

# Online supplement to “Macroprudential policies in CESEE – an intensity-adjusted approach”

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*This appendix provides additional information on several aspects of the paper “Macroprudential policies in CESEE – an intensity-adjusted approach” published in Focus on European Economic Integration Q2/20: (1) a detailed overview of the data sources used for the construction of the intensity-adjusted macroprudential policy index (MPPI) covering eleven EU countries in Central, Eastern and Southeastern Europe (CESEE) from 1997 to end-2018 on a quarterly basis, (2) details on the categorization of the different macroprudential policy measures and the applied weighting rules, and (3) a number of charts illustrating how individual subindices of the MPPI evolved by country over time. The data underlying the MPPI are available from the authors upon request. Extensions of the countries covered and regular updates will be part of future efforts.*

## 1 Data sources used for the construction of the MPPI

To construct a new intensity-adjusted macroprudential policy index (MPPI) for eleven EU countries in Central, Eastern and Southeastern Europe (CESEE), we used four databases capturing macroprudential policies (MPPs) from the prevailing literature. All of them are openly available and have been used for research purposes extensively. In the following, we describe the databases in more detail by citing the four papers which drew on them and were pertinent to the research we did.

*Budnik and Kleibl (2018)*: The European Central Bank’s Macroprudential Policies Evaluation Database (MaPPED) provides extensive details about macroprudential policies conducted by all current members of the EU, as reported by the various national authorities. It covers the period from 1951 to 2019 on a monthly basis. As individual measures are not codified, it is necessary to translate them into quantifiable measures. MaPPED does, however, include an indicator that signals whether a measure is considered to have had a tightening, loosening or ambiguous effect. Furthermore, it allows to explicitly distinguish between measures aimed at credit institutions’ foreign currency exposures and measures aimed either at both domestic and foreign currency exposures or only at domestic currency exposures. For these reasons, macroprudential policy actions can be investigated at a more granular level. MaPPED also contains the announcement and implementation dates of the measures. We used it as our main source for constructing the MPPI because its coverage of measures is the most comprehensive by far; it includes all the eleven CESEE countries in our sample and offers other useful features.

*Kochanska (2017)*: The database on macroprudential policy measures of the European Systemic Risk Board (ESRB) provides information on all EU Member States, which is updated regularly. Focusing on measures related to the banking sector, it provides the exact dates when measures were decided on and implemented, with much of the focus on the period since 2014. It features a more detailed differentiation for buffer rates. Generally speaking, this database provides

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the most precise descriptions of measures. However, like Budnik and Kleibl (2018), it does not offer an explicit codification of the individual measures. Moreover, it fails to explicitly indicate whether a certain measure can be expected to have a tightening or loosening impact. Thus, it is necessary to investigate each measure more thoroughly. Even though the ESRB’s database was already incorporated in the iMaPP database used by Alam et al. (2019), the period considered in that paper ended with 2016. Given its frequent updates on the ESRB’s website, we mainly used the ESRB database for updating the most recent observations in our database.

*Vandenbussche et al. (2015)*: Apart from providing a benchmark for the weighting rules applied in our study, this paper is also accompanied by a database containing an intensity-adjusted index for macroprudential measures for 16 CESEE countries from 1997 to 2010 on a quarterly basis. The authors not only supply the sources from which they gathered the information on individual measures (mostly country-specific Financial Stability Reports) but also annotate unclear phrasing within these sources. Thanks to the rather narrow regional focus of this study, coverage of MPP instruments used by CESEE countries is quite extensive and detailed. On the downside, the time span observed is rather short, ending with the fourth quarter of 2010, which is why newer macroprudential instruments (particularly capital buffers) were not included. Furthermore, the database provides only the implementation dates of policy measures; hence we cannot use it for distinguishing between announcement and implementation dates.

*Alam et al. (2019)*: The IMF’s iMaPP database integrates six former databases (inter alia the ESRB database mentioned above) and provides information on macroprudential policy measures from 1990 to 2016 on a monthly basis for 138 countries. In addition to standard tightening/loosening indices for a vast number of instruments, it offers an average loan-to-value (LTV) limit index, which provides something close to an intensity adjustment for LTV limits. Complemented by textual information on 27 instruments, some of which are broken down by targeted currency, iMaPP is highly suitable for cross-checking: there is no need to consult every single database already incorporated. This database also indicates whether a certain measure is considered to have a tightening or loosening impact, but not in an intensity-adjusted fashion. It only provides information on the implementation dates of policy actions. We therefore cannot differentiate the dates when a measure was decided on and when it was implemented for measures which we only found in iMaPP. Given iMaPP’s global focus, coverage for CESEE countries is not as extensive as by the three databases mentioned above. Nevertheless, it is a very suitable resource for cross-checking and a good starting point for extending the regional focus in future research.

Reassuringly, the basic information on almost all measures described in more than one of the databases coincides. As the date of announcement is only recorded in MaPPED and the ESRB database, the timing of the various measures was taken from these two databases, also when the implementation date found in the other databases differed. In the very rare case that policy-specific details were different across the four databases, we also opted for the information provided by the databases described in Budnik and Kleibl (2018) and Kochanska (2017) given their comprehensive nature and precise description of the measures. Nonetheless, it was possible to verify a very large proportion of the entries through multiple sources. Exceptions were the entries concerning the recent past that were covered only in

the ESRB database and partly in MaPPED. For these cases, however, a cross-check with official documents available on the ESRB website<sup>2</sup> was conducted wherever possible.

## 2 Construction and composition of the MPPI

We exemplified the codification of the measures feeding into the MPPI by differentiating between three basic weighting approaches (see section 1 of the paper). Here, we give a full overview of the specific instruments included in the MPPI and their respective weighting. Table 1 provides a short description of each instrument, the sources from which we mainly extracted information about each of the measures and details on their respective impact on the MPPI. In particular, the last column in table 1 specifies which changes of a certain instrument are necessary to induce a 1-point increase in the overall index as well as in the various subindices covering the instrument.<sup>3</sup> This allows for an easy comparison of the impact of different measures on the indices and facilitates calibration.

The subheadings in table 1 indicate to which subindex individual instruments belong. In the following, we provide more details on each subindex.

*CAP subindex:* contains measures targeting the capital requirements of credit institutions, such as the required minimum capital adequacy ratio (CAR), the required tier 1 capital ratio as well as recommendations and associated measures. The two indicators *CAR* and *Tier1* subsume information about binding requirements for credit institutions regarding their capital base. Recommendations are captured in *CAR\_recomm* and *Tier1\_recomm*, which are weighted less strongly due to their nonbinding nature. The residual group *CAR\_other* captures, for example, changes in the definitions of the capital base or other regulatory changes.

*RR subindex:* contains measures regarding minimum reserve requirements for credit institutions differentiated between domestic and foreign currency where applicable as well as associated measures. Unless stated otherwise, the minimum reserve requirements for domestic and foreign currency deposits are assumed to be the same. Their transformation ensures that, in case they differ, a change in either one of them is assigned less weight than if both are changed simultaneously. *RR\_base* acts as a residual group for changes in certain definitions and captures, for example, amendments as to which liabilities have to be included in the calculation of the reserve requirements.

*Capital-based subindex (CB-MPPI):* contains two subindices that target certain key figures related to the capitalization of credit institutions:

- *Buffer subindex:* comprises certain buffer rates, in particular the capital conservation buffer rate (CCoB), the countercyclical buffer rate (CCyB) and the systemic risk buffer rate (SyRB) applicable to credit institutions as well as the additional buffer rate for other systemically important institutions (O-SII buffer). Most of these buffer rates vary in size across countries. Functionally similar to minimum capital requirements, which are sometimes considered to be part of regulators’ microprudential toolkit, buffer rates are regarded as macroprudential instruments as they explicitly pursue a broader goal of preserving financial stability at a macro level. Moreover, compared with minimum capital requirements, buffers are a

<sup>2</sup> [https://www.esrb.europa.eu/national\\_policy/other/html/index.en.html](https://www.esrb.europa.eu/national_policy/other/html/index.en.html).

<sup>3</sup> To give an example, if the LTV limit were decreased by 5 percentage points, the overall MPPI as well as the BB-MPPI would increase by 1 index point.

rather recent phenomenon. Note that if the SyRB refers to all exposures (and not only to domestic ones), only the larger of the SyRB and O-SII buffer rate applies. This is relevant for Croatia and Romania in our dataset. In Croatia, we only recorded the SyRB as it applies to all credit institutions uniformly. In Romania, we recorded both the SyRB and the O-SII buffer, but with the SyRB set to its

Table 1

### Categorization of macroprudential policy instruments and weighting rules applied for intensity adjustment

Indicator	Description	Source(s)	Operationalization	Δ of instrument needed for Δ of +1 in index
<b>Minimum capital requirements (CAP subindex)</b>				
CAR	currently applicable capital adequacy ratio	Budnik and Kleibl (2018), Vandenbussche et al. (2015)	taken as is	increase of 1 percentage point
Tier1	currently applicable tier 1 capital ratio	Budnik and Kleibl (2018), Vandenbussche et al. (2015)	tier 1 ratio / 2	increase of 2 percentage points
CAR_recomm	recommendation for capital adequacy ratio, not binding	Budnik and Kleibl (2018), Alam et al. (2019)	if CAR_recomm > 0: (CAR_recomm – CAR) / 2	increase of 2 percentage points while CAR is constant
Tier1_recomm	recommendation for tier 1 capital ratio, not binding	Budnik and Kleibl (2018)	if Tier1_recomm > 0: (Tier1_recomm – Tier1) / 4	increase of 4 percentage points while Tier1 is constant
CAR_other	T/L-indicator for other tightening/loosening measures regarding capital requirements	Budnik and Kleibl (2018), Vandenbussche et al. (2015), Alam et al. (2019)	+/- 1 for tightening/loosening measures	1 tightening incident
<b>Minimum reserve requirements (RR subindex)</b>				
RR_LC	currently applicable reserve requirements for domestic currency deposits	Budnik and Kleibl (2018), Vandenbussche et al. (2015), Alam et al. (2019)	used for calculation of RR_calc	if RR_FC=RR_LC: increase of 5 percentage points in both
RR_FC	currently applicable reserve requirements for foreign currency deposits equal to RR_LC unless stated otherwise	Budnik and Kleibl (2018), Vandenbussche et al. (2015), Alam et al. (2019)		if RR_FC≠RR_LC increase of 10 percentage points in one of them c.p.
RR_calc	transformation of reserve requirements (domestic and foreign currency) includes marginal and special reserve requirements for foreign currency deposits (only Croatia) as follows: (MRR_rate/10)/2 or (SRR_rate/10)/4	authors' calculations	(RR_LC + RR_FC) / 10	for MRR_rate and SRR_rate in Croatia increase of 20 and 40 percentage points, respectively
RR_base	T/L-indicator for tightening/loosening measures regarding reserve requirements base	Budnik and Kleibl (2018), Vandenbussche et al. (2015), Alam et al. (2019)	+/- 0.25 for changes regarding single sectors/types +/- 0.50 for changes regarding general reserves	4 tightening incidents regarding single sectors/types 2 tightening incidents regarding general reserves
<b>Buffer requirements (buffer subindex)</b>				
CCoB	currently applicable capital conservation buffer rate	Budnik and Kleibl (2018), ESRB; Kochanska (2017)	taken as is	increase of 1 percentage point
CCyB	currently applicable counter-cyclical buffer rate	Budnik and Kleibl (2018), Alam et al. (2019), ESRB; Kochanska (2017)	taken as is	increase of 1 percentage point
SyRB	currently applicable systemic risk buffer rate	Budnik and Kleibl (2018), Alam et al. (2019), ESRB; Kochanska (2017)	taken as is (average if a range is given for the SyRB or if the SyRB is differentiated by institutions)	increase of the average rate applied to institutions by 1 percentage point
O-SII	currently applicable additional buffer rates for other systemically important institutions	ESRB; Kochanska (2017) ESRB website <sup>1</sup>	taken as is (average of all rates applied to institutions)	increase of the average rate applied to institutions by 1 percentage point

Source: Authors' compilation.

<sup>1</sup> [https://www.esrb.europa.eu/national\\_policy/systemically/html/index.en.html](https://www.esrb.europa.eu/national_policy/systemically/html/index.en.html).

Table 1 continued

### Categorization of macroprudential policy instruments and weighting rules applied for intensity adjustment

Indicator	Description	Source(s)	Operationalization	Δ of instrument needed for Δ of +1 in index
<b>Risk weights (RW subindex)</b>				
RW_MO_LC	currently applicable risk weights for residential real estate mortgage-backed loans denominated in local currency	Budnik and Kleibl (2018), Vandenbussche et al. (2015), Alam et al. (2019)	used for calculation of RW_MO_TO	for RW_MO_LC and RW_MO_FC:
RW_MO_FC	currently applicable risk weights for residential real estate mortgage-backed loans denominated in foreign currency	Budnik and Kleibl (2018), Vandenbussche et al. (2015), Alam et al. (2019)	default limit = 100	if RW_MO_LC = RW_MO_FC: increase of 10 percentage points in both c.p.
RW_Threshold	loan-to-value threshold above which a risk weight of 100% applies	Budnik and Kleibl (2018), Vandenbussche et al. (2015), Alam et al. (2019)	(RW_MO_LC + RW_MO_FC) / 20 + (100 – RW_Threshold) / 10	if RW_MO_LC ≠ RW_MO_FC: increase of 20 percentage points in one of them c.p.
RW_MO_TO	transformation of risk weights for residential real estate mortgage-backed loans	authors' calculations		for RW_Threshold: decrease of 10 percentage points c.p.
RW_CL_LC	currently applicable risk weights for consumer loans denominated in local currency	Budnik and Kleibl (2018), Vandenbussche et al. (2015)	used for calculation of RW_CL_TO	if RW_CL_FC = RW_CL_LC: increase of 25 percentage points in both
RW_CL_FC	currently applicable risk weights for consumer loans denominated in foreign currency equal to RW_CL_FC unless stated otherwise	Budnik and Kleibl (2018), Vandenbussche et al. (2015)	default limit = 100	if RW_CL_FC ≠ RW_CL_LC: increase of 50 percentage points in one of them c.p.
RW_CL_TO	transformation of risk weights for consumer loans	authors' calculations	RW_CL_LC / 25 + (RW_CL_FC - RW_CL_LC) / 50	
RW_other	T/L-indicator for other tightening/loosening measures regarding risk weights	Budnik and Kleibl (2018), Vandenbussche et al. (2015)	+/- 0.5 for tightening/loosening measures	2 tightening incidents
<b>Liquidity requirements (LR subindex)</b>				
LR_gen	T/L-indicator for tightening/loosening measures regarding general liquidity requirements	Budnik and Kleibl (2018), Alam et al. (2019), Vandenbussche (2015), ESRB; Kochanska (2017)	+/- 0.5 for tightening/loosening measures	2 tightening incidents
LR_FC	T/L-indicator for tightening/loosening measures regarding foreign currency liquidity requirements	Budnik and Kleibl (2018), Alam et al. (2019), Vandenbussche (2015), ESRB; Kochanska (2017)	+/- 0.5 for tightening/loosening measures	2 tightening incidents
<b>Single client exposure limits (SCE subindex)</b>				
SCE_limit	currently applicable single client exposure limit	Budnik and Kleibl (2018), ESRB; Kochanska (2017)	(35 – SCE_limit) / 10 default SCE_limit = 35	decrease of SCE_limit by 10 percentage points
SCE_def	currently applicable definition of a single client exposure	Budnik and Kleibl (2018), ESRB; Kochanska (2017)	(25 – SCE_def) / 10 default SCE_def = 25	decrease of SCE_def by 10 percentage points
SCE_agg	currently applicable limit for aggregate of all single client exposures	Budnik and Kleibl (2018), ESRB; Kochanska (2017)	(10 – SCE_agg / 100) / 4 default SCE_agg = 1000	decrease of SCE_agg by 400 percentage points
SCE_other	T/L-indicator for other tightening/loosening measures regarding intergroup exposure limits	Budnik and Kleibl (2018), ESRB; Kochanska (2017)	+/- 0.25 for tightening/loosening measures	4 tightening incidents
<b>Sectoral and market segment exposure limits (SMSE subindex)</b>				
SMSE	T/L indicator for tightening/loosening measures regarding sectoral and market segment exposures	Budnik and Kleibl (2018), ESRB; Kochanska (2017)	+/- 0.5 for tightening/loosening measures	2 tightening incidents

Source: Authors' compilation.

<sup>1</sup> [https://www.esrb.europa.eu/national\\_policy/systemically/html/index.en.html](https://www.esrb.europa.eu/national_policy/systemically/html/index.en.html)

Table 1 continued

### Categorization of macroprudential policy instruments and weighting rules applied for intensity adjustment

Indicator	Description	Source(s)	Operationalization	Δ of instrument needed for Δ of +1 in index
<b>Intragroup exposure limits (IGE subindex)</b>				
IGE_limit	currently applicable intragroup exposure limits	Budnik and Kleibl (2018), ESRB; Kochanska (2017)	$(35 - \text{IGE\_limit}) / 10$ default IGE_limit = 35	decrease of IGE_limit by 10 percentage points
IGE_other	T/L-indicator for other tightening/loosening measures regarding intragroup exposure limits	Budnik and Kleibl (2018), ESRB; Kochanska (2017)	+/- 0.25 for tightening/loosening measures	4 tightening incidents
<b>Foreign currency mismatch limits (FXM subindex)</b>				
FX_mis_single	currently applicable limit for exposure to an individual foreign currency	Budnik and Kleibl (2018), ESRB; Kochanska (2017)	$(25 - \text{FX\_mis\_single}) / 10$ default FX_mis_single = 25	decrease of FX_mis_single by 10 percentage points
FX_mis_agg	currently applicable limit for aggregate exposure to foreign currencies	Budnik and Kleibl (2018), ESRB; Kochanska (2017)	$(35 - \text{FX\_mis\_agg}) / 10$ default FX_mis_agg = 35	decrease of FX_mis_agg by 10 percentage points
FX_mis_other	T/L-indicator for other tightening/loosening measures regarding currency mismatch limits	Budnik and Kleibl (2018), ESRB; Kochanska (2017)	+/- 0.25 for tightening/loosening measures	4 tightening incidents
<b>Borrower-based instruments (borrower-based subindex)</b>				
LTV	currently applicable loan-to-value limit on collateralized house purchasing loans	Budnik and Kleibl (2018), Alam et al. (2019), Vandenbussche (2015), ESRB; Kochanska (2017)	$(100 - \text{LTV}) / 5$ default limit 100	decrease of LTV limit by 5 percentage points
LTV_FC	T/L-indicator for tightening/loosening measures regarding foreign currency loan-to-value limits	Budnik and Kleibl (2018), Alam et al. (2019), Vandenbussche (2015), ESRB; Kochanska (2017)	+/- 0.5 for tightening/loosening measures	2 tightening incidents
LTV_other	T/L-indicator for other tightening/loosening measures or recommendations regarding loan-to-value limits	Budnik and Kleibl (2018), Alam et al. (2019), Vandenbussche (2015), ESRB; Kochanska (2017)	+/- 0.5 for tightening/loosening measures	2 tightening incidents
DSTI	currently applicable debt service-to-income limits	Budnik and Kleibl (2018), Alam et al. (2019), Vandenbussche (2015), ESRB; Kochanska (2017)	$(1 - (\text{DSTI} / 60)) * 12$ default limit 60	decrease of DSTI limit by 5 percentage points
DSTI_FC	T/L-indicator for other tightening/loosening measures regarding foreign currency debt service-to-income limits	Budnik and Kleibl (2018), Alam et al. (2019), Vandenbussche (2015), ESRB; Kochanska (2017)	+/- 0.5 for tightening/loosening measures	2 tightening incidents
DSTI_other	T/L-indicator for other tightening/loosening measures or recommendations regarding debt service-to-income limits	Budnik and Kleibl (2018), Alam et al. (2019), Vandenbussche (2015), ESRB; Kochanska (2017)	+/- 0.5 for tightening/loosening measures	2 tightening incidents
BANS_FC	T/L-indicator for tightening/loosening of outright bans on foreign currency lending	Budnik and Kleibl (2018), ESRB; Kochanska (2017)	+/- 6 for tightening/loosening measures	–

Source: Authors' compilation.

<sup>1</sup> [https://www.esrb.europa.eu/national\\_policy/systemically/html/index.en.html](https://www.esrb.europa.eu/national_policy/systemically/html/index.en.html).

minimum value (it ranges from 1% to 2%) and recorded the O-SII buffer also with 1% as almost all O-SIIs in Romania are subject to a higher SyRB of 2%.

- *RW subindex*: contains measures regarding risk weights for mortgage and consumer loans that have to be applied by credit institutions to calculate their risk-weighted assets. These measures are, where applicable, differentiated between domestic



and foreign currency. Similar to minimum reserve requirements, the risk weights on domestic and foreign currency loans (both mortgage and consumer loans) are assumed to be the same unless stated otherwise, and a change in only one of them is weighted less strongly. For mortgage loans, most countries have defined an LTV limit above which a risk weight of 100% applies, whereas lower risk weights tend to be applied to loans below such limits. This is reflected in the operationalization of these measures. A residual group captures changes in definitions as to which assets these risk weights have to be applied or changes to the valuation procedures of property in case of mortgage loans.

*Liquidity-based subindex (LB-MPPI)*: contains five subindices that target certain key figures related to the liquidity situation and concentration risk of credit institutions:

- *LR subindex*: contains measures aimed at the liquidity of institutions, such as different short-run liquidity ratios differentiated by currency as well as associated measures. Given their complexity (e.g. as to the applicability on different capital bases), they are coded in a simple tightening/loosening (T/L)-indicator manner (dummy approach as specified in section 1 of the paper).
- *SCE subindex*: comprises maximum limits as well as definitions of exposure limits on single clients or connected groups of clients and limits on the aggregate exposure to such clients. The definition of when an exposure to a single client is “large” has direct repercussions on the sum of all these exposures and hence relates to the aggregate exposure to single clients. Thus, all three measures are included. The residual group *SCE\_other* captures other regulatory changes connected to these measures.
- *SMSE subindex*: contains exposure limits on certain sectors or market segments that a credit institution is obligated to adhere to. Such limits can apply to many sectors or market segments and the maximum limits can vary, which explains the codification in a simple T/L-indicator manner.
- *IGE subindex*: includes intragroup or intrabank exposure limits as well as associated measures. These limits regulate, for example, the exposure of banks to other members of its own group, which is particularly relevant for CESEE, given its traditionally large share of foreign subsidiaries and interlinked banking systems.
- *FXM subindex*: contains exposure limits on a single foreign currency as well as on foreign currencies overall for credit institutions. Associated measures like exemptions from these limits or tighter regulations for individual currencies are captured in a residual group.

*Borrower-based subindex (BB-MPPI)*: while the subindices above rather target the capital or liquidity part of key balance sheet figures of credit institutions, this category is aimed at credit institutions’ borrowers. It contains information about LTV and DSTI limits as well as associated measures, differentiating between domestic and foreign currency where applicable. Both LTV and DSTI limits for domestic currency loans were coded in an intensity-adjusted manner. However, as far as the limits on foreign currency loans are concerned, they often differ depending on certain foreign currencies and exemptions are thus made on a regular basis. Therefore, it was not possible to conduct a meaningful and comparable intensity adjustment. As a result, we likewise coded LTV and DSTI limits on foreign currency loans in a simple T/L-indicator manner. The same holds true for recommendations and definitional changes of borrower-based measures. Note that for the LTV limit, we explicitly consider measures that apply to collateralized house purchase loans as

definitions of mortgage loans differ sometimes across countries (see the example of Slovakia in section 2.3 of the paper). Finally, the borrower-based subindex includes also outright bans on foreign currency lending imposed by authorities.

All the four databases we used to construct our subindices provide implementation dates, i.e. the date when a certain measure becomes active. Two of these databases also provide information on the announcement or decision dates (MaPPED and the ESRB database). We compiled information regarding both the announcement and the implementation date whenever possible. For most instruments, the difference between these dates is of minor importance. Mostly, the difference between announcing a measure and implementing it does not exceed one quarter. However, considerably longer lead times can be observed for capital buffer requirements and minimum capital requirements. For instance, in the case of the CCyB, it takes up to one year between announcing and activating it. Moreover, another year can pass after activation to fully accumulate the targeted buffer, e.g. via retained earnings. Table 2 provides an overview of average time spans (i.e. delays) between announcement and implementation for instruments which were implemented more than one quarter after having been announced or decided on.

A first version of the MPPI is based on the implementation dates of macroprudential policies (shown in chart 2 of the paper), which reflects a common practice in the literature. We also constructed another version, using only the dates of announcement. A third version differentiates between the nature of the measures and the type of date used. In particular, a tightening measure, e.g. an increase in the required minimum capital adequacy ratio, that will become active in, say, two quarters’ time enables a credit institution to react instantaneously by building up larger capital reserves if necessary. In contrast, a loosening policy action for the same instrument would in turn not allow for an instantaneous reaction as the old regulations stay in place until the implementation date. Hence, for this third version of the MPPI, we used announcement dates for tightening policy measures, while factoring in the implementation dates for loosening measures. This version of the index is used for the econometric investigation in section 3 of our paper and for all charts shown in this supplement.

### 3 The MPPI and its subindices

By simply adding up the capital-based, the liquidity-based and the borrower-based subindices, we obtain the narrow macroprudential policy index (N-MPPI for short). By adding minimum capital requirements (i.e. the CAP subindex) and the subindex capturing changes in minimum reserve requirements (RR subindex) to the N-MPPI, we construct the (extended) MPPI. Empirical analyses can thus easily incorporate information about changes in the macroprudential environment and their magnitude. Subdividing the MPPI into several subindices also allows to investigate certain MPP instruments and their influence on variables of interest on a more disaggregated level. Chart 1 shows the MPPI for the eleven EU Member States in CESEE<sup>4</sup> as well as an aggregate for these countries that was compiled by simply averaging over all countries. Chart 2 shows the same for the N-MPPI. Charts 3 and 4 illustrate the role of the different components of the MPPI and the

<sup>4</sup> CESEE-11: Bulgaria (BG), the Czech Republic (CZ), Estonia (EE), Croatia (HR), Hungary (HU), Lithuania (LT), Latvia (LV), Poland (PL), Romania (RO), Slovenia (SI), Slovakia (SK).



N-MPPI, respectively. Charts 5 to 16 then depict the various subindices, beginning with the aggregate capital-based, liquidity-based and borrower-based MPP sub-indices, which are then followed by the individual subindices.

Table 2

### Differences between the announcement and implementation dates of MPP measures

Country	Instrument category	Average delay (in quarters)	Measure code
BG	–	–	–
CZ	Liquidity requirements (phasing-in)	10	CZ.1003.151000.00
EE	Risk weights	3	EE.0301.140100.00
HR	Risk weights	3	HR.0303.100300.00 HR.0303.100300.01
	Liquidity requirements	4	HR.1003.151000.00
	Intragroup exposure limits	3	HR.0902.100300.00 HR.0902.140100.00
	Single client exposure limits (phasing-in)	15	HR.0901.130700.00 HR.0901.130700.01
	Sectoral and market segment exposure limits	4	HR.0903.100300.00 HR.0905.140100.00
HU	Risk weights	2	HU.0301.140100.00
	Liquidity requirements	4	HU.1006.160100.00
	Single client exposure limits	3	HU.0901.140100.02
LT	Risk weights	3	LT.0301.140100.00
	Liquidity requirements	3	LT.1006.090400.00
LV	Foreign currency mismatch limits	3	LV.1005.140100.00
PL	Risk weights	3	PL.0301.070400.00 PL.0301.120600.00 PL.RIWO.586 (ESRB)
	Liquidity requirements	6	PL.1003.080700.00 PL.1003.080700.01
	Loan-to-value (LTV) limits	3	PL.0601.101200.00 PL.0601.120100.01 PL.0601.140100.00
	Debt service-to-income (DSTI) limits	3	PL.0604.101200.00 PL.0604.101200.01 PL.0604.101200.02 PL.0604.120100.00
RO	Risk weights	3	RO.0301.140100.00
SI	Liquidity requirements	4	SI.1003.130400.00 SI.1003.130400.01
SK	Intragroup exposure limits	3	SK.0902.140100.00
	Sectoral and market segment exposure limits	3	SK.0903.140100.00

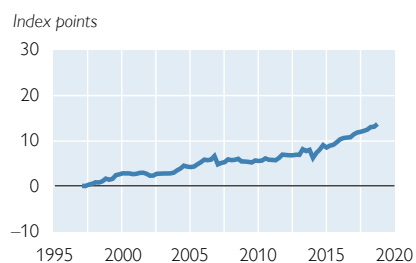
Source: Authors' compilation, ECB, ESRB.

Note: This table shows average delays (between announcement and implementation) for measures where the delay exceeded one quarter. Minimum capital requirements and buffer rates, for which longer delays are part of the implementation process, are excluded. The last column provides the codes under which the measures can be found in the ECB's MaPPED database (Budnik and Kleibl, 2018) or, if indicated, in the ESRB database (Kochanska, 2017).

Chart 1

## Intensity-adjusted macroprudential policy index (MPPI)

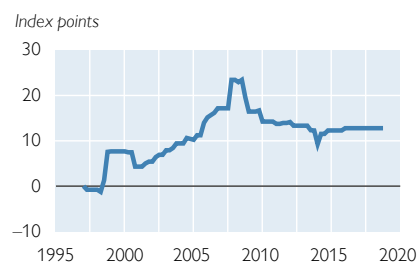
### CESEE-11



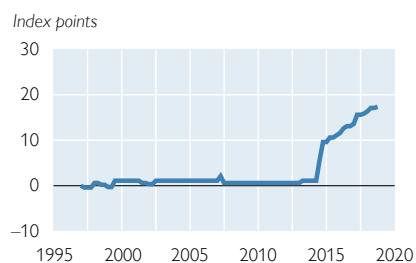
### Bulgaria



### Croatia



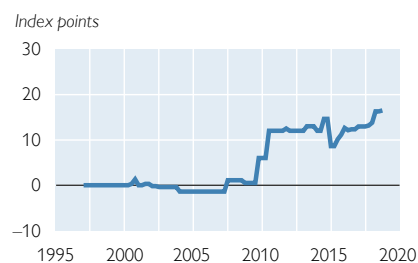
### Czech Republic



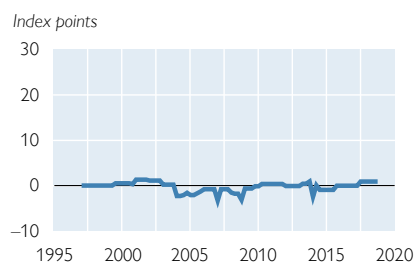
### Estonia



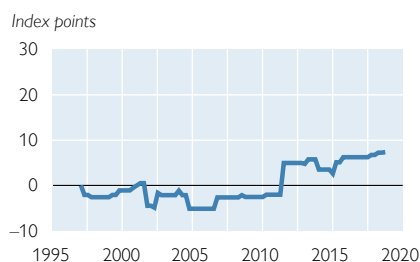
### Hungary



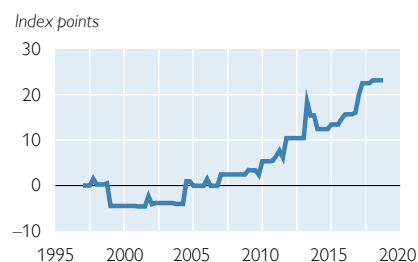
### Latvia



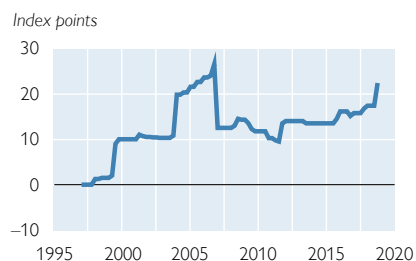
### Lithuania



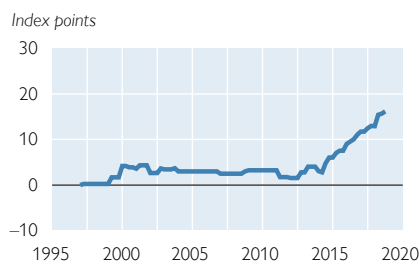
### Poland



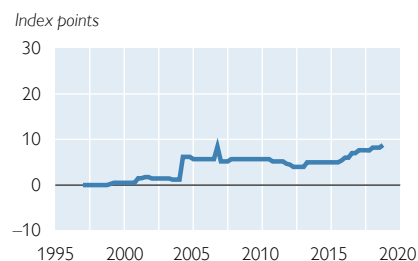
### Romania



### Slovakia



### Slovenia



— MPPI

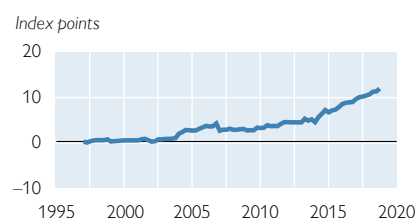
Source: Authors' calculations based on Alam et al. (2019), Budnik and Kleibl (2018), Kochanska (2017), Vandenbussche et al. (2015).

Note: Data are based on announcement dates of tightening and implementation dates of loosening macroprudential measures.

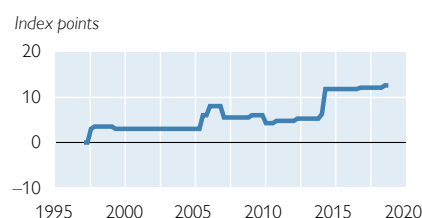
Chart 2

## Intensity-adjusted narrow macroprudential policy index (N-MPPI)

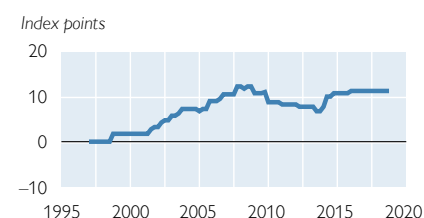
### CESEE-11



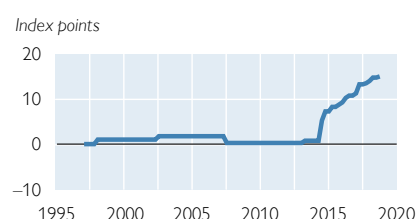
### Bulgaria



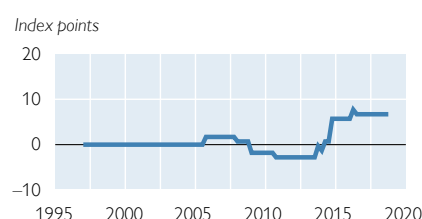
### Croatia



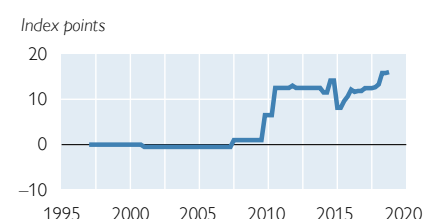
### Czech Republic



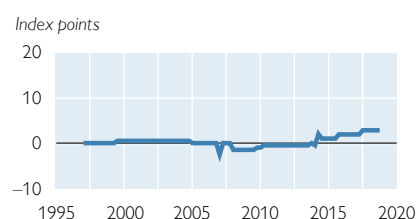
### Estonia



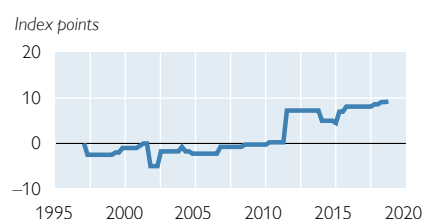
### Hungary



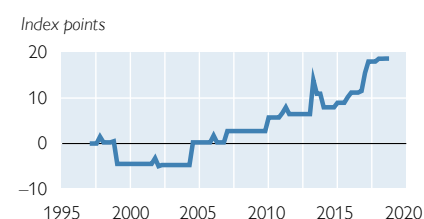
### Latvia



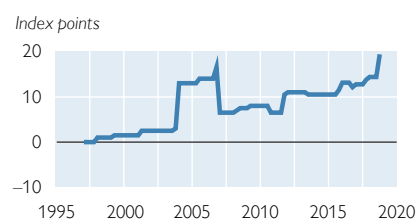
### Lithuania



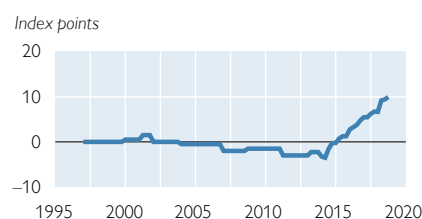
### Poland



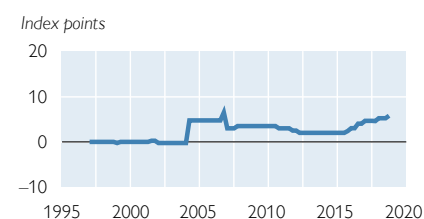
### Romania



### Slovakia



### Slovenia



— N-MPPI

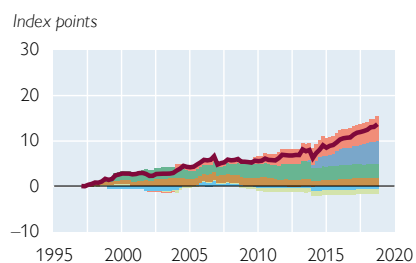
Source: Authors' calculations based on Alam et al. (2019), Budnik and Kleibl (2018), Kochanska (2017), Vandenbussche et al. (2015).

Note: Data are based on announcement dates of tightening and implementation dates of loosening macroprudential measures.

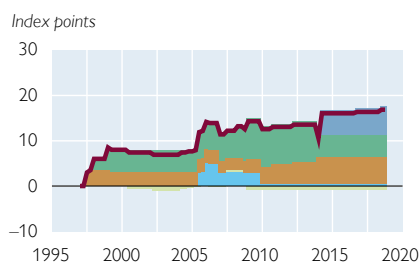
Chart 3

## Intensity-adjusted MPPI and subindex contributions in CESEE-11

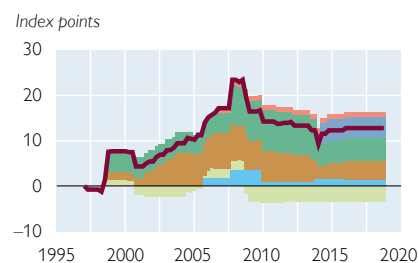
### CESEE-11



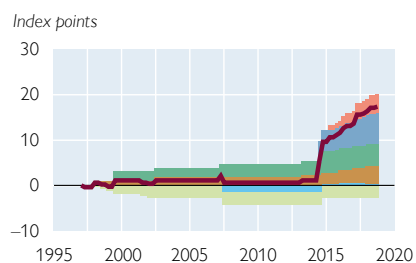
### Bulgaria



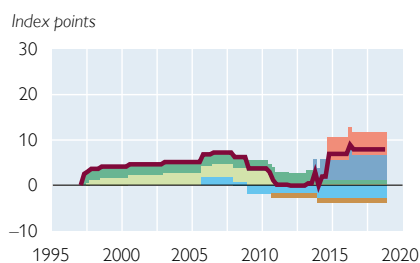
### Croatia



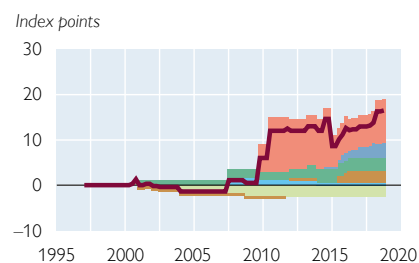
### Czech Republic



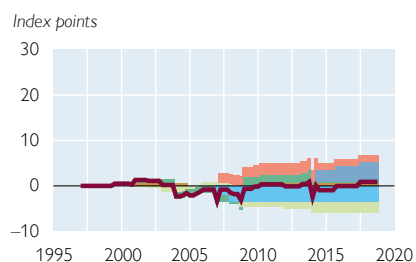
### Estonia



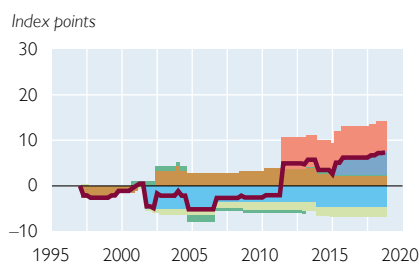
### Hungary



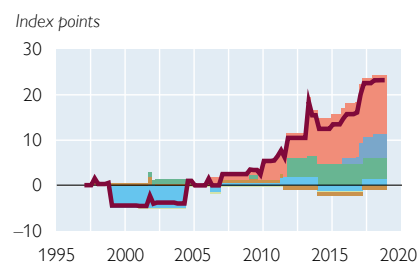
### Latvia



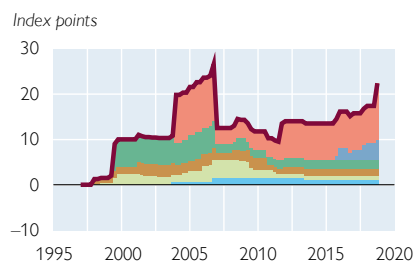
### Lithuania



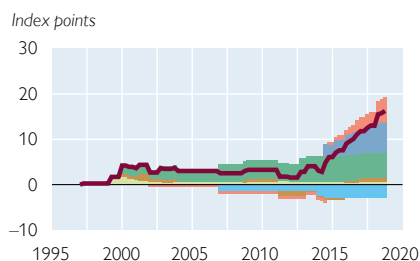
### Poland



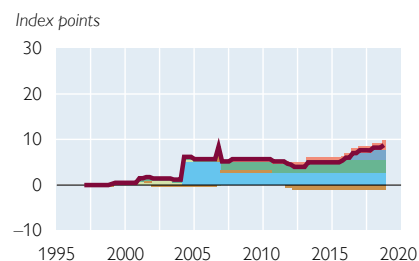
### Romania



### Slovakia



### Slovenia



Legend: MPPI (dark red line), Capital requirements (green), Reserve requirements (light green), Buffer requirements (blue), Risk weights (light blue), Liquidity-based measures (orange), Borrower-based measures (red).

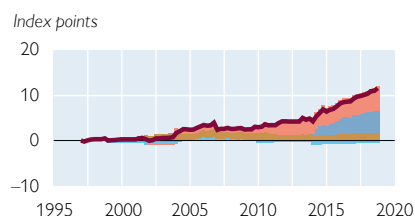
Source: Authors' calculations based on Alam et al. (2019), Budnik and Kleibl (2018), Kochanska (2017), Vandenbussche et al. (2015).

Note: Data are based on announcement dates of tightening and implementation dates of loosening macroprudential measures.

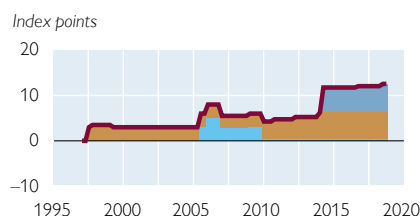
Chart 4

## Intensity-adjusted N-MPPI and subindex contributions in CESEE-11

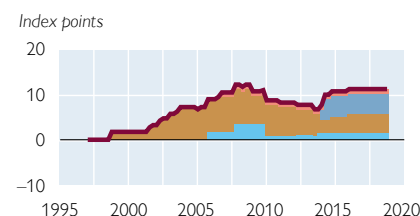
### CESEE-11



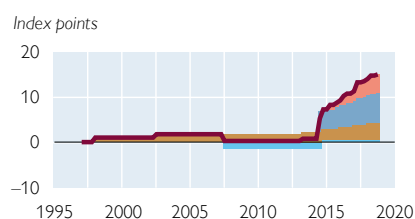
### Bulgaria



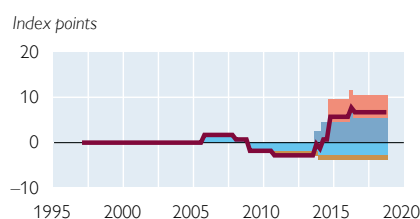
### Croatia



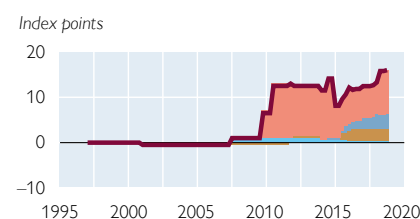
### Czech Republic



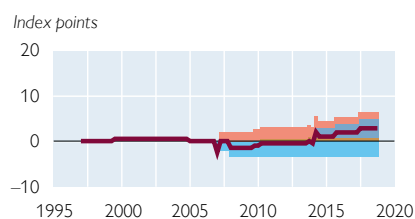
### Estonia



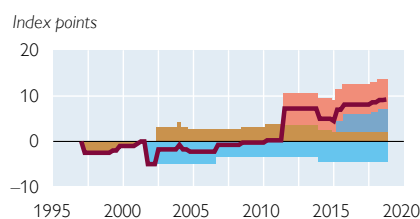
### Hungary



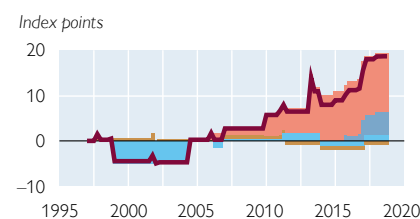
### Latvia



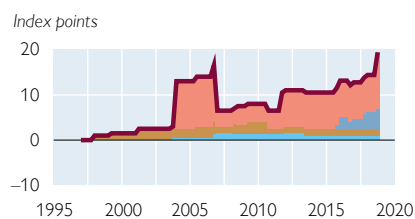
### Lithuania



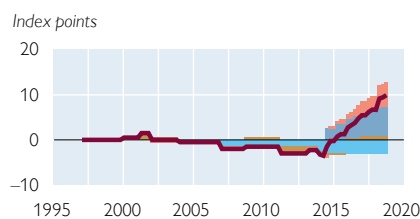
### Poland



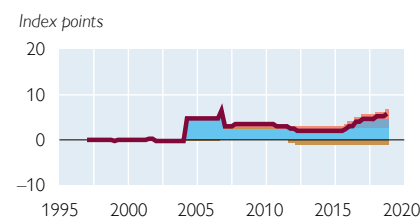
### Romania



### Slovakia



### Slovenia



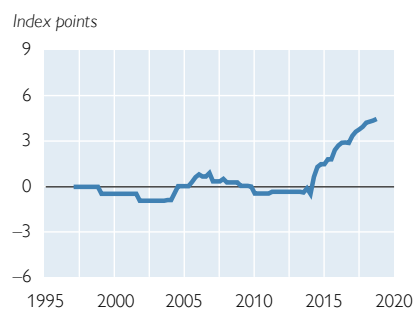
— N-MPPI — Buffer requirements — Risk weights — Liquidity-based measures — Borrower-based measures

Source: Authors' calculations based on Alam et al. (2019), Budnik and Kleibl (2018), Kochanska (2017), Vandenbussche et al. (2015).

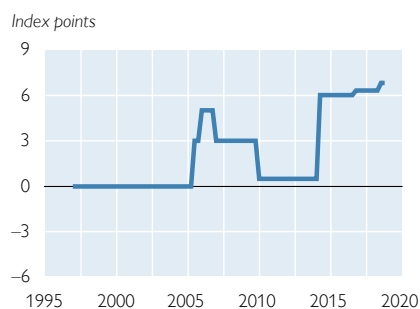
Note: Data are based on announcement dates of tightening and implementation dates of loosening macroprudential measures.

## Intensity-adjusted capital-based macroprudential policy subindex (CB-MPPI)

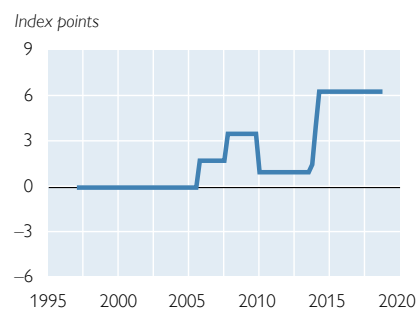
### CESEE-11



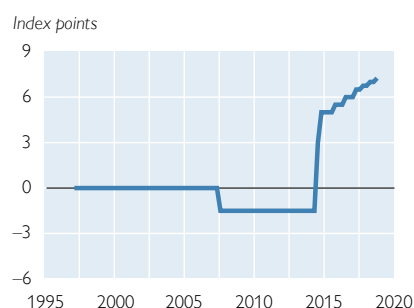
### Bulgaria



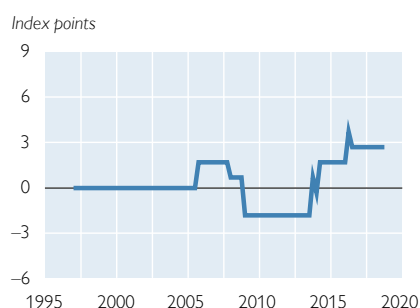
### Croatia



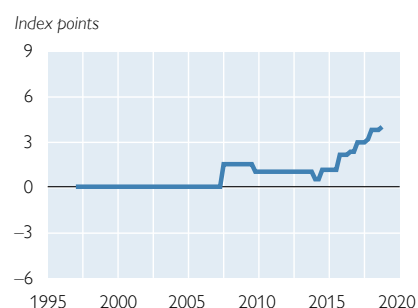
### Czech Republic



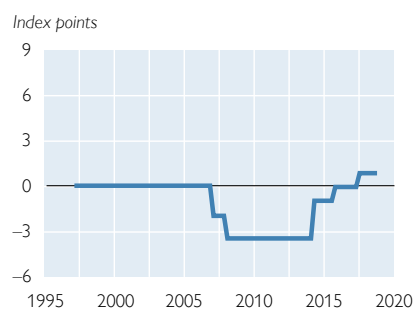
### Estonia



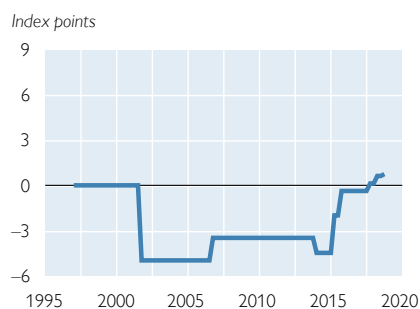
### Hungary



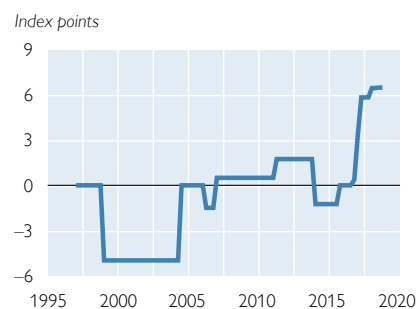
### Latvia



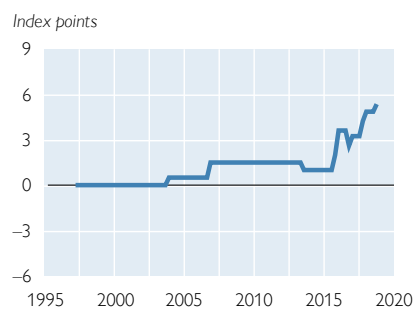
### Lithuania



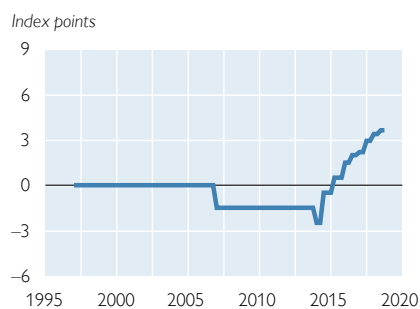
### Poland



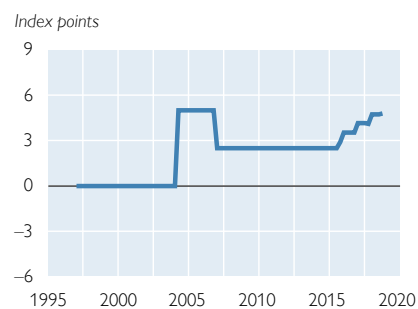
### Romania



### Slovakia



### Slovenia



— CB-MPPI

Source: Authors' calculations based on Alam et al. (2019), Budnik and Kleibl (2018), Kochanska (2017), Vandenbussche et al. (2015).

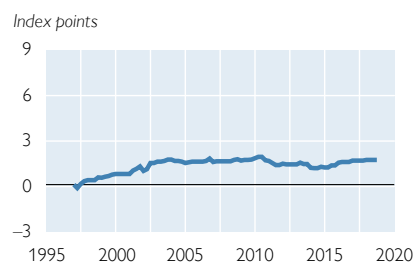
Note: Data are based on announcement dates of tightening and implementation dates of loosening macroprudential measures.



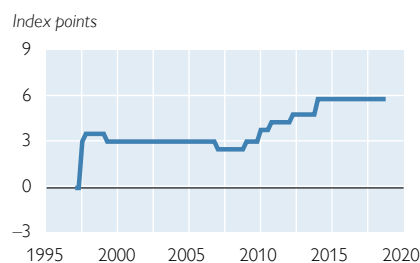
Chart 6

## Intensity-adjusted liquidity-based macroprudential policy subindex (LB-MPPI)

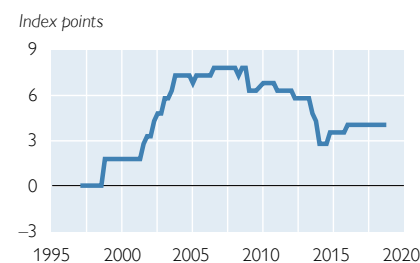
### CESEE-11



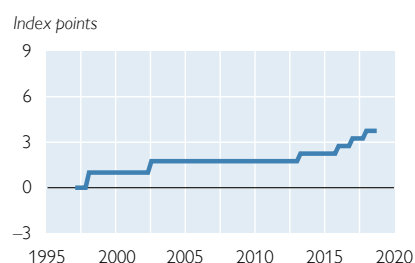
### Bulgaria



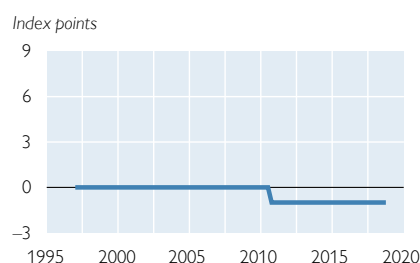
### Croatia



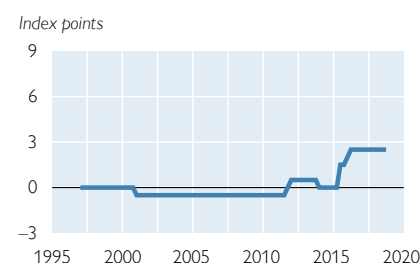
### Czech Republic



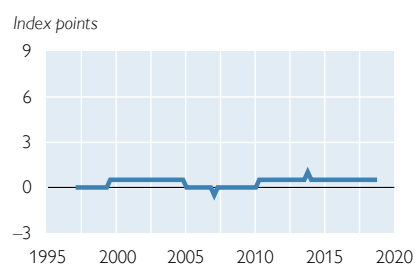
### Estonia



### Hungary



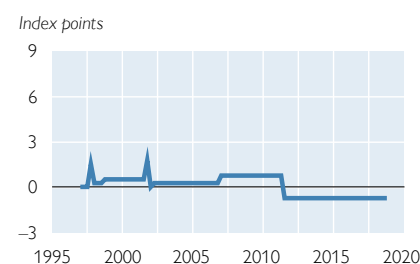
### Latvia



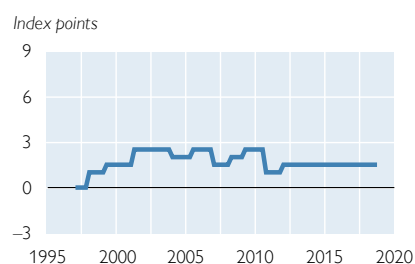
### Lithuania



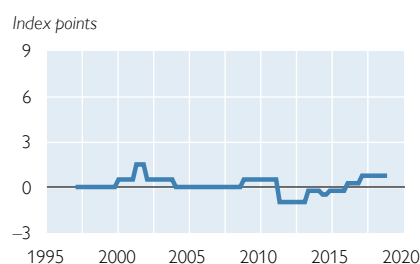
### Poland



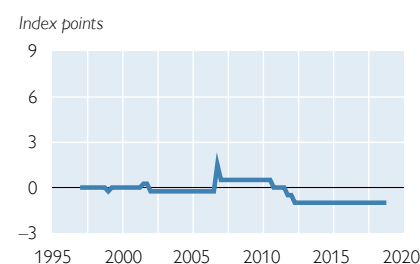
### Romania



### Slovakia



### Slovenia



— LB-MPPI

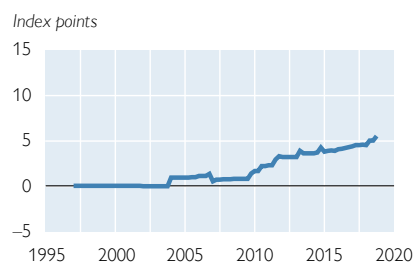
Source: Authors' calculations based on Alam et al. (2019), Budnik and Kleibl (2018), Kochanska (2017), Vandenbussche et al. (2015).

Note: Data are based on announcement dates of tightening and implementation dates of loosening macroprudential measures.

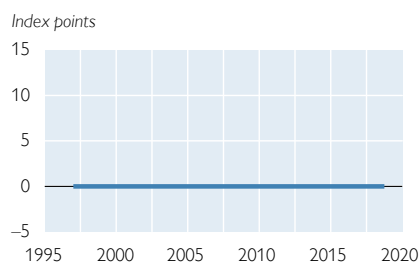
Chart 7

## Intensity-adjusted borrower-based macroprudential policy subindex (BB-MPPI)

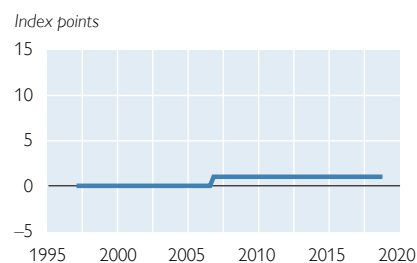
### CESEE-11



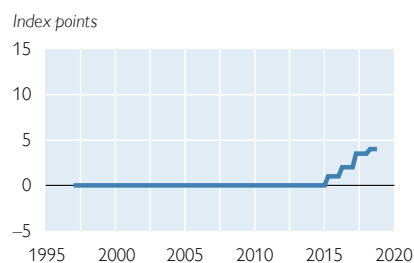
### Bulgaria



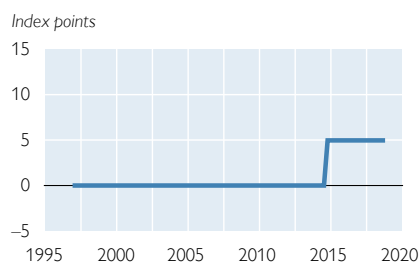
### Croatia



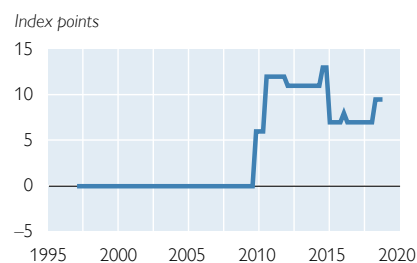
### Czech Republic



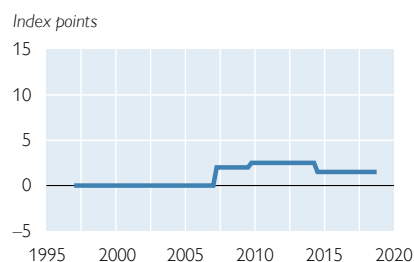
### Estonia



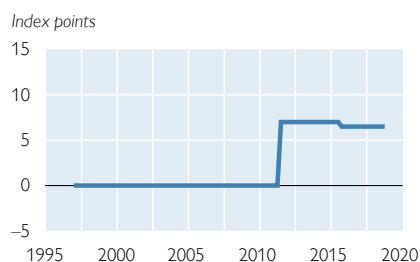
### Hungary



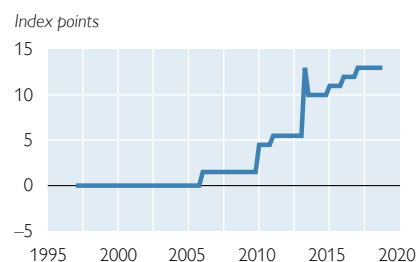
### Latvia



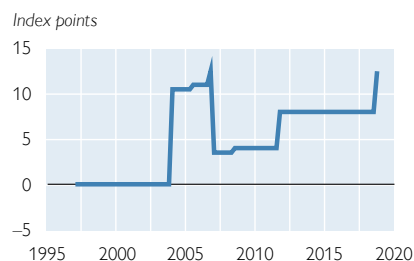
### Lithuania



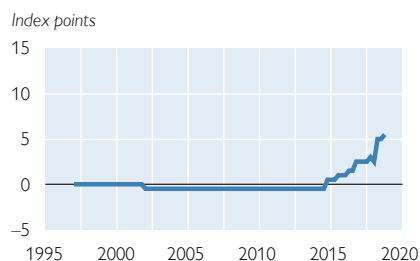
### Poland



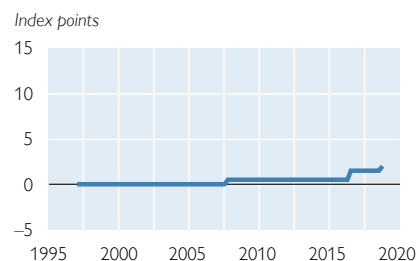
### Romania



### Slovakia



### Slovenia



— BB-MPPI

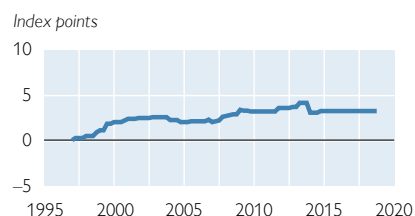
Source: Authors' calculations based on Alam et al. (2019), Budnik and Kleibl (2018), Kochanska (2017), Vandenbussche et al. (2015).

Note: Data are based on announcement dates of tightening and implementation dates of loosening macroprudential measures.

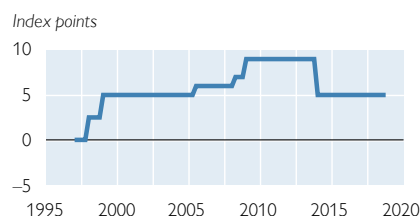
Chart 8

## Intensity-adjusted minimum capital requirements (CAP subindex)

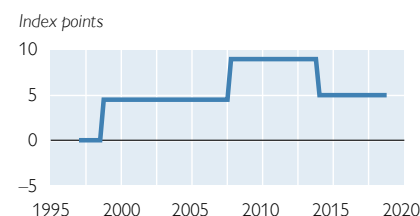
### CESEE-11



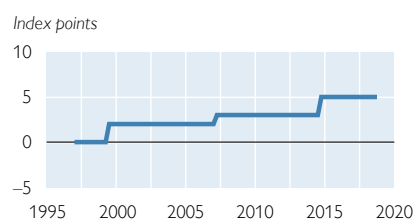
### Bulgaria



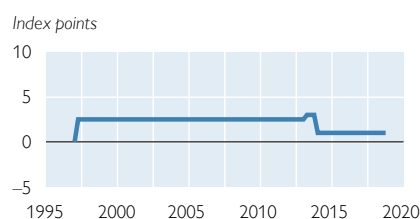
### Croatia



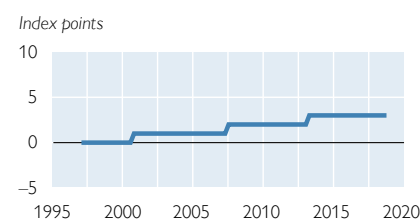
### Czech Republic



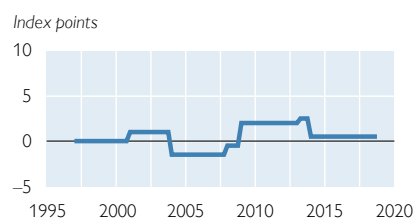
### Estonia



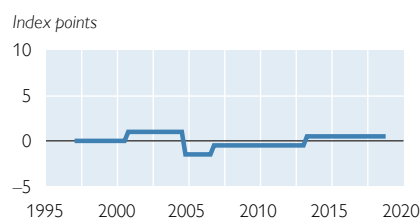
### Hungary



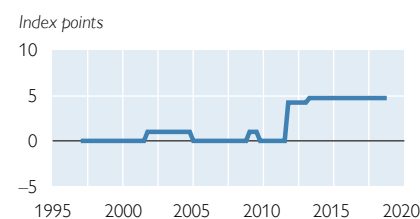
### Latvia



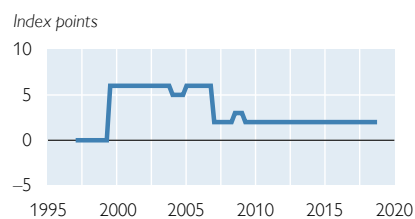
### Lithuania



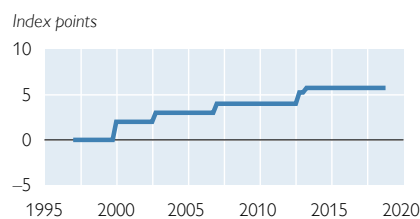
### Poland



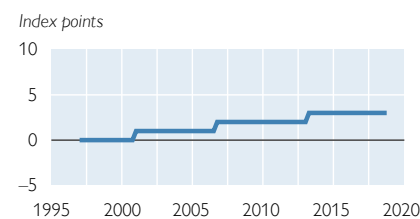
### Romania



### Slovakia



### Slovenia



— CAP subindex

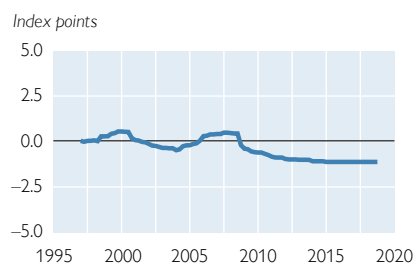
Source: Authors' calculations based on Alam et al. (2019), Budnik and Kleibl (2018), Kochanska (2017), Vandenbussche et al. (2015).

Note: Data are based on announcement dates of tightening and implementation dates of loosening macroprudential measures.

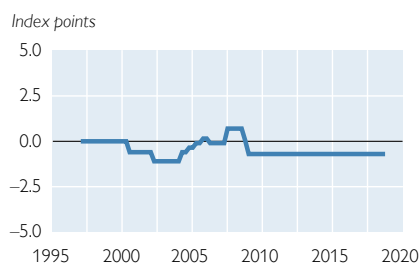
Chart 9

## Intensity-adjusted minimum reserve requirements (RR subindex)

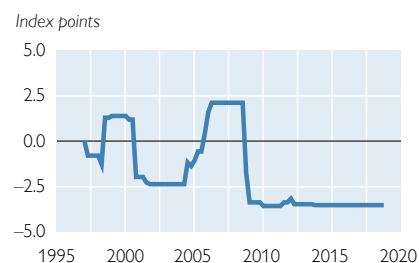
### CESEE-11



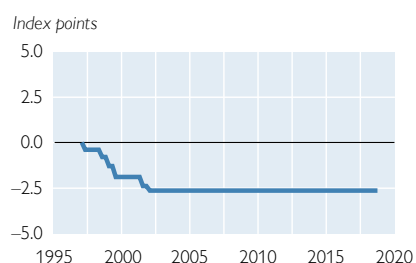
### Bulgaria



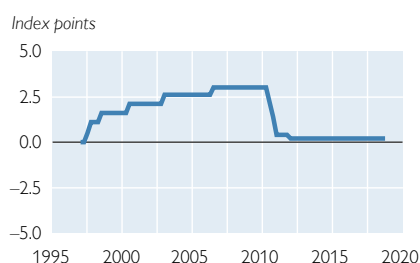
### Croatia



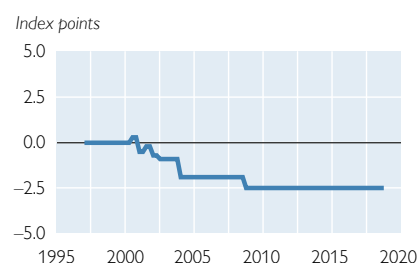
### Czech Republic



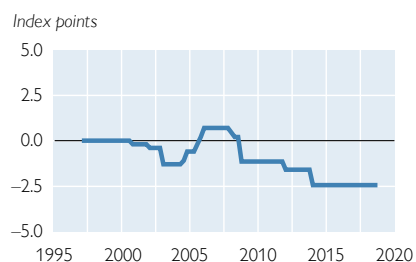
### Estonia



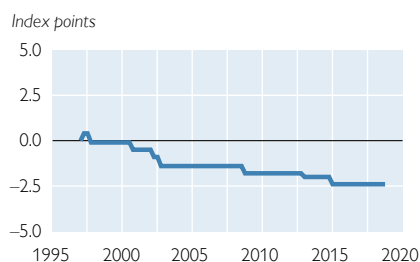
### Hungary



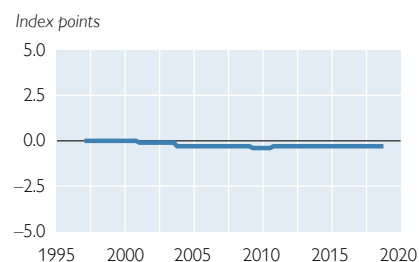
### Latvia



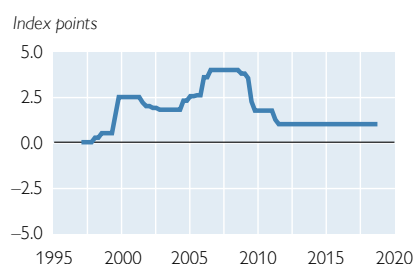
### Lithuania



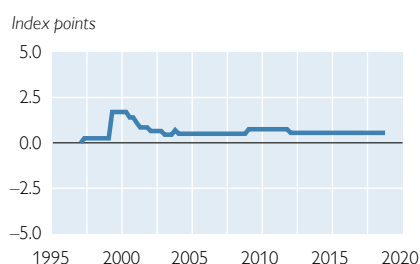
### Poland



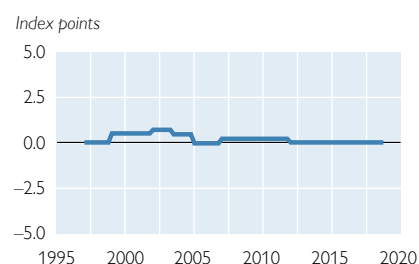
### Romania



### Slovakia



### Slovenia



— RR subindex

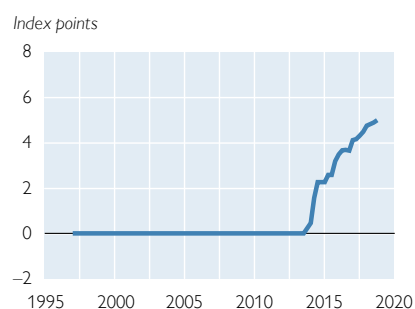
Source: Authors' calculations based on Alam et al. (2019), Budnik and Kleibl (2018), Kochanska (2017), Vandenbussche et al. (2015).

Note: Data are based on announcement dates of tightening and implementation dates of loosening macroprudential measures.

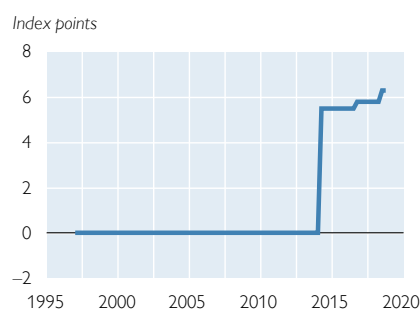
Chart 10

## Intensity-adjusted buffer requirements (buffer subindex)

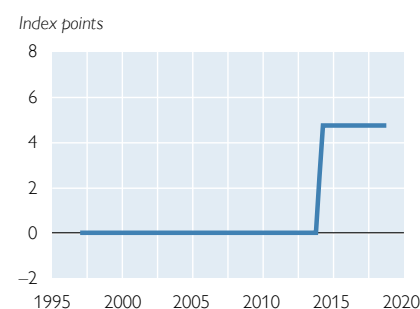
### CESEE-11



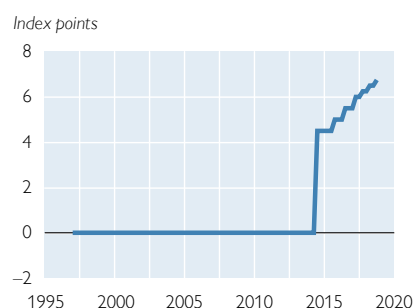
### Bulgaria



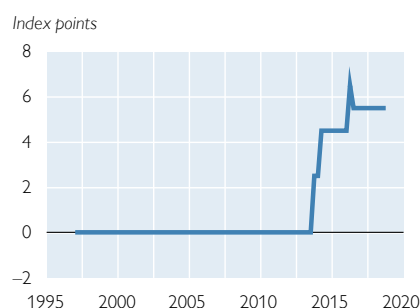
### Croatia



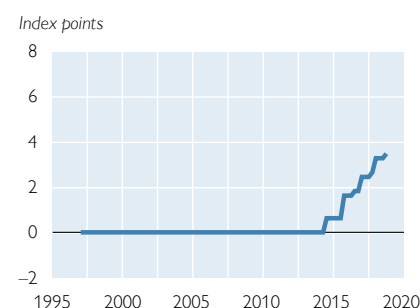
### Czech Republic



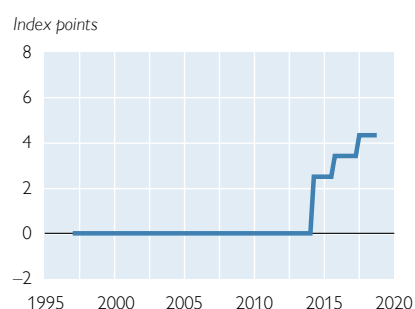
### Estonia



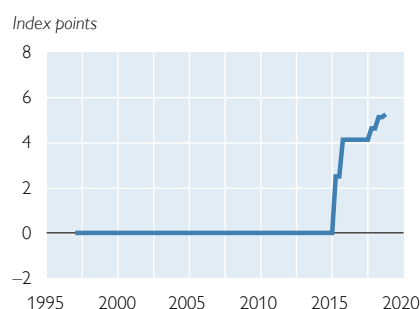
### Hungary



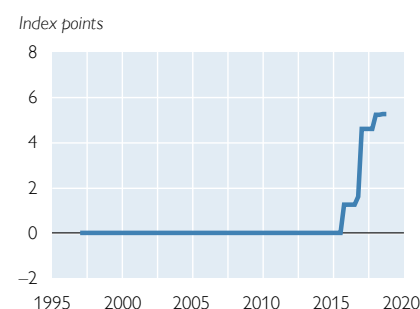
### Latvia



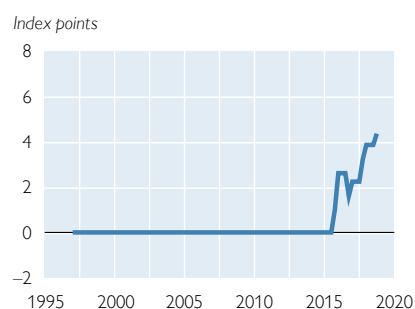
### Lithuania



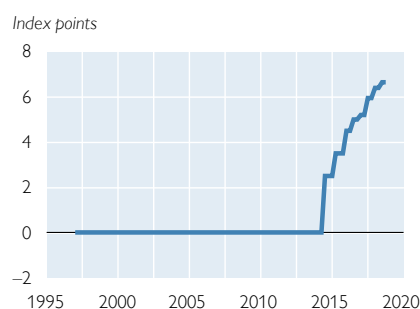
### Poland



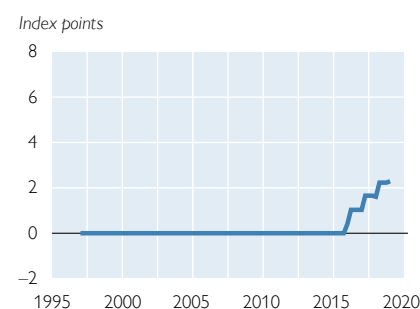
### Romania



### Slovakia



### Slovenia



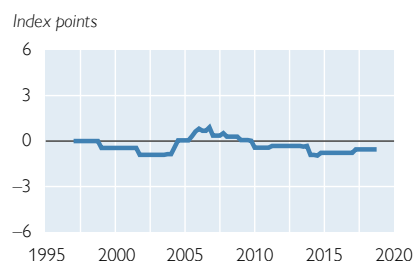
— Buffer subindex

Source: Authors' calculations based on Alam et al. (2019), Budnik and Kleibl (2018), Kochanska (2017), Vandenbussche et al. (2015).

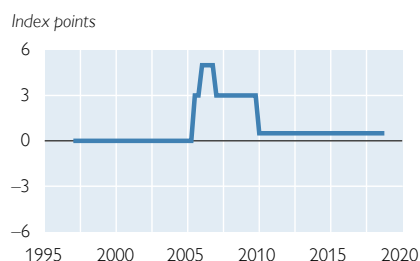
Note: Data are based on announcement dates of tightening and implementation dates of loosening macroprudential measures.

## Intensity-adjusted risk weights (RW subindex)

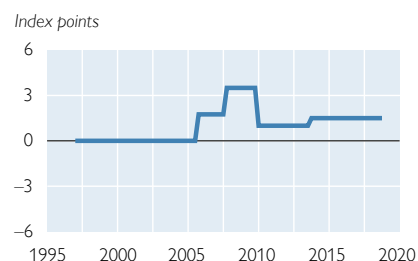
### CESEE-11



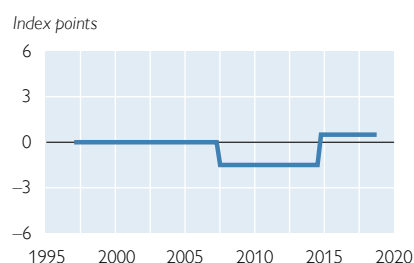
### Bulgaria



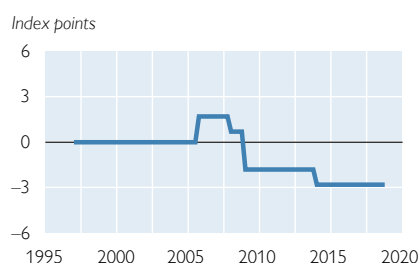
### Croatia



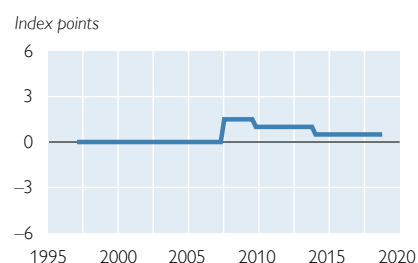
### Czech Republic



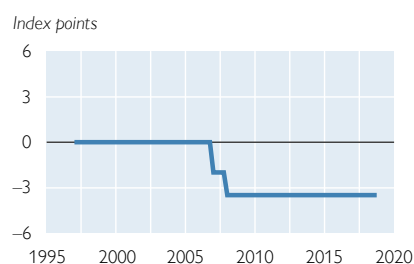
### Estonia



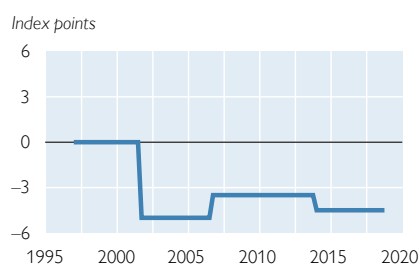
### Hungary



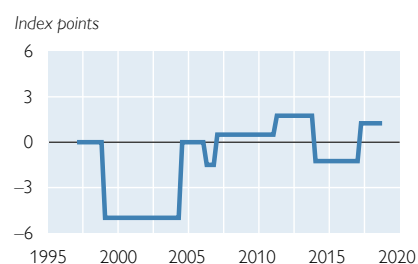
### Latvia



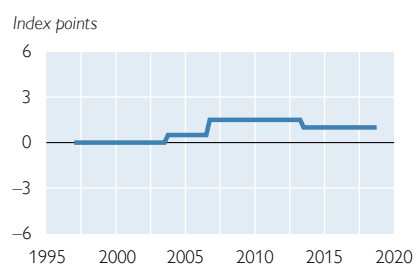
### Lithuania



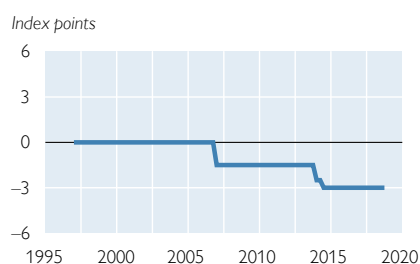
### Poland



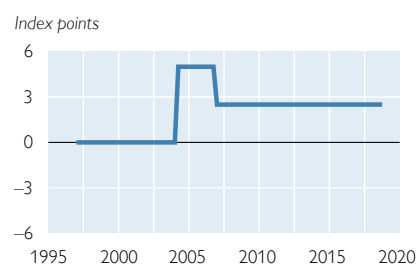
### Romania



### Slovakia



### Slovenia



— RW subindex

Source: Authors' calculations based on Alam et al. (2019), Budnik and Kleibl (2018), Kochanska (2017), Vandenbussche et al. (2015).

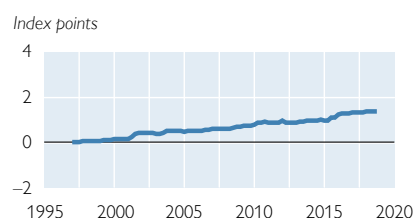
Note: Data are based on announcement dates of tightening and implementation dates of loosening macroprudential measures.



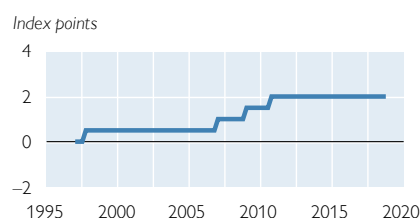
Chart 12

## Intensity-adjusted liquidity requirements (LR subindex)

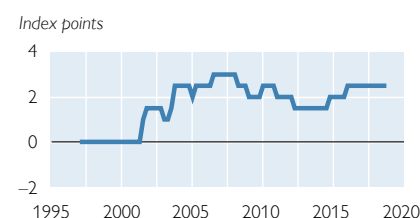
### CESEE-11



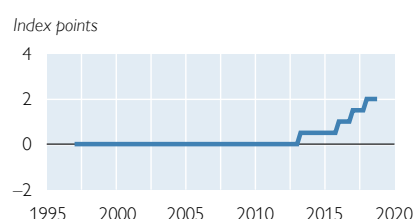
### Bulgaria



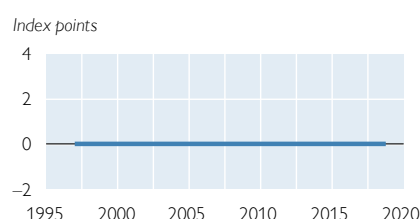
### Croatia



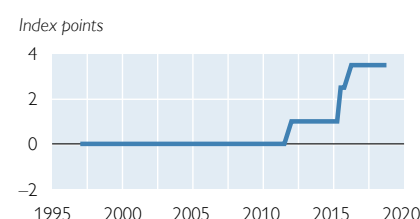
### Czech Republic



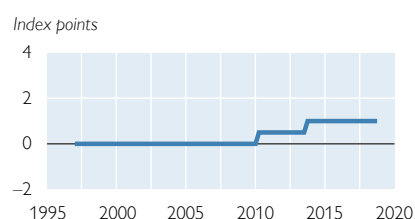
### Estonia



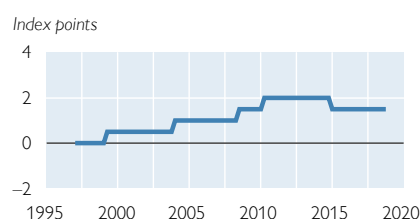
### Hungary



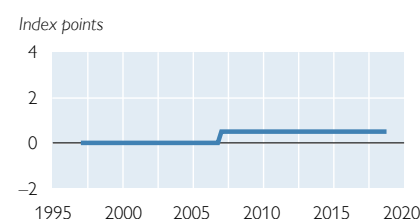
### Latvia



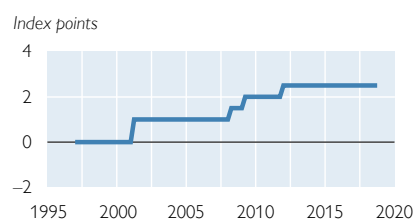
### Lithuania



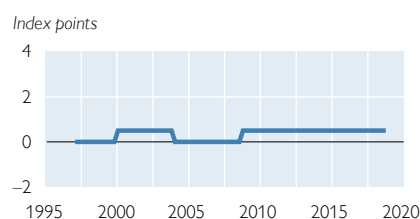
### Poland



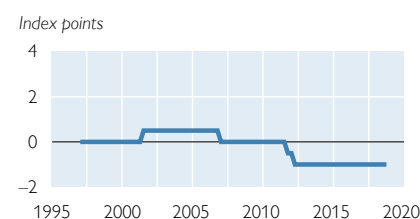
### Romania



### Slovakia



### Slovenia



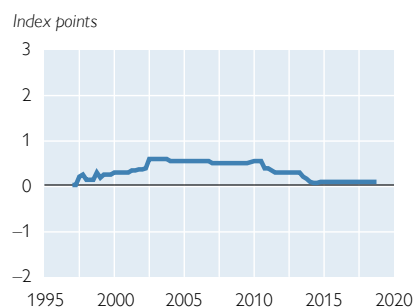
— LR subindex

Source: Authors' calculations based on Alam et al. (2019), Budnik and Kleibl (2018), Kochanska (2017), Vandenbussche et al. (2015).

Note: Data are based on announcement dates of tightening and implementation dates of loosening macroprudential measures.

## Intensity-adjusted single client exposure limits (SCE subindex)

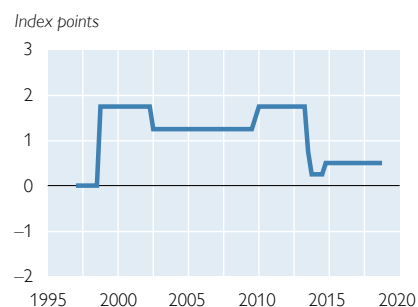
### CESEE-11



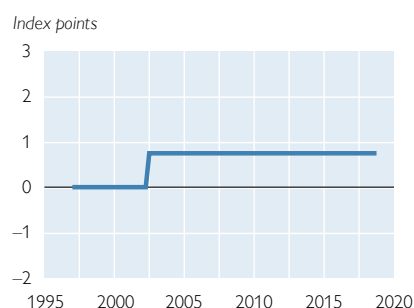
### Bulgaria



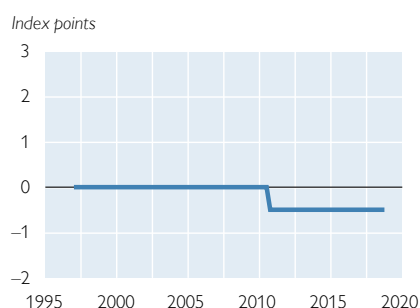
### Croatia



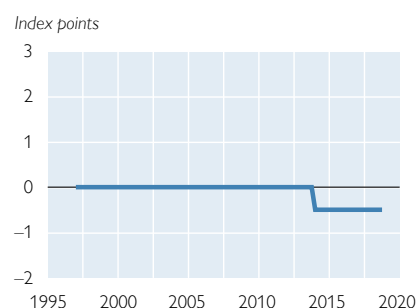
### Czech Republic



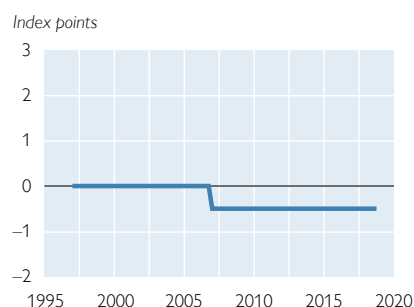
### Estonia



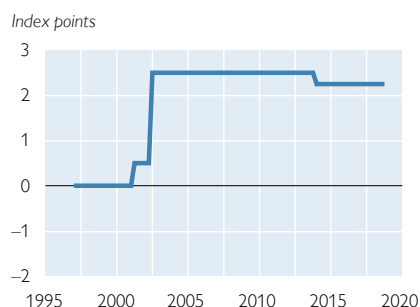
### Hungary



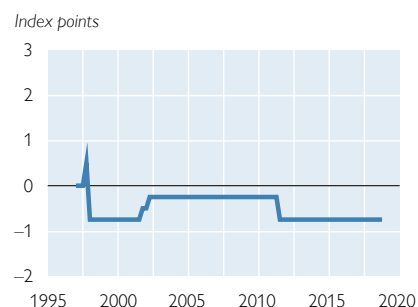
### Latvia



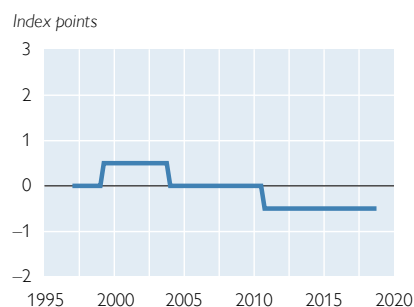
### Lithuania



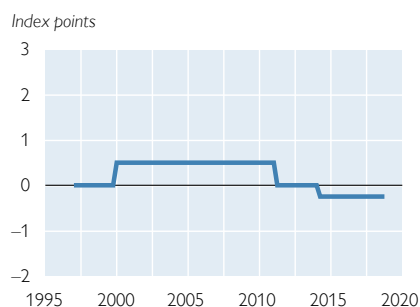
### Poland



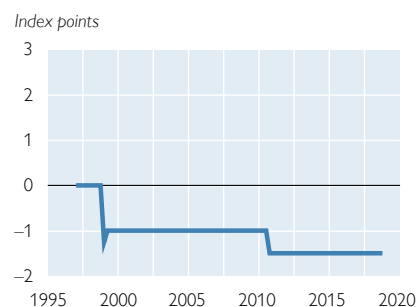
### Romania



### Slovakia



### Slovenia



— SCE subindex

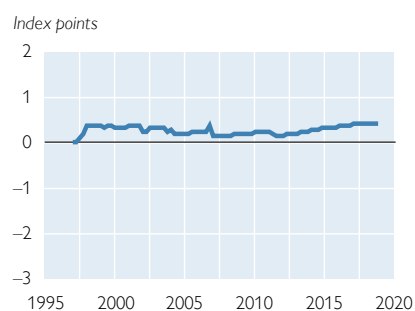
Source: Authors' calculations based on Alam et al. (2019), Budnik and Kleibl (2018), Kochanska (2017), Vandenbussche et al. (2015).

Note: Data are based on announcement dates of tightening and implementation dates of loosening macroprudential measures.

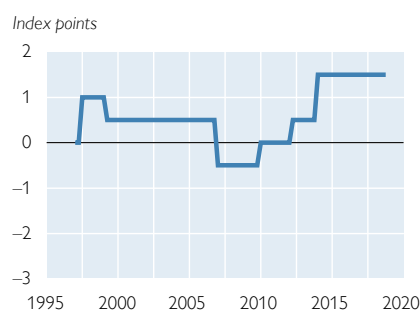
Chart 14

## Intensity-adjusted sectoral and market segments exposure limits (SMSE subindex)

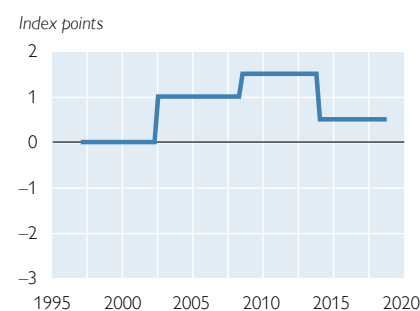
### CESEE-11



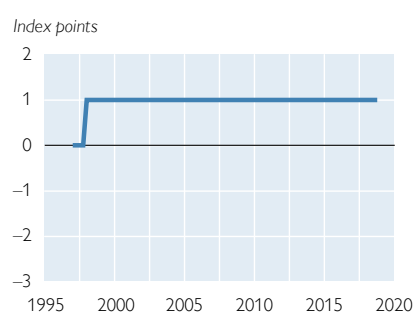
### Bulgaria



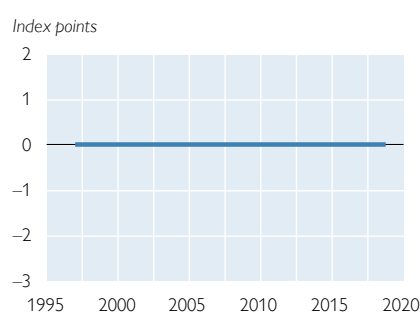
### Croatia



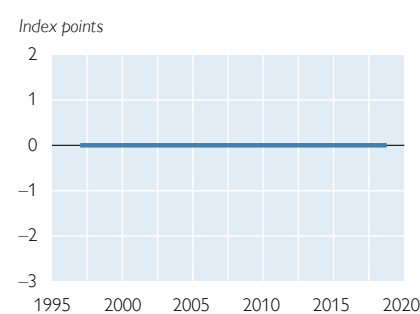
### Czech Republic



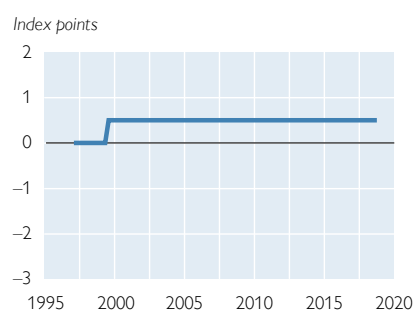
### Estonia



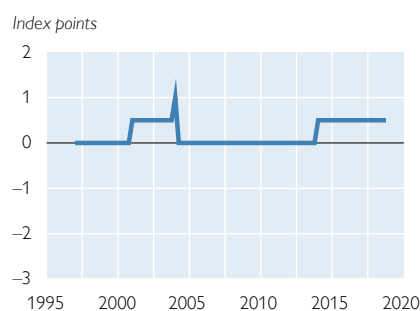
### Hungary



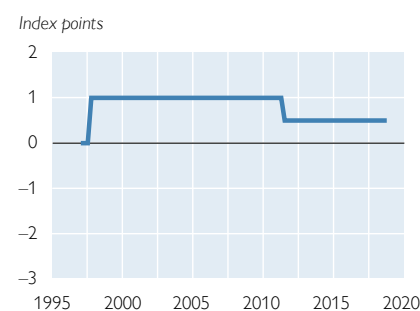
### Latvia



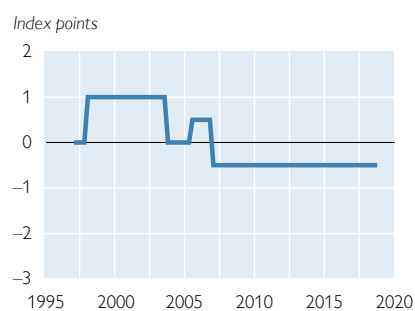
### Lithuania



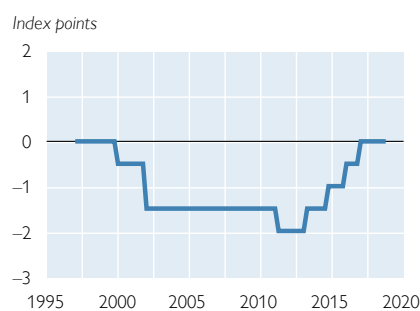
### Poland



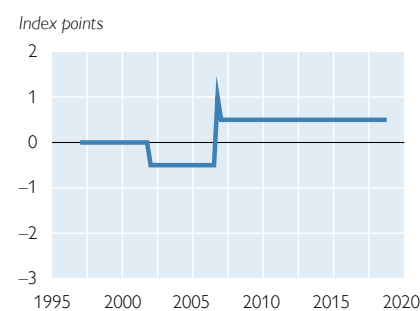
### Romania



### Slovakia



### Slovenia



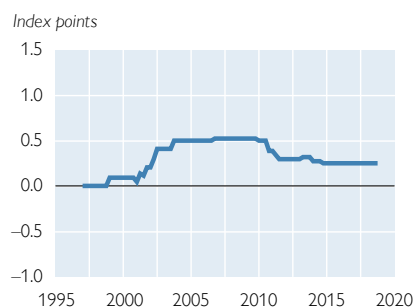
— SMSE subindex

Source: Authors' calculations based on Alam et al. (2019), Budnik and Kleibl (2018), Kochanska (2017), Vandenbussche et al. (2015).

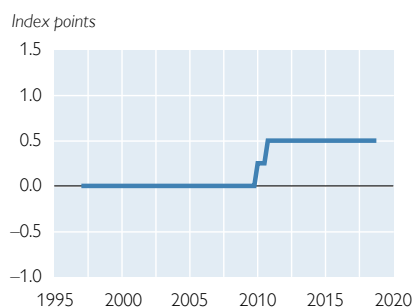
Note: Data are based on announcement dates of tightening and implementation dates of loosening macroprudential measures.

## Intensity-adjusted intragroup exposure limits (IGE subindex)

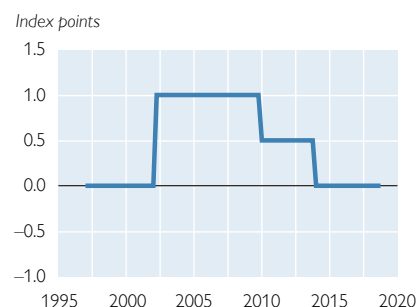
### CESEE-11



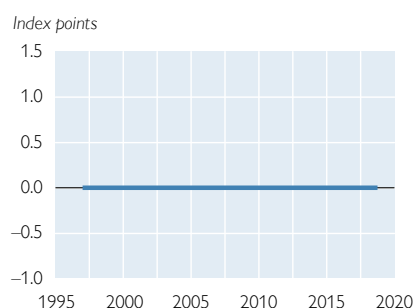
### Bulgaria



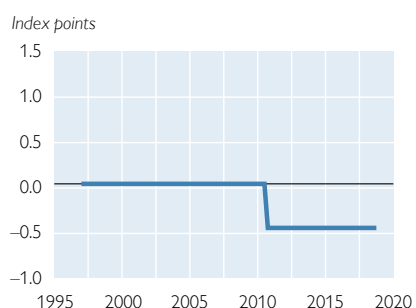
### Croatia



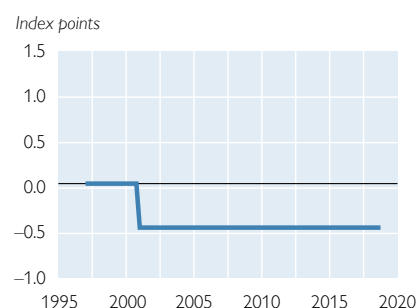
### Czech Republic



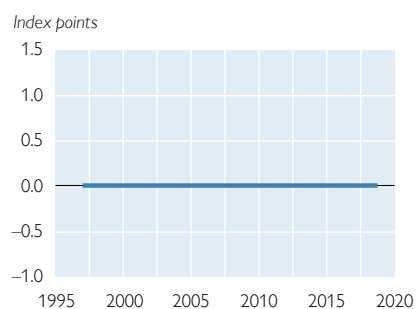
### Estonia



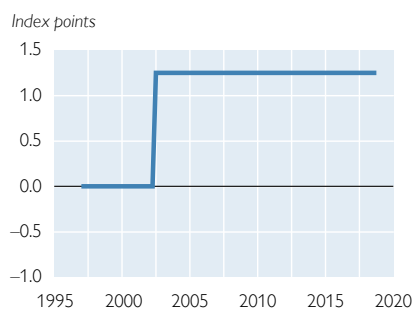
### Hungary



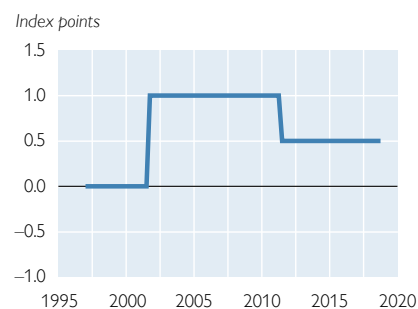
### Latvia



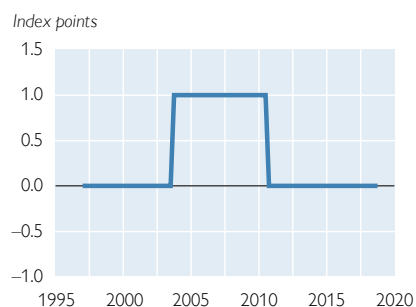
### Lithuania



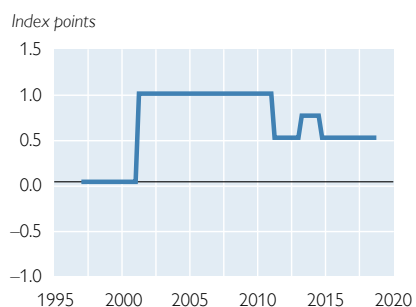
### Poland



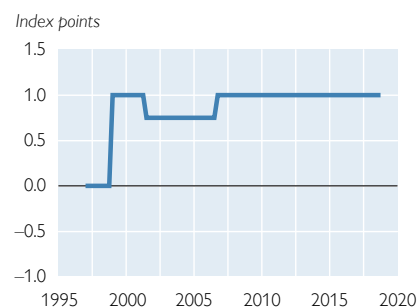
### Romania



### Slovakia



### Slovenia



— IGE subindex

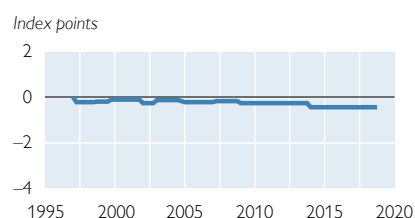
Source: Authors' calculations based on Alam et al. (2019), Budnik and Kleibl (2018), Kochanska (2017), Vandenbussche et al. (2015).

Note: Data are based on announcement dates of tightening and implementation dates of loosening macroprudential measures.

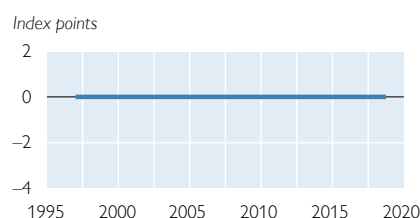
Chart 16

## Intensity-adjusted foreign currency mismatch limits (FXM subindex)

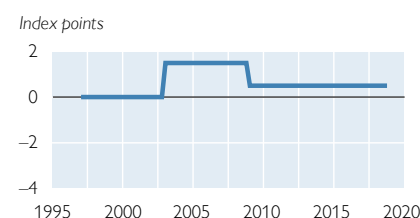
### CESEE-11



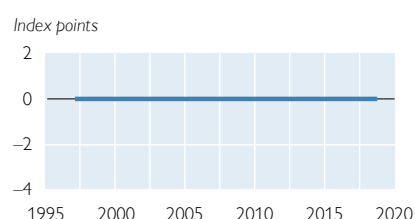
### Bulgaria



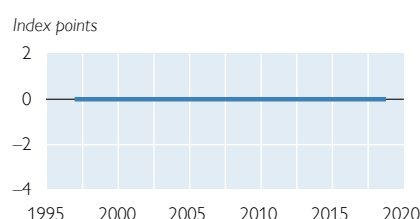
### Croatia



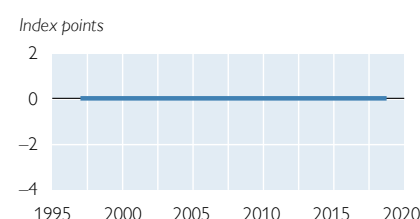
### Czech Republic



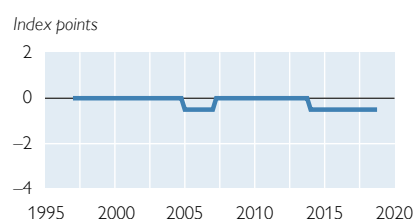
### Estonia



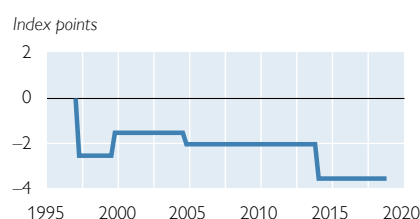
### Hungary



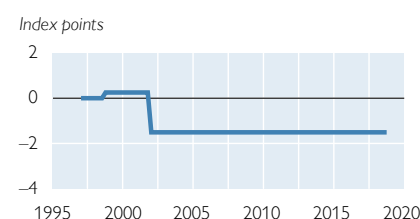
### Latvia



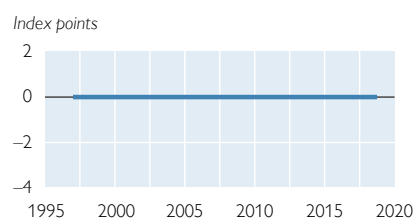
### Lithuania



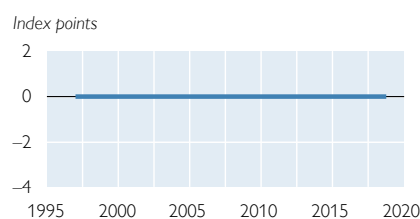
### Poland



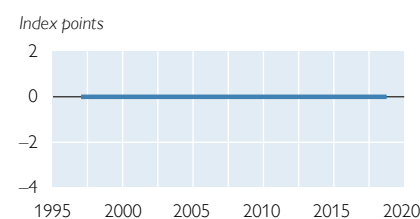
### Romania



### Slovakia



### Slovenia



— FXM subindex

Source: Authors' calculations based on Alam et al. (2019), Budnik and Kleibl (2018), Kochanska (2017), Vandenbussche et al. (2015).

Note: Data are based on announcement dates of tightening and implementation dates of loosening macroprudential measures.

## References

- Alam, Z., A. Alter, J. Eiseman, R. Gelos, H. Kang, M. Narita, E. Nier and N. Wang. 2019.** Digging Deeper – Evidence on the Effects of Macprudential Policies from a New Database. IMF Working Paper No. 19/66.
- Budnik, K. B. and J. Kleibl. 2018.** Macprudential Regulation in the European Union in 1995–2014: Introducing a New Data Set on Policy Actions of a Macprudential Nature. ECB Working Paper No. 2123.
- Kochanska, U. 2017.** The ESRB Macprudential Measures Database. In: IFC Bulletins chapters 46.
- Vandenbussche, J., U. Vogel and E. Detragiache. 2015.** Macprudential Policies and Housing Prices: A New Database and Empirical Evidence for Central, Eastern, and Southeastern Europe. In: Journal of Money, Credit and Banking 47(S1). 343–377.