oil	0.4

Sources: Authors.

Country model predictor selection

European Bank
for Reconstruction and Development

Country	Predictor1	Predictor2	Predictor3	Predictor4	Predictor5	Predictor6	Predictor7	Predictor8	Predictor9
EBRD	**PC1**	**PC2**	**PC6**	**LPC1**	**LPC3**				
Croatia	PC1	PC3							
Estonia	PC1	PC2	PC3						
Hungary	PC1	PC2	PC5						
Latvia	PC1	PC3							
Lithuania	PC1	PC2	LPC3						
Poland	PC1	PC4							
Slovak Republic	PC1	PC2	PC5	PC6	LPC1	LPC2	LPC5		
Slovenia	PC1	PC5	PC6	LPC1	LPC2	LPC4	LPC5		
Albania	PC1	PC2	PC3						
Bosnia and Herzegovina	PC1	PC2	PC4	LPC5					
Bulgaria	PC1	PC3	PC4	PC6	LPC1	LPC2			
Cyprus	PC1	PC2	PC3	PC5	LPC1	LPC5			
FYR Macedonia	PC1	PC2	LPC1						
Greece	PC1	PC3	PC6	LPC5					
Montenegro	PC1	PC2	PC4	LPC1	LPC2	LPC4			
Romania	PC1	PC3	PC4	PC6	LPC3				
Serbia	PC1	PC2	PC4	PC5	PC6				
Armenia	PC1	PC2	PC3	LPC1					
Azerbaijan	PC1	PC4	PC5						
Belarus	PC1	PC3	PC6						
Georgia	PC1	PC2	PC6	LPC2	LPC4				
Moldova	PC1								
Ukraine	PC1	LPC2	LPC4						
Turkey	PC1	PC2	PC6	LPC6					
Russia	PC1	PC2	PC6	LPC2	LPC6				
Kazakhstan	PC1	PC2	PC4	LPC4					
Kyrgyz Republic	PC1	PC2	PC6	LPC1	LPC6				
Mongolia	PC1	PC2	PC3	PC4	PC5	LPC3	LPC4	LPC5	LPC6
Tajikistan	PC1	PC4	PC5	LPC1					
Egypt	PC1	PC2	PC3	PC4	PC5	LPC3	LPC4	LPC5	
Jordan	PC1	PC2	PC3	PC4					
Morocco	PC1	PC2	LPC1	LPC3	LPC4				
Tunisia	PC1	PC2	PC4	LPC3	LPC5				
CEB	PC1	PC2	PC3	PC6	LPC5				
SEE	PC1								
EEC	PC1	PC5							
CA	PC1	PC5	PC6						
SEMED	PC1	PC2	PC3	LPC2	LPC5	LPC6			

Sources: Authors.