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Contents

Call for applications: Visiting Research Program

The Oesterreichische Nationalbank (OeNB) invites applications from external researchers (EU or Swiss nationals) for participation in a Visiting Research Program established by the OeNB's Economic Analysis and Research Department. The purpose of this program is to enhance cooperation with (preferably postdoc) members of academic and research institutions who work in the fields of macroeconomics, international economics or financial economics and/or whose research has a regional focus on Central, Eastern and Southeastern Europe.

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- a curriculum vitae,
- a research proposal that motivates and clearly describes the envisaged research project,
- an indication of the period envisaged for the research visit, and
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Applications for 2018 should be e-mailed to *eva.gehringer-wasserbauer@oenb.at* by May 1, 2018.

Applicants will be notified of the jury's decision by mid-June. The following round of applications will close on November 1, 2018.

Studies

A cost-risk analysis of sovereign debt composition in CESEE

Sebastian Beer[1]

Drawing on a newly compiled structural debt database, this article examines sovereign interest rate exposure in ten countries in Central, Eastern and Southeastern Europe (CESEE). The average maturity of sovereign debt has lengthened over time and converged across CESEE, indicating that the likelihood of sudden changes in interest rate has decreased since 2009. Using a simple theoretical model, this article identifies the drivers of this development, highlighting the role of debt managers' risk preferences.

JEL classification: H63
Keywords: debt management, interest rate risk, financial vulnerability, CESEE region

The composition of public debt affects both the costs and risks of running fiscal deficits. For instance, debt with a shorter term to maturity tends to have a lower interest rate, but is often associated with greater volatility and rollover risk. In principle, it is down to debt managers to identify such cost-risk tradeoffs, determine the acceptable level of risk and align the debt portfolio with the government's preferences (The World Bank and IMF, 2014).[2] The multitude of borrowing options and the volatility of financial markets also suggest that continuous risk monitoring and a comprehensive strategy are key in guiding sovereign borrowing decisions. Yet, in practice, public debt management efforts vary considerably (see e.g. Melecky, 2007; Cabral, 2015). Some debt agencies define strategic goals in terms of structural debt indicators, evaluate the achievement of targets periodically and continuously update their strategy based on in-depth assessments of financial and macroeconomic trends; some monitor the progression of structural debt indicators and economic variables rigorously, but do not disclose a more detailed quantitative strategy; and some follow no discernible strategy at all.

In the light of recent history, the variation in national endeavors is surprising. In the wake of the financial crisis, several European governments had to rely on third-party assistance to meet their debt obligations. In many countries, the difficulties in funding the public sector on private capital markets did not stem from imprudent borrowing decisions (Baldwin et al., 2015). Instead, the composition of public debt exacerbated the disastrous impact of the sudden hike in interest rates and, furthermore, the implied increase in funding requirements seems to have encouraged higher risk taking. De Broeck and Guscina (2011) document a shift in public debt structures toward shorter maturities, larger amounts of foreign currency debt and a greater reliance on floating interest rates following the financial crisis. As national governments are typically the largest domestic borrower, sovereign defaults have the potential to induce or amplify economic crises. In this context, effective public debt management is key to maintaining a country's financial stability.

Drawing on a newly compiled structural database, this article examines the outcomes of public debt management across countries in Central, Eastern and

[1] *This study was authored by Sebastian Beer (sebastian.beer@univie.ac.at) during his employment in the Foreign Research Division of the Oesterreichische Nationalbank (OeNB).* *The author would like to thank Markus Eller, Julia Wörz, Peter Backé, Martin Feldkircher (all OeNB) and the participants in a research discussion forum of the OeNB's Economic Analysis and Research Department in March 2017 for their valuable comments. Data support by Zoltan Walko (OeNB) is gratefully acknowledged.*

[2] *It should be noted that ministries of finance are typically responsible for deciding what to spend funds on, while debt agencies decide on how the spending is to be financed.*

Southeastern European (CESEE). Risk to a government's debt stock emanates from multiple sources, including uncertainty in the path of interest and exchange rates (market risk), unanticipated cash flow obligations (liquidity risk), nonperformance of borrowers (credit risk), nondelivery of contracted obligations (settlement risk) and other forms of risk that most organizations face but that are particularly severe for a debt management agency (operational risk).[3] The analysis investigates the cost-risk tradeoff involved in deciding on the debt portfolio's maturity structure. I define risk as the one-step ahead variance in the composite interest rate on short- and long-term bond obligations and costs as its expected value. By quantifying the potential magnitude of sudden fluctuations in interest rates, this article provides an initial comparative assessment of the costs, risks and risk preferences implicit in the structure of sovereign debt portfolios for several CESEE countries[4], which is intended to support the evaluation of financial vulnerabilities across the region.

The empirical findings reveal that interest rate risk, as defined above, has decreased in most of the countries under review. The average maturity[5] of public debt has lengthened over time and converged across the region. At the same time, the volatility of domestic bond yields has decreased or remained constant in most CESEE countries. This suggests that the impact of sudden interest rate hikes on local markets is less of a concern today than it was shortly after the financial crisis. Both debt management decisions (such as a lengthening of maturities) and changes in funding conditions (such as a decrease in the volatility of bond yields) may have led to the observed decrease in interest rate risk. On the basis of the insights of a simple theoretical model that identifies some of the drivers behind an optimal maturity decision, the empirical analysis disentangles the change in interest rate risks accordingly. The results suggest that the widespread decline in the relative costs of long-term borrowing has contributed significantly to the reduction in interest rate risk. Importantly, the analysis also suggests that changes in risk preferences have affected the conditional variance of interest payments both positively and negatively.

The article is structured as follows: The first section clarifies in a simple theoretical model the cost-risk tradeoff associated with the structure of the government debt portfolio, characterizing the basic properties of an optimal maturity structure and the optimal response to dynamics in the yield curve. To highlight the role of debt structure, the model takes the level of debt as given, determined by fiscal policy, and thus examines optimal behavior from an independent debt management perspective. Drawing on the model's insights, section 2 introduces the new structural debt database, outlining the empirical approach to measuring interest rate risk across countries. Section 3 provides a structural interpretation of the empirical findings, discussing costs, risks and debt managers' implicit risk preferences. Section 4 concludes.

[3] *The World Bank and IMF (2014) summarize and explain these risks in more detail.*

[4] *This article examines the magnitude and drivers of interest rate risk in Bulgaria, Croatia, the Czech Republic, Hungary, Poland, Romania, Russia, Slovakia, Slovenia and Turkey.*

[5] *Strictly speaking, the empirical findings are based on the debt portfolio's average term to refixing (ATR). If all debt is issued at a fixed interest rate, which is a reasonably good approximation for the countries under review, this measure is equivalent to the average term to maturity (ATM). For the sake of simplicity, this article refers mainly to ATM.*

1 Theoretical considerations

Over time, the theoretical literature on debt management has highlighted a range of goals (for a summary, see de Haan and Wolswijk, 2005). Early contributions focused on the potential stabilizing impact of structural debt decisions on business (Tobin, 1963) and taxation (Barro, 1999). Debt management was thus viewed as being closely linked to monetary policy. With the rise of New Keynesian models, which suggest that the business cycle can be managed solely with the short-term policy rate, the instrumental character of debt management vanished from the theoretical literature (Zampolli, 2012). Missale (2000) introduced risk minimization as an explicit objective in the context of the newly introduced fiscal frameworks. A common theme in these contributions is that interest payments should be contingent on the state of the economy and thereby smooth government outlays.

In practice, however, debt management agencies focus primarily on stabilizing government debt. The widespread mandate is to minimize sovereign funding costs with a view to containing risk at a prudent level. This section develops a simple model, describing the basic features of a maturity structure that would achieve the double objective of minimizing costs and the risk stemming from interest rate dynamics. Given the dominance of fixed-coupon bonds, the model disregards the issuance of variable rate debt and thus interchangeably uses the expressions "average term to refixing," "average term to maturity" or simply "average maturity." It also disregards the issuance of foreign currency obligations in order to confine the analysis to interest rate risk.

1.1 Basic setup

Consider a sovereign issuing two types of fixed-coupon bonds that differ only in terms of their maturity: one matures next year, while the other matures in N years. The overall financing needs are determined by fiscal policy, constant and normalized to 1. Debt managers decide on the share of obligations $(1-\alpha)$ that are rolled over each year. The remaining obligations are distributed evenly between N bonds, issued in N distinct years to ensure a smooth redemption profile. These assumptions imply that the composite interest rate paid in period t follows the weighted average

$$R_t = (1-\alpha) i_t^s + \frac{\alpha}{N} \sum_{j=1}^{N} i_{t+1-j}^l , \tag{1}$$

where α denotes the share of long-term debt, i_t^s is the interest rate paid on short-term obligations and i_t^l is the period t interest rate on long-term obligations. The parameter α also determines implicitly the average term to maturity (ATM) of the debt portfolio: a share $(1-\alpha)$ matures next year, while the remaining obligations mature in 1 to N years. The ATM is therefore derived from

$$ATM = (1-\alpha) * 1 + \alpha \frac{1}{N} (1 + 2 + \cdots N) = 1 + \alpha \frac{N-1}{2} , \tag{2}$$

after issuing this period's debt. A simple example explains why maturity structure plays a role in tempering the impact of interest rate dynamics: Suppose that the

entire debt portfolio consists of ten-year bonds *($\alpha = 1, N = 10$)*. The average maturity is then five and a half years, and one-tenth of the debt portfolio is rolled over each year. By contrast, if all the debt is financed with one-year bonds, the average maturity is exactly one year, and the entire portfolio is rolled over each year. Prevailing conditions on the sovereign bond market thus have less of an impact the longer the average maturity of the debt portfolio. The model formalizes this basic insight regarding the relation between maturity structure and risk.

For the sake of simplicity, I assume that long- and short-term bond yields are random variables with stationary means. Their average difference, the term spread, is positive and denoted by $b = i^l - i^s$. Arbitrage opportunities imply a correlation between deviations across the yield curve. I denote the variance in long- and short-run bond yields by σ_l^2 and σ_s^2 respectively, and their covariance by $\beta\sigma_s^2$. It follows that the average interest rate (the costs) and the one step-ahead variance (the risk) in the composite interest rate read

$$c(\alpha) = i_s + \alpha b \quad \textit{and} \quad r(\alpha) = (1 - \alpha e)^2\sigma_s^2 + \left(\frac{\alpha}{N}\right)^2 \sigma_l^2 \,, \tag{3}$$

where $e = 1 - \frac{\beta}{N}$ captures the relative sensitivity of interest payments associated with long- and short-term debt.[6] This system of equations represents the typical cost-risk tradeoff in debt management decisions: by increasing the maturity of public debt, debt managers increase average funding costs, $c'(\alpha) > 0$, as the yield curve is upward sloping. At the same time, a longer maturity reduces the likelihood of deviations from the target value, $r'(\alpha) < 0$, because a smaller share of debt needs to be rolled over each period.[7] It follows that, as the maturity lengthens, the composite interest rate becomes more stable and predictable, but increases in magnitude. Given that this tradeoff applies, by construction, to all values of α, the debt portfolio is efficient. Preferences determine optimality.

1.2 The optimal maturity structure

From the theoretical literature on the optimal maturity structure, I assume that debt managers pursue a mean-variance objective.[8] Preferences regarding cost-risk combinations thus follow

$$U(c, r) = \delta c(\alpha) + (1 - \delta) r(\alpha),$$

where δ represents the relative weight debt managers place on minimizing costs. A balanced choice of α requires the marginal rate of transformation between costs

[6] *To arrive at risk, note that* $R_t - E[R_t|t-1] = (1-\alpha)w_t^s + \frac{\alpha}{N}(\beta w_t^s + w_t^l) = (1 - e\alpha)w_t^s + \frac{\alpha}{N}w_t^l$, *where* w_t^k *is the idiosyncratic error of* k*-term bond yields in period* t*. Squaring this expression gives the second part of equation (3).*

[7] *An increase in unambiguously reduces the variance in the next period's interest rate if the sensitivity of long-term yields is sufficiently lower than that of short-term yields. The exact condition is* $\frac{\alpha}{N^2}\sigma_l^2 < e(1 - \alpha e)\sigma_s^2$. *As* N *tends to infinity, this condition merely requires a positive variance in short-term bond yields.*

[8] *The mean-variance objective can be interpreted as a second order approximation to a more general preference function in relation to interest rates.*

and risk to be aligned with debt managers' indifference curves. With linear preferences, this condition can be rearranged to give the optimal maturity structure as an explicit function of risk preferences and basic properties of the yield curve:

$$\alpha^* = \frac{(1-\delta)e\sigma_s^2 - \frac{1}{2}\delta b}{(1-\delta)\left(e\sigma_s^2 + \frac{\sigma_l^2}{N^2}\right)}. \tag{4}$$

The nonnegativity of short- and long-term bond volatility implies that this condition is sufficient. The equation provides a number of intuitive and useful insights. It shows that the optimal maturity structure is, as expected, a decreasing function of the relative weight placed on cost minimization, a decreasing function of the yield curve's slope and an increasing function of the volatility of both short-term and long-term bond yields. Notably, parallel shifts in the yield curve leave marginal incentives unchanged. The yield curve's intercept therefore does not affect the optimal maturity structure in this simple setting.

Note that this simple model neglects general equilibrium effects in that debt managers' choice of maturity structure does not affect the yield curve. While standard economic theory would support this claim from the perspective of exploiting arbitrage opportunities, the assumption might not hold true in practice. The annex thus provides an extension of the model, allowing for supply effects. The analysis suggests that portfolio-rebalancing effects, i.e. an increase in the term spread in response to a lengthening of average maturity, rationalize shorter optimal maturity structures owing to the increase in the marginal costs of long-term debt.

1.3 Implications for the assessment of interest rate risk

Structural debt indicators are widely used to gauge the degree of risk exposure. For instance, the maturity structure often serves to evaluate the degree of interest rate and/or rollover risk, with longer maturities perceived to be less risky. Structural indicators are a simple and effective tool for understanding risk developments within a country and over a limited time horizon. However, more generally, interest rate risk is the result of both active debt management decisions (the maturity structure) and market conditions (the volatility and structure of the yield curve):

$$r = f(\alpha, \sigma_s^2, \sigma_l^2).$$

Accordingly, the evaluation of interest rate risk requires at least estimates of the volatility of short- and long-term bond yields, in addition to information on the maturity structure. The theoretical model implies that more general developments in domestic financing conditions also impact indirectly on the degree of interest rate risk, as the optimal maturity structure is itself a function of basic properties of the yield curve and risk preferences. Interest rate risk can thus be viewed as the combined effect of local market characteristics and preferences:

$$r^* = g\left(\sigma_s^2, \sigma_l^2, b, \delta\right).$$

Accordingly, the same ATM could imply different degrees of effective interest rate risk, depending on the volatility of the underlying yield curve. Structural indicators may therefore be misleading measures for evaluating risk across countries or across a longer time horizon, where the underlying volatility plausibly changes.

2 Empirical analysis

2.1 Conceptual issues

The empirical analysis draws on the insights of the theoretical model and develops standardized risk measures that incorporate information on four drivers of risk: the volatility of short-term bonds, the volatility of long-term bonds, the term spread and risk preferences. In order to compile these measures and decompose risk accordingly, time-varying estimates of the parameter vector $(\sigma_s^2, \sigma_l^2, b, \delta)$ are needed. I proceed in four steps:

1. Time-varying estimates of short- and long-term bond yields are derived from both a simple regression analysis and nonparametric methods (see below for details). This step directly provides an estimate of the time-varying slope b.
2. A Cholesky decomposition of the estimated residuals identifies the structural shocks, where the order is derived from the theoretical model.
3. A local linear ridge regression on the (squared) structural residuals provides a flexible and time-varying estimate of the volatility of short- and long-term bond yields. The optimal bandwidth is determined via cross-validation (see below for details).
4. Combining time-specific information on the average maturity, volatility and slope of the yield curve with the theoretical model (equations (1) to (4)), finally, gives a time-varying estimate of the implicit weight placed on cost minimization, δ.

Interest rate risk then follows from the definition given above, while the decomposition employs a simple linearization. Note that observable yields reflect both investors' relative demand for long- and short-term bonds, and debt agencies' supply thereof. A structural decomposition of interest rate risk explicitly identifies changes in debt managers' risk preferences. Changes in investors' risk preferences, by contrast, work indirectly through a change in marginal costs; they are not identified and not constrained in this analysis.

2.2 Regression specification

Short- and long-term bond yields typically move in similar directions. To exploit efficiency gains in the estimation, I allow for correlation in residuals and examine the determinants of short- and long-term bond yields in a dynamic panel seemingly unrelated regression (SUR) approach. The estimating equation reads

$$y_{it} = y_{i,t-1} + \mu + \beta x_{it} + \tau_{it} + \epsilon_{it},$$

where the dependent variables are one- and ten-year generic bond yields, the vector x captures its drivers and the coefficient matrix is constant across countries. I drop the restriction and allow the coefficients to differ across countries when quantifying interest rate risk. The intercept vector is country- and yield-specific to control for heterogeneity in time preferences and the vector τ_{it} controls for country- and yield-specific time trends of the third order (compare the progression of yields

in the descriptive section below). The error-vector is independent and identically distributed across time, but not countries. I allow for a fully flexible country-specific covariance pattern between the unobservable components in one- and ten-year bond yields and estimate the system of equations with a feasible generalized least squares (GLS) approach, thereby increasing the efficiency of short- and long-term elasticity predictions. Given the extensive time dimension *(T=29)*, the bias in dynamic regression specifications (Nickell, 1981) should be less of a concern in this context. The estimation results seem to confirm this conjecture.

Term structure models suggest that the interest rate, the risk of default and the expected loss given default are the key determinants of bond yields (Liu et al., 2009). In the long run, the interest rate is a function of economic growth, households' time preferences, risk-free investment opportunities abroad and exchange rates. In the short run, monetary policy and inflation shocks are likely to play a role (Poghosyan, 2012). Accordingly, the explanatory vector comprises public debt and deficit as a share of government revenue to proxy for the risk of default. It also includes five macroeconomic variables: GDP growth, inflation, the three-month interbank rate, the real effective exchange rate and the share of nonperforming loans (NPL) in total loans, controlling for differences in contingent liabilities. In constructing the underlying series, I draw on quarterly information from IMF, Eurostat, Bloomberg and wiiw datasets, and perform seasonal adjustments using the U.S. Census Bureau's *X-13ARIMA-SEATS* method.

2.3 Nonparametric estimation of yields and yield volatility

Debt management agencies potentially rely on estimation methods that provide a more continuous update of the costs and interest rate risk associated with sovereign debt portfolios. Moreover, the decomposition of sovereign interest rate risk is based on a linear approximation that is valid only for small changes in interest rate risk. To overcome the challenge of discrete jumps in linear regression estimates, I rely on a nonparametric estimation method to determine the smooth function *f(t)* in

$$y_{it} = f_i(t) + \epsilon_{it},$$

where y_{it} is the yield on government bonds (short- or long-term) of country i in year t. I employ the local linear ridge estimator (as proposed by Seifert and Gasser, 1996; 2012), which approximates the unknown function *f(t)* locally with a linear regression line. More specifically, the estimator minimizes a weighted difference between observed yields and a linear function locally. Observations around the predicted value receive more weight than distant ones, and a bandwidth parameter determines the size of the neighborhood considered in the minimization. In contrast to simpler local linear regressions, a "ridge parameter" ensures that the slope of the local regression line is not too steep. I use a cross-validation approach to set the optimal bandwidth, i.e. I choose the bandwidth h^* such that

$$h^* = arg\,min_h \sum_{j \epsilon T} \left[y_{ij} - f^*_{i,-j}(j) \right]^2,$$

where $f^*_{i,j}$ is the predicted value of country i's yield in year j, using a local linear ridge estimator based on country-specific yield information that excludes year j. Furthermore, I use the optimal ridge parameter as proposed by Seifert and Gasser (2000) for normally distributed errors. With this approach, the smooth prediction of short- and long-term bond yields is uniquely determined and does not entail an arbitrary parameter.

I estimate the structural volatility of short- and long-term bond yields by relying on the same nonparametric technique. More specifically, after identifying structural residuals (using a Cholesky decomposition), I obtain an approximation to the function $g(t)$ in

$$s_{it}^2 = g_i(t) + \epsilon_{it},$$

where s_{it} is a structural residual in country i in year t. I determine the optimal bandwidth using cross-validation and set the ridge parameter to its theoretical optimum for a normal distribution. The annex presents the results of the regressions.

2.4 Data source: sovereign structural debt database

The main information source of the present analysis is a newly compiled dataset that summarizes public debt structures for 14 countries across the CESEE region. The dataset covers Albania, Bulgaria, Croatia, the Czech Republic, Hungary, Macedonia, Montenegro, Poland, Romania, Russia, Serbia, Slovakia, Slovenia and Turkey. The database is based on Bloomberg's DDIS function, which has recorded public sector obligations differentiated according to the type of debt (bonds versus loans), the type of coupon (fixed versus floating) and the currency of issuance on a quarterly basis since the fourth quarter of 2009. Granular information on redemption profiles enables the calculation of a range of structural indicators, including the average term to maturity of total debt and of domestic and foreign currency obligations, as well as the currency composition of total debt and the average term to refixing (ATR) of bond obligations. Notably, the magnitude of the debt recorded by Bloomberg is highly consistent with that of other data sources,[9] suggesting that the derived structural indicators provide an accurate depiction of sovereign debt structures across CESEE.

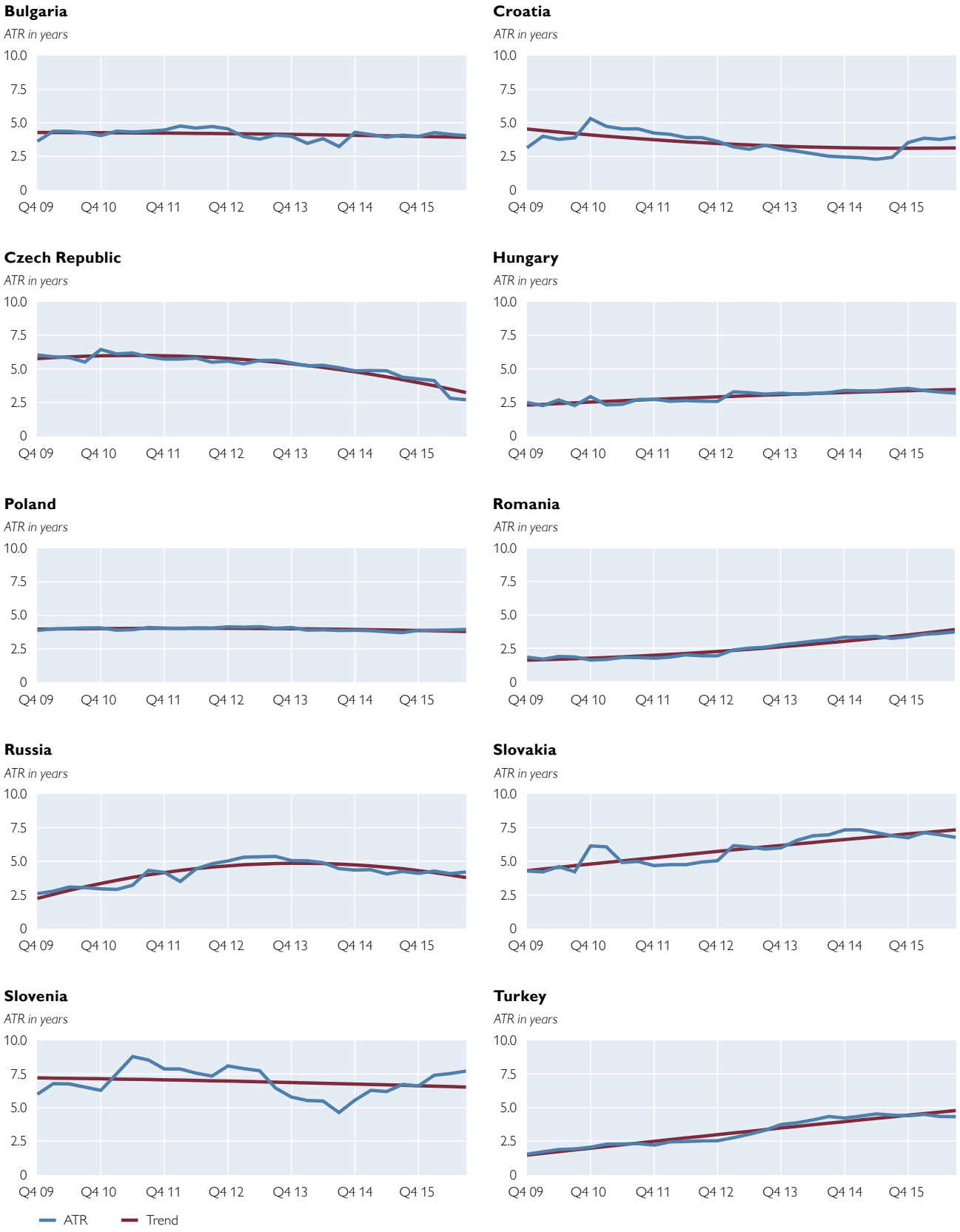
Chart 1 illustrates the progression of country-specific ATRs on domestic currency bonds.[10] The ATR increased for the Romanian, Russian, Slovakian and Turkish debt portfolios, but less so for the Hungarian debt portfolio; and it decreased notably for the Czech Republic's outstanding bonds. Assuming constant volatility in the underlying bond markets, this would indicate a reduction of risk in the former group and an increase in risk in the latter. On average, the ATR lengthened from three and a half years in 2009 to four and a half years in 2016. It is therefore

[9] *On average, the country-specific deviation between the debt recorded by Bloomberg and the debt recorded by the IMF's financial indicators lies at around 2%. With an average deviation of 8%, the database reveals the largest inconsistency for Slovenian debt.*

[10] *While other indicators follow directly from the information provided, the calculation of the ATR requires a few assumptions as it is based on a distinction between variable and fixed-coupon payments. A differentiation between variable and fixed-coupon bonds is available for total obligations, but it is not available for domestic currency obligations. Specifically, I assume that term loans are issued exclusively in foreign currencies and the ratio of domestic to foreign maturities is equivalent to the ratio of domestic to foreign refixing periods.*

Chart 1

Average maturities



Source: Bloomberg, author's calculations.

likely that risk has fallen across CESEE. Furthermore, a regression indicates that the standard deviation of refixing periods across countries has decreased over time, down from 1.8 percentage points in 2009 to 1.3 percentage points in 2016. While there are still large differences in refixing periods, their dispersion appears to have converged.

To better understand the drivers and possible consequences of changing maturity structures, chart 2 shows the progression of ten- (purple line) and one-year (blue line) generic bond yields as reported by Bloomberg. With the exception of Russia and Turkey, average financing costs decreased considerably over the observed time span, from around 5.7% in 2009 to 2.7% in 2016. The difference in the costs of short- and long-term funding determines the marginal costs debt managers face when selecting the maturity structure. Chart 2 suggests a large degree of heterogeneity in the associated dynamics. The yield curve's slope declined notably in the Czech Republic, Russia and Slovakia, and increased slightly in Hungary. While Bulgaria, Croatia and Poland experienced some dynamics in the intercept of their domestic yield curves, the slope remained largely unchanged. On average, the difference between ten- and one-year bond yields fell from 2.2 percentage points to 1.2 percentage points.

The dynamics described are broadly in line with theoretical predictions: assuming constant risk aversion and volatility in the bond markets, the aggregate flattening of yield curves led to a reduction in the marginal costs of hedging against interest rate risk. The average maturity of public debt portfolios increased as a consequence.

3 Sovereign interest rate risk in CESEE

This section provides estimates of the costs, risk and risk preferences associated with sovereign debt portfolios across CESEE. I combine the estimated volatility of short- and long-term bond yields with the observed maturity structure to obtain a simple indication of the interest rate risk. The first order condition for an optimal maturity structure, balancing costs and risk at the margin, relates this measure to risk preferences and domestic financing conditions. Several estimation steps are necessary to arrive at the results shown below. In order to highlight the probable error margin in these predictions, I present two distinct models: a dynamic SUR model and a nonparametric estimate. The first subsection concentrates on the magnitude of the interest rate risk and on how it changes over time, while the second subsection investigates the drivers of this change.

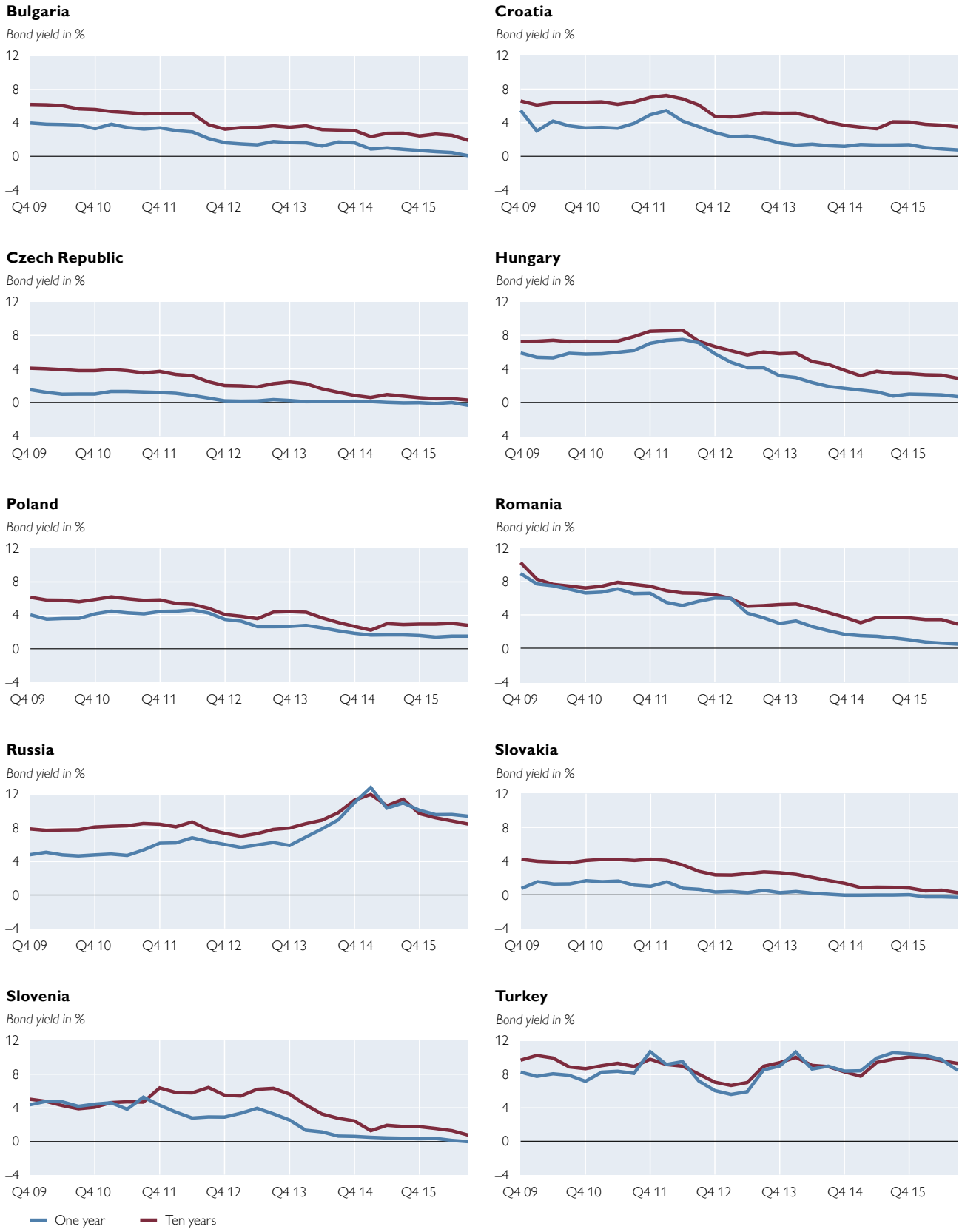
3.1 The magnitude of sovereign interest rate risk

Chart 3 illustrates the realized cost-risk tradeoffs across the observed CESEE countries. The horizontal axis represents average expected interest costs, while the vertical axis depicts the standard deviation of the composite interest rate (rather than its variance). The black diamonds are country-specific average values resulting from the dynamic (light blue) and nonparametric (dark blue) model; the horizontal and vertical black lines represent sample averages; the panels differentiate between years.

Chart 3 highlights that both the risk of sudden interest rate dynamics and the expected interest rate have decreased over time, when aggregated across CESEE. Between 2010 and 2015, risk fell from an average standard deviation of slightly below 0.3 percentage points to around 0.18 percentage points. Deviations from

Chart 2

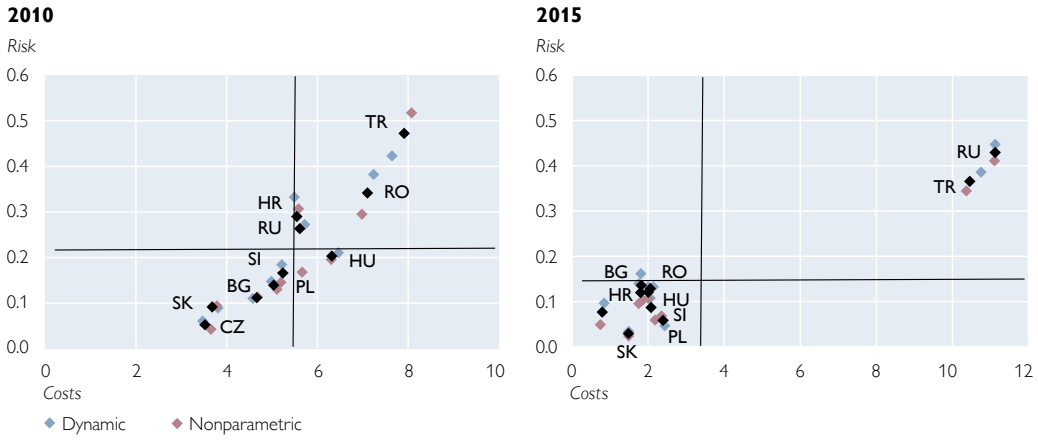
Yield curves



Source: Bloomberg, author's calculations.

Chart 3

Costs and risk



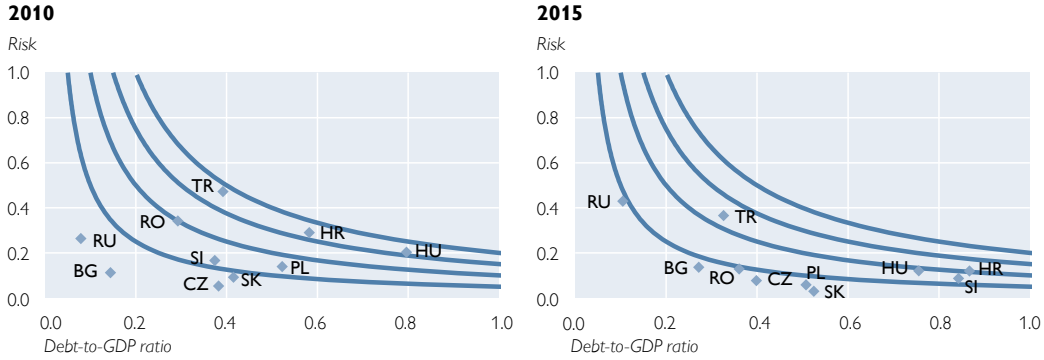
Source: Author's calculations.

the average interest rate are thus less likely today than they were shortly after the financial crisis. Chart 3 also shows that interest rate risk is largest in Turkey when averaging across the entire time span. Romania could reduce the degree of interest rate risk considerably, while Russia has moved up the risk ladder.

Chart 4 puts the interest rate risk into perspective with the overall level of debt, acknowledging that effective interest costs, as well as potential deviations from it, are the product of debt level and the interest rate. The blue lines indicate regions where the standard deviation of interest payments is 0.2%, 0.15%, 0.1% and 0.05% of GDP.[11] For normally distributed interest rates, the deviation from the expected rate thus remains below these limits in four out of five times. Chart 4 suggests a negative correlation between risk that emanates from the structure and

Chart 4

Size-adjusted risk



Source: Author's calculations.

Note: The blue lines indicate regions where the standard deviation of interest payments is 0.2%, 0.15%, 0.1% and 0.05% of GDP.

[11] *More specifically, the lines represent regions where* $d * \sqrt{r} = c$ *holds true for* $c = 0.2, 0.15, 0.1, 0.05$, *and* d *is the ratio of debt to GDP and* r *is risk (the one-step ahead variance).*

risk that emanates from the level of debt. Fiscal risk appears to be more dispersed when considering either the level or the structure of debt in isolation than when looking at those factors jointly. According to the figures presented in chart 4, Croatia, Hungary and Turkey exhibited the highest degree of uncertainty in 2015, with the theoretical standard deviation of interest payments amounting to roughly 0.1% of GDP.

3.2 The drivers of sovereign interest rate risk

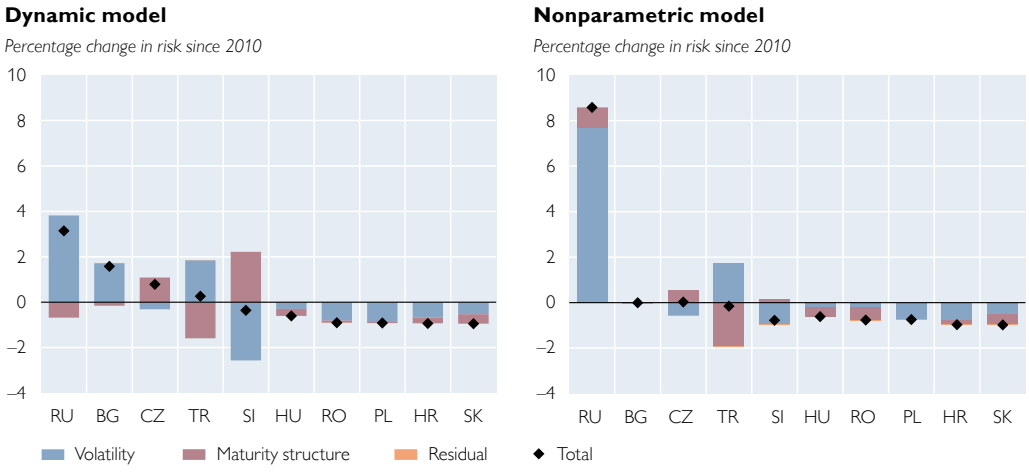
The maturity structure and the volatility of bond yields determine the degree of interest rate risk mechanically: the longer the average maturity, the less volatile are bond markets and the lower is the degree of interest rate risk.

Chart 5 decomposes the percentage change in interest rate risk between 2010 and 2015 accordingly. The bars in red and blue depict the percentage point contribution of the maturity structure and the volatility of short- and long-term bond yields, respectively; the yellow bars show residual contributions. The black diamond represents the sum of these three components. Chart 5 highlights volatility in bond markets as being the main driver of the change in risk. Depending on the specification (dynamic versus nonparametric), interest rate risk increased by up to 800% in Russia, mainly owing to increased volatility in bond yields. Similarly, the positive dynamics observed in Croatia, Poland, Romania and Slovenia, where interest rate risk fell by up to 90%, were due largely to a decrease in volatility on the bond markets. Developments in Turkey and the Czech Republic are particularly worthy of note. While the Czech Republic is the only country where risk seems to have increased, largely owing to a reduction in the length of terms to maturity, Turkey has succeeded in curbing overall interest rate risk despite an increase in underlying volatility.

From a debt management perspective, the degree of bond market volatility is just one of the pieces of information feeding into decisions on a sensible borrowing strategy, rather than a separate and unrelated driver of risk. The slope of the yield curve and preferences are additional factors that determine the optimal maturity structure and, in turn, interest rate risk.

Chart 5

Change in risk since 2010



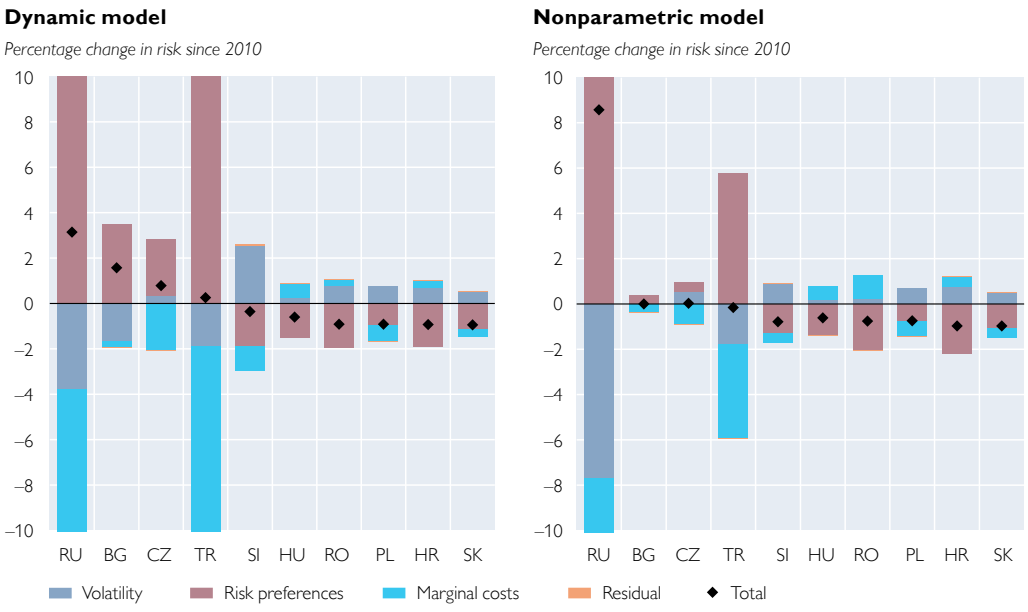
Source: Author's calculations.

Chart 6 illustrates the change in risk, decomposed from an optimal debt management perspective. Several differences come to light when contrasting this decomposition with the more mechanical view presented above. First, the volatility of bond yields plays a much smaller role and typically contributes in the opposite direction to that suggested by the first decomposition. This finding relates to the fact that volatility now affects the degree of interest rate risk both directly and indirectly: while escalated short-term dynamics increase the risk of future deviations mechanically, optimal debt management counterbalances this tendency by increasing the average maturity.[12] Second, the flattening of yield curves seems to have been a major reason behind the extension of average maturities, thus contributing significantly to the decrease in interest rate risk in many countries. Third, in most countries, changing risk preferences dampen the effect of other structural changes.

The behavioral decomposition highlights the cost-risk tradeoff involved in the management of public debt. With notable reductions in the marginal costs of long-term funding, as observed in the Czech Republic, Russia and Turkey, average maturities should have lengthened considerably. The fact that more maturity extensions are not imposed signals an increase in risk-taking preferences in those countries. By contrast, Croatia's debt agency extended the average maturity of public obligations slightly, despite the relative increase in the costs of long-term debt. This suggests that the degree of risk aversion has increased since 2010.

Chart 6

Change in risk since 2010



Source: Author's calculations.

[12] *The definition of risk and the optimal maturity structure implies that an increase in the volatility of short-term bond yields reduces total risk, while an increase in the volatility of long-term bond yields amplifies total risk when totaling the direct and indirect effects.*

4 Conclusion

This article draws on a new structural debt database to provide estimates of the risk and risk preferences associated with sovereign debt portfolios across CESEE. The empirical results suggest that the volatility of short- and long-term bond yields has decreased since 2010. At the same time, the average maturity of most debt portfolios has been extended, implying that the risk of sudden surges in sovereigns' composite interest rate is less likely today than it was shortly after the financial crisis. Notable exceptions from this general trend are Russia and Turkey, where interest rate risk remains prominent despite a lengthening of terms to maturity.

Combining the empirical results with a simple theoretical model facilitates the identification of the drivers of interest rate risk. The analysis suggests that both a reduction in the relative costs of long-term borrowing and a change in the weight debt managers place on cost minimization are key in understanding beneficial risk developments. As, in many countries, the yields on long-term borrowing (ten years) have dropped more sharply than the yields on short-term borrowing, the relative costs of long-term funding have decreased over time. Many debt management agencies have responded by increasing the share of long-term debt, thus reducing the composite interest rate's sensitivity to current market conditions. However, the ratio of marginal costs to marginal risk has increased over time. Risk minimization therefore seems to be of greater concern in many countries today than shortly after the financial crisis. In Bulgaria, the Czech Republic, Russia and Turkey, by contrast, debt managers' risk aversion seems to have decreased, hampering a further reduction in sovereign interest rate exposure over time.

The structural analysis provides valuable insights for optimal debt management. Most importantly, the model clarifies that a change in funding conditions requires a commensurate change in the structure of debt if costs and risk are to remain balanced at the margin. Yet in practice, debt management agencies tend to specify unconditional structural debt targets (or bands), with the result that interest payments are more volatile. Moreover, an increased responsiveness to prevailing conditions would imply the imposition of more extensions to average maturities. The current low interest rate environment would thus be locked in and boost fiscal space for the future.

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Annex

A.1 Drivers of sovereign bond yields in CESEE

Table A1 below summarizes the determinants of bond yields in a set of static regression specifications. Columns 1 and 2 show the estimated sensitivity of short-term financing costs, while columns 3 and 4 report estimates on the sensitivity of long-term financing costs. All specifications include country-specific time polynomials of the third order, as well as a set of year and quarter dummies to capture global trends in risk aversion. Columns 1 and 3 (labeled OLS – ordinary least squares) estimate the determinants of one- and ten-year bond yields in separate equations. In columns 2 and 4, a GLS approach increases the estimation efficiency by accounting for correlation between the equation's residuals.

Real interest rates and inflation impact significantly on the short and long end of sovereigns' yield curves. With an average short-run coefficient of around 0.36, short-term financing costs react more strongly to changes in the monetary variables. Ten-year bond yields increase by around 0.23 percentage points in response to a 1 percentage point increase in either inflation or the real interest rate. As expected, conventional monetary policy measures are thus more effective in steering the short end of the yield curve.

Furthermore, the results suggest that fiscal measures and contingent liabilities are important signals for the risk of default in the region. On average, the estimated impact of these variables is larger on long-term bond yields, likely reflecting the higher risk premium inherent in the costs of long-term funding. An increase of 1 percentage point in the ratio of debt to government revenue inflates ten-year bond yields instantaneously by 0.23 basis points. The response of one-year yields is not statistically significant. With estimated effects ranging between 0.01 basis points and 0.08 basis points, current deficits exert a similar, albeit much smaller, effect on the costs of short- and long-term funding. This result is in line with prior evidence, suggesting that the debt burden is a strong signal for the risk of default (Manasse et al., 2003), while the impact of fiscal deficits is less clear, potentially depending on the state of the economy (Jaramillo and Weber, 2013). Moreover, contingent liabilities affect sovereign borrowing costs across all estimated specifications. With an average response of 0.05 basis points, ten-year bond yields are more sensitive to changes in the share of nonperforming loans than one-year bonds (0.035 basis points).

The GLS approach suggests that lagged ten- and one-year bond yields are significant predictors of short-term yields, while the long end is only steered by the lagged effect of ten-year bond yields. The OLS estimations, by contrast, suggest that the lagged value of short-term bonds is negatively correlated with current long-term bonds.

Table A1

Drivers of short- and long-term bond yields, dynamic results

Dependent variable	One-year bond yields		Ten-year bond yields	
Estimation method	OLS	GLS	OLS	GLS
Explanatory variables	(1)	(2)	(3)	(4)
	Panel SUR regression, N=10, T=29			
Inflation	0.432***	0.380***	0.291***	0.238***
	(0.048)	(0.032)	(0.041)	(0.032)
Real interest rate	0.403***	0.356***	0.277***	0.235***
	(0.042)	(0.029)	(0.036)	(0.029)
Real effective exchange rate (REER)	–0.007***	–0.007***	0.008***	0.009***
	(0.002)	(0.001)	(0.001)	(0.001)
Debt-to-government revenue ratio	–0.008	0.006	0.291***	0.230***
	(0.074)	(0.057)	(0.071)	(0.057)
Deficit-to-government revenue ratio	0.036*	0.006	0.085***	0.012**
	(0.019)	(0.005)	(0.020)	(0.005)
Nonperforming loans (NPLs)	0.029***	0.043***	0.055***	0.055***
	(0.012)	(0.010)	(0.011)	(0.009)
Lag (one-year bond yield)	0.141*	0.259***	–0.153**	–0.065
	(0.076)	(0.046)	(0.068)	(0.046)
Lag (ten-year bond yield)	0.354***	0.264***	0.778***	0.736***
	(0.071)	(0.043)	(0.069)	(0.049)
Residual variation	0.241	0.280	0.223	0.183

Source: Author's calculations.

A.2 Portfolio rebalancing effects

The theoretical model abstracts from general equilibrium effects: debt managers' maturity choice does not affect the yield structure. In fact, standard economic theory predicts that arbitrage opportunities should equalize investors' riskless returns across all maturities (Modigliani and Sutch, 1966). Accordingly, the path of the central bank's policy rate determines both short- and long-term bond yields, while the relative supply of these bonds is irrelevant.

This view contrasts sharply with preferred habitat models, initially proposed by Culbertson (1957), where investors prefer specific time horizons. In its extreme form, the assumption of market segmentation implies that a shift in the composition of public debt toward longer maturities raises the yield on long-term debt and reduces the yield on short-term debt owing to supply effects. Vila and Vayanos (2009) and Greenwood and Vayanos (2014) extend the basic preferred habitat theory by incorporating arbitrage opportunities and thus introducing substitutability between debt maturities. Their model predicts that all yields increase in response to an increase in the debt portfolio's average maturity, reflecting the escalated aggregate risk associated with the larger supply of risky long-term debt.

Portfolio rebalancing effects influence the optimal maturity structure of government debt. If the reaction of long-term rates to a change in the portfolio composition is more pronounced than the sensitivity of short-term rates, the term spread is an increasing function of the maturity structure. The implications of portfolio rebalancing effects can be seen in

$$c(\alpha) = i_s + \alpha b(\alpha),$$

where the term spread, *b(α)*, is now an increasing function of the maturity structure. With this cost objective, the first order condition can be rearranged to give

$$\alpha^{*,pr} = \frac{(1-\delta)e\sigma_s^2 - \frac{1}{2}\delta b}{(1-\delta)\left(e\sigma_s^2 + \frac{\sigma_l^2}{N^2}\right) + \frac{1}{2}\delta b'}.$$

Contrasting this expression with the one given in the main text shows that the optimal maturity is strictly shorter in the presence of portfolio-rebalancing effects, owing to the positive term in the denominator. The presence of portfolio-rebalancing effects could thus rationalize shorter optimal maturities. To examine whether the yield structure in effect responds to the sovereign's maturity choice, I re-estimated the dynamic regressions, including the ATR, as an additional explanatory variable.

Table A2 presents the results. According to the dynamic estimations, short-term and long-term bond yields increase instantaneously by 6 basis points and by 13 basis points, respectively, in response to a one-year increase in the ATR, controlling for lagged values of bond yields. Both estimated effects are significant at the 1% level. Combining the estimated persistence in the yield curve with these coefficients suggests a cumulative response of 20 basis points and 38 basis points in short- and long-term bond yields, respectively. Simple OLS estimations confirm the positive impact at the long end of the yield curve, but do not reject the null hypothesis for the sensitivity of short-term financing costs to changes in the portfolio structure.

Portfolio rebalancing effects are at odds with the assumption of perfect arbitrage across the yield curve and thus inconsistent with some of the fundamental assumptions of the widely used New Keynesian model (Chadha and Zampolli, 2013). However, they are in line with optimization behavior in preferred habitat models (Vila and Vayanos, 2009; Greenwood and Vayanos, 2010). The effect of government debt structures on bond yields has been examined before (Greenwood and Vayanos, 2014; D'Amico and King, 2013; Gagnon et al., 2010; Zhu and Meaning, 2012), but prior work was limited to U.S. and U.K. data.

Table A2

Drivers of short- and long-term bond yields, dynamic results

Dependent variable	One-year bond yields		Ten-year bond yields	
Estimation method	OLS	GLS	OLS	GLS
Explanatory variables	(2)	(4)	(6)	(8)
	Panel SUR regression, N=10, T=29			
ATR	0.003	0.057*	0.098***	0.127***
	(0.039)	(0.030)	(0.036)	(0.030)
Inflation	0.433***	0.398***	0.294***	0.269***
	(0.048)	(0.033)	(0.041)	(0.033)
Real interest rate	0.407***	0.377***	0.277***	0.266***
	(0.042)	(0.030)	(0.036)	(0.029)
Real effective exchange rate (REER)	–0.007***	–0.010***	0.004*	0.003
	(0.002)	(0.002)	(0.002)	(0.002)
Debt-to-government revenue ratio	0.022	0.056	0.259***	0.285***
	(0.070)	(0.059)	(0.066)	(0.059)
Deficit-to-government revenue ratio	0.051***	0.011*	0.050***	0.014*
	(0.013)	(0.006)	(0.012)	(0.008)
Nonperforming loans (NPLs)	0.028**	0.052***	0.060***	0.068***
	(0.012)	(0.011)	(0.011)	(0.010)
Lag (one-year bond yield)	0.156**	0.274***	–0.154**	–0.056
	(0.075)	(0.046)	(0.066)	(0.045)
Lag (ten-year bond yield)	0.339***	0.227***	0.779***	0.695***
	(0.070)	(0.044)	(0.067)	(0.049)
Implied long-run rebalancing effect	0.140	0.200	0.340	0.380
Residual variation	0.241	0.280	0.224	0.182

Source: Author's calculations.

A geographic perspective on banking in Central, Eastern and Southeastern Europe

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Sarah Reiter,
Helmut Stix[1]

This study presents a novel dataset covering the geographic locations of bank branches in ten Central, Eastern and Southeastern European (CESEE) countries. Based on these data, we describe the spatial provision of banking services and study whether domestically owned and foreign-owned banks show different branching behavior. We find that the provision of banking services varies substantially between and within countries. Regressions show that these differences strongly correlate with the respective countries' GDP per capita. With regard to the question whether foreign and domestic banks show different branching behavior, we detect marked differences across countries. Thus, there is no "one-size-fits-all" explanation for the market behavior of foreign (and Austrian) banks in CESEE. In general, foreign banks in CESEE tend to branch in regions with higher population density. An exception among foreign banks are Austrian banks, which, on average across regions, also locate in areas with lower population density. When we match bank branch location data with household survey data, we find that the majority of CESEE households have a bank available within 2 km. Nevertheless, a sizeable share of CESEE households live 5 km or farther from the nearest bank branch.

We provide indicators of bank branch coverage, density, concentration and ownership at Nomenclature of Territorial Units for Statistics 3 (NUTS 3) level for download on the OeNB website.

JEL classification: D12, G11, D80
Keywords: bank branches, local market structure, spatial competition, foreign banks, Central, Eastern and Southeastern Europe, database

The geography of banking may have a significant impact on financial development in both developed and developing economies. A financial system could be large in terms of assets but have a relatively sparse bank branch network if banks focus on big corporations and regional agglomerations. As the accessibility of banking products and finance for a broad range of households and enterprises boosts economic development, policymakers may prefer banks to be physically accessible throughout the country, including poorer regions and less populated areas.[2] Furthermore, competition at the regional or local level has implications for access to, and the prices of, banking products. In a number of countries, policy measures have been taken to improve geographic coverage and increase competition and efficiency in the banking sector. One example is the 1994 Riegle-Neal Interstate Banking and Branching Efficiency Act in the United States that allowed nationwide branching in the U.S.A. (Dick, 2006). Another example is the 2005 Master Circular on Branch Authorisation in India, which specified that for each new bank branch in an "attractive, already banked" market, banks also had to open a new branch in an underbanked market (Young, 2015).

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[2] *We focus on the availability of banking infrastructure and do not aim to contribute to the debate on the possible downsides of financial inclusion with regard to access to credit and households' overindebtedness.*

The literature on spatial competition and market structure finds that the spatial distribution of bank branches within countries – at all levels of economic development – shows large disparities (Westrich et al., 2007; Okeahalam, 2009; Huysentruyt et al., 2013). Looking at bank branch coverage over time, the literature finds that regulation and banking market restructuring can significantly change geographic coverage and market structure (Dick, 2006; Damar, 2007; Sabater, 2013). In their comprehensive overview on the geography of banking in Europe and the U.S.A., Alessandrini et al. (2009) argue that two main trends characterize the deep changes observed in the geography of banking over the past two decades: (1) The regulatory easing of geographic restrictions, the opening of new branches and technological progress, including digitalization, reduced the "operational" distance between banks and their customers,[3] and (2) banking market consolidation, in particular mergers and acquisitions, reduced the number of banks and increased the "functional" distance between banks and their customers.

The literature has argued that the geographic distribution of bank branches and the local banking market structure have a substantial impact on households and enterprises. For enterprises, financing constraints may increase with the physical distance to bank branches (Alessandrini et al., 2009); loans tend to be costlier when they are "long distance" loans (Knyazeva and Knyazeva, 2012) and loan contracts tend to be more restrictive in that case (Hollander and Verriest, 2016). For households, previous research finds that there is a significant positive correlation between the number of bank branches and neighborhood average income (Westrich et al., 2007; Okeahalam, 2009; Huysentruyt et al., 2013), i.e. poorer households tend to live in areas where bank branches are fewer. The absence of banks has an impact on the financial inclusion (i.e. ownership of accounts and access to credit) of households: Globally, every fifth adult without a bank account names *lack of physical access to banks* as a reason for not having an account (Demirguc-Kunt et al., 2015). Distance to bank branches and bank branch density significantly affect households' demand for and use of banking services (Ho and Ishii, 2011; Brown et al., 2015) and ultimately consumer welfare (Dick, 2006, 2008).

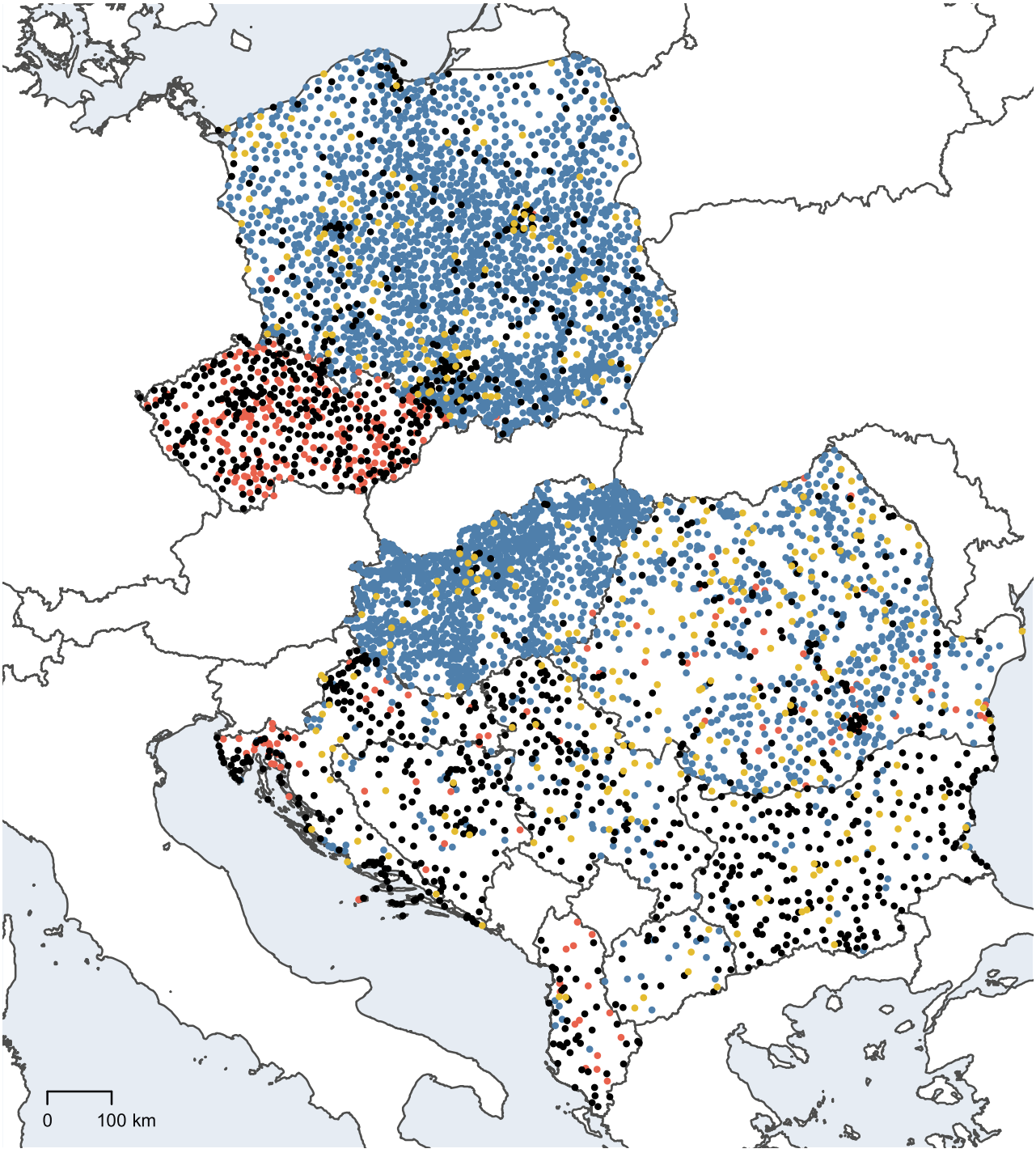
In this paper, we focus on the geography of banking in Central, Eastern and Southeastern Europe (CESEE). For several reasons, this region provides for a particularly interesting case study: During the transition from planned to market economies in the 1990s, the CESEE countries started building banking systems from scratch (see e.g. Barisitz, 2008). Therefore, both households and enterprises only have a comparatively short history of interactions with banks. Financial inclusion is still below the average of non-CESEE EU Member States.[4] In addition, during the transition process, CESEE economies developed regional disparities which parallel, or exceed, those of many Western European economies (Huber, 2007), which suggests that bank coverage and market structure will also vary significantly within countries. In this context, Sokol (2013) argues that more generally

[3] *Stern (2017) provides an analysis of the fintech sector in CESEE and shows that most of the new technologies have so far been used only on a small scale in the countries covered by our analysis. Furthermore, a recent World Bank report shows that in Central Europe 30% of individuals do not use the Internet and that the percentage of non-Internet users is even higher in the Western Balkans. In addition, there is a significant urban-rural divide in households' fixed Internet access (Kelly et al., 2017).*

[4] *For data on enterprise access to finance, see www.enterprisesurveys.org/. For data on households' financial inclusion, see www.worldbank.org/en/programs/globalfindex.*

Chart 1

Bank branches by bank ownership



Source: OeNB CESEE bank branch data.

Note: Each dot indicates a village or city with at least one bank branch. Colors indicate that the majority of branches in the respective villages or cities are domestic (blue), foreign/non-Austrian (black), Austrian (red) or that the shares of foreign and domestic branches are equal (yellow).

the current literature lacks research focused on understanding how finance influences social and spatial inequalities. Finally, the majority of banks in CESEE is foreign owned, and previous research has argued that foreign-owned banks significantly differ from domestically owned banks in how and to whom they provide banking services (Beck and Brown, 2015).

We introduce a new dataset covering all bank branches serving households in ten CESEE economies[5] that is unique in its depth and granularity.[6] It covers 210 banks with 28,540 bank branches. Chart 1 illustrates the location of bank branches across the ten CESEE economies covered by our analysis.

In this paper, we use this dataset to comprehensively describe and analyze local banking market structures in CESEE. In particular, we are interested in the variation of bank coverage, density and concentration between and within countries. Moreover, we study the differences between domestically owned and foreign-owned banks. Matching OeNB CESEE bank branch data with fine-grained data on local economic activity and urbanization levels, we analyze the determinants of banks' location choice[7] and find that foreign-owned banks tend to have more branches in economically more developed, urban areas where bank competition is higher. We conclude by providing a descriptive snapshot on how accessible banking services are for CESEE households. To facilitate research on how the banking environment affects economic outcomes, we make indicators of bank branch coverage, density, concentration and ownership available for download at Nomenclature of Territorial Units for Statistics 3 (NUTS 3) level.[8]

As we focus on banks serving households, our data are distinct from Beck et al. (2018), who collected data for 21 transition economies on all bank branches that provide funding to small and medium-sized enterprises (SMEs), excluding those serving households or large corporates, covering a total of 422 banks and 38,310 bank branches in 2009. In the following, we introduce the data used in our analysis.

1 Data

At the center of our analysis is a newly collected dataset on the location of bank branches serving households in ten CESEE countries.[9] We match these data with information on bank ownership, fine-grained data on local economic activity and a range of indicators at NUTS 3 level.

[5] *Throughout this study, the countries analyzed will be listed alphabetically and grouped according to their level of integration into the EU (EU Member States followed by (potential) EU candidate countries).*

[6] *For reasons of simplicity, we will refer to this dataset as "OeNB CESEE bank branch data."*

[7] *We treat the existing structure of branches as reflecting a location choice. However, we are aware of the fact that foreign banks may have acquired existing bank branch networks via mergers and acquisitions so that at the time of the merger or acquisition, the branch networks were a given.*

[8] *Nomenclature of Territorial Units for Statistics (NUTS) by regional level is a hierarchical system for dividing the economic territory of the European Union. NUTS 3 are the finest regional divisions, with a minimum of 150,000 and a maximum of 800,000 citizens per region. Thus, NUTS 3 regions can be equivalent to larger cities. The (potential) EU candidate countries Albania, Bosnia and Herzegovina, FYR Macedonia and Serbia have either already been, or are in the process of being, included in NUTS.*

[9] *The OeNB CESEE bank branch data are intended to be matched with OeNB Euro Survey data to help analyze CESEE households' financial decisions. The OeNB Euro Survey focuses on understanding the determinants of euroization and is therefore only conducted in CESEE countries whose legal tender is not the euro (Bulgaria, Croatia, the Czech Republic, Hungary, Poland, Romania, Albania, Bosnia and Herzegovina, FYR Macedonia and Serbia). This means that we neither collect OeNB CESEE bank branch data nor Euro Survey data for Slovakia, Slovenia, Montenegro and Kosovo.*

1.1 The OeNB CESEE bank branch data

For each bank serving households in the countries analyzed, we collected data on the number and location of all bank branches (address, latitude and longitude). In total, our dataset contains the geographic coordinates of 28,540 bank branches operated by 210 banks. For all countries analyzed, data were collected in 2013. Some central banks provided us with information on all bank branches in their countries; for the majority of CESEE countries, however, the data had to be hand-collected, which meant gathering the information on bank branches from the websites of all banks serving households in a given country.[10] For countries for which information on bank branches was hand-collected, our data cover all important banks serving households. We excluded a few very small banks serving households, however, which means the list of banks is not comprehensive. We verified that all the important banks are indeed covered by cross-checking our data with information from the OeNB Euro Survey of CESEE households. This cross-check showed that less than 5% of households are customers of a bank not covered by the OeNB CESEE bank branch data.[11] To ensure comparability of the OeNB CESEE bank branch data across countries, we also exclude very small banks in countries for which information on all bank branches is available from the respective central banks. Banks that serve less than 5% of all households are dropped from the dataset.[12]

Because data are hand-collected, data verification is of utmost importance. We perform data verification by cross-checking our data with several external sources which provide indicators of bank coverage at the country level (see annex, table A2). These country-level indicators are defined for all bank branches including those serving enterprises only, and are not defined for bank branches serving households and, therefore, are only a benchmark. We further check that banks' market shares in terms of assets positively correlate with their market shares in terms of bank branches (see annex, chart A1). Taken together, these cross-checks indicate that the OeNB CESEE bank branch data provide a valid picture of the banking landscape in CESEE.

We obtained the geographic coordinates of branch locations using Google Maps. For analyzing household finance, the accuracy of these geographic coordinates is critical as the distance to the nearest bank and bank density influence households' financial inclusion at a very local level (Dick, 2008; Ho and Ishii, 2011). In general, our geographic coordinates are accurate at the street level and can thus show branch dispersion within cities. For smaller villages, our geographic coordinates are mostly accurate at the level of the village center. This applies to 6% of bank branches.[13]

[10] *For a random sample of the geocoded addresses of the hand-collected data we used Google Streetview to verify the existence of these branches.*

[11] *In fact, in all countries except Serbia, 3% of households are customers of a bank not covered by the OeNB CESEE bank branch data.*

[12] *During the data collection process, we took care to distinguish between different types of bank branches. While some branches may offer only simple transaction services, others may offer loans. We aimed to harmonize the definition of "a bank branch serving households" to mean a bank branch at which an individual can at least open a bank account.*

[13] *The share of bank branches that are geocoded at the village center and not at the street level varies strongly between countries (Bulgaria: 2.8%, Croatia: 1.8%, the Czech Republic: 0%, Hungary: 0%, Poland: 0.9%, Romania: 7.5%, Albania: 48.7%, Bosnia and Herzegovina: 15.4%, FYR Macedonia: 19.1% and Serbia: 17.0%).*

In addition to street-level geographic coordinates, we collected the geographic coordinates of the city or village center where each bank branch is located. This allows us to assign all branches to the center of a village or city. Thus, we can describe local banking markets not only in terms of radii in kilometers around each bank branch but also in terms of administrative areas.

1.2 Bank ownership

We combine the OeNB CESEE bank branch data with information on the global ultimate owner of the respective banks. We obtained this information from Bureau van Dijk's bankscope and the Claessens and van Horen (2015) database. For some smaller banks, we obtained the information directly from the respective banks' websites.[14] Table 1, panel A, shows the number of banks serving households for each country. We see a strong variation across countries in the number of banks

Table 1

Number of banks and bank branches by bank ownership

Panel A. Number of banks by bank ownership

	Number of banks	Of which: domestic banks	Of which: foreign banks	Share of Austrian banks in foreign banks
		%		
Bulgaria	21	33.33	66.67	7.14
Croatia	28	50.00	50.00	28.57
Czech Republic	19	10.53	89.47	17.65
Hungary	11	36.36	63.64	28.57
Poland	24	45.83	54.17	7.69
Romania	27	22.22	77.78	19.05
Albania	11	18.18	81.82	11.11
Bosnia and Herzegovina	21	47.62	52.38	27.27
FYR Macedonia	16	37.50	62.50	10.00
Serbia	32	34.38	65.63	14.29

Panel B. Number of branches by bank ownership

	Number of branches	Of which: domestically owned branches	Of which: foreign-owned branches	Share of Austrian-owned branches in foreign-owned branches
		%		
Bulgaria	2,506	25.06	74.94	7.93
Croatia	1,148	23.26	76.74	34.28
Czech Republic	2,806	3.39	96.61	36.04
Hungary	2,718	73.03	26.97	34.92
Poland	10,432	56.08	43.92	6.44
Romania	5,207	34.34	65.66	37.23
Albania	460	13.91	86.09	25.25
Bosnia and Herzegovina	812	21.31	78.69	35.68
FYR Macedonia	413	45.04	54.96	11.89
Serbia	2,038	30.47	69.53	13.55

Source: OeNB CESEE bank branch data.

[14] *Until 2015, UniCredit's CESEE subsidiaries, with the exception of those in Poland, were managed by UniCredit Bank Austria AG on behalf of the Italian-based global ultimate owner UniCredit S.p.A. Therefore, these banks are treated in the data as "Italian owned" and not "Austrian owned."*

relevant for households. With the exception of Croatia, the percentage of domestically owned banks is below 50% in all CESEE countries under observation. In Croatia, Hungary, and Bosnia and Herzegovina more than one-quarter of foreign-owned banks serving households are Austrian.

Table 1, panel B, shows the number of bank branches serving households in each country. With the notable exceptions of Hungary, Poland, Romania and FYR Macedonia, the share of foreign-owned branches in the total number of branches is higher than that of foreign-owned banks in the total number of banks, i.e. foreign-owned banks have a higher number of branches than domestically owned banks. In Hungary and Poland, the comparatively high number of branches among domestically owned banks is related to the presence of domestically owned cooperative banks. In the Czech Republic, less than 4% of bank branches have a domestic owner. Compared to their share among foreign banks, Austrian banks tend to have more branches in CESEE (except in Serbia and Poland) than other foreign banks.

1.3 Additional data

To calculate indicators of bank coverage and density, we combine the OeNB CESEE bank branch data with information on surface area and population size at the country and NUTS 3 levels. We further match the OeNB CESEE bank branch data with indicators of local economic activity (i.e. average stable night lights) and GDP (where available at NUTS 3 level) and indicators of the urbanization level ("urban fabric," see annex, table A3 for a definition) and further indicators that could influence banks' location choice at NUTS 3 level. Table A3 in the annex provides a detailed definition and the sources of all variables.

2 Geographic coverage and bank branch density – a disaggregated view

Is the number of bank branches high or low for the country in question? To answer this question, we put the data from table 1, panel B, into perspective by expressing them in terms of population aged 14 years or older and in terms of country size (table 2). To provide a comparison with a country that did not undergo transition, we also collected corresponding data for Austria.[15] In Austria, there are on average 1,633 adult inhabitants per bank branch and 54 bank branches per 1,000 km^2. These figures vary substantially between Austrian NUTS 3 regions, namely from 970 to 5,866 adults per branch and from 17 to 720 branches per 1,000 km^2. These data show that Austria has by far the lowest number of adults per bank branch. Bank branches in Bosnia and Herzegovina and in FYR Macedonia have more than twice as many adults per bank branch, and those in Albania more than three times as many. Moreover, Austria has the highest number of bank branches per 1,000 km^2, followed by the Czech Republic and Poland. Bank branch density is found to be lowest in Bosnia and Herzegovina, FYR Macedonia and Albania.

Table 2 also gives a first indication that bank branch density strongly varies within countries. As a case in point, the number of adults per branch differs by 6,800 between regions in FYR Macedonia and by 12,200 between regions in Albania.

[15] *For Austria, data on bank branches is available for download from the OeNB website at www.oenb.at/Statistik/Klassifikationen/Bankstellenverzeichnis.html. We obtained the geographic coordinates for these data following the same procedure as for the CESEE data. Furthermore, we combined the data for Austria with the same indicators on surface area, population and economic activity we used for CESEE.*

Table 2

Bank branch density

Panel A. Number of adults (population aged 14+) per bank branch

	Country average	NUTS 3 minimum	NUTS 3 maximum	Difference between NUTS 3 minimum and maximum
Bulgaria	2,497	2,129	4,535	2,406
Czech Republic	3,197	2,033	6,935	4,901
Croatia	3,145	2,505	4,734	2,229
Hungary	3,111	2,163	6,263	4,100
Poland	3,104	2,473	5,478	3,005
Romania	3,236	2,213	7,343	5,130
Albania	5,077	3,200	15,376	12,177
Bosnia and Herzegovina	4,052	..	..	..
FYR Macedonia	4,149	3,503	10,258	6,755
Serbia	2,930	2,667	6,835	4,168

Panel B. Number of bank branches per 1,000 km²

	Country average	NUTS 3 minimum	NUTS 3 maximum	Difference between NUTS 3 minimum and maximum
Bulgaria	23	10	478	468
Czech Republic	36	3	289	285
Croatia	21	19	1,002	983
Hungary	30	10	726	715
Poland	34	11	1,277	1,265
Romania	23	6	3,550	3,544
Albania	17	3	108	105
Bosnia and Herzegovina	16	..	..	..
FYR Macedonia	16	8	97	88
Serbia	23	8	194	186

Source: OeNB CESEE Bank branch data, authors' calculations.

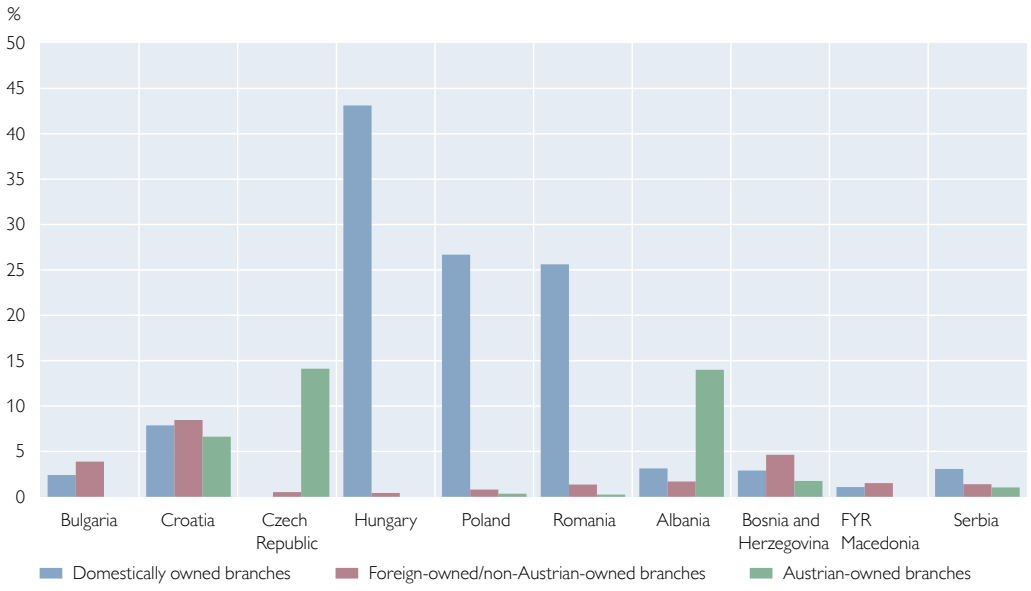
The number of branches per 1,000 km² varies by up to 3,500 in Romania and by up to 1,300 in Poland. Thus, as expected, bank branch coverage and density mirror other regional disparities found in the CESEE economies.

In addition to these regional disparities, we find that bank branches are locally clustered in urban areas. For the majority of branches, the distance to the next bank branch of any bank is less than 1 km. Chart 2 shows the percentage of bank branches which are farther than 5 km from the next bank branch. These branches are likely located in remote areas with fewer possible customers but also lower competition from other banks. With the exception of Hungary, Poland and Romania, less than every fifth bank branch in the CESEE countries observed is located more than 5 km from the next branch of any bank.

Previous research shows that foreign banks tend to serve wealthier households (Beck and Brown, 2015). This would imply that bank branch density within countries varies by global ultimate owner or, to put it differently, that foreign-owned banks are less likely to have branches in remote areas, which are often poorer. Chart 2 confirms differences between the location choice made by foreign and domestic banks for some countries: In Hungary, Poland and Romania, domestically owned banks have a significantly higher share of branches located more than 5 km

Chart 2

Bank branches located more than 5 km from nearest bank branch, by bank ownership



Source: OeNB CESEE bank branch data.

from the next branch of any bank. In turn, both in the Czech Republic and Albania, Austrian banks have a significantly higher share of branches in areas with low bank branch density than both other foreign-owned banks and domestic banks.[16] Thus, a look at the distances between bank branches suggests that there is no typical foreign bank location policy but that foreign banks' location policies differ between countries.

Table 2 and chart 2 depict the coverage and density of the overall bank branch network. However, while a certain region may be covered by a dense branch network, this network may be operated by no more than one or two large banks. In other words, banks may operate at a nationwide level or focus on certain regions. Table 3 indicates how branching policies (in terms of nationwide coverage) vary between banks. For example, in Bulgaria there are 259 villages or cities with at least one bank branch. While one bank has branches in just seven of these 259 villages or cities, which means it covers 2.7% of all "banked" villages or cities, another bank covers 230 villages or cities out of the 259 "banked" ones, i.e. 89.2%. On average, banks in Bulgaria cover 37.6% of all villages or cities that have at least one bank branch. The rate of bank coverage of such villages or cities varies significantly across countries, namely from 24% to 60%. Croatia has the lowest bank coverage rate, indicating that in Croatia banks tend to operate only in certain regions, whereas in Hungary – which records the highest rate – banks seem to follow a strategy of broader, nationwide operation. When we look at larger regions, i.e. NUTS 3, we find that the vast majority of banks tend to have at least one branch in every region (see online data supplement on the OeNB's website).

[16] *Table A4 in the annex presents descriptive statistics on the area covered by buildings and roads – the so-called "urban fabric" – surrounding bank branches. These statistics confirm that the majority of bank branches in CESEE are located in urban areas and that there are significant differences between domestically owned, foreign-owned/non-Austrian-owned and Austrian-owned banks; these patterns are not uniform across countries, however.*

Table 3

Indicators of banks' geographic coverage within countries

Panel A. Distribution of banks' geographic coverage

	Minimum share of villages or cities covered by at least one bank	Mean share of villages or cities covered by banks	Maximum share of villages or cities covered by at least one bank
	%		
Bulgaria	2.7	37.6	89.2
Croatia	0.8	24.3	51.8
Czech Republic	1.5	44.0	96.3
Hungary	0.1	60.4	96.2
Poland	1.4	24.6	57.5
Romania	0.3	33.8	90.2
Albania	18.2	45.5	84.9
Bosnia and Herzegovina	4.9	36.4	70.7
FYR Macedonia	2.6	52.2	79.5
Serbia	0.5	29.0	56.2

Panel B. Differences in banks' geographic coverage by bank ownership

	Mean share of villages or cities covered by banks		
	Domestically owned	Foreign-owned/ non-Austrian-owned	Austrian-owned
	%		
Bulgaria	30.2	41.2	26.6
Croatia	7.8	31.6	24.9
Czech Republic	10.1	30.6	71.0
Hungary	80.4	6.1	6.2
Poland	35.4	11.1	6.5
Romania	60.9	18.3	22.1
Albania	29.0	35.8	84.9
Bosnia and Herzegovina	12.7	40.9	46.1
FYR Macedonia	57.1	48.2	48.7
Serbia	33.1	28.5	19.0

Source: OeNB CESEE bank branch data.

Note: We only count localities that have at least one bank branch, i.e. the total number of villages or cities recorded here excludes all villages or cities that do not have any banks.

Panel B of table 3 compares banks' "regional versus nationwide" branching policy, broken down by bank ownership. Similar to what we see in chart 2, there are significant differences between domestically and foreign-owned banks but these differences again vary across countries. While in Hungary, Romania and FYR Macedonia, at least one domestically owned bank is present in the majority of villages or cities with at least one bank branch, domestically owned banks are present only in every tenth "banked" village or city, on average, in Croatia, the Czech Republic, and in Bosnia and Herzegovina.

Table 4

Herfindahl index

	Domestically owned branches	Foreign/ non-Austrian-owned branches	Austrian-owned branches
	Mean		
Bulgaria	0.14	0.15	0.09
Croatia	0.24	0.25	0.22
Czech Republic	0.10	0.15	0.29
Hungary	0.63	0.23	0.22
Poland	0.41	0.13	0.10
Romania	0.38	0.13	0.13
Albania	0.16	0.16	0.29
Bosnia and Herzegovina	0.19	0.21	0.19
FYR Macedonia	0.15	0.14	0.13
Serbia	0.14	0.12	0.09

Source: Authors' calculations.

We take a closer look at the local market structure in the vicinity of foreign- and domestically owned branches by comparing bank concentration in the relevant local market. To this end, we compute an index that is similar to the widely used Herfindahl index of concentration. Under the rigid assumption that each bank branch serves an equal number of customers, we can calculate the market shares of each bank within a certain radius from every bank branch in the dataset:

$$H_{Branch} = \sum_{i=1}^{N_{Banks}} q_i^2$$

where N_{Banks} denotes the number of banks within 5 km from each bank branch and qi=(number of branches of bank i within 5 km) / (number of all bank branches within 5 km). The index can thus vary between values close to zero and one. If there are no other branches within 5 km of a specific bank branch, the index equals one. It also equals one if there are ten other bank branches but they all belong to the same bank. If, on the other hand, there are ten other bank branches and each one belongs to a different bank, the index is close to zero. Table 4 shows that the average concentration index is relatively low at 0.25. In Hungary, Poland and Romania, domestic banks tend to operate in markets that are more concentrated. This is in line with the results presented in chart 2, showing that domestic banks tend to locate in remoter regions. With the exception of the Czech Republic and Albania, Austrian-owned bank branches are located in less concentrated and likely more competitive markets.

3 Determinants of bank branch location

The descriptive statistics above show that the coverage, density and concentration of bank branch networks vary significantly within countries. What determines the location of bank branches? Are the determinants for branch location different for domestically owned banks and for foreign-owned banks? We analyze this problem more formally in a number of regression analyses. Specifically, we estimate OLS regressions with three alternative dependent variables, namely (1) the number of bank branches per capita, (2) the share of foreign bank branches, and (3) the share of Austrian bank branches. Our explanatory variables are informed by previous research and comprise indicators of demand for banking services and local economic activity: GDP per capita or, alternatively, stable night light following Henderson et al. (2012), population density, the number of enterprises per capita as well as the number of robberies per capita as a proxy for crime rates. In all regressions, we control for differences between countries, e.g. in terms of institutional quality, by including country fixed effects. As the explanatory variables are mainly observed at NUTS 3 level only, we aggregate the OeNB CESEE bank branch data to the NUTS 3 level, which yields 260 observations in total. The share of foreign banks in the total number of banks thus refers to the share of foreign banks per NUTS 3 region. Table A3 in the annex provides a detailed description of all variables and their respective sources. As we do not observe bank branch locations over time, regressions do not identify causal relationships but rather reflect correlations.

Table 5 presents the results of the regression in which branches per capita are the dependent variable and shows the overall determinants of bank branch location. We find that local economic activity as measured by GDP per capita, stable night lights or the number of enterprises per capita is correlated positively and significantly with the number of bank branches per capita. Specifically, a one-standard-deviation change in GDP per capita translates into a 0.62 absolute change in the number of bank branches per 10,000 adults. This effect is sizeable as the average number of bank branches per 10,000 adults across NUTS 3 regions is 2.5. The magnitude of the effect is similar when we employ the number of enterprises per capita as a proxy for local economic activity (table 5, column 2): A one-standard-deviation change in the number of enterprises per capita is associated with 0.62 more branches per 10,000 adults.[17] Data for GDP or enterprises per capita are not available for Serbia or for Bosnia and Herzegovina. In addition, for Bosnia and Herzegovina, there are no population data at the NUTS 3 level. Employing night lights as a proxy for GDP, we also find a significant positive correlation with the number of bank branches per capita (column 3): A one-standard-deviation change in night lights per capita is associated with 0.12 more branches per 10,000 adults. Population density is correlated negatively and significantly with the number of bank branches per capita. A one-standard-deviation change in population density is associated with a 0.23 decrease in the number of bank branches per 10,000 adults. Finally, we employ a proxy for security: the number of robberies per capita. This is negatively and significantly associated with the number of bank branches per capita.

Table 5

Determinants of bank branch location

Dependent variable	log(bank branches per capita at NUTS 3 level)			
	(1)	(2)	(3)	(4)
log of GDP (at PPP) in euro per capita	0.567***	0.242**		0.526***
	(0.069)	(0.094)		(0.069)
log of population density	–0.089***	–0.146***		–0.048*
	(0.027)	(0.045)		(0.028)
log of enterprises per capita		0.541***		
		(0.088)		
log of night lights per capita			0.061**	
			(0.03)	
log of number of robberies per capita				–0.048**
				(0.024)
Constant	–13.135***	–8.145***	–8.407***	–12.715***
	(0.602)	(1.105)	(0.127)	(0.598)
Country fixed effects	Yes	Yes	Yes	Yes
Adjusted R-squared	0.56	0.65	0.36	0.38
Number of observations	198	137	230	178

Source: Authors' calculations.

*Note: ***, ** and * denote significance at the 1%, 5% and 10% level, respectively.*

[17] *The number of enterprises per capita is highly correlated with GDP per capita.*

We check for the robustness of our results by reducing the sample to those regions where we observe all explanatory variables, re-estimating all regressions for the specification with the lowest number of observations (table 5, column 2). We also re-run regressions by lagging our explanatory variables, i.e. by using data on GDP per capita from 2012 to explain the share of bank branches in 2013. None of these modifications qualitatively change our results.

Turning to the differences in the location decision of foreign and domestic banks, table 6 shows that local economic activity and population density correlate positively and significantly with the share of foreign bank branches. A one-standard-deviation increase in GDP per capita (e.g. a change from EUR 9,930 to EUR 15,239 per capita at PPP) translates into a 6 percentage point rise in the share of foreign bank branches in the total number of branches. A one-standard-deviation increase in population density leads to a 7 percentage point increase in the share of foreign bank branches. Because the share of foreign branches in the total number of branches at NUTS 3 level is very high on average in some countries, we perform a robustness check by reducing the sample to those countries where there is a significant variation in the share of foreign branches (see the last three columns of table 6). This check shows that the results do not change qualitatively.

In a final step, we analyze the determinants of Austrian banks' branch locations. The overall picture is similar to that obtained in table 6. Local economic activity is positively correlated with the share of Austrian bank branches in the total number of branches. The magnitude of the effect of economic activity is smaller, however. A one-standard-deviation increase in GDP per capita leads to a 2 percentage point increase in the share of foreign bank branches in the total number of branches. Population density is not associated with the share of Austrian banks' branches in the total number of banks. Thus, Austrian banks, as other foreign banks, are mainly present in richer regions. However, foreign banks are also mainly present in more

Table 6

Determinants of foreign bank branch location

Dependent variable	Share of foreign-owned bank branches in total number of bank branches at NUTS 3 level					
Sample	All countries			Hungary, Poland, Romania, FYR Macedonia		
log of GDP (at PPP) in euro per capita	0.090***	0.072*		0.109***	0.140***	
	(0.026)	(0.039)		(0.025)	(0.043)	
log of population density	0.030***	0,008		0.044***	0.036*	
	(0.01)	(0.015)		(0.009)	(0.02)	
log of enterprises per capita		0,047			0,006	
		(0.035)			(0.047)	
log of night lights per capita			0.046***			0.085***
			(0.011)			(0.012)
Constant	–0.229	0.19	0.644***	–1.009***	–1.242**	0.135***
	(0.226)	(0.461)	(0.038)	(0.217)	(0.502)	(0.05)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.88	0.88	0.81	0.82	0.87	0.66
Number of observations	198	137	248	123	62	130

Source: Authors' calculations.

*Note: ***, ** and * denote significance at the 1%, 5% and 10% level, respectively.*

Table 7

Determinants of Austrian bank branch location

Dependent variable	Share of Austrian-owned bank branches in total number of bank branches at NUTS 3 level					
Sample	All countries			Hungary, Poland, Romania, FYR Macedonia		
log of GDP (at PPP) in euro per capita	0.038**	0.091***		0.024**	0.058***	
	(0.016)	(0.023)		(0.011)	(0.02)	
log of population density	–0.01	–0.01		0.005	0.01	
	(0.005)	(0.009)		(0.004)	(0.011)	
log of enterprises per capita		–0.058**			–0,039	
		(0.023)			(0.024)	
log of night lights per capita			0.007			0.012**
			(0.005)			(0.005)
Constant	–0.092	–0.783***	0.235***	–0.167*	–0.630**	0.083***
	(0.133)	(0.253)	(0.025)	(0.095)	(0.238)	(0.017)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.86	0.79	0.86	0.92	0.8	0.93
Number of observations	198	137	248	123	62	130

Source: Authors' calculations.

*Note: ***, ** and * denote significance at the 1%, 5% and 10% level, respectively.*

populated areas – and this does not apply for Austrian banks. This regression result is, therefore, in line with previous descriptive findings.[18]

4 The banking landscape in CESEE from a household perspective

As we noted in the introduction, previous research has shown that the geographic distribution of bank branches and local banking market structure can have a substantial impact on households' financial inclusion and access to finance (Demirguc-Kunt et al. 2015; Ho and Ishii, 2011; Brown et al., 2015; Dick, 2006, 2008). To provide a first glimpse of whether this is also true for CESEE, we combine the OeNB CESEE bank branch data with the OeNB Euro Survey of CESEE households.[19] Interpreting the results requires some caution as resutls rely on the representativeness of the surveys with respect to the geographic distribution of the population, which cannot be validated. OeNB Euro Survey data are representative of the each country's population with regard to age, gender and regions, and the fact that we use a large number of households (about 6,000 per country) mitigates the caveat of finer-grained geographic representativeness.

Table 8 shows the percentage of households in CESEE that live within 1 km, 2 km or 5 km of the nearest bank. Again, to provide a comparison with a non-transition country, we also combine the data on Austrian bank branches with a representative survey of Austrian households. In Austria, 69% of households live

[18] *The regression specifications in table 6 and table 7 were repeated with an estimator that accounts for the limited structure of the dependent variable (i.e. a fractional logit estimator). This had only minor implications on our results.*

[19] *The OeNB Euro Survey is a representative survey of CESEE households conducted by the OeNB since 2007. We employ data from 2012 to 2016, when we obtained the geographic coordinates of the primary sampling units, i.e. the coordinates of the respective streets in cities or villages or of the center of small villages. The reported distance thus refers to the distance between the address of the primary sampling unit and that of the nearest bank branch and not the actual address of respondents. However, this discrepancy should be rather small on average. For more information on the OeNB Euro Survey, see www.oenb.at/en/Monetary-Policy/Surveys/OeNB-Euro-Survey.html.*

Table 8

Households' access to banks

	Households that have a bank within		
	1 km	2 km	5 km
	%		
Bulgaria	69	75	82
Croatia	52	62	80
Czech Republic	58	66	81
Hungary	74	86	92
Poland	68	79	93
Romania	60	64	75
Albania	54	65	77
Bosnia and Herzegovina	49	56	73
FYR Macedonia	54	62	76
Serbia	67	76	86

Source: OeNB Euro Survey, CESEE bank branch data, unpublished data from a representative survey of Austrian residents.

within 1 km, 83% of households within 2 km and 98% of households within 5 km of the nearest bank. In CESEE, with the exception of Bosnia and Herzegovina, the majority of survey respondents has at least one bank branch within 1 km (table 8) from their home. On average across CESEE countries, 69% of households live within 2 km of the nearest bank branch.

It is striking, however, to see how the percentage of households that live within 5 km from the nearest bank varies between countries. While only 2% of survey respondents in Austria do not have a bank within 5 km, in Bosnia and Herzegovina, Romania, Albania and FYR Macedonia more than 20% of households live more than 5 km away from the nearest bank branch. For some households in Albania and in Bosnia and Herzegovina, the nearest bank branch is even more than 40 km away. These differences between countries may partly reflect differences in population density.

There are many factors that may influence a household's decision to open a bank account or take out a loan, especially in CESEE, where the experience of previous economic and financial crises has led to a lack of trust in banks and a high cash preference (Stix, 2013). Nevertheless, table 9 provides some indication that the distance to the nearest bank and the likelihood of households having a bank

Table 9

Local banking markets and households' financial inclusion

	(a)	(b)	Null hypothesis: a=b	(c)	(d)	Null hypothesis: c=d
	Households without bank account	Households with a bank account		Households without loan	Households with a loan	
	Distance in km		*p-value*	*Distance in km*		*p-value*
Bulgaria	2.66	1.80	0.00	2.13	1.76	0.00
Croatia	3.17	2.56	0.01	2.61	2.61	0.99
Czech Republic	2.15	2.27	0.39	2.35	2.01	0.00
Hungary	1.51	1.23	0.00	1.27	1.35	0.22
Poland	1.84	1.33	0.00	1.49	1.22	0.00
Romania	3.35	2.01	0.00	2.87	2.21	0.00
Albania	3.35	2.60	0.00	3.02	2.82	0.27
Bosnia and Herzegovina	3.91	3.31	0.00	3.55	3.34	0.16
FYR Macedonia	3.82	2.46	0.00	2.93	2.02	0.00
Serbia	2.23	1.58	0.00	1.85	1.50	0.01

Source: OeNB Euro Survey and OeNB CESEE bank branch data.

Note: We define bank accounts as either current accounts, saving deposits or accounts with a debit or wage card. From OeNB Euro Survey data from 2011 to 2016, we find that the share of unbanked adults (respondents aged 14+) in the total population varies significantly between countries, coming to 26% in Bulgaria, 6% in Croatia, 5% in the Czech Republic, 23% in Hungary, 17% in Poland, 32% in Romania, 29% in Albania, 30% in Bosnia and Herzegovina, 20% in FYR Macedonia and 20% in Serbia. In Romania and Albania, the share of unbanked households decreased significantly after 2011, coming to 33% in 2016.

account or a loan are connected. On average across countries, households without a bank account live 2.8 km from the nearest bank while households with a bank account live 2.1 km from the nearest bank. Again, there is a strong variation across countries; with the exception of the Czech Republic, however, households with a bank account live significantly closer to the nearest bank branch than those without. Looking at loans, we find that the distance to the nearest bank branch does not differ significantly between those households that have and those that do not have a loan in Croatia, Hungary, Albania and in Bosnia and Herzegovina. For all other countries, households with a loan live significantly closer to the nearest bank branch than households that do not have a bank loan.

5 Conclusions

This paper discusses the geography of banking in ten Central, Eastern and Southeastern European (CESEE) countries using a novel dataset covering bank branch locations. In particular, we focus on two main aspects: first, on the provision of banking services, and second, on differences between domestic and foreign banks. Based on a descriptive account of the data used, our findings confirm – but also qualify – previous findings from the literature.

With regard to the supply of banking services, we find large regional differences between and within countries. A comparison with Austria as an example of a non-transition economy shows that large differences in banking services supply within countries are not specific to CESEE countries. Regressions show that these differences are strongly correlated with local economic activity and population density.

We look at the spatial distribution and concentration of banks' branch network from different angles and find highly consistent results regarding the branching behavior of both domestically owned and foreign-owned banks. Our regression results confirm that the share of foreign banks in total banks is higher in more economically active and more densely populated regions. However, this does not hold for the location of Austrian banks in CESEE, for which population density is not significant. This means that Austrian banks in CESEE locate also in more rural areas.

The fact that foreign banks have a high share in total banking assets in CESEE is well documented. Our spatial data confirm this fact, but also highlight strong differences between countries with regard to branch outreach. On average, in 7 out of 10 economies, foreign banks service more villages or cities than domestic banks. In 6 economies, domestic banks service less than 35% of "banked" villages or cities. Compared to other foreign banks, we find that Austrian banks operate branches in a very high share of "banked" villages or cities (i.e. they are present throughout the country) in the Czech Republic and in Albania. In Bosnia and Herzegovina, in FYR Macedonia and in Romania, Austrian banks are on average present in as many villages or cities as banks from other countries. The large dispersions observed across economies shows that there is no "one-size-fits-all" explanation for the geographic behavior of foreign banks in CESEE.

On the basis of our analysis, we cannot judge whether a certain branch density is optimal, we can only document what a specific branch density implies for households. Evidence from survey data shows that for almost all households in Austria the nearest bank branch is located within 5 km from the respective households, whereas this share is much lower in CESEE, coming e.g. to 73% in Bosnia and Herzegovina. However, this should not conceal the fact that for the majority of

CESEE households, the nearest bank can be found within 2 km. We provide some descriptive evidence that the geographic dispersion of banks influences the financial inclusion of households, i.e. households' decisions whether to have formal bank relations or not. In addition, local competition might affect households' financing conditions. Our paper is only one first step toward highlighting the importance of these interrelations, which should be analyzed in much more depth by future research.

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Annex

Table A1

OeNB CESEE bank branch data sources

Country	Source
Bulgaria	Hand-collected
Croatia	Hand-collected
Czech Republic	Hand-collected
Hungary	Magyar Nemzeti Bank
Poland	Hand-collected
Romania	Hand-collected
Albania	Bank of Albania
Bosnia and Herzegovina	Banking Agency of the Federation of Bosnia and Herzegovina, Banking Agency of Republika Srpska (headquarters only), hand-collected
FYR Macedonia	Hand-collected
Serbia	National Bank of Serbia

Source: Authors' compilation.

Table A2

Comparison of OeNB CESEE bank branch data with external data sources

	Total number of branches (OeNB)	Total number of branches (2017)[1] (SNL)	Total number of branches (ECB)	Number of commercial bank branches per 100,000 adults 2013 (GFDD)	Branches per 100,000 adults (OeNB)
Bulgaria	2,506	1,942	3,729	60.60	40.05
Czech Republic	1,148	1,787	2,135	24.34	31.28
Croatia	2,806	997	1,222	34.56	31.80
Hungary	2,718	1,127	3,247	15.44	32.15
Poland	10,432	7,605	15,479	32.98	32.22
Romania	5,207	3,632	5,492	31.43	30.90
Albania	460	311	..	23.70	19.70
Bosnia and Herzegovina	812	682	..	30.83	24.68
FYR Macedonia	413	331	..	24.27	24.10
Serbia	2,038	1,461	..	33.64	34.14

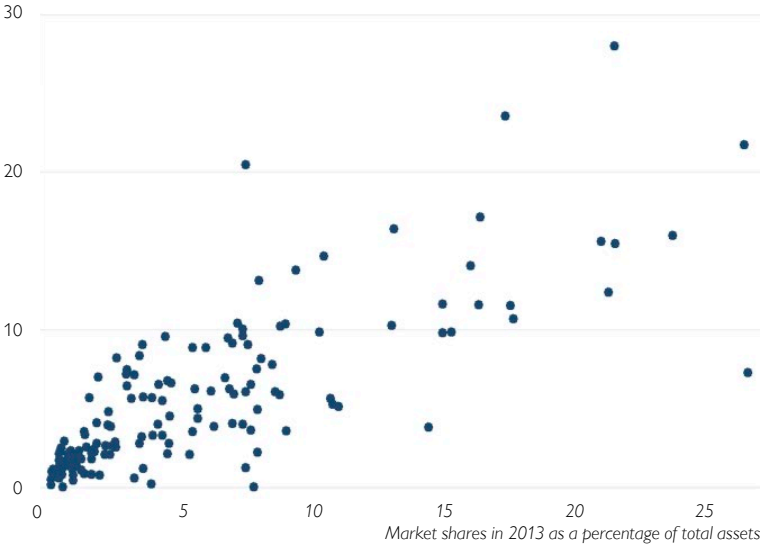
Source: OeNB CESEE bank branch data (OeNB), SNL Financial (SNL), ECB structural financial indicators (ECB), World Bank Global Financial Development Database (GFDD).

[1] Only includes SNL-covered companies for which specific branch location data are available.

Chart A1

Banks' market shares measured by bank branches and total assets

Market shares in 2013 as a percentage of total number of bank branches



Source: OeNB CESEE bank branch data, SNL Financial, national central banks.

Note: Dots represent individual banks.

Table A3

Definition of variables and sources

Variable	Definition	Sources
Branches	Represents the number of bank branches per capita by NUTS 3 region.	OeNB CESEE bank branch data
Banks	Represents the number of banks by NUTS 3 region.	OeNB CESEE bank branch data
Foreign share	Represents the share of foreign bank branches by NUTS 3 region.	OeNB CESEE bank branch data
Austrian share	Represents the share of Austrian bank branches by NUTS 3 region.	OeNB CESEE bank branch data
GDP	Represents gross domestic product (GDP) per capita by NUTS 3 region based on purchasing power parity (PPP) at current euro prices.	Information on GDP by NUTS 3 region was taken from the Eurostat database (see ec.europa.eu/eurostat/data/database). Since Eurostat provides GDP at the NUTS 3 level only at current market prices in EUR million, we had to compute PPP NUTS 3 level GDP per capita on our own. To do so, we first converted GDP provided by Eurostat to national currency units using end-of-period exchange rates provided by The Vienna Institute for International Economic Studies (wiiw). Second, we computed GDP converted into euro using PPP rates provided by the wiiw. Finally, we divided this indicator by the average annual population in the relevant country to get GDP per capita at PPP. Unfortunately, Eurostat does not provide GDP data for the NUTS 3 regions of Albania, Bosnia and Herzegovina, and Serbia. To the best of our knowledge, there exists no other database that provides GDP data for the NUTS 3 regions of Bosnia and Herzegovina and of Serbia. For Albania, however, GDP data by NUTS 3 region are provided by the Albanian Institute of Statistics (see Regional Accounts in Albania 2013, p. 31).
Night lights	Represents average stable night lights at NUTS 3 level.	National Center for Environmental Information, version 4, DMSP-OLS Nighttime Lights Time Series (see ngdc.noaa.gov/eog/dmsp/downloadV4composites.html). Authors' calculation for NUTS 3 level.
Population	Represents average annual population by NUTS 3 region.	Eurostat for Bulgaria, Croatia, the Czech Republic, Hungary, Poland, Romania and FYR Macedonia. Statistical Office of the Republic of Serbia for Serbia (see Statistical Yearbook). Note: The Statistical Office of the Republic of Serbia publishes population data only per June 30. We use this indicator as a proxy for average annual population. For Albania, average annual population data are provided by the Albanian Institute of Statistics (see Regional Accounts in Albania 2013, p. 36). According to the Agency for Statistics of Bosnia and Herzegovina, the NUTS classification in Bosnia and Herzegovina has not been completed yet. Hence, data on average annual population by NUTS 3 region is not yet available for Bosnia and Herzegovina.

Source: Authors' compilation.

Table A3 continued

Definition of variables and sources

Variable	Definition	Sources
Total area	Represents the total area of the NUTS 3 regions including inland waters expressed in km^2.	Information on the total area of the NUTS 3 regions is provided by Eurostat for five out of the ten countries under observation (Bulgaria, the Czech Republic, Hungary, Poland, Romania). For Serbia, data on the total area by NUTS 3 region are provided by the Statistical Office of the Republic of Serbia (see Statistical Yearbook). For Albania, data on the total area by NUTS 3 region is provided by the Albanian Institute of Statistics (see Regional Accounts in Albania 2013, p. 25). Since this information is only available for 2013, we assume that the area of the NUTS 3 regions did not change over time and will thus consider the same values for the years 2010 to 2015. This should be kept in mind when using the information on total areas for computing the population density for different years. Information on total areas is not available for Croatia, Bosnia and Herzegovina, and for FYR Macedonia.
Land area	Represents the total land area of the region, excluding inland waters expressed in km^2.	Information on land area is provided by Eurostat for seven out of the ten countries under observation (Bulgaria, Croatia, the Czech Republic, Hungary, Poland, Romania and FYR Macedonia). Information on land area is not available for Albania, Bosnia and Herzegovina, and Serbia.
Population density	Represents the population density by NUTS 3 region. Population density was computed by dividing average annual population by total area. If total area was not available for a NUTS 3 region, we used land area as a proxy for total area instead.	Authors' calculations based on the above sources.
Enterprises	Represents the total population of active enterprises by NUTS 3 region divided by the average annual population by NUTS 3 region. Total population of active enterprises includes industry, construction and services except insurance activities of holding companies (Statistical classification of economic activities in the European Community, revised classification – NACE Rev. 2).	Information on enterprises by NUTS 3 region is provided by Eurostat for six out of the ten countries under observation (Bulgaria, Croatia, the Czech Republic, Hungary, Poland, Romania). For Albania, data on the average annual population is provided by the Albanian Institute of Statistics (see Statistical Database). Information on enterprises is not available for Bosnia and Herzegovina, FYR Macedonia and Serbia.
Robbery	Represents the number of robberies at NUTS 3 level per year. Robbery is defined as stealing from a person with force or threat of force, including muggings (bag-snatching) and theft with violence. Pick-pocketing, extortion and blackmailing are generally not included.	Information on robbery by NUTS 3 region is provided by Eurostat for six out of the ten countries under observation (Bulgaria, Croatia, the Czech Republic, Hungary, Poland and Romania). Information on robbery is not available for Albania, Bosnia and Herzegovina, FYR Macedonia and Serbia.
Urban fabric	Represents the area covered by continuous urban fabric (buildings, roads and artificially surfaced area cover almost all the ground; nonlinear areas of vegetation and bare soil are exceptional) and discontinuous urban fabric (most of the land is covered by structures; buildings, roads and artificially surfaced areas associated with vegetated areas and bare soil, which occupy discontinuous but significant surfaces) within a radius of 1 km, 2 km, 5 km, 10 km and 20 km, respectively, of each bank branch.	CORINE Land Cover, authors' calculation.

Source: Authors' compilation.

Table A4

Differences in "urban fabric" surrounding bank branches, by bank ownership

	Area covered by urban fabric in a radius of 1 km around bank branch				
	Domestically owned branches	Foreign/non-Austrian-owned branches	Austrian-owned branches	Null hypothesis: domestic=foreign/ non-Austrian	Null hypothesis: foreign/non-Austrian=Austrian
	km²			*p-value*	
Bulgaria	2.08	2.08	2.18	0.99	0.12
Croatia	1.81	1.71	1.89	0.10	0.00
Czech Republic	2.15	1.93	1.74	0.00	0.00
Hungary	1.65	2.32	2.35	0.00	0.54
Poland	1.63	2.26	2.35	0.00	0.02
Romania	1.84	2.21	2.12	0.00	0.00
Albania	2.44	2.30	2.01	0.26	0.01
Bosnia and Herzegovina	1.67	1.86	1.75	0.08	0.10
FYR Macedonia	2.17	2.29	2.26	0.01	0.85
Serbia	1.99	2.22	2.30	0.09	0.16

Source: OeNB CESEE bank branch data, CORINE, authors' calculations.

Note: For a definition of urban fabric, see table A3. The total area A around a bank branch is $A=r^2*\pi\approx 3.14\ km^2$. We can see, for example, that urban fabric covers between 52% (Poland) and 78% (Albania) of the total area A surrounding domestically-owned bank branches.

How are reduced interest rate differentials affecting euroization in Southeastern Europe? Evidence from the OeNB Euro Survey[1]

Thomas Scheiber,
Julia Wörz[2]

Euroization is a widespread phenomenon in many Central, Eastern and especially Southeastern European countries. From the literature on euroization we derive potential implications of the recently observed reduced interest rate differential between local and foreign currencies for households' demand for cash holdings, foreign currency deposits and foreign currency loans. We contrast these hypotheses with recent changes in households' observed saving and borrowing behavior in the region. To this end, we combine information from the OeNB Euro Survey with data from national central banks. The different dynamics of asset and liability euroization observed in the recent period of reduced interest rate differentials in the euroized countries of Southeastern Europe by and large match the theoretical expectations. Based on the literature and the data compiled in this article we conclude that fostering trust in institutions, sustaining macroeconomic stability, providing incentives for saving in the local currency and pursuing a comprehensive policy mix of macro- and micro-prudential measures will help to maintain financial stability and to reduce euroization.

JEL classification: D14, G11, G18, E43, F34
Keywords: euroization, interest rate differential, household financial decisions, Southeastern Europe

The use of the euro as a parallel safe haven currency for saving and borrowing (referred to as de facto euroization or financial euroization) is a common phenomenon in many Central, Eastern and Southeastern European (CESEE) countries that have not yet joined the euro area. The global environment of currently low interest rates has led to smaller differences in interest rates on local versus foreign currency deposits and loans in the region (i.e. interest rate differentials). In this descriptive study, we investigate the potential impact of lower interest rate differentials on euroization. In doing so, we discuss the latest evidence from the OeNB Euro Survey, building on a number of research papers, some of which were (co-)authored by OeNB researchers on the topic of euroization in CESEE. Given the nature of the micro data, we adopt a household perspective across this descriptive study.

First, we describe the extent of euroization and interest rate differentials in the region. Second, we briefly reflect on how very low interest rates and, in particular, lower interest rate differentials between local and foreign currencies would generally impact on households' saving and borrowing decisions. Third, we look at the empirical evidence based on OeNB Euro Survey data, with a particular focus on Southeastern Europe, and finally, we draw some policy conclusions.

[1] *Based on a keynote address given at the conference "Negative euro area interest rates and spillovers on Western Balkan central bank policies and instruments" organized by the Swiss State Secretariat for Economic Affairs (SECO), the IMF and the Bank of Albania on May 4–5, 2017, in Tirana; see also Della Valle, G., E. Themeli and R. Veyrune (eds.). 2018. Negative euro area interest rates and spillovers on Western Balkan central bank policies and instruments. Tirana and Washington, D.C.: Bank of Albania and International Monetary Fund (forthcoming).*

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1 Euroization and interest rate developments in Central, Eastern and Southeastern Europe (CESEE)

Before discussing the impact of low interest rates and narrower interest rate differentials on euroization, we present some stylized facts on the extent of euroization and summarize the main findings of the literature on asset and liability euroization. This is followed by some stylized facts on interest rate developments in the region since 2012.

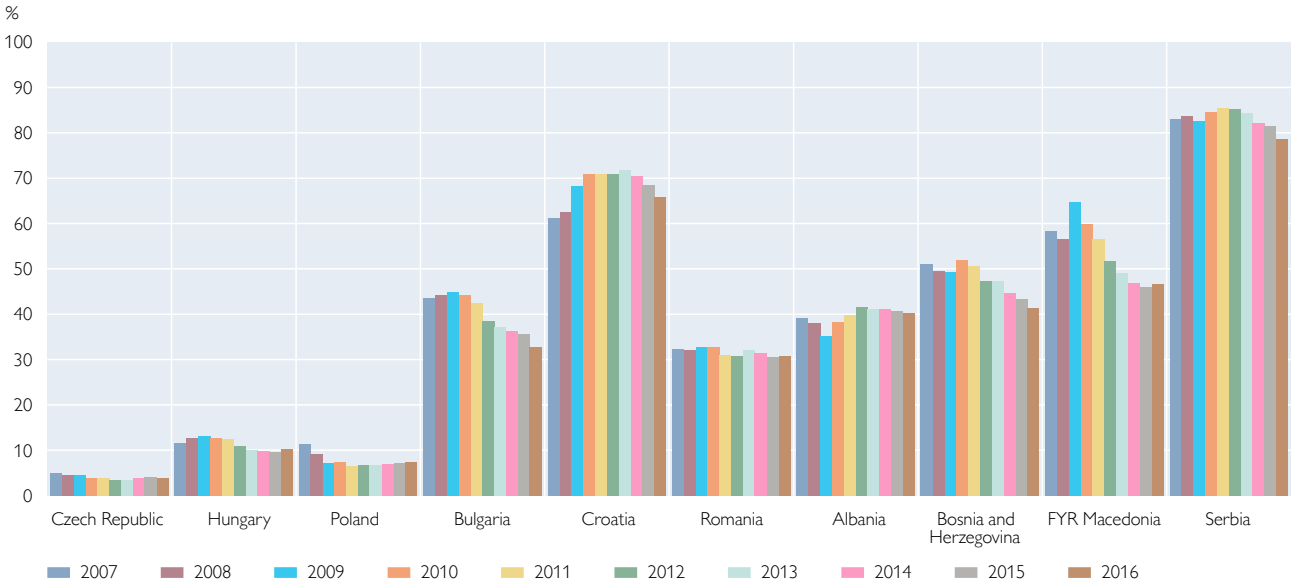
1.1 High and persistent degree of asset euroization in Southeastern Europe

Euroization is fairly widespread, especially in Southeastern Europe (SEE), as reflected, for example, by the asset euroization index for CESEE households shown in chart 1. Asset euroization is defined as euro cash holdings (taken from the OeNB Euro Survey) and foreign currency deposits (from monetary statistics provided by central banks) in relation to total cash holdings and total deposits in each economy. Our sample contains a set of countries with different exchange rate and monetary policy regimes. Two countries maintain a currency board (Bosnia and Herzegovina, and Bulgaria), two have a managed float (Croatia and the Former Yugoslav Republic of Macedonia) and the remaining six let their currency float. In principle, one would expect that countries with a fixed exchange rate show a lower degree of euroization as there is less necessity to hedge against exchange rate fluctuation. Yet, this is not what we observe in CESEE.

Asset euroization is not an issue in the Czech Republic, Hungary and Poland, where its level is low. In countries like Bulgaria, Romania, Albania, Bosnia and Herzegovina, and more recently in FYR Macedonia, asset euroization is at a medium level. Croatia and in particular Serbia have continuously shown very high levels of

Chart 1

Euroization index for the household sector



Source: National central banks, OeNB Euro Survey.

Note: Euroization index = (euro cash + foreign currency deposits) / (total cash + total deposits). For details see Scheiber and Stix (2009).

euroization.[3] Against this backdrop, the remainder of this study focuses on the SEE countries with a medium to high euroization level.

It is a well-established fact that asset euroization in SEE is a persistent phenomenon, even though we have observed some decrease in Bulgaria, Bosnia and Herzegovina, and FYR Macedonia in recent years. The question arises why households in SEE still prefer to save in foreign currency despite sustainable macroeconomic stabilization over the last decade.

1.2 Decline in interest rate differential between local currency and the euro

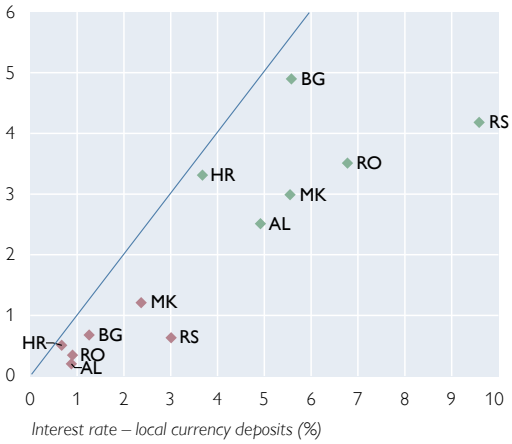
Over the past few years, interest rates across all market segments declined notably in SEE countries.[4] More importantly, the interest rate differential between local currencies and the euro declined, too. The international interest rate environment certainly induced some policy spillovers, which led to very low money market rates in Croatia, Romania and FYR Macedonia and to – slightly higher, but still – low rates in Albania and Serbia. Money market rates even turned negative in Bulgaria and Bosnia and Herzegovina, which is not surprising given that under these countries' currency board arrangements, their policy rates are driven by the monetary policy of the euro area.

Chart 2

Decline of interest rates and interest rate differentials for household deposits from 2012 to 2016

Interest rates on new deposits (weighted average maturity)

Interest rate – euro deposits (%)

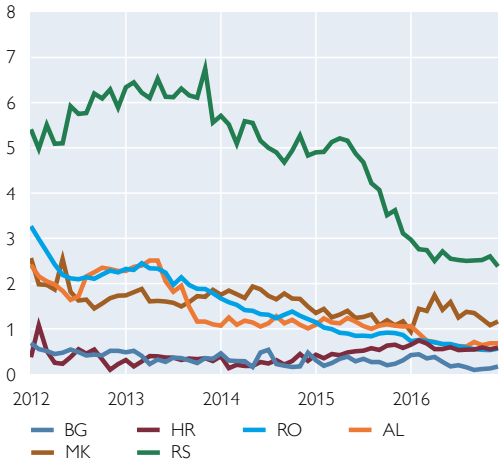


Source: National central banks.

Note: Red diamonds = Dec. 31, 2016, green diamonds = Jan. 31, 2012.

Interest rate differentials between local currency and euro

Percentage points



Source: National central banks, authors' own calculations.

Note: Interest rate differential for household deposits with agreed maturity (weighted average).

[3] *Note that the household sector includes nonprofit institutions serving households. If those were excluded, the ratio for Serbia would be even higher at around 90%.*

[4] *We do not investigate the reasons for this decline in interest rates in this paper. More specifically, we do not differentiate between low interest rates as a result of the current phase of globally low interest rates and low interest rates as a result of the successful catching-up process in the region. Such an analysis would go beyond the scope of the present paper.*

The left panel in chart 2 shows that interest rates on household deposits declined strongly between 2012 (green diamonds) and 2016 (red diamonds).[5] This holds true not only for euro deposits (to be read from the y-axis) but also for local currency deposits (x-axis). Moreover, interest rates on euro deposits always remained below those on local currency deposits (i.e. below the 45-degree line).

The right-hand panel in chart 2 shows that the differential between foreign-currency and local-currency interest rates on deposits also decreased substantially in some countries (in Bulgaria and Croatia the differential was already narrow in 2012). The pronounced country differences imply that apart from a purely mathematical regularity, international policy spillovers and swings in global risk sentiments, domestic developments must also have played a role. The differential shrank particularly strongly in Serbia, which is very likely related to successful macroeconomic stabilization in recent years.

Moreover, interest rates on household loans as well as the interest rate differential between local and foreign currency loans to households have declined in a similar way since 2012.

2 Theoretical considerations

In this section we will review some general explanations provided in the literature for the high degree of euroization in CESEE:

Ritzberger-Grünwald and Stix (2007) show that the economic history of a country has a greater influence on euro cash holdings than inflation or exchange rate expectations. Furthermore, expectations of euro adoption positively influence euro cash holdings.

Deposit substitution is to a large extent demand-driven (Brown and Stix, 2015; Zettelmeyer et al., 2010). We know from the OeNB Euro Survey that households have broad access to a wide range of saving products in domestic and foreign currency, yet they choose to save primarily in foreign currency (Beckmann et al., 2013). Brown and Stix (2015) provide evidence that deposit euroization is strongly related to expected price and exchange rate stability, i.e. monetary expectations – meaning that foreign currencies are considered to act as an insurance against the local currency's high exchange rate volatility – and network effects, meaning that households are more likely to use foreign currency deposits the more widespread deposit euroization is in a country. However, network effects can only partly explain the observed degree of persistence. Furthermore, the authors show that monetary expectations are related to both individual experience of financial crises in the early 1990s as well as to respondents' assessments of current policies and trust in institutions. Somewhat surprisingly, there are no differences between age cohorts. Even young people who lack the personal experience of the 1990s crises seem to have entrenched in their minds that foreign exchange deposits are safer than domestic currency deposits.

Looking at the liability side of households, recent research concludes that both demand and supply factors play a role. Most borrowers had a choice between a local currency loan and a foreign currency loan (Beckmann et al., 2015). The main determinants of households' demand for foreign currency loans are low interest rates, a lack of trust in the local currency, and high inflation or exchange

[5] *Bosnia and Herzegovina is excluded from chart 2 because of a lack of data.*

rate volatility (Crespo Cuaresma et al., 2011; Fidrmuc et al., 2013). Furthermore, expectations that the euro may be introduced in the foreseeable future play a role in some countries as well as a lack of knowledge on the risk inherent in foreign currency loans (Beckmann and Stix, 2015).

Households' preference for foreign-currency deposits implies that banks are highly euroized on the liability side. Therefore, in order to avoid currency mismatches in their balance sheets, banks have an incentive to lend in foreign currency. While foreign currency customer deposits are a major source of banks' foreign-currency funding, foreign-owned banks obviously also have access to foreign-currency funding from their parent banks. Basso et al. (2011) provided empirical evidence for transition countries that increasing access to foreign funding as well as substantial interest rate differentials between local and foreign currencies matter for the dollarization or euroization of both loans and deposits. However, Beckmann et al. (2015) show that foreign-currency funding from parent banks was not the main driver of loan euroization in CESEE, since lending practices between foreign-owned and domestically owned banks did not differ much, except in Hungary and Croatia. Moreover, given that parent bank funding has become less plentiful since the financial crisis, domestic foreign-currency deposits strongly determine the currency structure of banks' asset side as well.

Turning toward the influence of interest rates, we would expect that (very) low interest rates render cash hoarding more attractive for households as they reduce the opportunity cost of holding cash. However, in this particular region, the preference for saving in cash is significantly related to households' lack of trust in banks, memories of past banking crises and weak tax enforcement (Stix, 2013). Against this backdrop, the observed increase of trust in banks in some SEE countries in recent years may be a countervailing factor that mitigates the expected effect.

Furthermore, low interest rates certainly reduce the cost of borrowing for households. This should lead to a higher demand for new loans. Moreover, banks experience a compression in interest margins in a low interest rate environment, which could induce them, at least in theory (and to the extent that funding is available) to issue more loans in an attempt to substitute price for quantity. This was, in fact, observed in Switzerland, Denmark and Sweden during the recent years of ultra-low interest rates, where banks compensated for compressed interest rates by stepping up new lending and increasing fees (Scheiber et al., 2016; Madaschi and Pablos Nuevo, 2017). In the SEE region, however, some banks are still deleveraging, a legacy from the global financial crisis, and this might provide room for alternative forms of nonbank borrowing.[6]

In small open economies, and especially in those where the use of foreign currencies is high, such as SEE countries, saving and borrowing decisions are not only determined by the level of domestic interest rates but also by the interest rate differential between local and foreign currencies. Hence, we will briefly review the impact of compressed interest rate differentials. A considerable share of SEE households save in foreign currency in order to protect the purchasing power of their

[6] *For instance leasing, buying on credit, private loans, internet loans (peer-to-peer) or payday lending. There is not much evidence on this subject to date. Stern (2017) provides a first stocktaking of activities of fintechs in the region.*

savings. A narrower differential actually compresses the insurance premium;[7] as a result, it should become even more attractive to save in euro or in other foreign currencies. In contrast to this, some households may search for yield and may prefer the relatively higher remunerated local currency deposits. This would make saving in the local currency more attractive. The net effect remains an empirical question and we will present some empirical evidence in the next section.

Moreover, Ize and Levy Yeyati (2003) have shown that minimum variance portfolio (MVP) considerations affect the currency denomination of household deposits, assuming that the uncovered interest parity holds and that the interest rate does not play an important role in determining the currency denomination of deposits – which seems reasonable in a long-run perspective. The MVP theory suggests that deposit substitution will increase if households expect a higher volatility of domestic inflation or a lower volatility of the real exchange rate. Yet, in the short run, the uncovered interest parity can be violated and households deviate from the MVP: they increase the share of foreign currency assets in their portfolios (and decrease the share of foreign currency liabilities) as the real interest rate differential widens (Basso et al., 2011). Furthermore, Rajkovic and Urosevic (2017) have empirically shown that in the long run, households in euroized economies base their saving decision on the relative volatilities of inflation and nominal depreciation rates (which is in line with the MVP hypothesis) and do not take into account the interest rate differential, whereas in the short run, deposit euroization is additionally driven by the real interest rate differential (which is in line with the insurance premium hypothesis).

Hence, two different states are possible: First, the recent decline in the interest rate differential is associated with an increase in deposit euroization. This implies that the short-run factor "insurance premium" drives the dynamics of euroization, referred to as the transitory component of euroization. Or second, the interest rate differential and the level of deposit euroization move in the same direction, implying that a common and more fundamental underlying determinant of euroization in the long run has changed (referred to as the permanent component of euroization).

Turning to the borrowing decisions of households, it is clear that borrowing in foreign currency becomes relatively less attractive in an environment of a narrow interest rate differential, provided consumers are able to properly assess foreign currency risk. Again, banks could compensate for the decline in the differential through an increase in the volume of lending or by focusing more on fee income. If, for the reasons outlined above, foreign currency deposits at banks increase in the low interest rate environment, the increase in the volume of bank lending could be tilted toward foreign currency as banks strive to contain currency mismatches.

To sum up, in the presence of low interest rates and a narrow differential between interest rates in local and those in foreign currencies, demand for foreign currency deposits may go up (down) if short-run (long-run) determinants of euroization dominate the process, while at the same time taking out foreign currency loans may become less attractive to households.

[7] *The interest profit which is foregone by transferring savings from local currency deposits with a higher yield to lower interest-bearing foreign currency deposits can be seen as an insurance premium against the loss in purchasing power arising from a real depreciation of the local currency.*

3 Empirical evidence from the OeNB Euro Survey

In the following we will combine information from the OeNB Euro Survey[8] with data from national central banks to examine the impact of low interest rates and a reduced interest rate differential on euroization. To this end, we review three major aspects of euroization – cash holdings, deposits and loan demand – and the way they are affected by a reduction in the interest rate differential.

3.1 Limited impact on cash holdings

Chart 3 shows how households' preferences for cash holdings (left-hand panel) and households' actual per capita cash holdings (right-hand panel) have changed over time.

Clearly, there is a high preference for saving in cash in SEE. Even households with a savings account tend to agree with the statement that they prefer to save in cash. Households' cash preference is highly persistent and related to a number of factors, such as weak institutions, tax evasion, lack of trust in banks and network effects in the use of foreign currency cash (Stix, 2013). Against the backdrop of the low interest rate environment and the decrease in the interest rate differential,

Chart 3

Cash preference and real cash holdings from 2012 to 2016

Cash preference over time

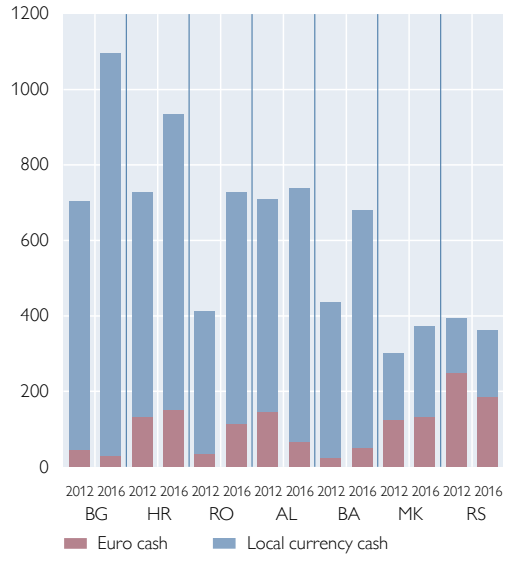
% of respondents with savings deposits

Source: OeNB Euro Survey.

Note: Percentage of respondents who have a strong cash preference, derived from the statement "I prefer to hold cash rather than a savings account."

Inflation-adjusted cash holdings per capita

EUR



Source: OeNB Euro Survey, national central banks.

Note: Per capita holdings in local currency and euro projected for the population aged 15 and older; adjusted for inflation.

[8] *The OeNB Euro Survey is conducted among households in ten CESEE countries: six EU Member States (Bulgaria, the Czech Republic, Croatia, Hungary, Poland, Romania) and four non-EU countries (Albania, Bosnia and Herzegovina, FYR Macedonia, Serbia). From 2007 to 2014, surveys were conducted twice a year; from 2015, the survey frequency was reduced to once a year (autumn). Samples consist of 1,000 randomly selected respondents per country and represent the population over 14 years. Samples are representative with respect to age, gender and regional distribution. For details see https://www.oenb.at/en/Monetary-Policy/Surveys/OeNB-Euro-Survey.html*

we can identify two countries where cash preferences have increased notably, i.e. Romania and Bosnia and Herzegovina, whereas in the other five countries under review, they seem to be unaffected by these developments.[9]

Turning to actual cash holdings (right-hand panel of chart 3), we observe some increase in real cash holdings in Bulgaria, Bosnia and Herzegovina, Croatia and Romania, and more or less unaffected levels in Albania, FYR Macedonia and Serbia.

Apart from the low interest rate environment, there might be other reasons for the observed increase in real cash holdings in some countries. Lacking stringent empirical evidence, we can only point to some events that may have had an impact. In Romania, cash holdings have increased since autumn 2016, which could be related to political developments during that time. In Bulgaria, the banking turmoil of 2015 could have undermined trust in banks. Stix (2013) showed that due to past banking crises experiences, households in the region tend to be concerned about the safety of their deposits and/or trust in banks; in other words, they are highly sensitive to any crisis signals from the banking sector, and therefore, a run on bank deposits is more likely there than in other European countries. A credible deposit insurance scheme actually contains this risk, yet evidence from the OeNB Euro Survey suggests that people's knowledge about the existence of deposit insurance schemes is still rather limited in the region. In some cases, more than 50% of respondents were not aware of a deposit insurance scheme in their country, even though it existed; and those respondents who were aware often underestimated the extent of coverage.

3.2 Impact on deposit euroization

Turning to the impact of narrower interest rate differentials on deposit substitution, we see that the left-hand panel of chart 4 shows that in Albania, Croatia and Romania, the share of foreign currency deposits in total deposits and the interest rate differential moved in opposite directions between 2012 and 2016.[10] In Albania and Romania, deposit euroization increased as the interest rate differential declined, i.e. the insurance premium for holding euro deposits was reduced, while for Croatia, we observe the exact opposite pattern. As mentioned above, this pattern indicates that the change of the interest rate differential will affect mainly the transitory component of deposit euroization (Rajkovic and Urosevic, 2017).

In Bulgaria, FYR Macedonia and Serbia, by contrast, the share of foreign currency deposits and the interest rate differential moved in the same direction, i.e. both variables declined. This indicates that fundamental factors (for instance macroeconomic variables) that determine the level of permanent deposit euroization have probably changed too.

The right-hand panel of chart 4 shows that the preference for foreign currency deposits actually decreased in Croatia and Serbia. In all other countries, it remained broadly unchanged, except for Bosnia and Herzegovina, where the preference for euro deposits increased.

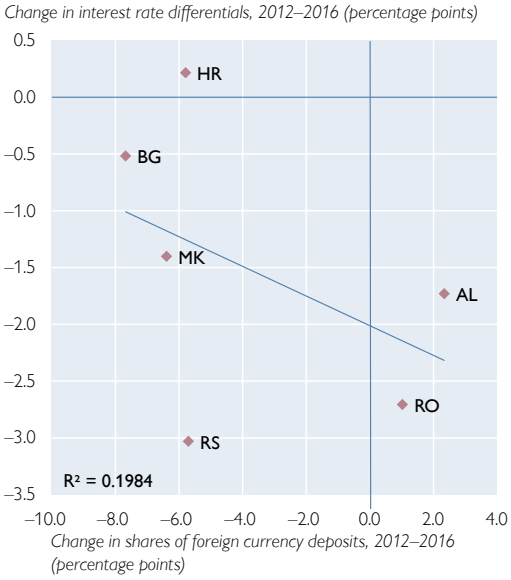
[9] *Note that we ignore changes that are below five percentage points because variation in the data is rather high – like in any survey data.*

[10] *Bosnia and Herzegovina is excluded from the left-hand panel of chart 4 because of a lack of data.*

Chart 4

Mixed impact of interest rate environment on deposit substitution across SEE countries

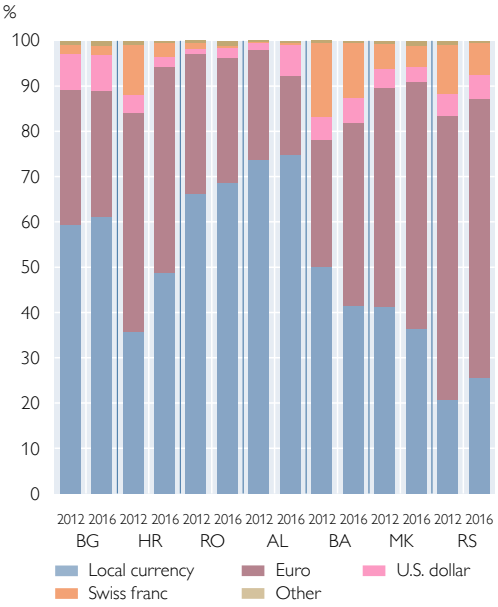
Change in interest rate differentials and currency denomination of deposits



Source: National central banks, authors' calculations, OeNB Euro Survey.

Note: Interest rate differential for household deposits with agreed maturity (weighted average), local currency vs. euro.

Preference for foreign currency deposits



Source: OeNB Euro Survey, national central banks.

Note: Answers refer to the question: "Suppose you had 2 average monthly salaries to deposit in a savings account. Would you choose to deposit this amount in …". Respondents answering "Don't know" or "No answer" are excluded.

From the policy perspective of de-euroization, with its aim of strengthening the use of the domestic currency, the decreasing preference for foreign currency deposits in Croatia and Serbia is good news. For Serbia (which is still in an early phase of de-euroization), the results suggest that recent efforts of macroeconomic stabilization (which appears to be the main driver of the observed compression of the interest rate differential) are contributing to the dinarization of household deposits. Croatia already has a longer track record of macroeconomic stabilization, evidenced e.g. by many years of exchange rate stability versus the euro, which explains among other things the rather low interest rate differential in and prior to 2012 (see chart 2). Consequently, the recent increase in the interest rate differential has strengthened demand for local currency deposits and reduced deposit substitution – as the insurance premium hypothesis expects.

3.3 Surprising rebound of demand for foreign currency loans in Albania, Croatia and Serbia

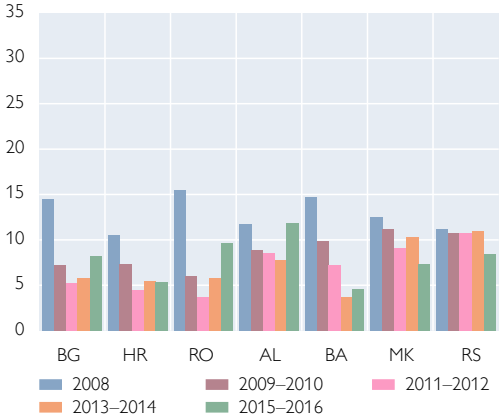
Finally, we turn to the response of loan demand to low interest rates and a narrower interest rate differential. Based on the theoretical considerations above, we would expect an increase in loan demand in response to reduced interest rates. The left-hand panel of chart 5 reports the share of respondents who plan to take out a loan within the subsequent year for the years 2008 to 2016. After the global financial crisis, loan demand dropped considerably and remained subdued for

Chart 5

Recent rebound in household borrowing tilted toward foreign currency loans

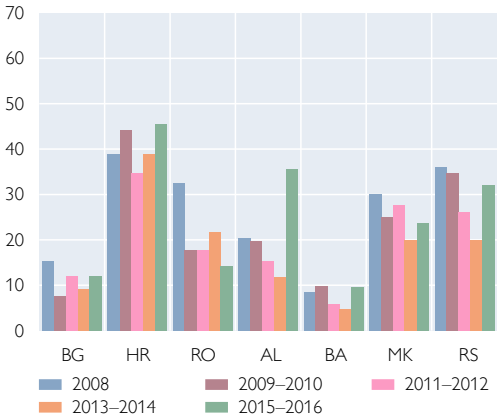
Do you plan to take out a loan within the next year?

% of respondents (period average)



Do you plan to take out a foreign currency loan within the next year?

% of respondents planning to take out a loan (period average)



Source: OeNB Euro Survey.

Note: Respondents answering "Don't know" or who refused to answer are excluded.

several years. More recently, loan demand picked up in Bulgaria, Croatia, Romania and Albania.

Given the reduction in the interest rate differential and that households are able to correctly assess exchange rate risks we would expect loan demand to be tilted, in theory, toward local currency loans. Surprisingly though, the right panel of chart 5 reveals that among those respondents who plan to take out a loan, the share of households planning to take out a foreign currency loan is on the rise in Albania, Croatia and Serbia.

From the perspective of financial stability, it is worthwhile to investigate in more detail the causes of this surprising and not necessarily desired behavior. One of the reasons appears to be debt relief measures for households indebted in foreign currency. In fact, Beckmann (2017) presents evidence that recent debt relief measures for borrowers in CESEE countries have increased expectations of future government interventions. Although expectations of government bailout do not influence loan demand as such, they significantly increase demand for foreign currency loans.

4 Policy implications

In this study we review descriptive evidence on the relationship between low interest rates, and in particular compressed interest rate differentials between local and foreign currencies, on the one hand, and households' saving and borrowing decisions in Southeastern European countries in the recent era of very low interest rates since 2012, on the other. We draw on data from the OeNB Euro Survey as well as on recently published articles based on these data and complement the picture with statistics from national central banks.

Concerning households' saving behavior, we find that in Albania and Romania, the decline of interest rate differentials was accompanied by an increase in deposit euroization, i.e. a decline of the implicit insurance premium for saving in foreign currency. This is an unwelcome development because it goes against the use of the

local currency and does not support the deepening of domestic financial markets based on local currencies. Moreover, a high degree of euroization in the financial sector reduces the effectiveness of monetary transmission and effectively limits the space for exchange rate movements under flexible exchange rate regimes. In order to prevent deposit euroization from rising, measures such as reserve requirements, taxes and the like could be used to raise the insurance premium for foreign currency savings. Interestingly, over the same period, the interest rate differential increased in Croatia, resulting in decreasing deposit substitution, which is considered a welcome outcome. Finally, in Bulgaria, FYR Macedonia and Serbia deposit substitution declined despite the fact that the interest rate differential has declined as well since 2012. That suggests that fundamentals that have an impact on the level of deposit substitution in the long run have improved.

From a policy perspective, measures geared at de-euroization, such as sustainable macroeconomic stabilization, inclusive growth strategies and measures that foster trust in the local currency are superior to measures that merely focus on sustaining a sufficiently high insurance premium for saving in foreign currency. Rajkovic and Urosevic (2017) argue that stabilization and trust-enhancing policies that are also geared to inclusion affect the variables that determine the permanent component of euroization. In contrast, measures that focus only on a sizeable insurance premium for foreign currency savings tend to influence only the transitory component of euroization, i.e. changing the risk-return relation but leaving households' underlying preferences for saving in foreign currency unchanged.

Increasing the insurance premium for saving in foreign currency is subject to an additional trade-off. Against the backdrop of (very) low interest rates and a rather high preference for saving in cash in some SEE countries, households may alternatively respond by increasing their euro cash holdings instead of shifting to local currency deposits. As a result, scarce capital could be withdrawn from productive ends – a likewise unwelcome development. Hence, a cautious policy mix has to accommodate all these potential reactions.

Concerning households' borrowing decisions, recent developments have changed important variables on both the supply and the demand sides. While the complex interactions on the banks' side are not part of this study, we are in a position to shed some light on the demand side of household borrowing. OeNB Euro Survey data show that the number of households planning to take out a loan within the subsequent year has picked up in some SEE countries but is still below pre-crisis levels. Concerning households' demand for foreign currency borrowing, theory would suggest that the lower interest rate differential implies lower demand for foreign currency loans. Based on descriptive results from the OeNB Euro Survey, we do not observe a general decline in the demand for foreign currency loans; in fact, it has remained fairly stable since 2012 and even started to rebound in Albania, Croatia and Serbia. This implies that other factors are relevant, too. First, efforts to minimize the overall variance of household portfolios (i.e. MVP effects) could still outweigh the effect of a compressed interest rate differential. Second, Beckmann (2017) presented evidence that recent debt relief measures for borrowers in some CESEE countries have raised households' expectations of future government interventions and significantly increased demand for foreign currency loans.

From a financial stability point of view, credit developments and potential interactions between supply-side and demand-side factors should be monitored closely

in the current environment of compressed interest rate differentials in order to detect a possible re-emergence of foreign currency lending to unhedged borrowers with insufficient risk-bearing capacities. If necessary, associated risks to financial stability should consequently be addressed via macro-prudential measures and micro-prudential supervision of banks' lending practices.

Finally, euroization in SEE, or, more specifically, households' persistent preference for saving in cash and/or foreign currency, is grounded in a lack of trust – trust in the local currency, trust in banks and trust in public institutions in general. In sum, this suggests that a strategy to reduce euroization should rest on the following three key pillars: (1) addressing the permanent component of euroization via fostering trust in institutions and sustaining macroeconomic stability, (2) providing incentives for saving in the local currency once a track record of macroeconomic sustainability has been established, and (3) implementing a comprehensive policy mix of macro- and microprudential measures that help to maintain financial stability.

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Event wrap-ups and miscellaneous

Conference on European Economic Integration 2017: A modern take on structural reforms – past and future challenges for CESEE and Europe at large

Compiled by
Teresa Messner and
Julia Wörz[1]

Structural reforms in Central, Eastern and Southeastern Europe (CESEE) and in Europe as a whole were the focus of this year's Conference on European Economic Integration (CEEI), which was hosted by the Oesterreichische Nationalbank (OeNB) in Vienna on November 20 and 21, 2017.[2] Around 230 participants from 25 different countries attended the CEEI 2017 to listen to presentations by high-ranking representatives of central banks, international organizations and academia. The conference highlighted that Europe is facing new social and economic challenges such as globalization, digitalization, changing demographics, inequality and divergence. Even though the EU is still in need of further reform, the crisis has given way to huge reform momentum and triggered reform and integration steps such as the banking union, the strengthened Stability and Growth Pact and the Single Supervisory Mechanism. While structural reforms can foster growth and employment, they can also reinforce the unequal distribution of wealth, income and chances – a fact observed in many transition countries. Especially with respect to labor and product market reforms, trade-offs between growth and equality frequently need to be addressed. The focus of structural reforms should be on productivity-enhancing measures, in particular on education and innovation. Common legal norms could improve the financing of innovation in small economies and the funding of small-scale projects, which are typical for CESEE countries. Yet, far more often than legal obstacles, lack of human capital limits innovation.

In his opening remarks, OeNB Governor *Ewald Nowotny* noted that structural reform should not be seen as a panacea for growth in Europe. Especially in the short to medium term, monetary and fiscal policies play a decisive role in stimulating the economy. Yet, in the long run, structural policies are crucial for the euro area, Nowotny explained. From the monetary policy perspective, he particularly welcomed efforts to further deepen Economic and Monetary Union and progress toward more fiscal risk-sharing through a macroeconomic stabilization function. In this context, he referred to structural policies that keep costs and wages flexible and production factors mobile and thus enable the economies of individual member countries to swiftly adjust to asymmetric shocks in a monetary union. In the same vein, the European Commission has raised the idea of providing financial incentives for structural reforms, recognizing their short-term costs but also their positive spillovers to the rest of the European Union. Governor Nowotny noted that structural convergence among EU Member States – in particular in the CESEE region – is well underway. During the transition process, many CESEE countries followed the advice of institutions that favored a shock therapy as opposed to a gradual approach more in line with the European social model. Some of the reforms may have gone too far according to Nowotny, which might explain

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[2] *The conference proceedings will be published by Edward Elgar Publishing Ltd. in the course of 2018. Presentations and papers, information about the speakers and the conference program are available at www.oenb.at.*

why we have recently seen some policy reversals. Governor Nowotny summarized that in order to design future-oriented structural reforms, a comprehensive packaging of reforms is needed to reap the benefits intended. Ideally, reforms should also make public administration more efficient and include a supportive macroeconomic policy mix.

The reform agenda of a European Social Union

Georg Fischer, Former Director of the European Commission's Directorate-General for Employment, Social Affairs and Inclusion, started off the conference with his presentation of the reform agenda of a European Social Union. Just a few days before the CEEI, the EU, the European Parliament and the Commission had proclaimed the "European Pillar of Social Rights" in Gothenburg. While not a binding document, the proclamation is still a self-commitment by the Member States, responding to the social trends Europe is facing: globalization, digitalization, aging, inequality, unemployment and – more generally – divergence. The 20 principles in the proclamation have been drafted as individual rights, e.g. minimum wages that make it possible to live in dignity, public support and social protection (also for those with nonstandard contracts), fair working conditions and social rights in dynamic labor markets. Acknowledging the difficulties in implementing these principles, the European Commission offers several routes forward, including the foundation of a new authority that coordinates national labor administrations and a scoreboard of indicators to document progress in reaching social milestones. The latter could be used at a later stage for a system of conditional funding – a topic for the next budget negotiations.

Past and current reform strategies in Europe

The first panel on "Past and current reform strategies in Europe" was chaired by OeNB Governor Nowotny and featured governors and board members of the four Visegrad countries and Slovenia. *Boštjan Jazbec*, Governor of Banka Slovenije, started out by contesting the criticism directed at the ECB for creating an environment of instability. He argued that structural reforms would help mitigate the external effects of accommodative monetary policy but that, so far, such reforms were not being seriously tackled. Turning the argument around, he warned that if structural reforms do not happen we may face potential asset bubbles as a result of the ECB's monetary policy. He added that Banka Slovenije has been innovative and effective in addressing the challenges implied by the crisis, in particular in dealing with nonperforming loans. *Jozef Makúch*, Governor of Národná banka Slovenska, reported that reforms implemented in Slovakia since 2000 had boosted GDP growth and had a positive impact on the labor market up until the crisis. Subsequently, however, GDP growth stalled, requiring further reforms, especially in the realm of health care, education, R & D and IT. In a similar vein, *Barnabás Virág*, Executive Director at the Magyar Nemzeti Bank, argued that despite the currently better economic environment there is no time for idleness. As a lesson from the Hungarian crisis management experience, he pointed out that well-synchronized fiscal, monetary, structural and macroprudential policies are definitely needed; they have proven successful at reviving sustainable economic growth, bringing down public debt and increasing employment. However, according to Virág, despite many achievements there is still room

for further strengthening competitiveness and boosting convergence. Particular attention should be paid to raising productivity, reducing large differences in competitiveness between large and smaller firms as well as to education, especially in light of the new industrial revolution. Interestingly, the remarks by *Jiří Rusnok*, Governor of Česká národní banka, contrasted somewhat with the previous contributions in that he said that the exceptionally good economic developments in the Czech Republic are not necessarily the result of any particular reforms over the past ten years. According to Rusnok, the authorities have only conducted sound fiscal policy while monetary policy has provided some additional stimulus. Finally, *Paweł Szałamacha*, member of the Management Board of Narodowy Bank Polski, explained that a substantial part of economic convergence over the last decade may be attributed to Poland's low starting point. While successive Polish governments have recognized that the "low-hanging fruits" have been picked, the necessary growth-enhancing reforms have been driven by long-run planning only to a limited extent. Polish authorities recognize in particular the need to improve innovation capacity, which should be the new long-run growth engine. However, according to Szałamacha, little progress has been observed so far in this respect. In the debate concluding the first panel the most lively discussion related to the benefits of being a member of the euro area. According to Jazbec, for a small open economy like Slovenia, the euro was an important anchor during the crisis. In stark contrast, Szałamacha argued that the adjustment mechanism of a floating currency worked well for Poland during the crisis so that joining the euro is not on the table at the moment. According to him, it is the issue of convergence that matters rather than the question of euro adoption. Yet another approach was taken by Rusnok, who believes that euro adoption is a purely political decision. While he stressed that the Czech central bank could easily live with both options, euro adoption is not on the horizon at the moment. He added that an important factor for a decision on euro adoption is the still uncompleted banking union. According to Rusnok, Česká národní banka would be happy to hand over powers if EU institutions were also willing to take over the responsibility.

Best practices – which reforms are sustainable?

Session 1 dealt with the fight against corruption and governance issues in Romania as well as pension reforms in Poland and was chaired by *Kurt Pribil*, Executive Director, Oesterreichische Nationalbank. In his introductory remarks, Pribil underlined the relevance of these two topics also for other countries in the CESEE region. Furthermore, he reminded the audience about the EU's cooperation and verification mechanism that had been set up inter alia due to concerns about the high level of corruption when Romania joined the EU in 2007. Moreover, Pribil briefly touched upon pension reforms undertaken in many CESEE countries in the late 1990s and early 2000s.

Alina Mungiu-Pippidi, Professor of Democracy Studies at the Hertie School of Governance, started her presentation by showing subindices from the Global Competitiveness Index and highlighted that the transparency of government policymaking has increased over the past ten years, but that no improvement can be observed with regard to favoritism in decisions by government officials and wasteful government spending. Mungiu-Pippidi also highlighted the suspiciously stable profit rates of Romanian companies that were living on public funds, also

during the 2008/2009 crisis. When anticorruption prosecution gained momentum in the years after EU accession, some improvements became visible regarding government contracting in the construction market, however. Moreover, judiciary independence has improved markedly in Romania since 2007. Yet, Mungiu-Pippidi pointed out that government spending has remained very wasteful with regard to roads infrastructure investments and that administrative capacities have remained weak. Furthermore, Mungiu-Pippidi underlined the strong correlation between the level of corruption and brain drain. She concluded that Romania's crackdown on corruption (several high level politicians have been arrested) has not been sufficient to change systematic patterns of corruption and called for EU funds that will change patterns of poor governance.

Paweł Strzelecki, economic expert at Narodowy Bank Polski and assistant professor at the Warsaw School of Economics, started his presentation by discussing the problem of population aging in EU countries and highlighting related challenges with regard to public expenditures for pensions. He also pointed out that there are no easy solutions for reducing the consequences of population aging for pension systems (there are three options: changing the retirement age, changing contributions or changing pension benefits). Moreover, he pointed to the dynamic inconsistency problem: Pension reforms bring long-term benefits, but in the short term may be perceived only as a burden. He then gave an overview of pension reforms in Poland since the late 1990s. In his view, major pension reform steps were always conducted by governments with strong public support. Strzelecki then discussed how labor force participation rates were affected by the pension reform in 2009, the retirement age increases in 2016 and the return to lower retirement ages in 2017. He also highlighted the trend toward keeping stable replacement rates in the Polish pension system. In addition to familiarizing the audience with the case of Poland, Strzelecki also took a more general view and presented some data on pension reforms in the EU. Moreover, Strzelecki touched upon the implications of the robotization of jobs for the labor market and social security systems.

Financing technological change and innovation – heterogeneous growth opportunities across Europe

The second panel entitled "Financing technological change and innovation – heterogeneous growth opportunities across Europe" was chaired by the OeNB's Vice Governor *Andreas Ittner* and brought together representatives from Austrian banks and international financial institutions. Vice Governor Ittner referred to the profound shifts arising from technological change and innovation and ensuing disruptions in established firms' business models as well as structural and societal challenges, including distributional effects. He underlined the vital role of financing in addressing these challenges for both, the private and the public sector.

In her statement, *Claudia Höller*, Chief Financial Officer and Chief Risk Officer at Erste Bank der oesterreichischen Sparkassen AG, noted that the current economic recovery is supporting innovation and technological change. In this context she emphasized the important role of banks as reliable business partners for financing innovation. To fulfill this role banks need to be innovative and flexible themselves. They need to stay committed to their respective business models but constantly scrutinize them. She stressed the positive experience of start-up offers

by Erste Bank. With respect to the catching-up performance in CESEE, she admitted that the speed and substance of the convergence process has not always met initial expectations, with the notable exception of innovation in e-commerce, e-government and broadband access. *Helena Schweiger*, Associate Director at the European Bank for Reconstruction and Development (EBRD), asserted that most innovations in the region are not new to the world, but new to local markets and firms. She highlighted that innovative firms are more likely to be adversely affected by an inadequate business environment, citing factors like corruption, skills mismatch and difficult access to finance as impediments to their business. The financial system in CESEE is strongly bank-based, which offers pros and cons for the financing of innovations: A bank-based system may hamper innovation by firms as intangible assets cannot be collateralized; also, firms may be hesitant to disclose sensitive information on innovative activity and banks may be technologically conservative. On the other hand, banks specialize in building lending relationships with clients, they may finance innovations beyond pure R & D and they may simply be the only source of financing for many CESEE firms. Schweiger also showed that firms whose credit demands are met innovate more. *Johann Strobl*, Chief Executive Officer at Raiffeisen Bank International AG (RBI), confirmed banks' interest in finding innovators and financing them to show their openness for innovation. Yet, typical bank-based financing is based on cash flow, which favors process innovation and innovation by large, established firms over start-up financing. Strobl identified new financial technologies as a small segment where banks support start-up firms and mentioned the RBI fintech accelerator program in this respect. He also pointed toward a structural disadvantage of CESEE countries, as small markets are generally less innovative. In his view a uniform legal environment could help overcome the problems of market size; further brain drain from the CESEE region needs to be addressed. *Tanja Tanayama*, Advisor at the European Investment Bank (EIB), reminded conference attendants about the importance of innovation for boosting subdued productivity growth in CESEE. She cited structural factors as reasons behind Europe's generally low levels of R & D intensity, which is even lagging behind China in this respect. The EIB's newly published investment survey shows that while access to finance has improved, lack of finance still remains an obstacle for innovative firms. Hence, Europe needs to move away from a purely bank-based system. Whereas Tanayama considered crowdfunding an important new development, she added that public support – which is limited by the fiscal compact – remains important. She strongly advocated guarantees as a better instrument for public support rather than grants. In line with the previous speaker, she also emphasized the lack of highly qualified staff rather than financing as an obstacle to innovation by firms. This point was widely taken up in the discussion, as was the issue of small country and project size. To remedy problems of size, teaming up with larger, Western European banks was seen as a good and fast reaction. Yet, referring to the example of Finland, Tanayama pointed out that such a short-term strategy does not afford protection against a too narrow specialization of countries, which is a natural way of trying to achieve a critical mass of innovation adopters. In conclusion, developing generic innovation skills through the education system, independent of a specific industry or sector, seems to be the way forward.

The EU perspective: learning from past reforms to address future challenges

In her dinner speech, *Sonja Puntscher Riekmann*, Jean Monnet Professor and Director of the Salzburg Centre of European Union Studies, argued that the crisis has returned Member States into the driver's seat, with the status of the European Council being enhanced. Puntscher Riekmann reminded the audience that it was only the crisis which allowed the implementation of a wide range of measures – such as banking union – that had been in the pipeline for a long time. Hence, a positive reading of the crisis recognizes that it paved the way for a great deal of transformation, such as the ECB becoming a true lender of last resort, the introduction of a large number of new instruments and a rise of new intergovernmentalism. Thus while the Member States themselves were setting the agenda, the solutions were European. This contrasts with a pessimistic view that perceives the EU's reaction to the crisis as "too little, too late" and as clumsy European decision making. In Riekmann's view, the complaints that the EU is too weak are not justified given the clear commitment to the euro. Despite difficult decision making, large national majorities were gained for the Single Supervisory Mechanism (SSM) and the fiscal compact. On the other hand, some measures taken to strengthen the euro have increased inequality and divergence in the EU, therefore the social dimension needs to be tackled with high priority now. This is all the more important since the social dimension constitutes the defining element that sets the EU model apart from other integration models. Riekmann admitted that tackling social issues is a difficult task as Europe is built around two contradictory lines of reasoning: the logic of economic openness versus the logic of national sovereignty. She concluded by underlining that Europe has achieved a lot but that nothing is guaranteed.

Revisiting transition reforms

Sergei Guriev, Chief Economist at the European Bank for Reconstruction and Development (EBRD) held the keynote speech on day 2 of the conference. He presented the key takeaways of the EBRD's past research on its activities in the EBRD region, he gave an assessment of reform measures and pointed out necessary adjustments to these measures to meet future challenges.

Due to far-reaching market reforms the EBRD region experienced a remarkable catching-up process between 1998 and 2009. Since the crisis, however, the region's recovery has been slow, and it particularly underperformed in relation to comparable emerging market economies. Guriev stressed that the drivers of the previous catching-up process, such as improved factor use, the region's inclusion in global value chains, European integration and the emergence of foreign banks and subsequent availability of credit, have been exhausted. As these "low-hanging fruits have been harvested" a new growth model as well as legitimate and sustainable reforms are needed. Guriev made three propositions to boost productivity in the EBRD region: First, he suggested increasing human capital, second, boosting investment in infrastructure and lastly promoting innovation in order to improve firm productivity.

Given the weak post-crisis performance, Guriev expressed concerns about stalling reform efforts and weak reform support. Besides corruption limiting trust

in institutions, the main reason for the distrust in reforms is that classic market-oriented reforms (liberalization, privatization, capital markets and pension systems) – while benefitting overall growth in the region – have notably increased income and wealth inequality across countries. Furthermore, he highlighted the emergence of inequality of opportunities, a form of inequality that is based on factors such as gender, race and family background – hence, factors individuals can hardly change themselves. This suggests that there are two types of inequality: "unfair" inequality of opportunity based on differences in innate circumstances and "fair" inequality based on differences in effort. EBRD research suggests that unfair inequality of opportunities has a negative effect on support for reforms, while fair inequality shows the opposite effects.

Guriev therefore stressed that transition reforms need to be adjusted and broadened in order to promote equality of wealth, income and opportunities, so they can subsequently regain support. He concluded that reforms need to enhance competitiveness, integration and resilience, and that they need to be well governed, green and inclusive.

The winner takes it all? Distributional effects of reforms

Session 2 dealt with the distributional effects of structural reforms and was chaired by OeNB Director *Doris Ritzberger-Grünwald*. In her introduction, Ritzberger-Grünwald emphasized the welcome shift in focus on topics such as equality, economic inclusion and equal opportunities, which was strongly reflected in Sergei Guriev's keynote speech and the 2016/17 EBRD Transition Report. She also pointed toward the leading role of the OECD in assessing and providing advice on structural reforms and further alluded to the puzzling breakdown of the Phillips curve and disappointing wage growth as compared to before the crisis.

Orsetta Causa, Senior Economist at the OECD, gave an overview of the work of the OECD, which was among the first institutions to analyze the nexus between policies and income inequality. The OECD's analysis of growth dividends for different income groups takes a granular approach. As such, the analysis differentiates between the macro effects of reforms, i.e. macro-level effects through labor productivity or labor utilization, and micro effects, i.e. effects that do not result from the macro effects and thus are additional effects.

Differentiating between these effects, Causa illustrated how reforms affect different income groups: For example, a reduction of unemployment benefits has an overall disequalizing effect on household income. Moreover, while better labor utilization (macro effect) contributes positively along the income distribution, micro effects suggest even stronger negative effects for the poor. By contrast, product market reforms have small positive effects for all income groups, and gains in economic performance thus seem to have less disequalizing effects. Causa highlighted that social preferences influence reform tradeoffs. Tradeoffs between growth and equality occur when reforms adjust social benefits or labor markets and target poorer households. Product market reforms have less negative distributional effects. OECD research suggests that, as a result, easing barriers to firm entry and competition in product markets delivers macroeconomic gains without creating tradeoffs.

Following this presentation, *Paul Ramskogler*, Principal Economist at the OeNB, gave insights into his research on the nexus between wage setting and inflation. Since the crisis, wage growth has been stubbornly low and the correlation between unemployment and wage growth has decreased, evident in a flattening of the Phillips curve. In discussing the drivers behind this trend, Ramskogler emphasized that unemployment is not the only determinant of labor market slack. He argued that considering the existence of nonlinearities of the Phillips curve relationship as well as using a broader set of unemployment or employment measures may increase the fit of nexus estimations.

Going beyond inflation, productivity and unemployment, Ramskogler investigated whether labor market segmentation, i.e. the structure of the labor market, also affects wage growth. Therefore he included labor market dualities (different qualities of jobs), proxied by the incidence of temporary contracts, in the wage determination equation.

He found that the incidence of temporary contracts has dampened wage growth more strongly than before the crisis, and that these have a larger effect in CESEE countries. There are two motives for using temporary contracts, i.e. the avoidance of wage-steering institutions and higher competition among employees. Ramskogler concluded that a reduction of the share of temporary contracts might smoothen the macroeconomic impact of labor market developments.

How can structural reforms serve integrated production networks and mitigate protectionist threats?

The session that addressed this question was chaired by *Helene Schuberth*, Head of the Foreign Research Division of the OeNB. She noted that the consequential decline in trade costs but also technological progress have led to a fundamental transformation of production processes. Today, most export goods are produced in an internationally fragmented manner, which has given rise to international production networks or so-called global value chains (GVCs). European countries show a high degree of participation in GVCs, especially the smaller euro area members and the CESEE countries. While economics is able to describe patterns of GVC specialization fairly well, it still needs to improve the understanding of how domestic policy measures – and in particular structural policies – should be designed such that they promote integration and at the same time ensure high, sustainable and inclusive income growth. The fact that economic integration – and thus also globalization – in many instances has only accomplished economic growth that was not inclusive and therefore created losers, especially among low-skilled workers in European economies, has led to rising protectionist sentiment.

Raphael Auer, Senior Economist at the Bank for International Settlements, presented recent research from his institution. The growing importance of GVCs has given rise to a number of spillover effects – for instance R & D spillovers, business cycle spillovers or inflation spillovers. As a result, national inflation dynamics have synchronized and this has contributed to the rise of globalized inflation, which is of eminent policy interest to central banks. Recent political events (e.g. Brexit, U.S. election) have brought protectionism to the fore again. A rise in protectionism would spill beyond directly affected partners via the global

production network. Hence, bilateral import tariffs would shift the global geography of trade and affect third-country trade, too. It even could cause a global rebound of inflation that has gone missing over the last decade. Furthermore, BIS research confirms that bilateral import tariffs would have heterogeneous distributional effects across sectors but much less across skill types.

Robert Stehrer, Scientific Director of The Vienna Institute for International Economic Studies (wiiw), elaborated on the spillovers of nontariff measures (NTMs) in international production networks. NTMs, which represent modern forms of protectionism, are an important and debated issue in trade negotiations. They are strongly related to behind-the-border measures and can be put in place for various reasons (e.g. technical product standards, consumer safety or environmental protection), not only because of their effects on trade. Robert Stehrer emphasized that NTMs should not necessarily be seen as trade costs. NTMs are often beneficial in themselves, promoting safety standards and consumer needs, and they can lead to a reduction of trade costs due to harmonization. Related empirical research of the wiiw shows that ad valorem equivalents of NTMs are trade enhancing in almost 50% of cases. Clearly, the impact of NTMs on trade are diverse due to the complexity of regulations. Yet, evidence suggests that on average NTMs are less trade restrictive than (already low) tariffs and in general positively affect growth and productivity as well as the quality of exported goods.

Daria Taglioni, Lead Economist at the World Bank, encouraged CESEE countries to pursue more structural reforms for upgrading their position in GVCs and for avoiding the middle-income trap. At first glance, CESEE total factor productivity (TFP) growth has declined significantly since 2010 compared to the pre-crisis levels. However, once one controls for enhanced GVC participation and technology creation at GVC level, sectoral post-crisis TFP growth was not significantly different from pre-crisis TFP growth. In other words, on a sectoral level TFP growth returned where GVC participation was enhanced and where technology creation and catching-up continued. Over the past decade GVCs evolved from exploiting primarily fixed comparative advantages (via vertical specialization in trade and FDI) to increasingly using dynamic comparative advantages (e.g. trade in services, knowledge and innovation networks). As a result, macroeconomic dependencies between countries deepened, income distributions became more polarized and new barriers to innovation were created. Clearly, in terms of structural reform, there is no silver bullet to address these globalization challenges for the CESEE region. Nevertheless, Taglioni concluded that growing complexity will require ongoing adjustment and reforms. To participate successfully in GVCs the traditional prescription of labor and product market reforms will not be sufficient. She advocated a holistic approach that carefully sequences a bundle of trade, infrastructure, competition, education and innovation policies that nurtures a local manufacturing base as well as environmentally, socially and governmentally sustainable business models.

Reforming EU frameworks or EU countries?

The last panel discussion of the conference was chaired by OeNB Executive Director *Peter Mooslechner* and raised the following question: "Reforming EU frameworks or EU countries?". In very general terms, structural reforms can be defined as all fundamental institutional changes that improve the functioning of an

economy. Mooslechner emphasized the vagueness of the meaning of "structure," referring to Fritz Machlup's 1958 article[3]. He pointed out that, when talking about structural reforms, we need to be aware of differences in objectives, in views concerning the effectiveness of measures as well as in national, regional and individual preferences. After all, these differences are what makes it difficult to agree on structural reforms on a broader level.

The panel discussion was kicked off by *Klaus Masuch*, Principal Advisor at the ECB. He argued that recent reform progress has been limited due to vested interests, people's fear of losing out and weak social trust. Moreover, "Brussels" or the euro area are often used as popular scapegoats. Against this background, Masuch warned against the risk of delaying reforms and even of a vicious "no-reform cycle." By way of example he demonstrated that institutional quality – a crucial catalyzer of growth – has deteriorated over the last 20 years in several EU countries. *László Csaba*, professor at Central European University and Corvinus University, stated his firm belief that despite some remaining problems Economic and Monetary Union (EMU) has been a great success and that almost all necessary reform steps have been taken. Most importantly, the ECB has become a true lender of last resort and banking union has gone a long way. Moreover, Csaba emphasized that he does not think that Europe has hindered adjustment and that he does not see any benefit of staying out of the euro area for small and open economies. *Hubert Gabrisch* of the Wiesbaden Institute for Law and Economics contested the view of his preceding speaker, voicing his skepticism about centralizing everything at EU level. In his view, recent crises have challenged the existing architecture of the EU. In particular, asymmetric shocks have become synchronized and have more lasting effects. As a result, monetary policy needs to be complemented by longer-term policies and structural reforms. Respecting the unique political character and reality of the EU, Gabrisch would prefer the creation of new sovereignties on the EU level rather than the transfer of national sovereignties. In concrete terms, he proposes the creation of a central fiscal risk-sharing capacity. He believes that such an intergovernmental arrangement would be feasible without any Treaty changes. Moreover, it would reconcile a euro area-wide fiscal risk-sharing instrument with the sovereign fiscal responsibility of member countries as well as address the wide-spread mistrust against a redistributive transfer union. *Lúcio Vinhas de Souza* of the European Political Strategy Centre, the European Commission's in-house think tank, expressed the view that the effectiveness of reforms has declined over the last ten years. Hence, for more sustainable reforms different types of instruments would be necessary. The European Commission has addressed this issue through an overhaul of its surveillance tools to better monitor vulnerabilities in the Member States.

To conclude, the CEEI identified ample room for future reforms and pointed toward concrete reform options in various policy dimensions. The conference proved to be very topical as the current economic recovery is providing a good environment for implementing necessary reforms. Hence, by focusing on structural aspects of EU reform and reforms in EU Member States, the conference added to a long list of successful and interesting conferences on European economic integration.

[3] *Machlup, F. 1958. Structure and Structural Change: Weaselwords and Jargon. Zeitschrift für Nationalökonomie. 280–298.*

Olga Radzyner Award winners 2017

Compiled by
Aleksandra Riedl[1]

The Olga Radzyner Award is bestowed annually on young economists from Central, Eastern and Southeastern Europe (CESEE) for excellent scientific work on European economic integration. The Oesterreichische Nationalbank (OeNB) established this award in 2000 to commemorate the former head of its Foreign Research Division, Olga Radzyner, who pioneered the OeNB's CESEE-related research activities.[1]

In 2017, the OeNB received 20 submissions for the Olga Radzyner Award from candidates from 16 countries. The submitted papers covered a great variety of topics with a focus on European integration and the completion and deepening of the single market. These topics ranged from monetary policy transmission channels, legacy effects of the global financial crisis, economic effects of attitudes toward national identities, analysis of inflation, fiscal policy and stock markets to banking sector studies. Quite a few submissions analyzed developments in candidate and potential candidate countries.

For this year's award, the jury of OeNB reviewers chose four papers they considered outstanding in terms of their originality, analytical quality and use of state-of-the-art methods. The awards were conferred by OeNB Governor Ewald Nowotny on November 20, 2017, on the occasion of the Conference on European Economic Integration. The winners are (in alphabetical order):

Piotr Denderski and *Wojciech Paczos* (Poland) – for their paper *"Foreign banks and the bank lending channel."* Denderski and Paczos both hold PhD degrees and are assistant professors at two different universities in the U.K. – at the University of Leicester and the University of Cardiff. In their paper, they carefully analyze the bank lending channel of monetary policy in 11 transition economies in the period from 1998 to 2012 and show that, in line with theoretical expectations, banks curb their credit supply after an increase in the monetary policy rate and vice versa. Interestingly, they find that the bank lending channel is weaker for foreign-owned banks and that the observed difference cannot be explained by parent bank characteristics but rather by the high profitability of foreign-owned banks as compared to domestically owned banks.

Arta Hoxha (Republic of Kosovo) – for her paper *"Explaining the impact of the global financial crisis on European transition countries: a GVAR approach."* Hoxha is a PhD student at Staffordshire University in the U.K. In her paper, she examines how the Baltic, Southeastern European and CESEE EU economies respond to shocks in advanced European countries (EU-15). Hoxha finds that a decrease in the EU's GDP and an increase in financial stress both depress output throughout the examined regions, but that the Baltic countries show the most pronounced responses. In the case of the Baltic region, shocks tend to spill over through foreign credit flows, FDI and remittances.

Stjepan Srhoj (Croatia) – for his paper *"Getting ready for the EU Single Market – the impact of development grants on firm competitiveness."* Srhoj is a teaching and research assistant at the University of Dubrovnik and a PhD student at the University of Innsbruck. Based on a unique and carefully constructed firm-level dataset, he analyzes the effects of public grants on firms' export, productivity and employment performance in Croatia. He finds that smaller firms' exports and employment figures experience a significant boost from public development grants, especially

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from larger grants, while there seem to be no noteworthy effects on large companies. Srhoj's results are thus in line with arguments in favor of industry support schemes and related theories.

Andrzej Torój (Poland) – for his paper *"Managing external macroeconomic imbalances in the EU: the welfare cost of scoreboard-based constraints."* Torój is an assistant professor at the Warsaw School of Economics. In his paper, he analyzes the welfare implications of the recently introduced thresholds on external imbalance indicators envisaged by the macroeconomic imbalance procedure (MIP). Within the framework of a New Keynesian DSGE model, Torój employs both flexible exchange rate and common currency scenarios to evaluate the impact of implementing the lower bound on the current account deficit (–4%) for Poland. He shows that welfare loss remains very limited as compared to an optimum unconstrained policy scenario, but that these costs are lower in the case of flexible exchange rates than in a common currency scenario. His results indicate that a scoreboard-based evaluation of external imbalances leaves some room for fine-tuning in the course of future MIP reforms.

Referees for Focus on European Economic Integration 2015–2017

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