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UDC: 336.027
DOI: 10.2478/jcbtp-2024-0014

Journal of Central Banking Theory and Practice, 2024, 2, pp. 89-107
Received: 11 April 2023; accepted: 15 June 2023

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The Side Effects of Macroprudential Policies on Economic Performance in the Arab Region

Abstract: Macroprudential policy mainly aims to enhance financial stability and reduce the possibility of costly financial crises. However, to achieve this, macroprudential policy decisions may have some unintended side effects on economic growth. The paper provides an empirical framework for investigating potential side effects of macroprudential policy tools in developing countries. The results show that macroprudential policy decisions may lead to a decline in economic growth in developing countries, but the depth and efficiency of the financial sector may interact with macroprudential policy decisions to support economic environment stability. In the Arab region, the results differ compared to other developing countries, as the macroprudential policy interventions have a positive impact on economic growth, especially for the macroprudential tools that aim to enhance the resilience of the banking sector, while there is no effect of the cyclical macroprudential tools on economic growth.

Keywords: Macroprudential Policy, Central Banks, Economic Growth, Arab Region.

JEL classifications: G10, G18, G21, O16, O40.

Introduction

Since the 2008 global financial crisis, central banks have increasingly focused on promoting financial stability as a primary objective of their policies, along with the achievement of other traditional objectives, by assessing systemic risks

and using macroprudential policy (*MaP*) tools to mitigate the build-up of systemic risks, enhance the resilience of financial institutions, and strengthen the ability of the banking system to absorb shocks, thus reducing the possibility of financial crises. Measuring the effectiveness of the applied *MaP* is a challenge for central banks as well as researchers in general due to the relative infrequency of financial crises and the difficulty of attributing them accurately to fundamental factors (Boar, Gambacorta, Lombardo & da Silva, 2017). However, another strand of literature measures another aspect related to the *MaP* actions, which is its interaction with other economic policies and the trade-offs between the objectives of those policies, by analyzing the transmission channels of the intended and unintended side effects of the *MaP* tools on economic performance, whether those tools used to reduce systemic risks (asset-side instruments such as the debt-to-income ratio DTI and the loan-to-value ratio LTV) or tools are used to enhance banks' ability to absorb shocks (such as capital-based instruments and liquidity-based instruments). Some other literature attempts to analyze the indirect interaction between macroprudential instruments and economic growth by analyzing the impact of credit-related macroprudential policy tools on credit growth, which plays a vital role in providing liquidity in the economy, thus supporting economic activity (Obeid, 2023, Ganić, 2023).

In general, previous literature was based on exploring the link between *MaP* and economic performance by assessing the impact of *MaP* tools on the quantities and costs of lending and thus the implications for short-term economic growth (Drehmann and Gambacorta, 2012). Accordingly, poorly designed MaP may limit the ability of the banking sector to use its liquidity efficiently and, as a result, may reduce economic growth. On the other hand, some studies indicated that *MaP* measures can enhance economic growth, as the *MaP* was designed to increase the resilience of the financial system and tame the financial cycle (BCBS, 2010). In addition, *MaP* instruments can mitigate the adverse effects of the volatility of capital flows on economic growth by building-up buffers (Neanidis, 2017; IMF, 2017). Furthermore, higher capital requirements preserve the financial system, which reflects positively on the economic environment in the long run, but in the short run, they can constrain credit and limit economic expansion (Mendicino, Nikolov, Suarez & Supera, 2020). *MaP* tools can also reduce excess credit and the likelihood of costly financial crises (Schularick and Taylor, 2012). However, there is little empirical evidence on how the use of such instruments affects monetary policy objectives, namely, inflation and output.

Central banks in the Arab region, like other countries in the world, seek to enhance financial stability and reduce the possibility of any conflict between the objectives of macroprudential and monetary policies, which leads to the integration of these

two policies. Many Arab central banks have established financial stability committees to ensure coordination between those policies. So far, there is insufficient empirical evidence to assess the side effects of *MaP* decisions on the economies in Arab countries, although enhancing the resilience of the banking sector theoretically reflects positively on the economy in general (Zeqiraj, Mrasori, Iskenderoglu & Sohag, 2021). Therefore, this study provides an opportunity to understand those side effects that may result from the *MaP* decisions of Arab central banks that aim to reduce systemic risks and enhance the ability of the financial system to withstand shocks and thus avoid falling into a costly financial crisis.

The study is structured as follows: Section 1 introduces some related empirical studies on the impact of *MaP* on economic growth. Section 2 provides an overview of the most important decisions taken by Arab central banks in terms of *MaP*. Section 3 presents the data and the econometric model. Section 4 introduces the econometric methodology used in the study to explore the factors affecting economic growth in the Arab countries, and we focus on analyzing the side effects of the *MaP*. Section 5 discusses the empirical results, while Section 6 provides policy recommendations for central banks.

1. Literature review

The analysis of the link between *MaP* and economic growth has received less attention (Boar et al., 2017). The researchers tried to find the side effects of *MaP* decisions on economic variables, as some of them focused on a specific type of *MaP* tools, such as the loan-to-value (LTV) and debt-to-income (DTI) ratios, when analyzing the side effects of *MaP* decisions, while a number of other researchers have focused on exploring the effects of a set of *MaP* instruments. For instance, Kim, Lee & Jang (2015) explored the effectiveness of LTV and DTI ratios on mitigating systemic risks in 43 countries using a cross-regional VAR model. In addition to the side effects of these tools on economic growth, the results revealed that a ten percentage point decrease in the LTV limit (tighten) lowered real GDP by 0.8 percent in the long run, while a ten percent decrease in the DTI limits (tighten) lowered real GDP by 0.3 percent.

Boar et al. (2017) attempted to find the impact of *MaP* actions on long-run economic growth by using data covering 64 emerging and advanced countries. The study relied on 1,149 *MaP* actions taken by 64 countries. The results revealed that countries with frequent use of *MaP* tools tend to reduce economic volatility, which means *MaP* promotes a more stable macroeconomic environment, bearing in mind that the impact becomes more effective when financial development

and openness are sufficiently large. However, non-systemic *MaP* decisions and interventions tend to have negative effects on economic growth.

Kim and Mehrotra (2017) tried to analyze the impact of monetary and macroprudential polices on inflation, GDP, and credit. They used a VAR model to identify these effects for four countries in Asia. The study revealed that there is a negative effect of *MaP* instruments on GDP and inflation. Sanchez and Rohn (2016) used quantile regressions to analyze the side effects of *MaP* instruments on GDP growth and GDP-at-risk in 42 OECD countries. The results showed a negative impact of *MaP* actions on GDP growth but also reduced the tail risk of GDP growth. The same study found a negative impact of the LTV tool on output growth.

Andries and Melnic (2019) used the System Generalized Method of Moments (GMM) to assess the side effects of the *MaP* on GDP per capita growth rate in 61 advanced and emerging economies in Asia, Africa, America, and Europe during the 2000-2015 period. The results showed that there is a positive relationship between MaP and the real economy, as *MaP* that target banks have a positive impact on real economic growth, while the borrower-related MaP has an insignificant impact on real economic growth. Belkhir, Naceur, Candelon & Wijnandts (2020) explored the relationship between *MaP* on the one hand and banking crises and economic growth on the other hand, by using a sample of more than 100 countries covering the 2000-2017 period. The results of the study indicated that *MaP* has a direct impact on reducing the possibility of banking crises, while they lead to a decline in economic growth. However, when these two effects are accounted for together, the study found that *MaP* has a positive effect on financial stability. That is, *MaP* reduces economic growth but at the same time reduces the possibility of systemic banking crises. This study also used the Generalized Impulse Response Function (GIRF) and the dynamic panel logit with fixed effect to enhance the accuracy of the results, including the effects of the tightening shock on macroprudential supervision.

Aikman, Kelly, McCann & Yao et al. (2021) tried to investigate the channels of transmission of the intended and unintended side effects of *MaP* on the macroeconomy by studying the effects of the loan-to-value and debt-to-income ratios, as these measures are supposed to lead to benefits and impose costs on the economy. In terms of benefits, as is well known, the use of these tools leads to taming housing credit cycles, thus reducing the accumulation of systemic risks. As for the negative effects, they are led to impose restrictions on liquidity, reducing consumption, and declining construction activities. However, these negative effects are short-term, and their impact on the economy is less in the long term. Trabelsi (2022) examined the relationship between *MaP* and price stability from

a different perspective by analyzing the impact of *MaP* transparency on inflation in emerging and developing countries. The study found that *MaP* transparency can contribute to achieving stable inflation in emerging and developing countries. The effect is transmitted through the reduced occurrence of banking crises.

It is worth indicating that, despite what has been mentioned in many previous literatures regarding the possibility of negative side effects of the *MaP* tools on economic growth, it must be taken into account that several central banks have reduced or released some of the *MaP* tools in the COVID-19 crisis (which did not emerge from the financial sector), as those central banks aimed to support other economic policy decisions and support economic recovery. In this paper, the period of the coronavirus pandemic will be considered, as it was an exceptional crisis that had not originated in the financial sector. The aim of easing or releasing the *MaP* tools in this period is to achieve a balance between supporting economic policies decisions and maintaining the integrity of the financial positions of the banking sector.

2. An overview on the macroprudential policy decisions of Arab central banks

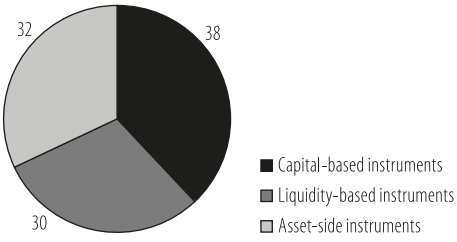
After the global financial crisis in 2008, interest in the Arab region increased in expanding the tasks of central banks to include the promotion of financial stability through the establishment of specialized departments within the central bank whose tasks would be to assess systemic risks in the financial sector and to make appropriate recommendations for senior management in the central bank. Most Arab central banks have amended their laws to explicitly stipulate that financial stability is one of their tasks and objectives, with the aim of giving the central bank appropriate powers. Financial stability committees have also been established with the aim of coordinating and making decisions related to macroprudential policy.

The paper covers macroprudential policy decisions taken by Arab central banks in the period 2010-2021, as this period is ideal in terms of evaluating the side effects of macroprudential policy decisions on economic performance because interest in macroprudential policy began in Arab countries after the global financial crisis, as mentioned above. Figures (1) and (2) show the MaP decisions and measures taken by Arab central banks within the framework of their endeavour to enhance financial stability through a set of tools: (1) Macroprudential instruments for resilience and enhancing the ability of the banking sector to absorb losses; and (2) Cyclical macroprudential instruments that aim to reduce systemic risks in the banking

sector. The first set includes capital-based and liquidity-based instruments, and the second set includes asset-side instruments. The study does not address the tools related to currencies and changes in reserve requirements for macroprudential purposes because their change was limited during the study period.

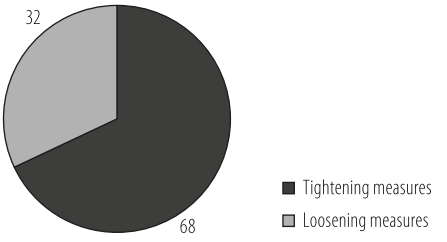
The paper divides capital-based instruments into five categories that include countercyclical capital buffer, leverage ratio, capital requirement buffer for systemically important banks, general or dynamic provisions, and any other changes in capital requirements. As for the liquidity-based instruments, they include liquidity coverage ratio, net stable funding ratio, loan-to-deposit ratio, and legal liquidity requirements. Finally, regarding the asset-side instruments, they include the loan-to-value ratio, the debt-to-income ratio, and any other restrictions on assets.

Figure 1: Types of macroprudential policy instruments (in percent) during the period 2010 - 2021



Source: Financial Stability Report in the Arab region, (2022), Arab Monetary Fund.

Figure 2: Types of macroprudential policy measures (in percent) during the period 2010 - 2021



Source: Financial Stability Report in the Arab region, (2022), Arab Monetary Fund.

3. Model and data

This paper examines the cumulative side effects of macroprudential tools on economic growth for a panel of 36 countries; the study sample includes twelve Arab countries (Bahrain, Egypt, Iraq, Jordan, Kuwait, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Tunisia, and the United Arab Emirates UAE), in addition to 24 non-Arab emerging market economies[1], based on annual data cover-

[1] The sample of non-Arab emerging market countries includes Albania, Angola, Armenia, Azerbaijan, Belarus, Bolivia, Bosnia and Herzegovina, Botswana, Bulgaria, Chile, Croatia, Georgia, Hungary, Indonesia, Malaysia, Mexico, Nigeria, Pakistan, Peru, the Philippines, Poland, Thailand, Uruguay and Vietnam.

ing the 2010-2022 period. Practically, to ascertain the side effects of the *MaP* on economic growth, we consider the baseline econometric model that was used in previous literature (see Boar et al., 2017). However, because the study targets the Arab region, the model will be modified by adding a dummy variable (*D*) that expresses the interaction between macroprudential policy decisions in Arab countries with specific independent variables and their side effects on economic performance as follows[2]:

$$\begin{cases} GDP_{it} = GDP_{i,t-1} + (\beta_1 + \beta_2 D_i) MaP_{it} + (\beta_3 + \beta_4 D_i) FD_{it} + (\beta_5 + \beta_6 D_i) OPEN_{it} \\ +(\beta_7 + \beta_8 D_i)(FD_{it} * MaP_{it}) + (\beta_9 + \beta_{10} D_i)(OPEN_{it} * MaP_{it}) + \\ +\S X_{it} + \alpha_i + \theta_t + \varepsilon_{i,t} \\ i = 1, 2, \ldots, N, t = 1, 2, \ldots, T \end{cases} \quad (1)$$

where *i* refers to the cross-section dimension (country) and *t* the time series dimension (time period), GDP_{it} is the real gross domestic product growth rate, MaP_{it} refers to the macroprudential policy index, which will be discussed later in detail, D_i is a dummy variable that takes the value of 1 for the Arab country and the value of zero for the non-Arab country, FD_{it} is the financial development index, which is used in several studies (e.g. Sahay et al. (2015), Svirydzenka (2016) and Poghosyan (2022)), where the value of this index ranges between zero and 1, in this paper, the FD_{it} index contains ten weighted sub-indices that measure the "depth", "efficiency" and "access" of financial institutions[3], $OPEN_{it}$ is the openness index (which was used by Chinn and Ito (2006)). Moreover, the interactions between the macroprudential policy index and financial development are analyzed, with the aim of measuring the impact of the depth and efficiency of the financial sector on the macroprudential policy decisions taken by central banks and their implications for economic performance. The interactions between the macroprudential policy index and trade openness are also analyzed, with the aim of adding the transmission dimension of the cross-border effects. X_{it} is a set of control variables that include a dummy variable to assess the impact of the COVID-19 pandemic (this variable takes the value 1 for the period 2020-2022, and zero otherwise), the inflation rate (*INF*), the public debt to GDP (*debt to GDP*) and the capital account (KA) (the value will be normalized from 0 to 1), while αi refers to country fixed effects, θ_t is the time fixed effects, and ε_{it} is the dis-

[2] The aim of adding non-Arab countries to the study sample is to overcome the challenge of having a small sample (small N) in case of relying on Arab countries only, and thus provide a sufficient sample that makes the estimation more efficient (i.e. more precise).

[3] This index contains: private credit to GDP, pension fund assets to GDP and insurance premiums to GDP (for depth), interest rate margin, lending-deposit spread, cost income ratio, ROA, and ROE (for efficiency), branches per 100,000 adults, and ATMs per 100,000 adults (for access).

turbance term. The data in this paper relies on the World Bank, the International Monetary Fund (IMF), and the Arab Monetary Fund (AMF) databases (see Table 1) to obtain all variables used in this paper.

Table 1. Definition of dependent and independent variables

Variable abbreviation	Definition	Source of data
	Dependent variable	
GDP	Year on year real GDP growth rate (%)	World Bank (World Development Indicators)
	Independent variables	
MaP	Macroprudential policy index (from -12 to 12) (To be discussed later)	Author calculation based on: (1) Arab Monetary Fund database, and (2) the IMF database (Macroprudential Survey).
FD	Financial Development Index (from 0 to 1), this index contains ten weighted sub-indices that measure the "depth", "efficiency" and "access" of financial institutions.	Author calculation based on the World Bank database (Global Financial Development Database).
OPEN	Sum of imports and exports to GDP (%)	World Bank (World Development Indicators)
	Independent variables: Control variables	
INF	The consumer price index	IMF (International Financial Statistics)
debt to GDP	General government gross debt to GDP (%)	IMF (International Financial Statistics)
KA	Capital account (normalized from 0 to 1)	World Bank (World Development Indicators)
COVID-19	Dummy variable to capture the COVID-19 pandemic (binary)	-

4. Econometric methodology

4.1. Macroprudential Policy Index Design

In the following, we discuss how to construct the macroprudential policy index (MaP^{index}) that will be used in this paper, but before that, we review some previous literature to clarify the methodologies for building the MaP^{index} used in it. Cerutti, Claessens & Laeven (2017) divided twelve *MaP* instruments into two categories: the first category includes those that constrain the demand for credit (such as loan-to-value and debt-to-income ratios), and the second category includes instruments that limit the supply of credit (such as capital and liquidity buffers). They built an aggregate MaP^{index} by giving a value of zero in the periods in which no tool was used and a value of 1 starting from the period in which the tool was used, and then calculating the total of the sub-indicators to obtain the aggregate index whose value ranges from 0 to 12. Subsequently, the same methodology, with minor modifications, was used in other studies, in order to construct the MaP^{index} and measure its impact on economic variables (see Andries

and Melnic (2019); Belkhir et al. (2020)). Boar et al. (2019) used a simple MaP^{index} represented by the logarithm of the five-year sum of the number of changes in *MaP* instruments in the country, as this indicator was based on the number of changes (at least one change for each tightening and loosening period) rather than the direction of the changes. They estimated the impact of MaP^{index} from three aspects: cyclical-oriented measures, resilience-oriented measures, and the total of all instruments. In this study, the methodology for preparing the MaP^{index} does not differ significantly from the methodologies used in previous studies, but it will be done in two ways:

(1) The first approach measures the effects of the *MaP* on the real economic performance through the number of times that the *MaP* tools were changed, regardless of the direction of the *MaP* (i.e., tightening or loosening), with the aim of finding the gradual net effects of the *MaP* on economic growth in the Arab countries. In this case, we use the following equation to express the MaP^{index} :

$$MaP_{ij,t}^{Index} = \begin{cases} 0\,, \ if \quad \Delta MaP_{ij,t} = 0 \\ h/_{n}\,, \ if \quad |\Delta MaP_{ij,t}| > 0 \end{cases} \tag{2}$$

i: denotes the macroprudential policy tool changed in a given country.

t: time.

j: refers to country.

h: the order of the period of the changed MaP tool among the whole period, where t = {1, 2,…, n}.

n: the maximum time limit for full implementation (reduction) of a macroprudential policy decision, where h ≤ n.

Therefore, we find the aggregate $MaP_{ij,t}^{Index}$ for each country by calculating three values: an aggregate value for all instruments, and the cyclical-oriented instruments, and the resilience-oriented instruments, where $-1 \leq \Delta MaP_{ij,t}^{Index} \leq 1$

Therefore, the following equation expresses the aggregate MaP^{Index} in each country at time *t*:

$$MaP_{ij,t}^{Index(Aggregate)} = \sum_{i}^{k} \left| MaP_{ij,t}^{Index(Resilience)} \right| + \sum_{i}^{k} \left| MaP_{ij,t}^{Index(Cyclical)} \right| \tag{3}$$

Where k is the number of the macroprudential tool(s) applied (reduced) in country *j* in the same period (*t*), $0 \leq MaP_{ij,t}^{Index(Aggregate)} \leq 12$

(2) The second approach depends on taking the *MaP* direction (i.e. tightening or loosening) into account in order to measure the impact of each of the *MaP* tightening and easing separately, moreover, we try to enhance the accuracy of measuring the short and long-term impact by analyzing the gradual effect of the *MaP* actions on economic growth. In this case, we use the following equation to express the MaP^{index}:

$$MaP_{ij,t}^{Index} = \begin{cases} -h/n, & if\ \Delta MaP_{ij,t}^{Loose} < 0 \\ 0, & \Delta MaP_{ij,t} = 0 \\ h/n, & if\ \Delta MaP_{ij,t}^{Tight} > 0 \end{cases} \quad (4)$$

where $-1 \leq \Delta MAP_{ij,t}^{Index} \leq 1$

i: denotes the macroprudential policy tool changed in a given country.

j: refers to country.

t: period.

h: the order of the period of the applied (reduced) MaP tool among the whole period, where t = {1, 2,…, n}.

n: the maximum time limit for full implementation (reduction) of a macroprudential policy decision, where h ≤ n.

Where *h* and *n* are dummy variables, *n* refers to the number of periods in which the tool was changed, and *h* refers to the order of the period in which the tool was changed. For example, if a capital buffer was applied (i.e. tightening the tool) gradually over 4 time periods in equal proportions, so *n* takes the value of 4, while *h* takes the value of the period's order in which it is applied, i.e., $h \in \{1, 2, 3, 4\}$. In the first period of application, the value of the MaP^{Index} will be 1/4 = 0.25 and in the second one will be 2/4 = 0.50 and so on. If the application is in one period, then h and n take the value of 1. In the event that the tool is released or reduced (i.e. loosening the tool) over several periods or in one period, the same methodology that was applied when tightening the tool will be used, but with a negative sign for the index. Finally, in the time periods in which no application of any *MaP* tool occurs, then the value of the index will be zero. Therefore, the following equation expresses the aggregate MaP^{Index} in each country:

$$MaP_{ij,t}^{Index(Aggregate)} = \sum_i^k \Delta MaP_{ij,t}^{Index(Resilience)} + \sum_i^k \Delta MaP_{ij,t}^{Index(Cyclical)} \quad (5)$$

Where *k* is the number of the macroprudential tools applied (reduced) in country *j* in the same period (*t*), $-12 \leq MaP_{ij,t}^{Index(Aggregate)} \leq 12$

Finally, we find three values for the MaP^{Index} for each of the two approaches mentioned above; that is, we build six econometric models using the same variables that were previously discussed, but with changing the MaP^{Index} values, this help to capture and estimate the effects of the MaP^{Index} on economic growth from three angles: cyclical-oriented measures, resilience-oriented measures, and the overall effects for all instruments.

4.2. Econometric model

This study evaluates the dynamic response of *GDP* growth in the Arab countries to a set of financial and economic factors, and more emphasis will be placed on the side effects of macroprudential policy decisions. The paper uses difference GMM (generalized method of moments) approach, which was used by Arellano and Bond (1991) and Blundell and Bond (1998), as shown below:

$$Z_{i,t} = \propto + \gamma Z_{i,t-1} + \beta` X_{i,t} + \Psi_i + \varepsilon_{i,t} \qquad (6)$$
$$i = 1, 2, \dots, N, \qquad t = 2, \dots, T$$

Where *Z* refers to *GDP* growth rate, and *X* represents a set of explanatory variables: macroprudential policy index, financial development, openness, inflation, public debt to GDP and the capital account, dummy variable (COVID-19) and $\varepsilon_{i,t}$ is the error term. Regarding the Ψ_i term, it indicates a country-specific effect that is not captured by the random error term $\varepsilon_{i,t}$, given that the value of the error component term $\Psi_i + \varepsilon_{i,t}$ has a compound standard deviation, where $E(\Psi_i) = 0$, $E(\varepsilon_{i,t}) = 0$ and also $E(\Psi_i + \varepsilon_{i,t}) = 0$ for each: $i=1,\dots,N$ and $t=2,\dots,T$. Now we use the first difference transformation to remove the country-specific effects. Equation (5) becomes:

$$Z_{i,t} - Z_{i,t-1} = \gamma(Z_{i,t-1} - Z_{i,t-2}) + \beta`(X_{i,t} - X_{i,t-1}) + (\varepsilon_{i,t} - \varepsilon_{i,t-1}) \qquad (7)$$

There is still correlation between the $Z_{i,t} - Z_{i,t-1}$ term and the random error $(\varepsilon_{i,t} - \varepsilon_{i,t-1})$, Levine, Norman & Beck (2000) propose to use instruments to deal with endogeneity problem as well as to deal with correlation between $(\varepsilon_{i,t} - \varepsilon_{i,t-1})$ and the lagged dependent variable. So the GMM estimator for panel data uses the following moment conditions:

$$E[Z_{i,t-s}(\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0 \quad \textit{for } t=3,\dots,T,\ s \geq 2 \qquad (8)$$

$$E[X_{i,t-s}(\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0 \quad \textit{for } t=3,\dots,T,\ s \geq 2 \qquad (9)$$

Blundell and Bond (1998) suggest that Monte Carlo simulations and asymptotic variance calculations reveal that this extended GMM estimator offers efficiency benefits where the first difference GMM estimator performs poorly. The instruments are appropriate under the assumption that there is no correlation between the differences of the right-hand side variables and the country specific effect, even though there may be a correlation between these variables and the levels of the country specific effect in the level regression. The additional moment conditions for the second part of the system, which is the regression in levels, are:

$$E[\Delta Z_{i,t-s}(\Psi_i + \varepsilon_{i,t})] = 0 \quad for\ s=1\ and\ t=2,3,\ldots,T \tag{10}$$

$$E[\Delta X_{i,t-s}(\Psi_i + \varepsilon_{i,t})] = 0 \quad for\ s=1 and\ t=2,\ 3,\ldots,T \tag{11}$$

Considering the foregoing, the use of moment conditions in the GMM technique generates consistent and efficient results. So, the next step we need to check the robustness and reliability of the results, and we must verify the validity of the instruments in the system GMM estimator. In this regard, Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998) suggested some additional tests to check the reliability of the system GMM estimator. Accordingly, we conduct the "Hansen" test herein to evaluate the validity of the tools used in the estimation, and we use the "Diff-in Hansen" test to verify the validity of the additional instantaneous application condition needed to build the GMM system, and we use the "Wald" test to check the validity of the tools, and finally we conduct the "Arellano-Bond" test to verify that the error is not sequentially related.

5. Analysis of the results

5.1. Descriptive analysis

Table (2) reports descriptive statistics for two groups: the first group includes all countries (i.e. the whole sample), and the second group includes only Arab countries. Regarding the aggregate *MaP* index (MaP_{aggl}), which expresses the number of times the tools are changed without considering the direction, the use of *MaP* tools is, on average, more prevalent in the Arab countries (mean 0.865) relative to the whole sample (mean 0.682). This result does not change for the other *MaP* indexes (cyclical-oriented measures and resilience-oriented measures). The *MaP* cyclical-oriented index (MaP_{cycl}) in the Arab countries, on average, reaches 0.167, while the average for all countries is 0.127. As for the *MaP* resilience-oriented index (MaP_{resl}), it reaches 0.698 in the Arab region (on average), while the average

is 0.555 for all countries, which means that the cyclical-oriented and resilience-oriented measures are on average more used in the Arab countries than the other countries.

Regarding the *MaP* index that takes the directions into account (MaP_{agg2}), according to Table 2, the results change; the *MaP* index considering the direction, on average, in the whole sample (mean 0.507) is larger than the Arab countries (mean 0.476). The *MaP* cyclical-oriented index (MaP_{cyc2}) in the whole sample, on average, reaches 0.083, while the average for the Arab countries is 0.063. As for the *MaP* resilience-oriented index (MaP_{res2}), it reaches 0.424 in the whole sample (on average), while the average is 0.413 for the Arab countries.

Table 2: Descriptive statistics of the data

			For all countries (the whole sample)			
Descriptive data	Mean	Median	Maximum	Minimum	Std. Dev.	Observations
GDP	0.031	0.033	0.196	-0.113	0.040	432
FD	0.511	0.506	3.569	0.174	0.210	432
OPEN	0.879	0.826	1.919	0.164	0.366	432
INF	1.853	1.212	29.507	-2.318	2.282	432
CAP	-0.002	-0.099	3.131	-3.001	0.957	432
DEBT	0.420	0.439	1.297	-0.098	0.269	432
MaP_{res1}	0.555	0.000	6.000	0.000	0.846	432
MaP_{cyc1}	0.127	0.000	2.000	0.000	0.367	432
MaP_{agg1}	0.682	0.000	7.000	0.000	0.980	432
MaP_{res2}	0.424	0.000	4.000	-6.000	0.886	432
MaP_{cyc2}	0.083	0.000	2.000	-1.000	0.364	432
MaP_{agg2}	0.507	0.000	4.000	-7.000	1.004	432
			For the Arab countries			
GDP	0.030	0.029	0.196	-0.113	0.044	144
FD	0.538	0.519	3.569	0.232	0.312	144
OPEN	0.914	0.839	1.919	0.303	0.360	144
INF	2.717	1.826	29.507	-2.318	3.662	144
CAP	-0.005	-0.011	2.627	-2.336	0.956	144
DEBT	0.464	0.460	1.297	0.016	0.287	144
MaP_{res1}	0.698	0.000	6.000	0.000	1.026	144
MaP_{cyc1}	0.167	0.000	2.000	0.000	0.392	144
MaP_{agg1}	0.865	0.4000	7.000	0.000	1.238	144
MaP_{res2}	0.413	0.000	3.300	-6.000	1.138	144
MaP_{cyc2}	0.063	0.000	1.000	-1.000	0.378	144
MaP_{agg2}	0.476	0.000	4.000	-7.000	1.298	144

Source: Author's calculations

5.2. Discussion of the results

The GMM results of the side effects of the *MaP* decisions from the full panel of 36 countries, including twelve Arab countries, over the 2010-2021 period are displayed in Table 3. We start by analyzing the impact of *MaP* decisions regardless of its direction, as the results show that there is a significant negative statistical relationship (in the developing economies) between the *MaP* indexes and economic growth, as the increase of the three indexes, i.e. the aggregate *Map* index, the resilience-oriented *MaP* index, and the cyclical-oriented *MaP* index, by one unit leads to a decline in economic growth by 14.1, 14.3, and 11.0 basis points, respectively, and this result is consistent with a number of previous studies with regard to emerging economies, as those studies show that the number of frequently changing macroprudential policy tools, especially the loan-to-value ratio, has a negative impact on economic growth (see Richter, Schularik & Shim, 2019; and Belkhir et al. 2020). Nevertheless, the MaP indexes become positive and more effective if the financial development index in the country rises, and this result is consistent with Boar et al. (2019). This result may indicate that the development of the financial sector pushes central banks to make macroprudential policy decisions more prudent, which indirectly supports the stability of the macroeconomic environment. As for the interaction of the macroprudential policy indicator with trade openness, the results do not show a statistically significant effect of that interaction on economic growth. Moving on to analyzing the impact of macroprudential policy decisions in the Arab region, the results differ compared to the study sample, as Table 3 shows that there is a positive, statistically significant effect of the aggregate *MaP* index and the resilience-oriented *MaP* index on economic growth in line with Boar et al. (2019), while the results do not show a significant relationship between the cyclical-oriented *MaP* index and economic growth. The increase of the aggregate *MaP* and resilience-oriented *MaP* indexes by one unit leads to an increase in economic growth of 13.3 and 13.6 basis points, respectively. Regarding the resilience-oriented *MaP* index, the effect may become negative if this is accompanied by an increase in the financial development index. The positive relationship between the aggregate *MaP* and the resilience-oriented *MaP* indexes on the one hand, and the economic growth on the other hand, can be explained by the fact that the Arab banking sector was not affected by any precautionary decisions of central banks that relate to enhancing their resilience, as they enjoy high levels of capital adequacy ratio and liquidity higher than those applied according to Basel III requirements, as the capital adequacy ratio from 2013 to 2022 amounted to more than 17%, which is higher by a comfortable margin than that determined under Basel III requirements which is 10.5% of risk-weighted assets (Arab Monetary Fund, 2022), and the same applies to liquidity requirements, where banks maintain high levels of liquid assets, and

very high levels of liquidity coverage and net stable funding ratios (Arab Monetary Fund, 2022). It is possible to conclude that the Arab economy is not negatively affected by the macroprudential policy decisions, and the banking sector in the Arab region continues its role of financial mediation and pumping liquidity into the economy without any negative side effects from the macroprudential policy decisions. So, enhancing the resilience of the banking sector and maintaining capital adequacy and liquidity levels higher than international standards by a comfortable margin gives it confidence and thus grants more loans to its customers (Arab Monetary Fund, 2022), noting that the application of International Financial Reporting Standard No. 9 (IFRS9) contributes to strengthening provisions in the banking sector.

Regarding the effects of the *MaP* considering its direction (i.e. tightening or loosening), the results do not change significantly for the study sample, with the exception that the cyclical-oriented *MaP* index becomes insignificant while the negative impact of the aggregate *MaP* and the resilience-oriented *MaP* indexes decrease, which may indicate that the direction of the macroprudential policy reduces the side effects on the economic environment, as the increase in the aggregate *MaP* and the resilience-oriented *MaP* indexes by one unit leads to a decrease in economic growth by 12.4 and 10.4 basis points, respectively. The interaction of the three *MaP* indexes with the financial development index remains the same, as the effect of the interaction on economic growth is still positive and significant. It seems that the financial development may play a vital role in stabilizing the economic environment in the event that macroprudential policy decisions are taken. This can be easily deduced by noting that the coefficient values for this variable are the largest for all study models.

Turning to the Arab region, there are some differences compared to the previous econometrics analysis results of the *MaP* impact, which did not take the direction into consideration, as the aggregate *MaP* index became insignificant, while the cyclical-oriented *MaP* index remained insignificant, and the resilience-oriented *MaP* index remained significant, but with a lesser effect. The influence of the resilience-oriented *MaP* index may become negative if this is accompanied by an increase in the financial development index.

Table 3: The side effects of Macroprudential Policy instruments on real GDP growth in emerging market economies and the Arab region

Variables (The dependent variable is the real GDP growth)	The effects of the MaP regardless its direction (i.e., tightening or loosening)			The effects of the MaP considering its direction		
	Total	Resilience	Cyclical	Total	Resilience	Cyclical
	(I)	(II)	(III)	(IV)	(V)	(VI)
MaP	-0.1419**	-0.1430*	-0.1102*	-0.1241*	-0.1038**	-0.1430
	(0.0697)	(0.0707)	(0.0610)	(0.0676)	(0.0437)	(0.1022)
FD	-0.1808**	-0.1885**	-0.2033***	-0.0808**	-0.0986	-0.1452*
	(0.0847)	(0.0854)	(0.0712)	(0.0316)	(0.0942)	(0.0760)
OPEN	0.1889***	0.1611***	0.1996***	0.1597***	0.1107*	0.1607**
	(0.0472)	(0.0495)	(0.0646)	(0.0422)	(0.0604)	(0.0707)
FD x MaP	0.2283*	0.2523**	0.2145**	0.2224*	0.1555**	0.2520*
	(0.1149)	(0.1148)	(0.1001)	(0.1119)	(0.0633)	(0.1470)
OPEN x MaP	-0.0050	-0.0132	-0.0085	-0.0207	-0.0022	0.0140
	(0.0532)	(0.0535)	(0.0322)	(0.0549)	(0.0349)	(0.0481)
MaP x D1	0.1325*	0.1355*	-0.0940	0.0856	0.0968**	0.0404
	(0.0693)	(0.0722)	(0.1246)	(0.0666)	(0.0434)	(0.2962)
FD x D1	0.1798*	0.1849*	0.1929**	0.0456	0.0910	0.1315*
	(0.0937)	(0.0936)	(0.0718)	(0.0330)	(0.0909)	(0.0782)
OPEN x D1	-0.2257	-0.2240	-0.1188	-0.2079	-0.0886	-0.1638
	(0.1467)	(0.1416)	(0.1244)	(0.1462)	(0.1457)	(0.1691)
FD x MaP x D1	-0.1979	-0.2183*	-0.1286	-0.1488	-0.1213*	-0.0858
	(0.1308)	(0.1284)	(0.1815)	(0.1215)	(0.0601)	(0.4015)
OPEN x MaP x D1	-0.0227	-0.0132	-0.0089	0.0043	-0.0267	0.0081
	(0.0606)	(0.0606)	(0.0622)	(0.0597)	(0.0424)	(0.1132)
Other control variables (1)	yes	yes	yes	yes	yes	yes
Time fixed effects	yes	yes	yes	yes	yes	yes
# of countries	36	36	36	36	36	36
# of observations	360	360	360	360	360	360
Serial correlation test(2)	0.3779	0.4532	0.1909	0.3272	0.4437	0. 3921
Hansen test (3)	0.5143	0.1605	0.4259	0.6758	0.3916	0.5264

The dependent variable is real GDP growth. D_i is a dummy variable that takes the value of 1 for the Arab country, and the value of zero for the non-Arab country. The standard error value is placed in parentheses. *, ** and *** are the 10%, 5%, and 1% significance in the first-stage regression, respectively.

The control variables include a dummy variable to assess the impact of the COVID-19 pandemic (this variable takes the value of 1 for the period 2020-2022, and zero otherwise), the inflation rate (the consumer price index) (INF), the public debt to GDP (debt to GDP) and the capital account (KA) (the value will be normalized from 0 to 1).

The results of this test report p-values for the null hypothesis, so the errors in the first-difference regression show no second-order serial correlation.

The Hansen test reveals the p-values of the null hypothesis, so the test emphasizes that the instruments used and the residuals are not correlated.

Source: Author's calculations

6. Conclusion

This paper presents empirical evidence on the potential side effects of macroprudential policy interventions using difference GMM (generalized method of moments). The paper shows that there may be transmission channels between macroprudential policy and economic growth; thus, there are intended or unintended effects of macroprudential policy decisions on the macroeconomic environment, and the impact and its size depend on the type of macroprudential tool used. The results show that the impact of the macroprudential policy may lead to a decline in economic growth rates, but that effect may change in the event of an increase in the depth and efficiency of the financial sector. As for the Arab countries, the economy in the Arab countries has benefited from the macroprudential policy interventions, as this leads to enhance the economic environment stability, but on the other hand, there are no significant effects of the cyclical macroprudential policy tools. The results confirm the findings of previous studies in terms of the importance of paying attention to the side effects of macroprudential policy interventions on economic activity.

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