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Macroprudential policy and credit allocation: evidence from South Africa*

Serena Merrino,† Keagile Lesame‡ and Ilias Chondrogiannis§

Abstract

In 2013, South Africa amended its bank regulatory framework in line with the Basel III accord, which introduced system-wide capital and liquidity adequacy requirements designed to curb the economy's financial cycle – so-called macroprudential policy. These regulations aim to create a more resilient banking system, but they can also lead to changes in lending behaviour, potentially affecting the availability and terms of loans to specific segments of the credit market. This is especially important in emerging markets such as South Africa, where market segmentation and inequality are more prominent than elsewhere. This paper examines how South Africa's credit market has responded to macroprudential policy measures, with a focus on borrowers' heterogeneity, to evaluate whether financial stability objectives are achieved at the expense of an equitable credit allocation. Our empirical approach is two-fold and employs both panel and time-series data for the period 2008–2023. We find that macroprudential regulation has reduced lending to households, especially if poor, to the benefit of firms, especially if large. We also find that this regulation triggers lenders' adverse selection by penalising more creditworthy enterprises. Our results suggest that while Basel III has reduced reckless consumer credit, it has also redistributed finance in ways that are not beneficial to long-term growth and financial stability.

JEL classification

E44, E58, G21, C32, C33

Key words

Macroprudential policy, credit market, South Africa, distribution, SMEs, financial regulation

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1. Introduction

In the aftermath of the global financial crisis (GFC), policymakers were tasked with tackling system-wide risks and incorporating macrofinancial stability into their regulatory approach. Against this backdrop, in 2009 the Basel Committee on Banking Supervision issued the first draft of the Basel III agreements, which was endorsed by its 28 members and phased in over a six-year transition period starting in January 2013 (Basel Committee on Banking Supervision 2011). The new regulatory framework augmented the existing bank-specific requirements with macroprudential rules, whereby aggregate levels of capital, assets and liquidity are regulated based on the economy's financial cycle and the systemic relevance of the banks (i.e. interconnectedness). These rules are enforced horizontally across all depository institutions rather than at only one institution at a time.

While reducing systemic risk is the policy's goal, results from large cross-country studies indicate that macroprudential policy (MaPP) actions are associated with milder credit growth and procyclicality,[1] whose excesses have too often anticipated banking crises (Schularick and Taylor 2012). These intermediate targets are achieved because, to insulate profits from regulatory pressure and higher funding costs, banks are compelled to change the size or composition of their balance sheet, including their loan portfolio.[2] In this regard, one concern that has emerged around the implementation of Basel III is whether, due to information asymmetries, changes in lending behaviour affect the allocation of credit across types of borrowers and loans in unintended ways, such as disproportionally rationing credit to borrowers with observable vulnerabilities (e.g. small- and medium-sized enterprises (SMEs) and low-income households).[3] If bank regulation amplifies existing market frictions, vital parts of the productive sector could be systematically locked out of the credit market because of adverse selection, with negative effects on the real economy and possibly on the policy's overall

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1 See Borio and Shim (2007), Zhang and Zoli (2014), Akinci and Olmstead-Rumsey (2018), Ayyagari, Beck and Martinez Peria (2018), Carreras, Davis and Piggott (2018) and Gómez et al. (2020).

2 As an example, to comply with higher liquidity requirements, banks could reduce less-liquid assets like loans, whereas tighter capital adequacy ratios mean that banks have less capital available to lend, especially to riskier borrowers.

3 In light of this, Basel III allows banks to assign a so-called 'supporting factor' to SMEs and retail credit lines when calibrating their internal risk assessment.

effectiveness. Furthermore, regulatory restrictions focused on financial stability might clash with the government's distributional objectives, especially in emerging markets such as South Africa, where market segmentation and inequality are more prominent than elsewhere.

Despite its global scale, MaPP was born out of necessity in the wake of the GFC, so its transmission mechanism and redistributive effects are not yet well understood. The aim of this paper is to produce evidence of the effects of these regulations on credit distribution in South Africa and to evaluate whether MaPP's financial stability objective is at the expense of an equitable and growth-enhancing credit allocation. Due to the absence of a credit registry in South Africa, a detailed micro-level analysis that accounts for relevant characteristics of borrowers is difficult. Yet, given data availability, we can explore the allocation of credit across types of borrowers (households versus non-financial firms), their characteristics (size, location and creditworthiness of firms; households by income) and types of loan (short-term versus long-term debt). To take advantage of all available data, our empirical approach is two-fold. First, we estimate impulse response functions (IRFs) by local projections (LPs) with quarterly data on total bank lending, distinguished by type of borrowers, for the period 2008Q1–2023Q1 (SARB 2023). We then use the same methodology on households' total borrowing, distinguished by income (National Credit Regulator 2023). Second, we estimate a fixed effects panel regression on firm borrowing, employing annual firm-level tax administrative data from the South African Revenue Service for the period 2010–2021 (National Treasury and UNU-WIDER 2023). In both cases, MaPP is measured by an index that captures policy actions related to six instruments, while the policy shock that determines IRFs is identified through the narrative method.

In conducting these estimations and examining their results, the paper relates to a relatively new strand of literature that is trying to shed light on the impact of MaPP. More importantly, it aims to enrich the discussion about unintended distributional effects in macroeconomics, effectively exploring the existence of a trade-off between financial stability and inclusion. In the next section, we review relevant scholarship and initiate a discussion on MaPP and credit distribution, focusing on bank-based measures. Section 3 discusses stylised facts on South Africa's credit market and

MaPP. Sections 4 and 5 present the datasets and the LP and fixed effects models, and section 6 concludes.

2. Bank regulation and credit allocation

2.1 Adjustments in bank lending behaviour

The effect of regulatory capital and liquidity on credit growth and allocation depends on a variety of factors that characterise both lenders' and borrowers' behaviours. For example, capital-related measures (such as countercyclical buffers and the leverage ratio) require banks to hold higher levels and classes of equity based on the risk profile of their assets. In the context of the Modigliani-Miller theory, both equity and debt would become cheaper because of the market's appreciation of a stronger bank funding structure (Gambacorta and Mistrulli 2004). In this case, or if banks stood above minimum requirements, regulatory reforms would be unlikely to have an impact on lending (Cohen and Scatigna 2014). However, further capitalisation could also result in higher costs of equity, due to the favourable tax treatment of debt, the existence of deposit insurance and information asymmetry that leads to agency costs (Harimohan and Nelson 2014). The increased cost of bank fund-raising could then induce bankers to rebalance their loan portfolio in an effort to shield their profits. Similarly, in response to higher liquidity standards, non-compliant banks could either shift to stable funding (by increasing the duration of liabilities or by issuing new equity) or adjust the composition of their loan portfolios toward shorter maturities and more liquid assets (such as government bonds), which could in turn reduce their net interest margin (King 2013). In South Africa, Rapapali and Steenkamp (2020) and Diesel et al. (2022) show that bank funding costs have increased since the GFC, while Pillay and Makrelov (2024) show that South African banks' lending has been affected by excess capital holdings. Overall, reactions depend on each bank's trade-off between the marginal costs of better funding and the marginal cost of cutting back on lending, and it is not possible to establish a priori whether and how regulatory policy has affected the credit market. Nevertheless, there is agreement in the literature that macroprudential measures are effective in curbing excessive credit growth (Lim et al. 2011; Cerutti, Claessens and Laeven 2017).

Stiglitz and Weiss's (1981) theory of credit rationing underpins the existence of adverse selection in banks' discriminatory lending decisions.[4] In short, lenders subjectively evaluate loan applications based on the probability of repayment, the marginal cost of granting the loan and the collateral offered (Freel 2007; Baas and Schrooten 2006). Given information asymmetry, credit risk is inferred from the borrower's credit history, the expected returns of the project and the business experience of the firm. In addition, credit decisions are informed by a presumed level of risk, which is based on the borrower's observable characteristics (such as the sector, location, age and size of the firm). Not only do younger, smaller firms have higher financial constraints, but they are also perceived as riskier in general, and they often fail to produce financial statements that comply with a bank's requirements (Zambaldi et al. 2011). If regulatory pressure systematically jeopardises the risk assessment of marginal borrowers, it could lock a vital part of the productive sector out of the banks' credit market, but for reasons unrelated to the profitability of the business and the affordability of the loan. In this scenario, MaPP's trade-off between financial stability and inclusion is a double-edged sword.

Conversely, if more conservative lending standards were accompanied by a fair risk assessment of borrowers, banks would withhold loans from fundamentally riskier borrowers, engendering a virtuous cycle whereby a lower probability and the conditional impact of a financial crisis eventually create more economic opportunities. For instance, legislation that hinders households from taking on excessive debt based on their objective ability to repay discourages financial recklessness. A much-contested example relates to using finance as a substitute for public support to low-income households to meet their consumption needs, which only results in spiralling indebtedness (James 2014). Similarly, to the extent that credit decisions ration out low-rated non-financial firms (NFFs), a lower credit supply allegedly expedites Schumpeterian creative destruction, so it is effective in supporting stability.[5] Ayyagari,

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4 Discriminatory credit rationing implies a situation where the small business sector and low-income households receive no loans, or less than the amount applied for, at prevailing market rates.

5 However, Kang et al. (2021: 2) note that "for those highly debt-ridden borrowers, banks' incentive to reduce credit amid macroprudential tightening might be muted. If banks cut down their credit to those firms greatly, it might increase the odds of borrower failure and thus the delinquent loans would be translated into banks' own bad assets, causing a write-down of banks' equity and a reduction in their capital adequacy ratio."

Beck and Martinez Peria (2018) find that in emerging economies MaPP binds small and young firms relatively more – but given that this effect is concentrated on the least creditworthy firms, MaPP is consistent with its goal of reducing systemic risk. Kang et al. (2021) find a U-shaped policy effect on the debt distribution of firms in China: bank regulation tightens credit more intensely for firms with high leverage, but only up to a threshold after which the policy effect declines. They also observe that, at the same level of firms' indebtedness, banks prefer state-owned firms and large firms and that borrower-based measures possibly shift bank lending from households to firms.

However, banks do not necessarily need to reduce lending volumes to absorb a regulatory shock. For example, banks can attempt to increase retained earnings by raising the spread and passing on funding costs to borrowers or by engaging in "greater risk taking and shifting their portfolios toward higher-yielding loans by increasing the average maturity of their loans and their exposure to riskier firms, such as smaller firms or firms operating in industries with higher bankruptcy risk" (Duquerroy, Matray and Saidi 2022: 3). Jimenez et al. (2015) perform a difference-in-difference analysis of Spain's credit registry data to estimate the impact of dynamic provisioning. Interestingly, they observe that after the policy shock, banks – especially if small – lend relatively more to risky firms, suggesting that higher requirements may increase bank risk-taking in search of a yield. Along the same lines, Dell'Ariccia and Marquez's (2004) theoretical framework, which focuses on contexts characterised by large information asymmetries, shows that "when forced to curtail their loan portfolio, informed banks reduce lending to a greater extent in less captive sectors, and retain larger market shares in the more captive but more profitable sectors" (Dell'Ariccia and Marquez 2004: 186).

2.2 Borrowing and regulatory arbitrage

Having shown how financial regulation matters for the supply of credit, we now look at how borrowers react to changes in banks' lending behaviour. A changed regulatory environment can depress borrowers' demand for credit, through both economic (such as a higher cost of borrowing) and non-economic factors (such as weaker financial literacy and networks). However, lower access to bank loans may be accompanied by higher competition in the non-regulated banking sector, giving rise to regulatory arbitrage. In this vein, Cerutti et al. (2015) reveal that MaPP is more effective in

financially closed but developed economies because there is less opportunity to circumvent regulation by moving to foreign or informal lenders.[6] In South Africa, Kemp (2017) and the International Monetary Fund (2022) note that non-bank financial institutions (NBFIs) have grown at a faster pace than banks and that the SARB's exclusively bank-based macroprudential toolkit raises the opportunity for cross-sector regulatory arbitrage, "even by encouraging banks to operate in the shadow banking space" (Kemp 2017: 24). In this respect, it must also be noted that the South African capital account has become increasingly liberalised in recent times, which allows for the possibility of cross-border substitution too (SARB 2018). Moreover, according to Jimenez et al. (2015), regulatory arbitrage jeopardises the effectiveness of MaPP to halt credit booms in good times, when firms can more easily switch to alternative lenders. Instead, capital buffers mitigate the credit crunch in bad times, because better-equipped banks keep serving their existing clients.

One problem with regulatory arbitrage is that bank lending is usually more advantageous than services offered by other (i.e. micro-finance) institutions. James (1987) shows that the announcement of a bank loan leads to a positive stock price response for the firm obtaining the loan. Given that SMEs tend to rely on debt finance relatively more than their larger counterparts, granting them access to affordable long-term and developmental finance as well as bills discounting tools and other commercial finance products is key to their ability to generate income. Ayyagari et al. (2018) argue that only borrower-based measures are associated with declines in SME growth and investments, presumably because bank-based restrictions allow firms to borrow elsewhere. Analogously, when low-income individuals have no access to funding (including from the government) for risk management, education or housing, they are refused the attainment of basic needs. Benefits stemming from a far-reaching and well-diversified distribution of financial resources are commonly associated with higher financial stability and lower inequality and poverty (Beck, Demirgüç-Kunt and Levine 2007). By contrast, lower financial market participation inhibits monetary policy transmission and its countercyclical effectiveness (Mehrotra and Yetman 2015). Hence, if MaPP skews the credit distribution, pushing marginal borrowers out of the

[6] See also Aiyar, Calomiris and Wieladek (2014), Reinhardt and Sowerbutts (2015) and De Schryder and Opitz (2021).

pool, it could paradoxically compromise financial stability itself. Finally, a further question relates to the timing of the policy's redistributive effects. Intuitively, MaPP may decrease financial inclusion in the short term only, while pro-inclusion effects may emerge over time from enhanced confidence in the system's ability to ensure financial service provision.[7]

3. Lending and bank regulations in South Africa

3.1 Credit market dynamics

Similar to the rest of the world, the South African banking sector has expanded and become more globally connected in the last few decades, as well as concentrated into a few large conglomerates (Aron and Muellbauer 2013; Havemann 2021). Following the 1994 elections, the democratisation of South African society and the relatively loose monetary policy that followed sustained a rapid expansion in bank lending, particularly unsecured consumer loans. In 2002, the default of Saambou Bank and the consequent small-bank crisis prompted a wave of bank consolidations and tighter regulation aimed at curbing reckless lending (such as the 2005 National Credit Act). Although credit volume contracted immediately after the crisis, it continued to expand in the following years and up to the GFC, with annual growth peaking at 19.5% in 2006, fuelling consumption and output. Over this time, real gross domestic product (GDP) growth, which averaged 4.5% annually, pushed South Africa into the group of first-tier emerging markets (SARB 2023).

In between the GFC and the COVID-19 pandemic, South Africa experienced a period of stagnant economic growth, but lower-than-usual rates succeeded in stimulating credit, albeit at a slower pace than previously observed. Figure 1 breaks down bank lending by type of borrower. Notably, from 2011 to 2017 the share of household credit decreases to the benefit of the non-financial corporate sector. Furthermore, the rise in corporate credit is driven by large firms: over the whole period considered (2008–2023), large firms gained a 9% share of total private credit, bringing their share to 46%, while the share of SMEs declined from 33% to 22% of corporate credit.

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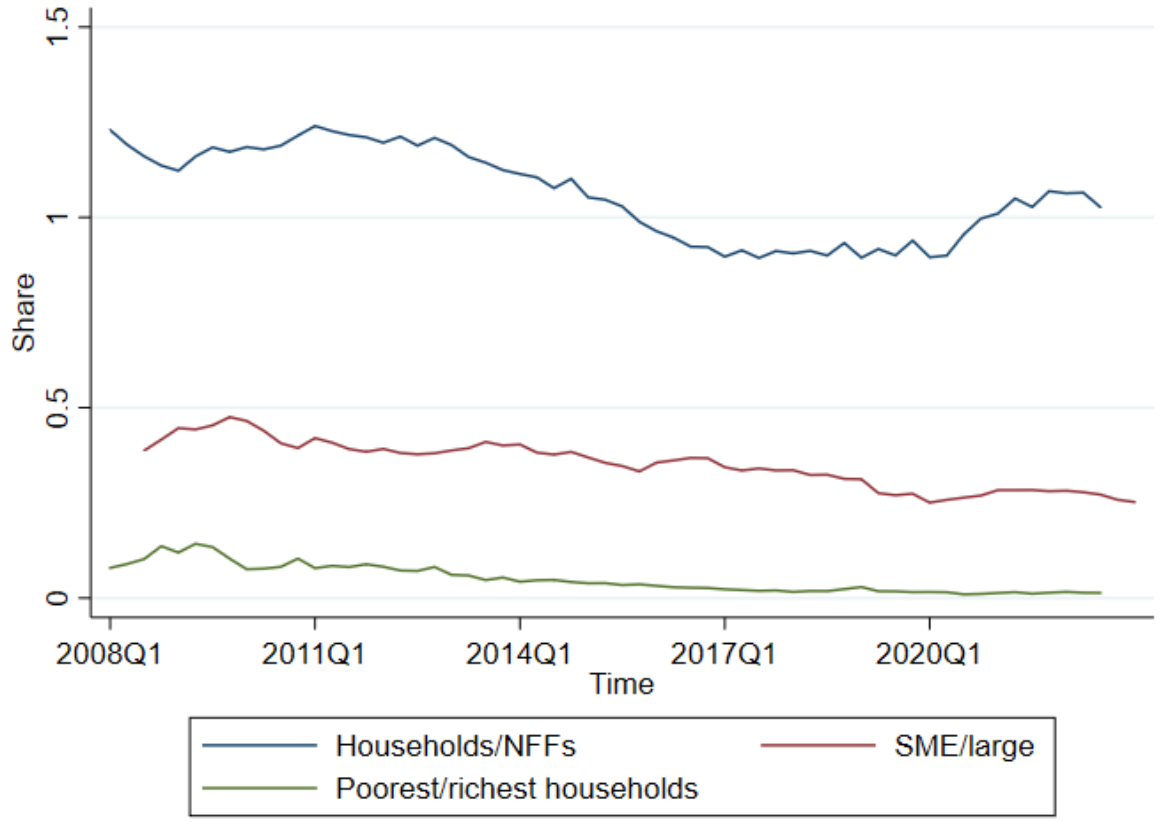
[7] See Cull, Demirgüç-Kunt and Lyman (2012) for a review of the link between financial stability and inclusion.

Figure 1: Shares of bank loans by type of borrower (2008Q1–2023Q1)



Source: SARB and National Credit Regulator (2023)[8]

This last piece of information must be read in context: despite the South African SME sector comprising 98.5% of total businesses and contributing 40% of GDP (Cunha et al. 2020), it is dominated by micro (87%) and young (85% are less than five years old) firms that make no use of formal credit (Makina et al. 2015; SME South Africa 2018). In 2018, only about 9% of SMEs reported having received funding from private sources (SME South Africa 2018), of which only 20% came from financial institutions. This figure reflects other emerging market economies but seems impressively low if benchmarked against South Africa's well-developed financial sector. Supply-side bottlenecks – such as high cost of funding, high collateral requirements, long loan processing times, lack of financial knowledge and disclosure to inform credit risk assessments – have prevented SMEs from obtaining bank financing, paving the way for a proliferation of micro-lending, venture capital funds and unregistered money

[8] SARB's monthly total bank data on credit risk (BA200) are available from January 2008 to April 2023.

lenders (Hollander and van Lil 2019) that eventually increase the risk exposure of these already vulnerable borrowers (Ardington et al. 2004).

The evolution of household debt offers further supporting evidence: while credit volume declines for all brackets of income distribution, it does so disproportionally for poorer households. In 2023, households earning more than R15 000 per month accounted for over 88% of total household borrowing. In addition, even though banks remain predominant lenders in the consumer credit market, in the period considered they lost 10% of their market share and reached a low of 74% in 2017. In summary, stylised facts indicate that while bank lending has kept increasing in absolute terms, a redistribution of credit from consumers – especially in the low-income category – and SMEs to the large corporate sector has taken place in South Africa since the GFC. These figures reflect South Africa's two-tiered economy, where the under-developed economy of the townships and former homelands is cut off from the high-end economy. They also suggest the possibility that credit supply, at least for retail, is leaking outside the regulated sector.

3.2 Macroprudential policy

3.2.1 Policy index

To build a database of the Basel III reforms in South Africa, we start by consulting the Bank of International Settlements (BIS) Regulatory Consistency Assessment Programme: Basel III implementation dashboard (BIS 2023a). To virtually track all MaPP actions implemented, we also survey the SARB's legislative instruments, BIS country reports and other secondary sources (such as Makrelov, Pillay and Morule 2021). We only consider policies that are 'binding' and that alter the balance sheet composition of banks, implying that we exclude policy recommendations as well as disclosure tools such as Pillar 3. The final database provides details on monthly actions subdivided into six capital or liquidity tools implemented between 2012 and 2023.[9] Building on the weighting scheme proposed by Meuleman and Vander Vennet (2020), we then construct an index of each policy instrument's life cycle. Each action is given

[9] The six tools are: capital conservation buffer, countercyclical capital buffer, minimum leverage ratio, domestic systemically important banks add-on, net stable funding ratio and minimum liquidity coverage ratio.

a positive or negative value, depending on whether it tightens or loosens the policy stance, and a certain weight according to the following criteria: first-time tool activation receives the highest weight (1), a lower value is assigned to the announcement date of the policy (0.5),[10] and even lower values are assigned to recalibration in the level (0.25) and to changes in the scope or definition of the tool (0.1). The lowest value (0.05) is assigned when implementation is postponed or further guidance is provided; zero is given if no action occurred in that month. Finally, we produce a cumulative index by simply adding up the indices of all the policy instruments implemented during a single period.[11] All instruments carry equal weight because of the difficulty in predicting the type of policies that are more effective in safeguarding the stability of the financial system. Once the tool is deactivated, the cumulative index drops to zero. We derive the quarterly and annual index series by taking averages, and we distinguish the MaPP index by its capital and liquidity components (see the monthly cumulative indices in Figure A1 in the annexure).

3.2.2 Stylised facts

Notably, the Prudential Authority has adopted a bank-focused strategy for implementing Basel III, through which it presently regulates 33 deposit-taking banks.[12] On the capital side, the South African toolkit proves to be stricter than the Basel III framework: the total capital adequacy ratio is set at a minimum of 10%, in contrast to the 8% rule of Basel III. With weak credit growth, the countercyclical capital buffer has consistently been kept at zero, but the capital conservation buffer and Pillar 2A were enforced in 2019 – and then temporarily reversed in response to the pandemic. An extra surcharge of capital is also imposed for six domestic systemically important banks – which account for over 93% of total assets (SARB 2022). Finally, the leverage ratio was raised to 4% in 2018, one point above international requirements. In addition, total capital adequacy ratios have consistently stood well above minimum

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10 This equates to assuming that agents can react to policies from the moment they are announced whenever there is a delay between the legislation's passage and its implementation.

11 For robustness, we also derive and employ a simplified version of the policy index, which only accounts for eight instruments (on the capital side: risk-based capital requirements, capital conservation and countercyclical capital buffer, Pillar 2A add-on, leverage ratio and D-SIFIs add-on; on the liquidity side: liquidity coverage ratio and net stable funding ratio).

12 NBFIs such as microlenders, venture capital and money market and investment funds remain outside the regulatory scope.

requirements (SARB 2023), reflecting rising fiscal risks (Makrelov, Pillay and Morule 2021; Pillay and Makrelov 2024). On the liquidity side, by 2019 South Africa had enforced a liquidity coverage ratio at 100%, later loosened in response to the COVID-19 crisis, and a net stable funding ratio. The liquidity coverage ratio of the South African banking sector exceeded 145% in 2023 (SARB 2023), reflecting a preference for highly liquid instruments, such as government securities, at the expense of higher-return assets, such as loans. In what follows, we aim to understand whether the financial regulations imposed on banks and phased in since 2013 have had any effect on how credit is allocated in the private sector.

4. Data and methodology

4.1 IRFs by local projections

The main challenge of structural modelling is usually in identifying the structural innovations. In this case, MaPP shocks have been extrapolated through the narrative method, which analyses the motivation behind each policy action to assess whether it actually constitutes an innovation unrelated to the state of the economy and unanticipated by financial agents (see Richter, Schularick and Shim 2019). For this reason, we drop all countercyclical MaPP actions that react to economic fluctuations and only consider those that address long-term financial stability. Contrary to the monetary policy context, however, macroprudential policies rarely seem to be countercyclical: in fact, we only exclude the 2020 COVID-19 relief measures, which were officially implemented to avert a looming credit crunch. To test for exogeneity, we then carry out the following exercises: (i) we produce the scatterplot of each index against the output gap and core consumer price index (all variables are in logs and standardised) and (ii) we regress each index on lagged real output gap, inflation and banks' return on equity. The results, which are presented in the annexure, confirm that none of the predictors used to proxy for short-term economic conditions are systematically related to changes in the narrative MaPP index. The fact that macroprudential policies included in the narratively identified index are orthogonal to the economic and financial cycle is, therefore, the key identification assumption in this setting.

In order to empirically assess the effect of MaPP shocks on credit aggregates, we employ IRFs estimated by the LP method (Jordá 2005). The model requires ordinary least squares estimation of a series of regressions for each horizon h and each variable, as described by equation (1):

$$Lending_{t+h} = \alpha_h + \beta_h(L)MaPP_t + \Pi_h(L)macro_t + \Gamma_h(L)TA_t + u_{t+h} \quad (1)$$

where h = 1, 2, … 8; the dependent variable is a measure of lending volume distinguished by borrower – sourced from the BIS or the National Credit Regulator; α_h is the constant; and $macro_{t-1}$ denotes the vector of control variables, which includes the real repo rate, the core inflation rate, the output gap – all sourced from the SARB – and a dummy that accounts for the recessions following the GFC and the pandemic. We also include the log difference of banks' total assets, TA_t. Finally, the slope β_h reflects the response of variable y at horizon h to the $MaPP_t$'s exogenous shock impulse happening at time t. All variables enter equation (1) with four lags. The impulse responses relative to y are then constructed from all estimated values of β_h. As in Jordá (2005), the Newey-West correction is employed to predict robust standard errors that account for the serial correlation in u_{t+h}. The dataset (described in Table A2 in the annexure) is quarterly; it begins in 2008Q1 and goes through 2023Q1.

4.2 Fixed effects panel data model

Furthermore, we employ annual firm-level tax administrative data (National Treasury and UNU-WIDER 2023) from the South African Revenue Service, restricted to active and non-financial firms and winsorised at 5%. The selected period is 2010–2021. Descriptive statistics are presented in the annexure. Thus, while LPs are estimated on time-series data reported (and supplied) by the regulated banking sector, this panel data model is built on firm-level credit reported (and received) by NFFs, which therefore includes funding from both banks and non-bank institutions. Following Ayyagari, Beck and Martinez Peria (2018), we specify a fixed effects model as follows:

$$Firm\ borrowing_{i,t} =$$
$$\beta + \beta_1 MaPP_{t-1} * firm_{i,t-1} + \beta_2 macro_{t-1} + \beta_3 TA_{i,t-1} + \delta_i + \lambda_t + u_{i,t} \quad (2)$$

The dependent variable is a measure of a firm's borrowing growth, expressed as the log difference of the variable: (i) short-term borrowing is total current liabilities, that is, debt with residual maturity of less than one year, or (ii) long-term borrowing is total non-current liabilities, that is, debt with residual maturity of one year or more, which also includes corporate bonds. On the right-hand side, β is the fixed effects intercept to account for sample heterogeneity, while regressors are distinguished by three clusters subject to firm fixed effects δ_{i}, time effects λ_t, and the error $u_{i,t}$. $\mathrm{MaPP}_{\mathrm{t}}$ is the independent variable, the change in one of the three policy indices that were described in section 3.2; $\mathrm{macro}_{\mathrm{t}}$ is a vector of macroeconomic variables that control for the real GDP growth rate, the change in the real repo rate;[13] and we choose to control for the natural log of total assets $TA_{i,t}$, to account for changes in external financing due to firm growth, because large firms are likely to need more credit to finance their assets. Finally, we interact the policy index with $\mathrm{firm}_{\mathrm{i,t}}$ – that is, one of the following firm characteristics: (i) the size class, categorised into small, medium and large depending on the borrowing firm's turnover;[14] (ii) return on assets, as profitability not only allows firms to substitute bank financing with internal funds but also signals financial strength; or (iii) leverage, measured by the ratio of total debt to total assets. The independent and control variables are lagged to exclude reverse causality problems.

5. Results and discussion

Figure 2a plots the IRFs of different measures of household bank loans to a one-unit increase in the MaPP index, with the shaded area representing the 90% confidence interval. In the middle and bottom panels, the tightening lowers households' share by 0.6% of total bank lending and by 2% with respect to NFFs' bank loans. The effect peaks after five quarters, but it persists over two years. In the bottom panel, bank lending to households decreases as a share of GDP too, but only temporarily. Figure 2b confirms that the response of NFFs' bank lending is opposite to that of households'. Our first set of results indicate that the credit redistribution from

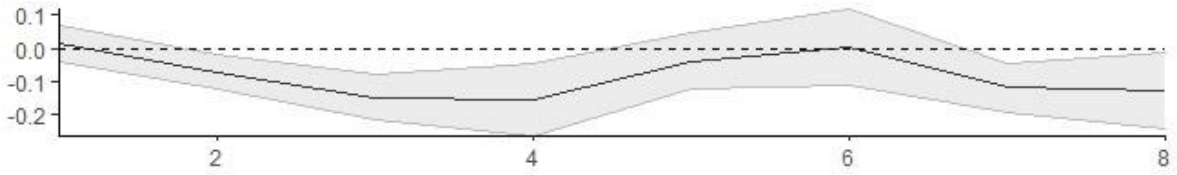
[13] Given that this specification includes time effects, the dummy variable that captures the lockdown effect is redundant.

[14] These thresholds by sector are defined by the National Small Business Amendment Act (2003) and are updated annually by Statistics South Africa.

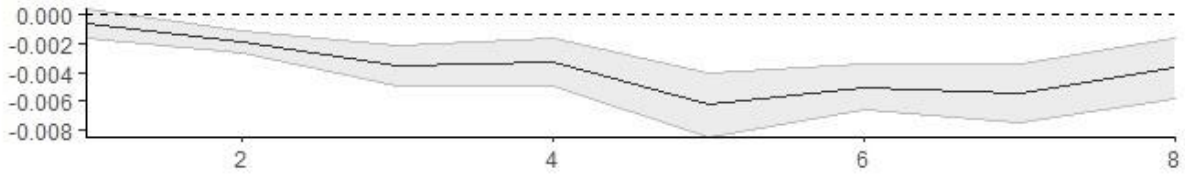
households to firms observed in the last decade in South Africa has been partly triggered by banks responding to MaPP.

Figure 2a: IRFs by LPs: MaPP tightening on bank lending to households

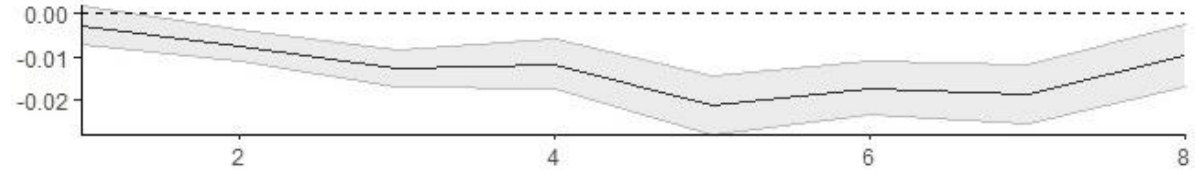
A) Share of GDP



B) Share of private bank lending



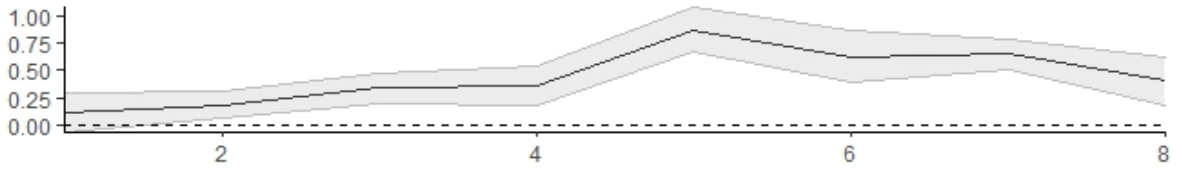
C) Share of corporate bank lending



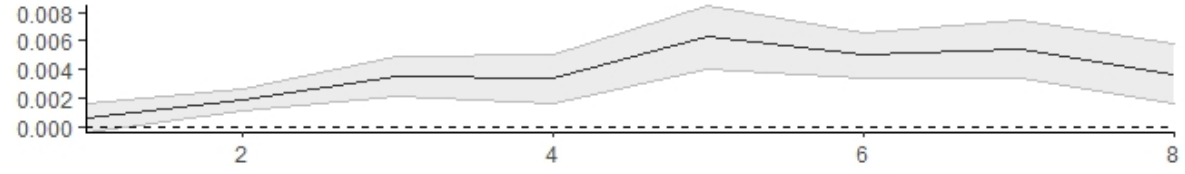
Source: BIS (2023b)

Figure 2b: IRFs by LPs: MaPP tightening on bank lending to NFFs

A) Share of GDP



B) Share of private bank lending



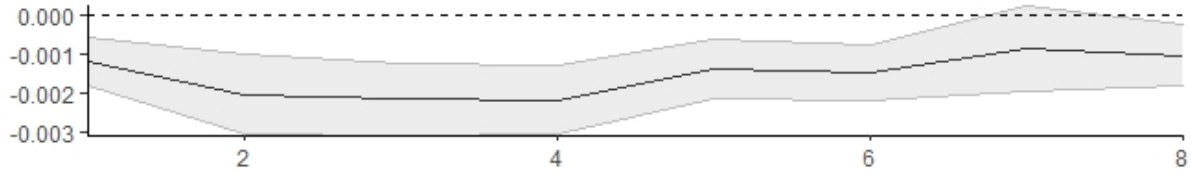
Source: BIS (2023b)

5.1 Households' characteristics

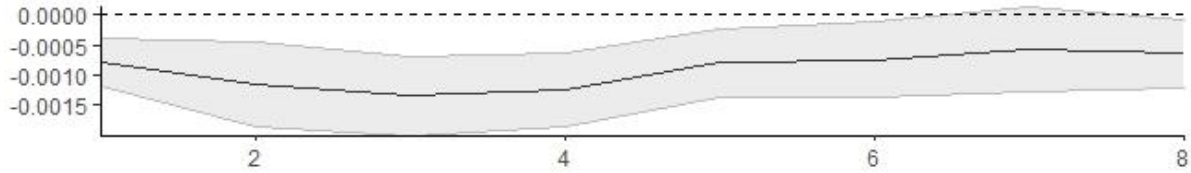
In the next impulse response analysis, we test whether credit rationing to households (as seen in Figure 2a) depends on the income decile that borrowers belong to. In Figure 3, a unit increase in the MaPP index lowers the credit share of the poorest households (R0–R3 500), both as a share of the richest households (>R15 000) and as a share of the total. All effects are small and temporary: a 0.1–0.2% increase over six quarters. As a robustness check, we also combine the highest income categories (>R7 500) and find that their aggregate share increases by 0.2% in response to the shock. Overall, this set of results suggests that financial regulation prompts a shift in lenders' preferences to the advantage of larger borrowers.

Figure 3: IRFs by LPs: MaPP tightening on credit to poorest households

A) Share of credit to richest households



B) Share of total credit to households



Source: National Credit Regulator (2023)

Some authors have expressed concern that South African banks' funding structure – mostly consisting of costly deposits – makes compliance more costly than in advanced economies, where banks have shifted funding towards wholesale debt (Diesel et al. 2022). Kemp (2017) warns that South African banks might comply with the net stable funding ratio by reducing long-term assets. We therefore replicate the estimation by distinguishing mortgages from short-term household credit, but we find no significant effect.

5.2 Firms' heterogeneity

In this section, we complement the previous result by analysing firm-level data to assess whether the positive effects on firms' lending depend on the characteristics of the borrowing firm (i.e. size and location). Table 1a shows that MaPP tightening has a significant and negative effect on firm borrowing, which varies from -0.1% to -0.9% in the case of short-term finance and from -2.2% to -3.3% in the case of long-term finance. In addition, results show that, while the policy has a positive effect on large firms' financing, especially if short-term, the effect on medium-sized firms is ambiguous and not statistically significant. We then estimate equation (2) on a restricted sample of small firms and find no significant policy effect on any form of small firms' borrowing. Overall, Table 1a reveals that MaPP substantially encourages corporate lending to large firms, especially at short maturities. The reason for this result may be twofold: lenders may prefer to substitute consumer and SME credit by funding large and well-established businesses, and large firms' external financing may increase due to non-bank sources of finance (such as the bond market).

Table 1a: MaPP with firm size interaction by type of borrowing[15]

	(1)	(2)	(3)	(4)
	Short-term borrowing		Long-term borrowing	
MaPP # medium		0.001 (0.835)		-0.008 (0.227)
MaPP # large		0.069*** (0.000)		0.036*** (0.000)
MaPP	-0.001** (0.001)	-0.009*** (0.000)	-0.021*** (0.000)	-0.033*** (0.000)
N	2 833 625	2 448 265	344 865	323 882
R^2	0.418	0.441	0.193	0.187

p-values in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: National Treasury and UNU-WIDER (2023)

When distinguishing between different tools of MaPP, results show that the effects are mostly driven by liquidity tools, which trigger a substantial rise in short-term borrowing from large firms (47.1%) and, to a lower extent, medium-size firms (29.3%) – see

15 In the first model specification, we estimate equation (2) by excluding both control variables and interaction terms. In the second specification, we include control variables and interact the policy index with a dummy for firm size (medium vs large).

Tables 1b and 1c. This shift towards short-term corporate finance is in line with the argument that tighter liquidity standards have compelled South African banks to reduce the number of less liquid, longer-term assets on their balance sheets. Another explanation posits that policy tightening prompts firms to fulfil their financing needs outside of the regulated banking sector (i.e. regulatory arbitrage) by borrowing short-term from NBFIs, especially if small and young, or by raising finance internally or through the bond market, if large enough.

Table 1b: Capital instruments with firm size interaction by type of borrowing

	(1)	(2)	(3)	(4)
	Short-term borrowing		**Long-term borrowing**	
Cap # medium		0.014*** (0.000)		-0.023* (0.011)
Cap # large		0.081*** (0.000)		0.014 (0.157)
Cap	0.001** (0.091)	-0.011*** (0.000)	-0.128*** (0.000)	-0.001 (0.845)
N	2 833 625	2 448 265	344 865	323 882
R^2	0.418	0.438	0.193	0.185

Table 1c: Liquidity instruments with firm size interaction by type of borrowing

	(1)	(2)	(3)	(4)
	Short-term borrowing		**Long-term borrowing**	
Liq # medium		0.293*** (0.000)		-0.002 (0.938)
Liq # large		0.471*** (0.000)		-0.170** (0.001)
Liq	-0.010*** (0.000)	-0.023*** (0.000)	-0.074*** (0.000)	-0.018* (0.008)
N	2 833 625	2 448 265	344 865	323 882
R^2	0.418	0.438	0.193	0.185

p-values in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: National Treasury and UNU-WIDER (2023)

In addition, we estimate equation (2) by distinguishing each sample of NFFs by their geographical location. South Africa is divided into nine provinces, which differ substantially in their share of national economic activity – with Gauteng, the Western Cape and KwaZulu-Natal representing the financial cores. Table A3 in the annexure shows that in these provinces and the Eastern Cape and Mpumalanga (fourth and fifth

in terms of economic activity), a macroprudential tightening favours credit to NFFs. This result indicates that only firms in the core benefit from the credit redistribution of MaPP. It may also suggest that tighter regulation accentuates the lenders' preference for firms in the core rather than the periphery – but having no data on loan applications, we cannot confirm this assumption.

5.3 Firms' creditworthiness

At this point, we explore whether the relationship between macroprudential policies and firms' financing growth varies depending on the financial strength of the borrowing firm. We interact the MaPP measures with two different proxies for creditworthiness – the leverage ratio and the return on assets – and we estimate equation (2) on three samples restricted to firms of each size class and each of the three policy indices, with and without controls.[16] Table 2 shows that the more firms are leveraged, the more they use external financing. The interaction term coefficient is always positive and significant for short-term borrowing and always negative but less significant for long-term borrowing. In other words, tighter regulation prompts more-indebted firms to receive more short-term credit than they would be allocated otherwise, regardless of their size class. For robustness purposes, we repeat this exercise using the solvency ratio as a proxy for firm creditworthiness and find a very similar pattern. This outcome suggests that more stringent regulation provides banks with incentives to lend at short maturities even if borrowers are relatively more leveraged (i.e. adverse selection).

[16] In the output tables, we only show results from the model specification that includes control variables.

Table 2: Leverage interaction by firm size and type of borrowing

	Small	Medium	Large	Small	Medium	Large
	Short-term borrowing			Long-term borrowing		
Lev	1.269***	1.314***	0.550***	1.819***	1.517***	0.722***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
MaPP	-0.006***	-0.011***	-0.009***	0.009*	0.019**	-0.001
	(0.000)	(0.000)	(0.000)	(0.036)	(0.005)	(0.994)
MaPP # Lev	0.011***	0.021***	0.013**	-0.023**	-0.038**	-0.064**
	(0.000)	(0.000)	(0.004)	(0.002)	(0.003)	(0.005)
N	1 562 254	523 524	362 479	128 247	88 998	106 637
R^2	0.139	0.117	0.082	0.045	0.027	0.026

p-values in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: National Treasury and UNU-WIDER (2023)

Lastly, we interact the MaPP index with firms' returns on assets. Table 3 indicates that a firm's profitability and financing are strongly and positively related, especially if the firm is small. However, a policy tightening rations long-term finance to more profitable firms, providing further evidence of adverse selection of both SMEs and large firms, where information asymmetries prevent accurate screening of creditworthiness. The negative effect is small and borne relatively more by large firms. Reduced borrowing of more-profitable firms can be explained by these firms' relatively low demand for loans in the face of tighter regulation and higher borrowing costs. For example, the 5.6% decrease in long-term borrowing by large and creditworthy firms may be due to these firms raising finance through the bond market.

Table 3: Profitability interaction by firm size and type of borrowing

	Small	Medium	Large	Small	Medium	Large
	Short-term borrowing			Long-term borrowing		
RoA	0.436***	-0.513***	0.135***	0.939***	0.792***	0.393***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
MaPP	0.004***	0.004**	-0.005**	0.001	0.006	-0.029***
	(0.000)	(0.001)	(0.001)	(0.718)	(0.121)	(0.000)
MaPP # RoA	-0.010***	-0.018***	-0.004	-0.022**	-0.039*	-0.056*
	(0.000)	(0.000)	(0.501)	(0.003)	(0.017)	(0.018)
N	1 562 112	523 518	362 462	128 236	88,997	106 634
R^2	0.318	0.267	0.252	0.001	0.120	0.169

p-values in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: National Treasury and UNU-WIDER (2023)

6. Conclusions

Taken together, these results suggest that macroprudential regulation has affected the allocation of credit between types of borrowers in South Africa. On the one hand, MaPP has contributed to the redistribution of credit from the household to the non-financial corporate sector, in keeping with a trend that has been observed over the last decade. In addition, tighter regulation has effectively reduced borrowing by the poorest households: while the ability of low-income households to meet their demand for financial resources must be preserved, it is unlikely that standard lines of consumer credit are a sustainable option.[17] Lack of data on households' creditworthiness precludes the possibility of drawing bolder conclusions on whether the relative reduction of consumer credit is a positive policy achievement, but we can safely assume that the shift from household to corporate finance is conducive to lower risk. In addition, we do not find evidence of significant effects on SME financing.

On the other hand, our results indicate that MaPP can move credit allocation in ways that are not beneficial to funding long-term growth and strengthening financial stability. In particular, the positive effect on corporate lending hides a shift from long-term to short-term finance, which is mostly captured by large firms (and less by medium-sized firms) and by businesses that are located in the financial cores of the country. Additionally, more-indebted firms seem to receive more short-term credit than they would be allocated if policy was not tightened, while more profitable ones are penalised, providing further evidence of adverse selection where information asymmetries prevent accurate screening of creditworthiness and regulatory pressure encourages a portfolio shift towards assets with shorter maturities. Notably, our result for South Africa differs from Ayyagari et al.'s (2018) cross-country study, which concluded that lower SME credit is conducive to lower credit risk.

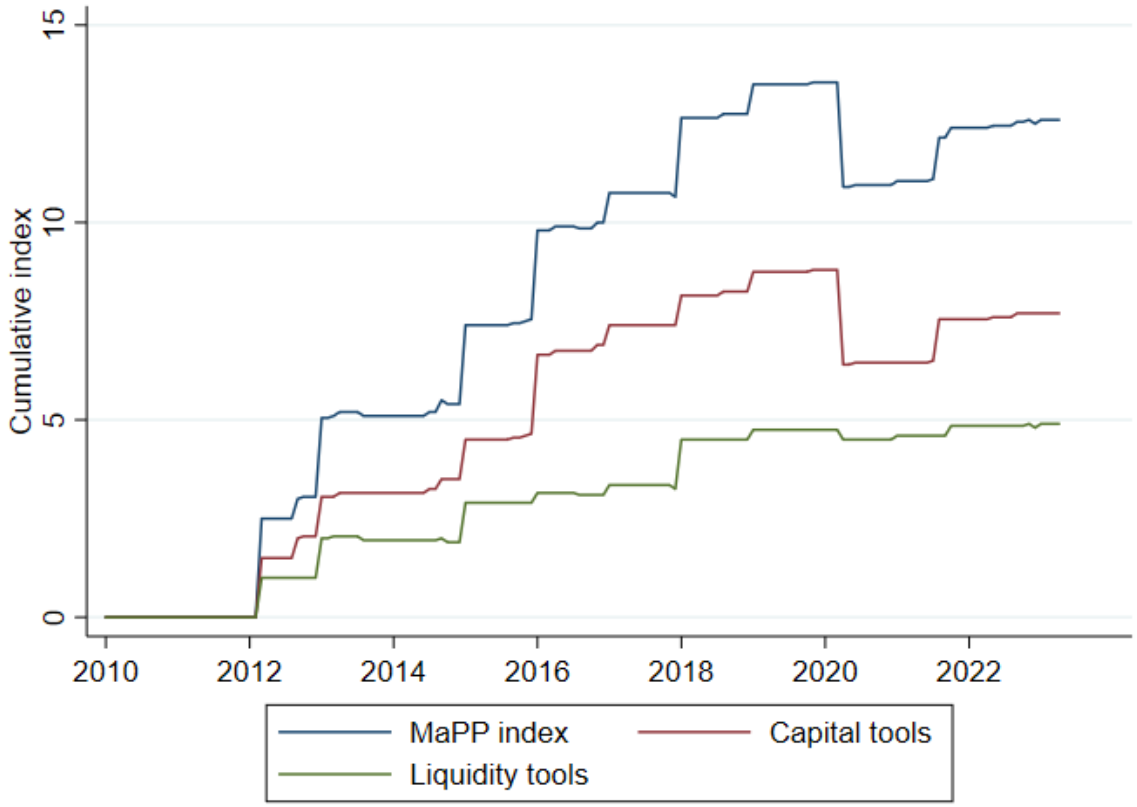
While the absence of a credit registry has limited our ability to fully disaggregate the credit market and account for the dark side of the economy, these results testify to the importance of exploring the distributional impact of macrofinancial policies. Future research should not only look for further validation of our assertions but consider various implications too. First, adverse selection and poor bank lending practices can

[17] Read Louis and Chartier (2017) for an inclusive financial alternative in South Africa.

compromise bank-specific and systemic risks, even if regulation reduces credit gaps and procyclicality. Hence, if regulation skews the credit distribution, pushing marginal borrowers out of the pool to the advantage of more indebted and less profitable ones, it could paradoxically compromise financial stability itself. Second, the credit market must be regulated to secure accessible funding flows to productive investment. Financially excluded poor communities often represent an untapped source of sustainable growth and business development, so the distributional impact of regulatory tightening is a question worth tackling – also because of its potential impact on economic activity. Third, lower financial market participation inhibits monetary policy transmission and its countercyclical effectiveness (Mehrotra and Yetman 2015). Finally, the evidence we have produced calls for joint public–private initiatives that can counterbalance the costs of prudential measures by promoting access to credit markets (such as by reducing information asymmetries and improving credit scores) and channelling financial resources to targeted productive segments.

Annexure

Figure A1: Cumulative policy indices (2010–2023)



Source: Authors' calculations

Table A1: Shock exogeneity

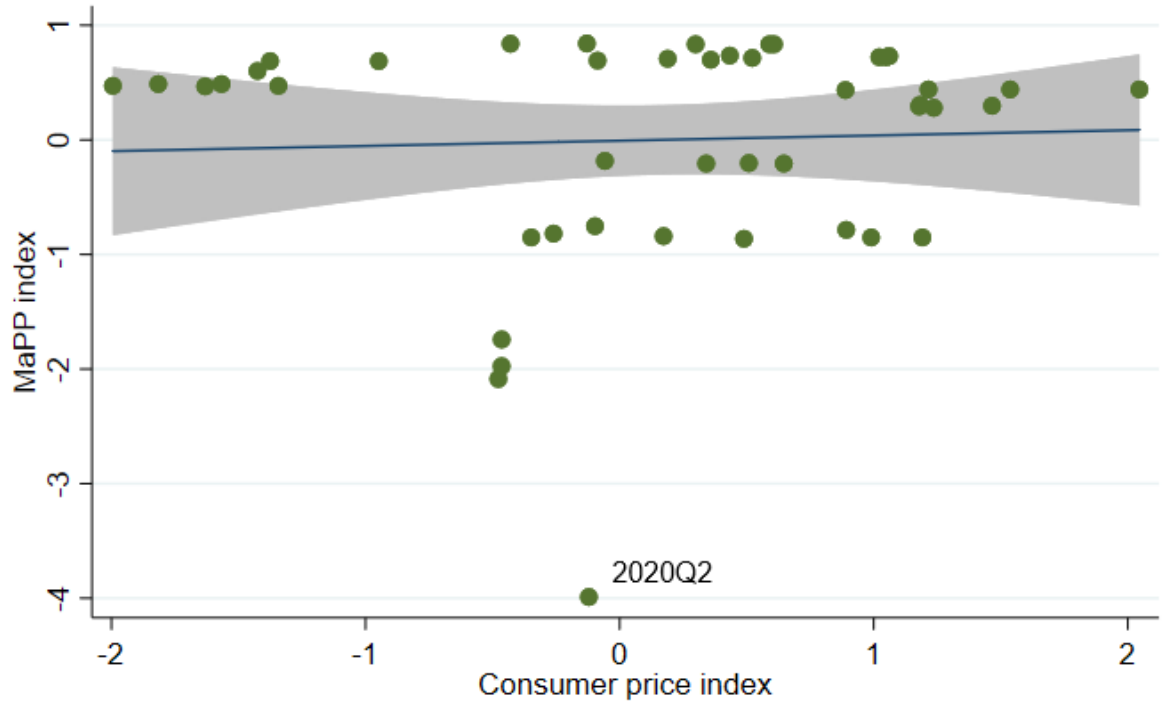
	Δ MaPP index	Δ Capital index	Δ Liquidity index
Output gap	-3.29 (0.452)	-2.759 (0.385)	- 0.536 (0.749)
Inflation	0.021 (0.962)	0.017 (0.957)	0.003 (0.984)
Return on equity	7.421 (0.136)	5.278 (0.143)	2.143 (0.259)
N	52	52	52
R^2	0.05	0.05	0.03

p-values in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

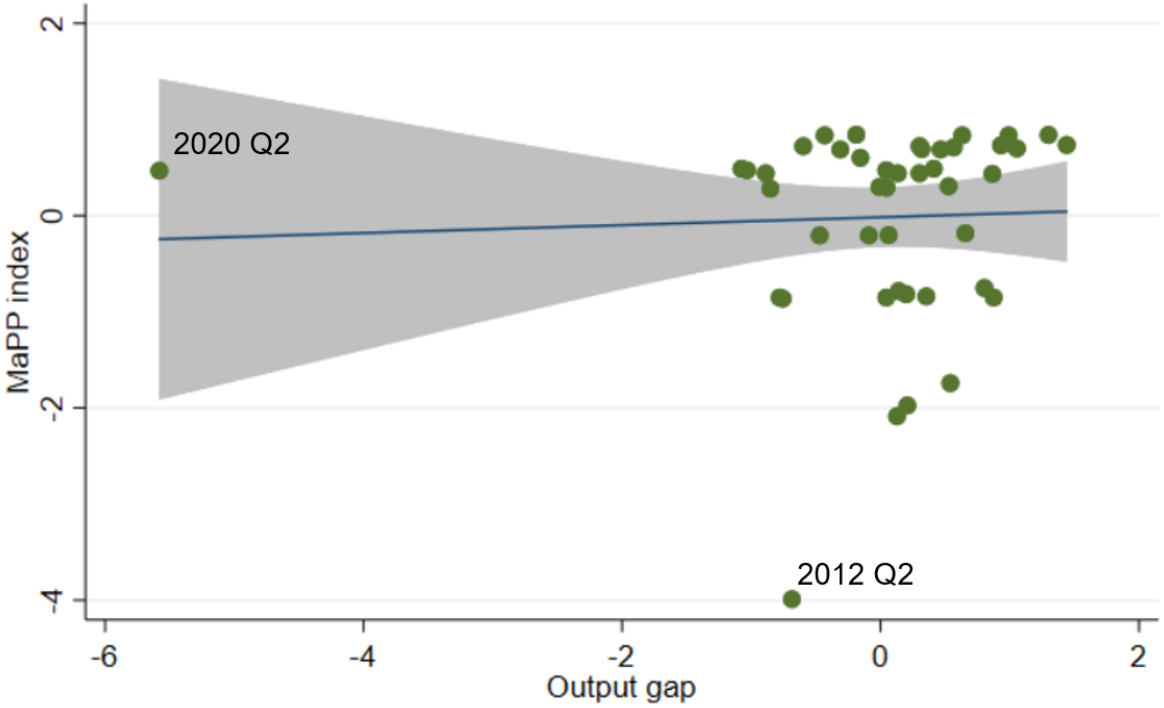
Source: SARB and authors' calculations

Figure A2: Scatterplot of MaPP index and consumer price index



Source: SARB and authors' calculations

Figure A3: Scatterplot of MaPP index and the output gap



Source: SARB and authors' calculations

Table A2: Summary statistics[18]

Variable	Type	N	Mean	Std. dev.	Min.	Max.
Lending to households	Time series	61	1 597 888	337 981	1 048 450	2 224 774
Lending to NFFs	Time series	61	1 549 740	459 456	852 750	2 247 869
Repo rate	Time series	61	6.24	1.9	3.5	12
Core inflation	Time series	61	4.37	0.25	3	4.9
Output gap	Time series	61	-0.0004	0.0250	-0.1671	0.0285
Total assets (banks)	Time series	61	4 730 184	1 368 612	2 856 592	7 407 195
Short-term borrowing	Firm-level	615 552	2 813 911	6 181 377	5 042	34 700 000
Long-term borrowing	Firm-level	3 427 167	2 151 898	4 344 002	1 700	20 700 000
Total assets	Firm-level	3 860 734	5 683 982	10 800 000	8 034	52 900 000
Leverage ratio	Firm-level	3 422 488	0.4437	0.4590	0.0029	1.8653
Return on assets	Firm-level	3 860 020	0.4414	0.8168	0.0034	4.2243

Table A3: Firm borrowing and MaPP by province

	Gauteng	Eastern Cape	Northern Cape	Free State	Western Cape	North West	KwaZulu-Natal	Mpuma-langa	Limpopo
MaPP	0.010*** (0.000)	0.011*** (0.000)	0.003 (0.426)	0.007* (0.017)	0.007*** (0.000)	0.005+ (0.093)	0.011*** (0.000)	0.014*** (0.000)	0.006* (0.040)
N	291 406	90 764	30 358	58 795	218 392	53 113	547 809	68 164	51 230
R^2	0.062	0.078	0.072	0.065	0.078	0.065	0.071	0.087	0.070

[18] The number of observations for firm-level variables N corresponds to the number of firms multiplied by the number of years of data available for each firm.

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