



Банк России

# MEASURING THE DEBT SERVICE RATIO IN RUSSIA: MICRO-LEVEL DATA APPROACH

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The views expressed in this presentation are solely those of the authors and do not necessarily reflect the official position of the Bank of Russia.



# How to Measure Debt Burden of the Economy?

- Stock of Debt / Assets
- Stock of Debt / Income → **Credit-to-GDP**
- Debt Service Costs / Income → **Debt Service Ratio**

# Why to measure Debt Service Ratio?

$$\text{DSR} = \text{Cost of Servicing the Debt} / \text{Income}$$

## DSR as an accurate EWI of an upcoming banking crisis

- Drehmann and Juselius (2012)

## Negative effects of higher DSR levels on CAPEX growth

- Juselius and Drehmann (2015)
- Drehmann et al. (2017)

**Credit-to-GDP =**

$$\frac{\textit{Stock of Debt}_t}{\text{Aggregate income}_t}$$



**Stock to Flow**

vs

**DSR =**

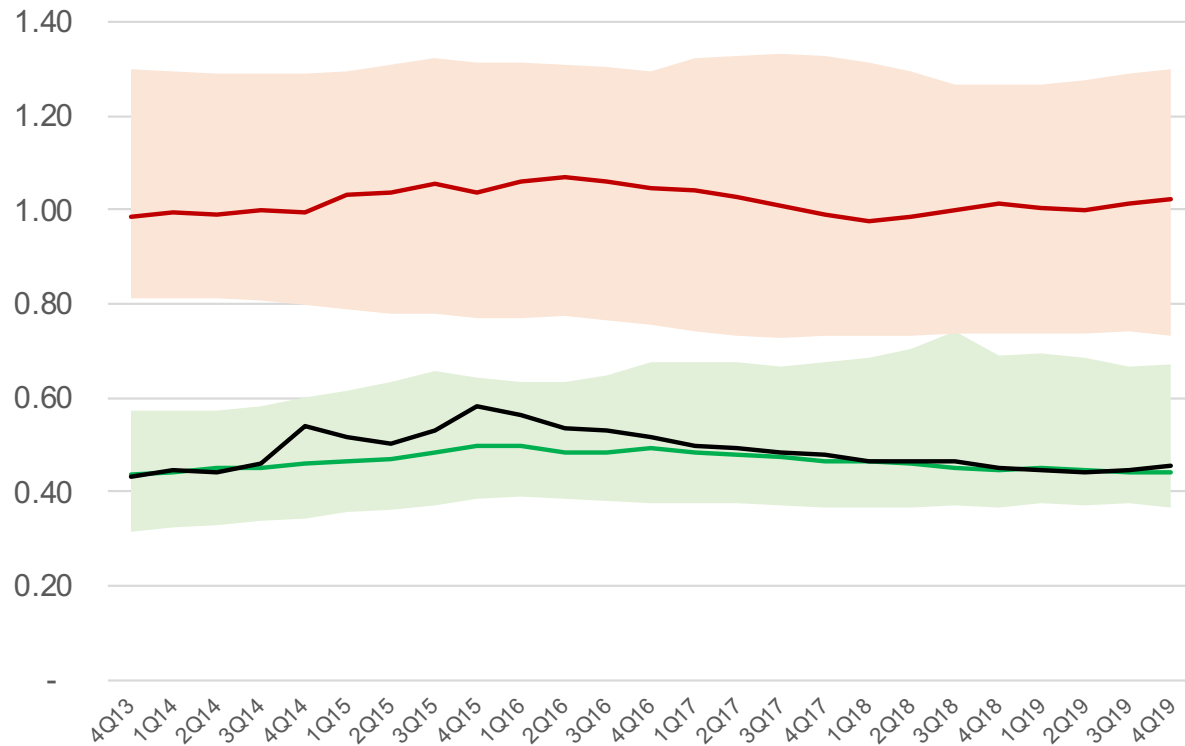
$$\frac{\text{Debt Service Cost}_t}{\text{Aggregate income}_t}$$



**Flow to Flow**

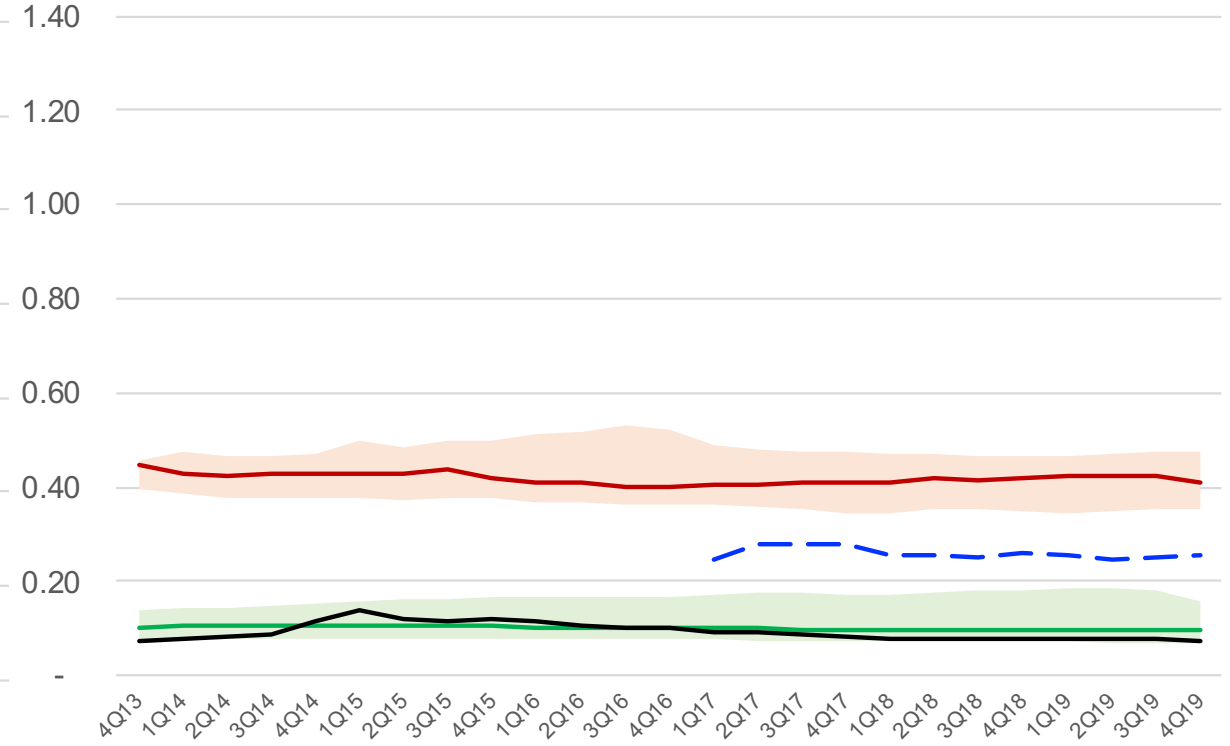
- remaining maturity effect
- interest rate effect

## Credit-to-GDP



- Advanced Economies (median)
- Emerging Market Economies (median)
- Russia

## DSR



- Advanced Economies, NFCs (median)
- Emerging Market Economies, private non-financial sector (median)
- - **Russia, non-banking sector (micro-level data)**
- Russia, private non-financial sector (BIS)

shaded green and pink areas on both graphs represent the 25<sup>th</sup> and 75<sup>th</sup> percentile



# Methodology

## Drehmann and Juselius (2012):

$$DSR_t = \frac{\text{Debt service cost}_t}{\text{Aggregate income}_t} = \frac{i_t * D_t}{\left(1 - \frac{1}{(1 + i_t)^{s_t}}\right) * Y_t}$$

$D$  – stock of debt (amount of debt outstanding) at each estimation point  $t$

$Y$  – quarterly income (GDP)

$i$  – lending rates,

$S$  – remaining maturity in quarters

When applied to micro-level data:

$$DSR_t = \frac{\sum_{j=1}^N \frac{i_{j,t} * D_{j,t}}{(1 - (1 + i_{j,t})^{-s_{j,t}})}}{Y_t}$$

$j$  – individual loan

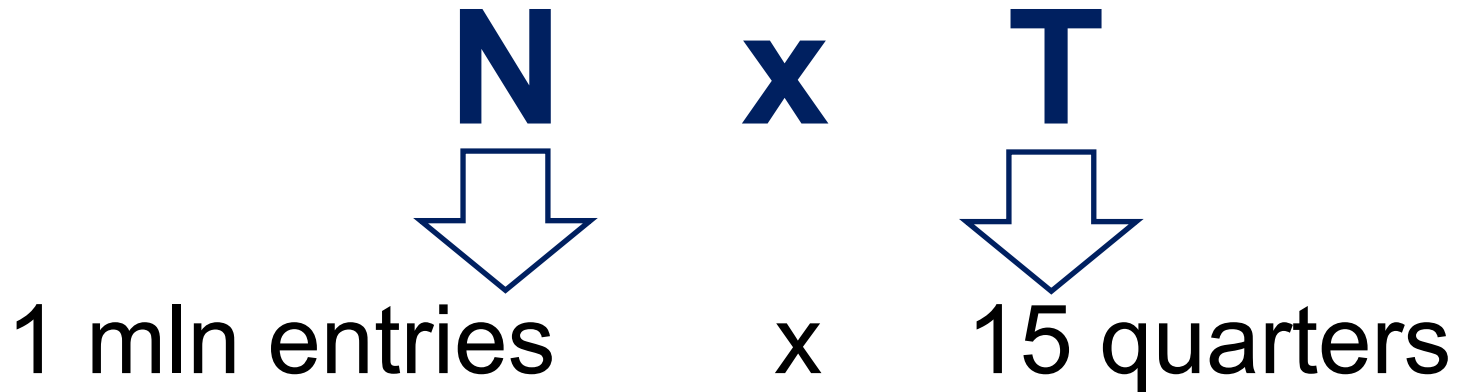
$N$  – number of entries

**Number of entries in the credit registry ~  
1 mln X 15 Q**





# Micro-Level Database



Micro-level data insight “*bank – firm (industry) – loan*” level

- amounts of new loans issued and the stock of debt, incl. currency details
- quality mark for each loan
- initial and remaining maturity for each loan
- scheduled and actual repayments of interest and amortization of debt
- fix/floating interest rates
- roll-overs

1. Remaining maturity is fixed:
- |                  |                         |
|------------------|-------------------------|
| BIS              | 13 y.                   |
| BoR (2015, 2017) | 4 y.                    |
| Credit Registry  | actual maturity is used |

**FINDING 1: asymmetric distribution**

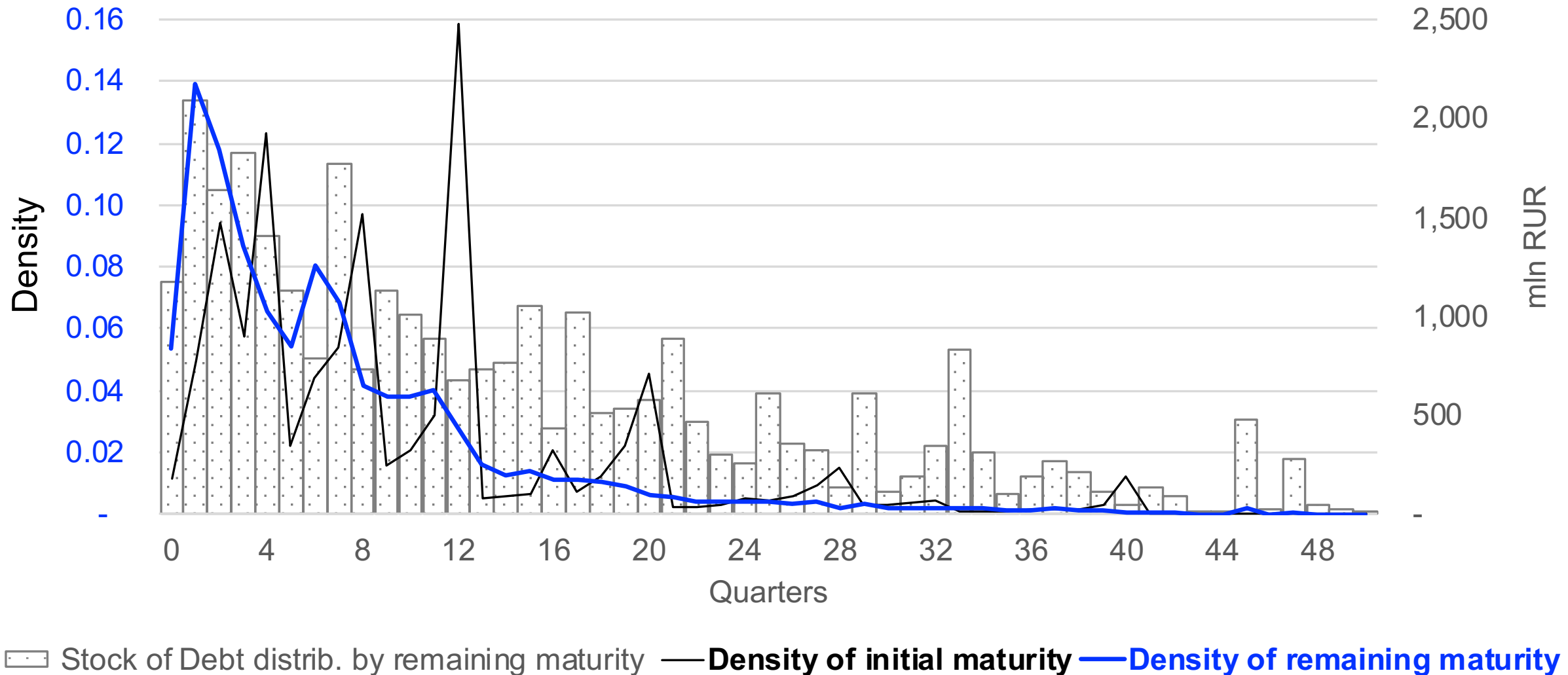
2. Stock of debt ( $D$ ) is amortized over the maturity of loan

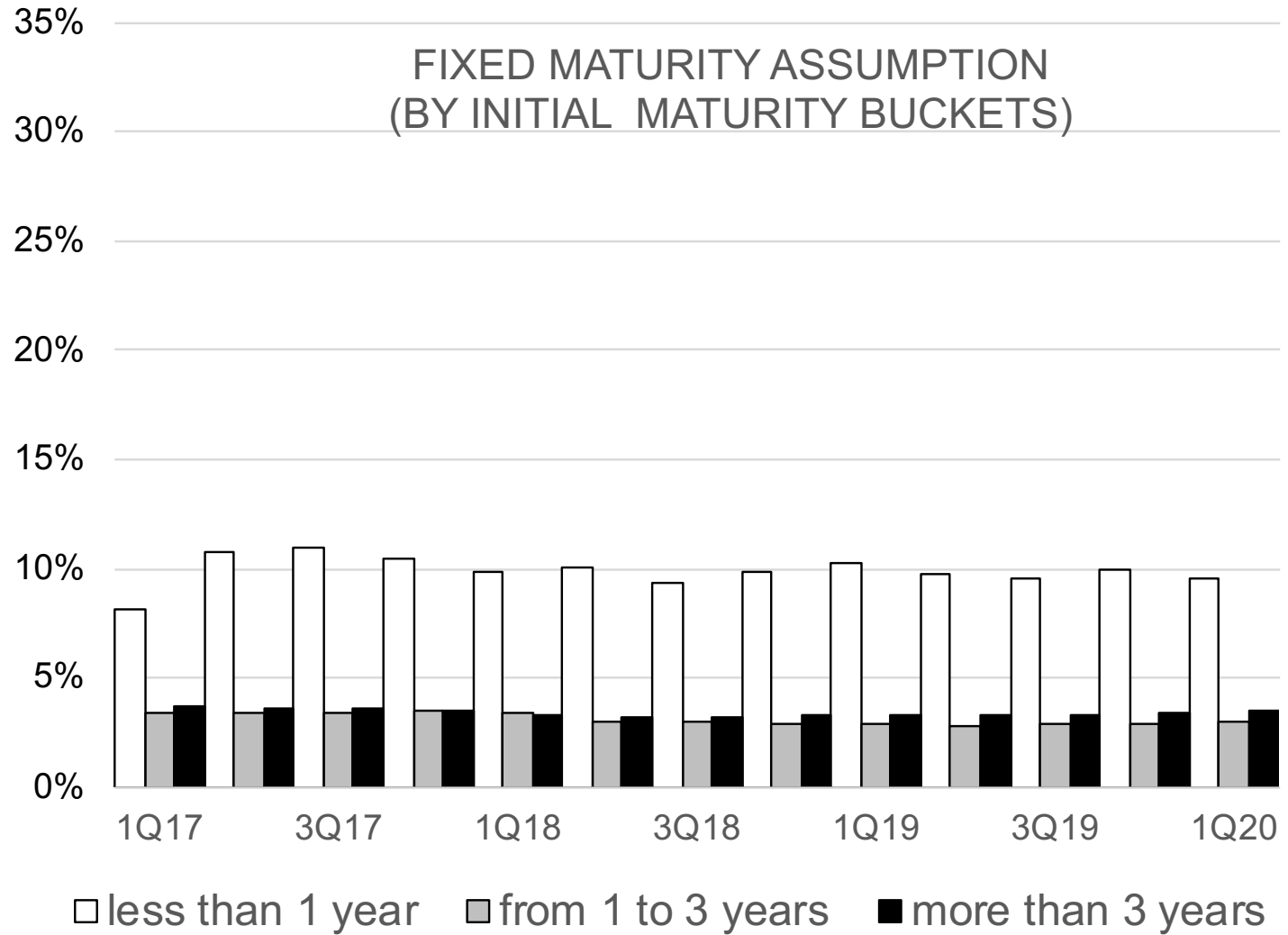
**FINDING 2: heterogeneity in debt redemption stance**

*Drehmann et al. (2015) discuss the impact of aggregate assumption and the assumption about repayment schemes (instalment loans vs bullet loans) on the accuracy of DSR estimates*

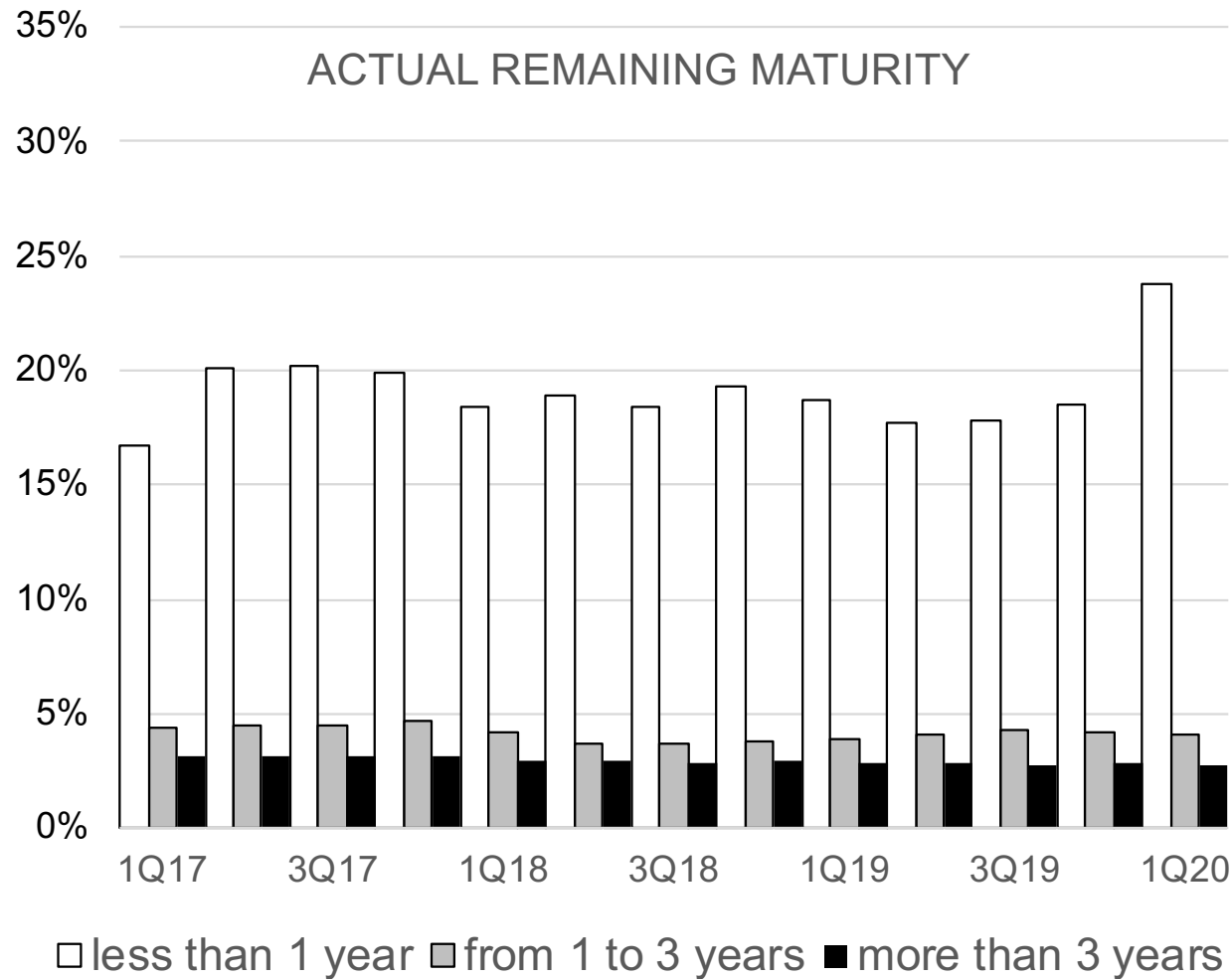


# Results

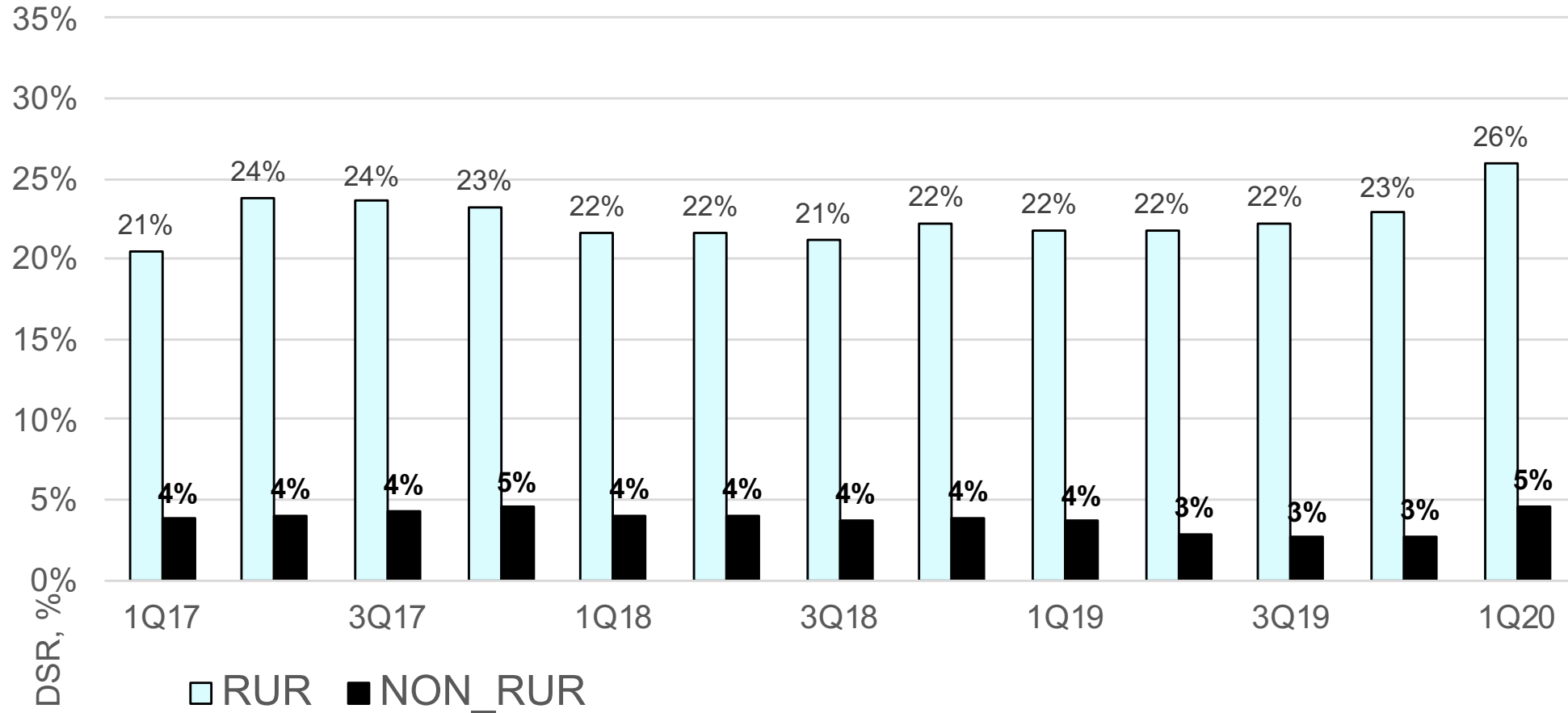




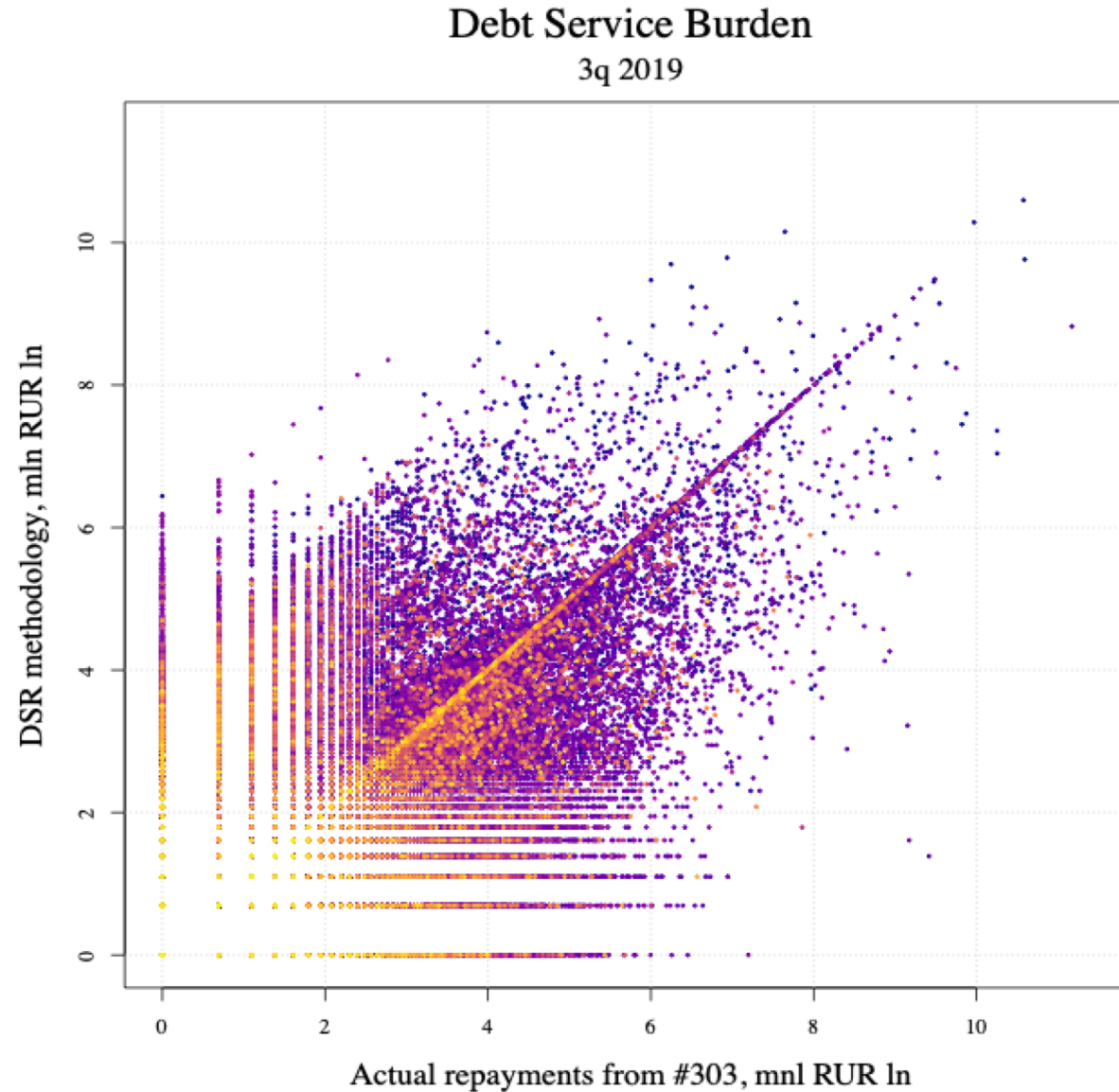
## Major part of debt servicing costs attributable to debt with shorter remaining maturity



## 85% of the debt servicing costs comes from domestic currency debt

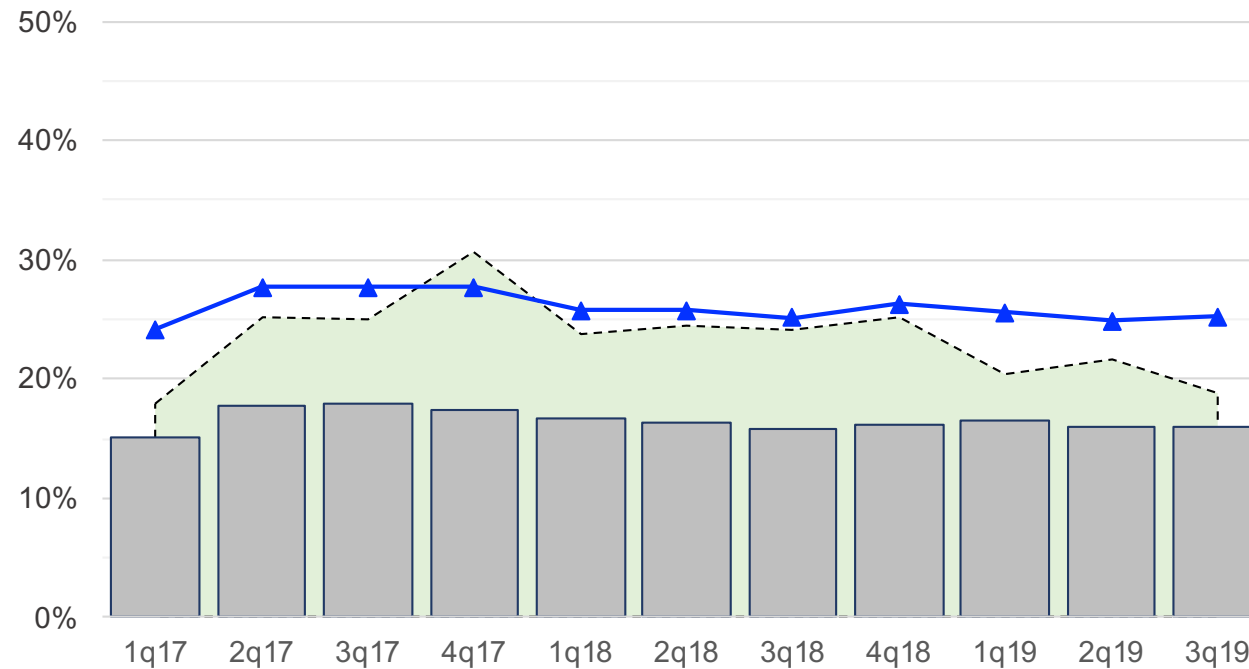








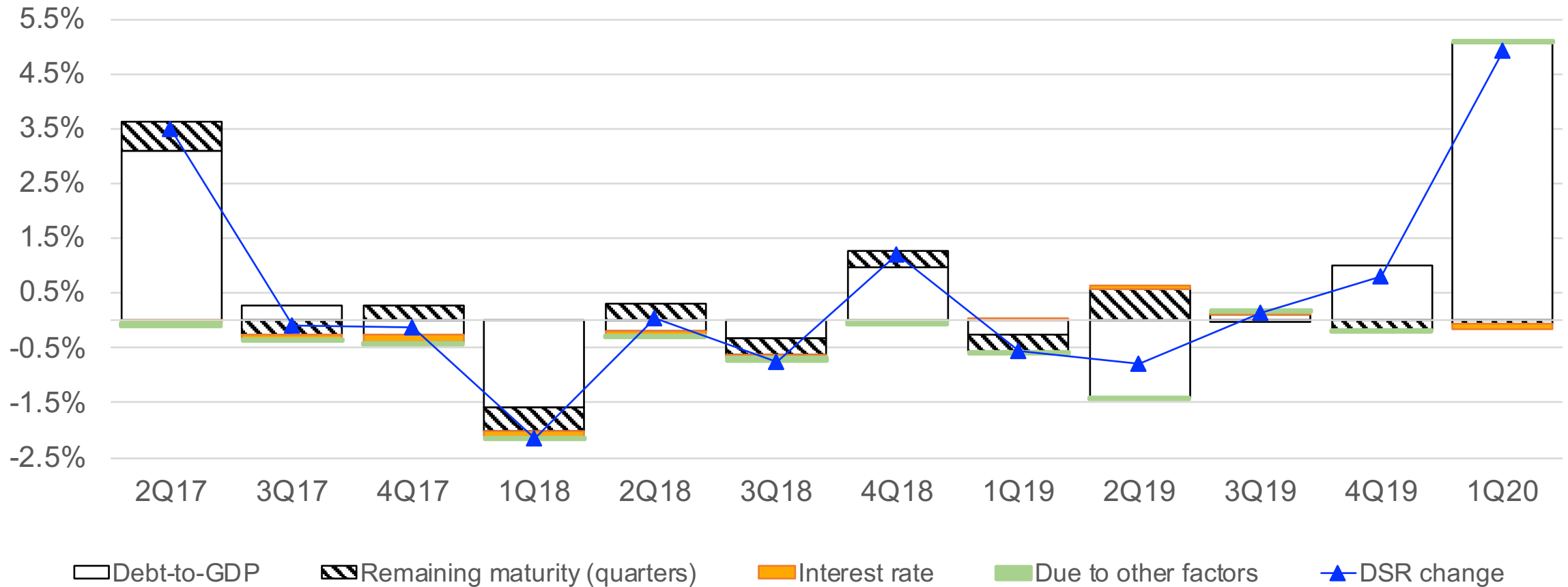
## DSR is feasible approximation of the debt service burden



--- Actual payments (interest and amortization)

■ Aggregate fixed initial maturity assumption

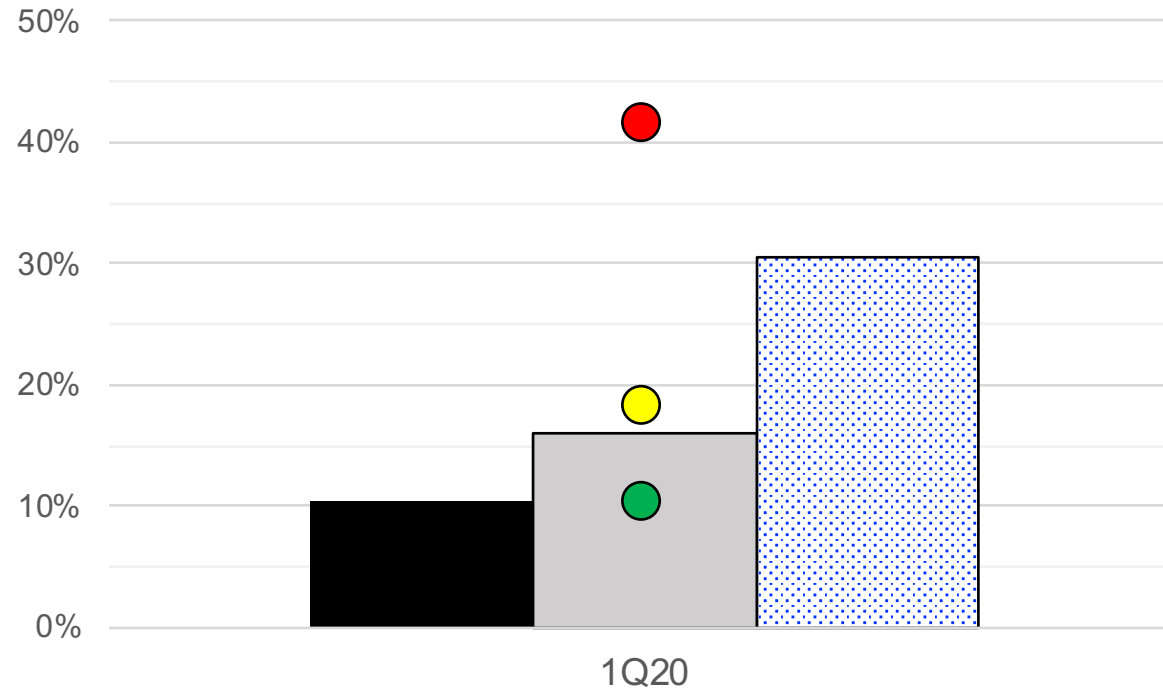
▲ Estimated with micro-level data





# Conclusion

## CALIBRATION IS ESSENTIAL



- Russia, private non-financial sector (by BIS)
- Russia, non-banking sector (estimated with aggregate assumption)
- **Russia, non-banking sector (estimated with micro-level data)**
- **EMEs median, DSRs of the private non-financial sector**
- DEs median, DSRs of the private non-financial sector
- **DEs median, DSRs of NFCs**

1. DSR *feasibly* approximates debt service burden of the economy *if calculated with micro-level data*

2. Sectoral *heterogeneity* of the DSRs

3. To be continued :

– **Benchmark to other countries (BIS Initiative)** –

