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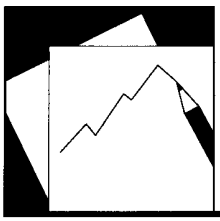

IMF Working Paper

Measuring and Mending Monetary Policy Effectiveness Under Capital Account Restrictions—Lessons from Mauritania

Robert Blotevogel

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Middle East and Central Asia Department

Measuring and Mending Monetary Policy Effectiveness Under Capital Account Restrictions—Lessons from Mauritania

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Abstract

I propose a new approach to identifying exogenous monetary policy shocks in low-income countries with capital account restrictions. In the case of Mauritania, a domestic repatriation requirement is the key institutional characteristic that allows me to establish exogeneity. Unlike in advanced countries, I find no evidence for a statistically significant impact of exogenous monetary policy shocks on bank lending. Using a unique bank-level dataset on monthly balance sheets of six Mauritanian banks over the period 2006–11, I estimate structural vector autoregressions and two-stage least square panel models to demonstrate the ineffectiveness of monetary policy. Finally, I discuss how a reduction in banks' loan concentration ratios and improvements in the liquidity management framework could make monetary stimuli more effective.

JEL Classification Numbers: E5, O11, O16

Keywords: monetary policy effectiveness, exogenous monetary policy shocks, capital account restrictions, low-income countries, liquidity management, loan concentration.

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Contents Page

I. INTRODUCTION

Monetary policy in low-income countries may be substantially less effective than in advanced economies. Proponents of this view, Mishra, Montiel, and Spilimbergo (2012) make a twofold argument. First, institutional constraints prevent asset price, exchange rate, and interest rate channels from working in the first place. Second, regarding the possibility of an effective credit channel, they make the case that many market characteristics that tend to weaken the credit channel are often predominant in low-income countries. To take just one example, banks in uncontested markets could use lower policy rates as a way to increase net interest margins, without increasing credit supply. This response would blunt the transmission mechanism, stopping monetary policy from influencing output or prices.

Empirical results that testify to the ineffectiveness of monetary policy are only as good as the identifying assumptions underpinning them. Establishing exogeneity has been a key focus in the empirical literature on monetary policy in advanced countries. Prominent examples are Bernanke and Blinder (1992), Romer and Romer (2004), and Sims and Zha (2006). Yet for low-income countries, as Mishra and Montiel (2012) point out, much of the empirical work has relied on rather ad-hoc identifying assumptions.

This paper proposes a new way of identifying exogenous monetary policy shocks in low-income countries with capital account restrictions. Restrictions on capital transfers provide a way to tie identifying assumptions to economic institutions. Consider the case of Mauritania. Mauritanian exporters have to sell at least a fraction of their export revenue to the central bank. The local banks that are responsible for executing these repatriation transactions see their deposits at the central bank increase as a result. If financial markets are shallow as they are in Mauritania, commercial banks' deposits at the central bank, or reserves, are often the best available indicator of the monetary policy stance. There is therefore a direct link between export revenue and changes in the stance of monetary policy. Under the relatively weak assumption that export revenue is largely exogenous to the country itself in the short run, it is possible to examine the effect of exogenous changes in monetary policy.

I find that Mauritanian banks do not react to exogenous monetary policy shocks; that is, bank lending bears no systematic relationship to changes in bank reserves. I estimate structural vector autoregressions (VARs) and two-stage least square panel (2SLS) models to demonstrate the general ineffectiveness of monetary policy in Mauritania. This result is consistent with, and in fact lends additional support to, the conclusions in Mishra and Montiel's (2012) literature survey: that "it is hard to come away from [their] review of the evidence with much confidence in the strength of monetary transmission in low-income countries."

The results in this paper offer two crucial innovations to the existing literature on monetary policy effectiveness in low-income countries. First, the identification strategy for estimating exogenous monetary policy shocks is based on Mauritania's repatriation requirement, a key

institutional characteristic of the country. Second, the bank-level dataset is unique, consisting of monthly balance sheet information of six Mauritanian banks. By contrast, the existing literature has only relied on aggregate money and credit time series, complicating clean identification.

In Mauritania as in other Sub-Saharan countries, key constraints that drive a wedge through the monetary transmission mechanism are banks' concentrated loan portfolios and restricted refinancing options. Banks in Mauritania only lend to a narrow range of customers—primarily to related parties, state-owned enterprises, and civil servants. Given that this group of customers either has preferential access or tends to offer attractive risk and return profiles for banks, it is unlikely that they include many potential borrowers who are currently credit-constrained. But without credit-constrained potential borrowers, banks will be hard pressed to expand lending following unexpected increases in available liquidity; they do not have a pipeline of potential customers. Similarly, because banks cannot be sure that they will meet unexpected demands on their own liquidity by refinancing in the domestic money market, they tend to build significant liquidity buffers for precautionary reasons. Reducing loan concentration ratios and reforming the liquidity management framework are therefore not only promising avenues for improving access to financial services, but also for giving more traction to monetary policy.

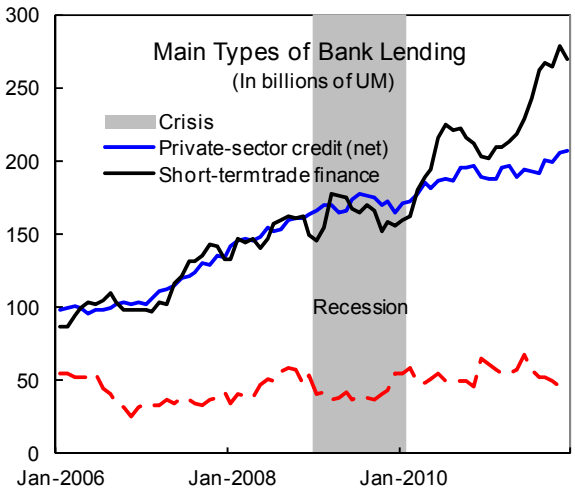
I organize the rest of the paper as follows. Section II briefly summarizes the recent history of bank lending in Mauritania, and Section III describes the monetary policy framework and explains the logic behind the identification strategy. The empirical results of the bank-by-bank vector autoregressions and the 2SLS panel models are in Section IV, as well as a number of robustness tests. Section V presents policy options for increasing monetary policy effectiveness, essentially based on the notion that banks need to lend to a wider range of customers. Section VI concludes with a brief discussion of the extent to which the methodology used in this paper can apply in other countries.

II. Overview of Recent Developments in Bank Lending

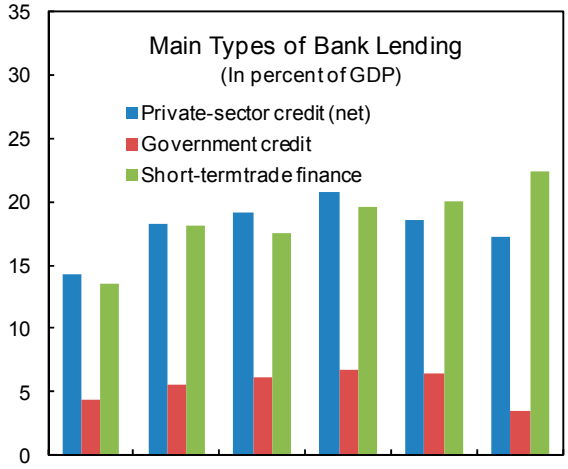
Bank lending in Mauritania takes three main forms: private-sector credit, government credit, and short-term trade finance. Private-sector credit includes lending to state-owned enterprises, but a separate series of lending to these companies is not available. All three types of bank lending fulfill essential economic functions.

Levine, Loayza, and Beck (2000) show that countries with more bank-provided private-sector credit tend to grow faster. Hauner (2009) points to the function of government debt as creating "safe assets." Risk-free assets underpin many financial transactions as collateral, thereby fostering financial development. Finally, short-term trade finance facilitates the imports of essential consumer goods in Mauritania, notably food staples and fuel. I use the terms bank lending and credit interchangeably, with the understanding that both terms subsume these three categories.

Private-sector credit and trade finance tracked each other relatively closely until 2009, a year marked by domestic recession and political turmoil in the aftermath of a *coup d'état* in the previous year. Subsequently, banks increasingly oriented their businesses towards trade finance. Although private-sector credit continued to grow in nominal terms, it fell as a share of GDP in 2010 and 2011. Credit to the government fell markedly in the beginning of the sample period, when oil exploration started in Mauritania. However, hopes of turning Mauritania into an oil economy quickly evaporated due to technical difficulties in the exploration process. These problems only surfaced after the government had agreed to a significant increase in public-sector wages, which pushed up domestic financing requirements in 2008. Subsequently, government credit has remained relatively stable, implying a drop relative to GDP.



Source: Central Bank of Mauritania.

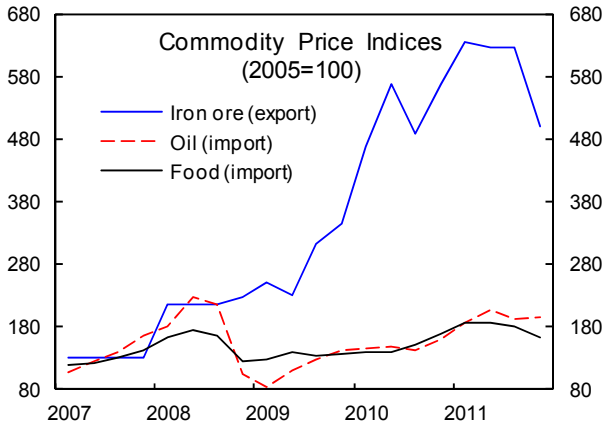


Source: Central Bank of Mauritania; and IMF staff estimates.

The behavior of private-sector credit towards the end of the sample period provides the motivation for this paper. Lending to households and companies expanded meagerly in nominal terms and fell as a share of GDP—despite ample funding. Numerically, private-sector credit grew 10 percent year-on-year in 2011, while the rate of deposit growth, at 19 percent, was almost twice as high. High deposit growth was the mirror image of surging liquidity in the banking sector. Banks' excess reserves—the difference between total and required reserves—went from UM3.1 billion in the first quarter of 2011 to UM33.1 billion in the final three months of the year.

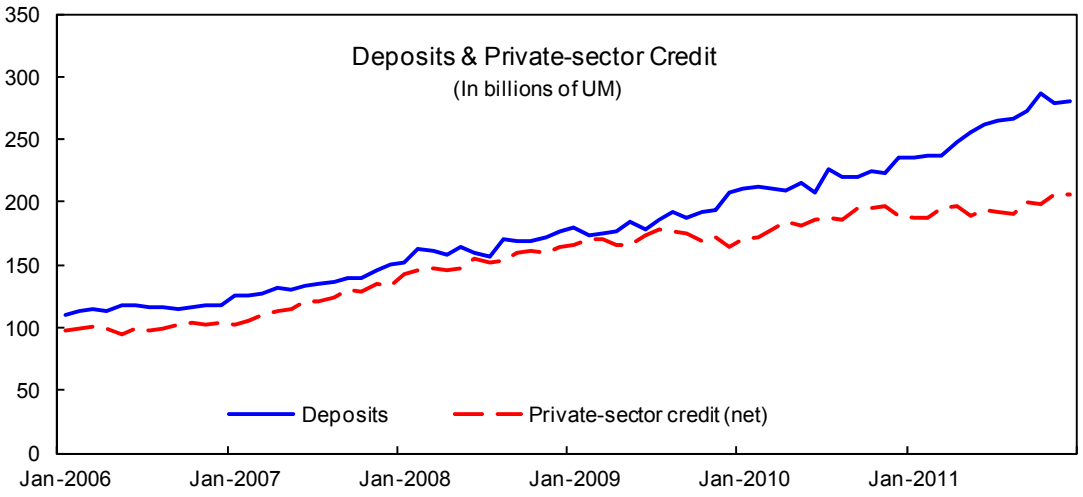
The next section demonstrates that the creation of about UM30 billion of free reserves is equivalent to a significant loosening of monetary policy. This change in the monetary policy stance was itself a by-product of the foreign exchange accumulation by the Central Bank of Mauritania (CBM). In 2010/11, Mauritania's terms of trade improved markedly, leading to unprecedented foreign exchange inflows. The CBM used this opportunity to build foreign exchange reserve buffers, expanding its balance sheet in the process. Specifically, the export-related foreign exchange revenue affected banks' liquidity position through two channels:

(i) record repatriations by state-owned and foreign mining companies led to expenditures in domestic currency, increasing domestic currency deposits of local banks; and (ii) higher mining-related non-tax revenue enabled the Treasury to reduce domestic financing requirements, resulting in a drop in bank-financed government credit.



Source: International Financial Statistics.

The 2011 episode poses several questions. Why did the banks not exploit the surge in domestic funding to lend more to the private sector? Did abundant liquidity mostly lead to more short-term trade finance, explaining the uptick of that series in the previous chart? Alternatively, did banks' willingness to lend increase, only to be offset by a simultaneous plunge in demand for credit? The next section explains how I identify episodes in which banks' liquidity profile changes for reasons that are unlikely to be systematically related to any unobserved third factors affecting the domestic credit market, such as the state of demand. Theoretically, these episodes correspond to changes in banks' credit supply schedules, while keeping demand fixed.



Source: Central Bank of Mauritania.

III. Indentifying Exogenous Shocks in Mauritania's Monetary Policy Framework

This paper's identification strategy exploits the tendency of Mauritania's monetary policy stance to shift in response to external developments. In two steps, I illustrate the logic behind this approach. First, I clarify which of the candidate indicators offers the most reliable signal of Mauritania's monetary policy stance. Although formal tests in the spirit of Bernanke and Mihov (1998) would add empirical rigor to the discussion, the relatively basic nature of

Mauritania's monetary policy framework allows me to identify the indicator *a priori,* on theoretical grounds. Second, I show that this indicator, bank reserves, depends on Mauritania's external trade performance.

A. The monetary policy framework

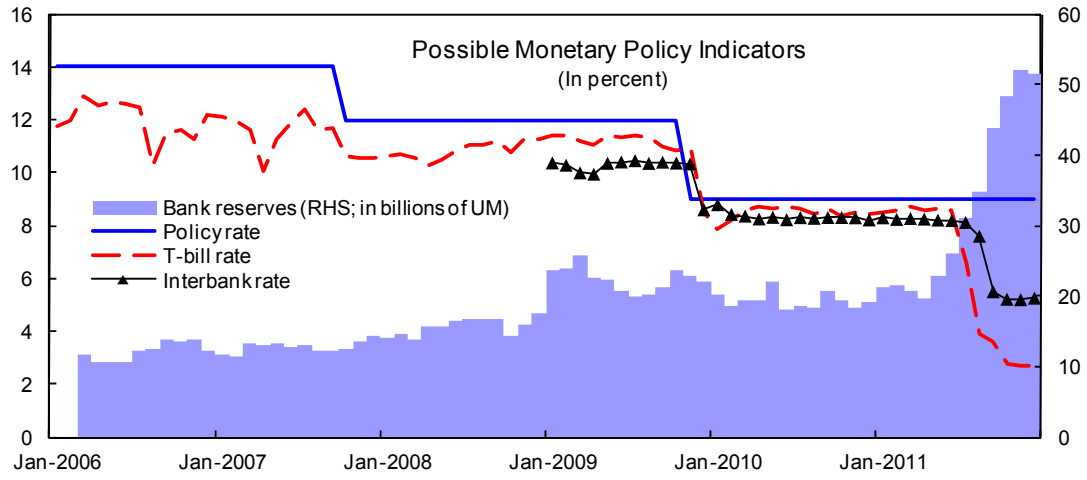
The CBM's intermediate target is the broad money aggregate M2, but there is no officially defined operational target. This leaves four candidate indicators that could, in principle, contain information about the monetary policy stance:

- **The policy rate** plays next to no role in determining banks' funding costs. Banks rarely use the CBM's refinancing facility, which is priced at the policy rate. The monthly stock of outstanding central bank credit to the banking sector has remained unchanged since 2009. The rate itself changes infrequently, with the last change dating back to November 2009.

- **The T-bill rate** mostly varies according to the Treasury's domestic financing needs, although there have been a few episodes of T-bill issuances for monetary purposes in the past. The CBM does not conduct open market operations.

- **The interbank rate** closely follows the T-bill rate as all interbank transactions are collateralized against T-bills. However, the interbank market is shallow. Some of the largest banks avoid this market entirely because of a lack of transparency and because of counterparty risk. The CBM does not intervene directly in this market.

- **Bank reserves** are unremunerated. Free (or excess) reserves, the amount of reserves above the required 7 percent of resident deposits (reserve requirement), is liquidity available for payment purposes. If free reserves reach a level that is above some precautionary threshold, banks have an incentive to use this liquidity for lending.



Source: Central Bank of Mauritania.

Given that the policy rate has little to no relevance to banks and that T-bill and interbank rates mostly depend on fiscal policy, the only indicator that can signal the stance of monetary

policy on a consistent basis is banks' holdings of central bank reserves. Using reserves as an indicator of monetary policy is a common choice in low-income countries without an active liquidity management framework (Saxegaard, 2006, Baldini et. al, 2012, and Davoodi, Dixit, and Pinto, 2013). However, Christiano and Eichenbaum (1992) and Christiano, Eichenbaum and Evans (1999) use reserves as the monetary policy indicator in their analysis of the United States.

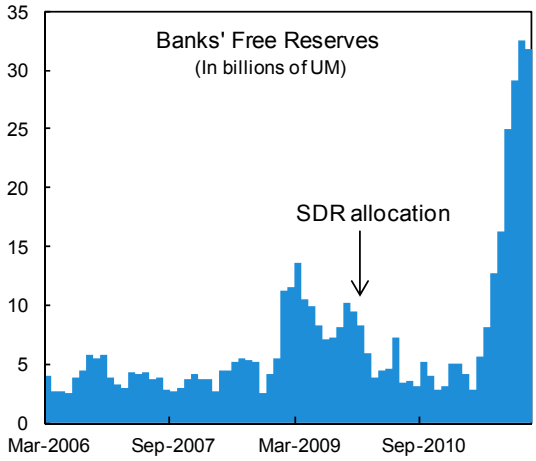
B. The monetary policy stance and economic developments

Mauritania is a small, resource-dependent open economy with a closed capital account and a managed exchange rate regime without preannounced path. In principle, this framework gives the CBM room to conduct monetary policy independently; yet in practice, domestic liquidity conditions in the banking sector have fluctuated with external developments as the CBM kept short-term volatility in the exchange rate low, limiting its role as a shock absorber. To conduct monetary policy independently under a stable exchange rate, the CBM would need to offset external shocks with liquidity operations that have opposite effects. Concretely, positive external shocks would call for sterilization of capital inflows. Negative shocks would require liquidity injections to compensate for dwindling foreign exchange inflows. In the past, however, the CBM has not followed this operational guide.

Consider the impact of the positive terms of trade shock in 2010–11. The rapid accumulation of net foreign assets by the CBM called for large-scale sterilization operations. But because its financial resources are severely constrained, the CBM was unable to cover the costs associated with these liquidity operations and therefore refrained from undertaking them. One of the CBM's biggest assets (57 percent of total assets on average over the period 2006–11) is a nonnegotiable claim on the government, carrying below-market interest rates and bearing the name of the CBM as creditor. Since the claim generates little revenue and cannot be traded with banks, it serves no purpose in liquidity-absorbing operations. The CBM also decided against raising the required reserve ratio from the applicable 7 percent for fear of penalizing some of the smaller banks that did not benefit to the same degree from the surge in foreign exchange inflows.

In the opposite case of a negative external shock, the CBM would need to inject liquidity as a countercyclical action. The problem with this response, however, is that a fall in the demand for domestic currency tends to accompany external crises, particularly if the foreign exchange buffers of the central bank are small. This was the case in Mauritania for most of the sample period. The first generation of currency crises models by Krugman (1979) and Flood and Garber (1984) emphasize that countercyclical monetary policy responses can only be effective if monetary injections remain consistent with domestic money demand. Monetary stimuli over and above money demand will translate into a loss of foreign exchange reserves and can even lead to a currency crisis. Agénor and Flood (1994) show that this conclusion still holds in the presence of capital controls.

Mauritania's experience in 2009 illustrates how little room for maneuver the CBM enjoyed in crisis times. When the international market for iron ore, Mauritania's main export, collapsed in the beginning of the year, the authorities attempted to increase bank liquidity by rationing the supply of foreign exchange, reducing T-bills issuance, and raising government spending. But the CBM could not sustain the monetary stimulus. Following the initial injection, banks' free reserves drained throughout the year, as residents tried to exchange local currency for foreign exchange, capital account restrictions notwithstanding. The IMF's special SDR allocation and the associated increase in government spending offered only temporary relief, and the fall in liquidity regained momentum quickly afterwards. Liquidity did not recover to the levels reached immediately after the stimulus.



Source: Central Bank of Mauritania.

C. Exogenous monetary policy shocks

Bank reserves are the best available indicator of Mauritania's monetary policy stance. The challenge is to identify exogenous changes in bank reserves. That is, changes that are not related to any unobserved factors that also affect the Mauritanian economy and banks' lending activities. In identifying such exogenous shocks, I exploit the positive relationship between external developments and bank reserves.

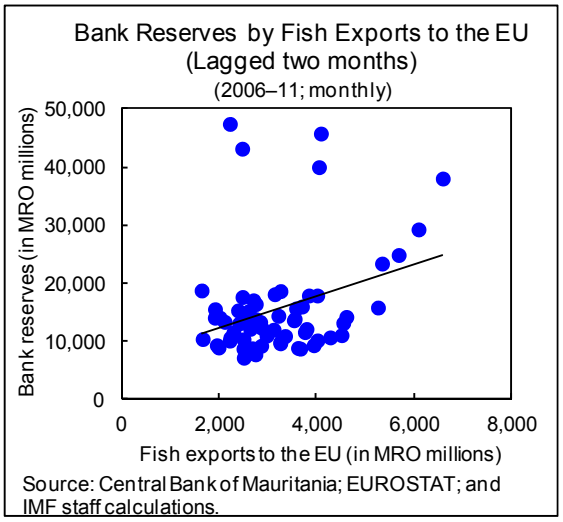
The external event that I use to identify exogenous monetary policy shocks are fish exports. The intuition behind this empirical strategy is that changes in fish exports are primarily driven by factors that are likely to be fully exogenous to the Mauritanian economy—international fish prices and fish captures. In addition, fish exports need to be able to explain a significant fraction of the variation in bank reserves; they have to be relevant. The formal tests of these conditions follow in the section IV, but here I provide the intuition.

Exogeneity requires that fish exports must not be systematically related to bank lending in any other way than through their indirect impact via reserves. Concretely, fish exports must not directly influence bank lending, must not have any effect on unobserved third factors that drive bank lending, and these unobserved factors must not, in turn, affect fish exports.

On the possibility of fish exports having an impact on bank lending (direct or via third factors), spillovers from the fishing industry to the rest of the economy seem negligible given the sector's small size. Fish exports accounted for only 16 percent of total good exports over the six years to 2011. Equally important, credit to the fish sector has stayed flat in nominal terms over the same period, with its share in total credit more than halving from 16 percent to

7 percent. Regarding the opposite direction of causality, the effect of unobserved third factors on fish exports, note that fish exports are primarily driven by the world price of Mauritanian fish varieties and fish captures. Fish prices and captures are unlikely to exhibit a systematic relationship with other forces that affect the state of the Mauritanian economy, although, as an empirical fact, fish prices have had some positive correlation with the price of iron ore (by far Mauritania's most important export) in the past.

The key reason why fish exports help explain bank reserves is a repatriation requirement for fish exporters. Empirically, the correlation coefficient is 0.32 at a two-month lag to account for the usual payment terms in export transactions. Until 2010, fish exporters had to sell a share of their foreign exchange receipts to the central bank. The CBM subsequently relaxed this requirement somewhat by asking fish exporters to merely domicile their receipts at the CBM. Regardless of the technical details of the repatriation requirement, the important point for this paper is that banks in charge of executing repatriations see their reserves increasing—reserves are the asset counterpart to fish exporters' deposits at commercial banks.



IV. Empirical Results

I employ two different approaches to testing the relationship between monetary policy shocks and bank lending: structural VARs and 2SLS panels with fixed effects. Overall, I find that neither method succeeds in uncovering a robust relationship between monetary policy and banks' lending activities. The estimated impulse response functions of the VARs are flat, indicating that monetary policy shocks do not lead to a significant response in bank lending. Similarly, the estimated coefficients on bank reserves in the panel models are never statistically different from zero.

Both of the empirical methods and results carry their respective strengths. The advantage of bank-by-bank VARs lies in their ability to model bank-specific responses to monetary policy shocks. Responses that vary across banks address the Pesaran and Smith (1995) critique, which says that imposing homogeneity in panel models falsifies statistical inference if in reality responses are heterogeneous across panel members. Panel models, on the other hand, can extract cross-sectional information that is common to the banks.

A. Data

The data consist of a panel of six Mauritanian banks over the period of January 2006 to October 2011. I excluded from the sample the banks that do not have business relationships with the fish exporting industry as this relationship is at the heart of my empirical identification strategy. The six banks in the sample represent over 75 percent of total assets of the Mauritanian banking system, and their combined private-credit to GDP ratio averages 14 percent over the sample period. They are all privately owned; five are part of larger commercial conglomerates, while the remaining one is a subsidiary of a large European banking group.

The banks report on a monthly basis the composition of their balance sheet, including the three credit categories discussed in Section II, to the banking supervision department of the CBM. Data on fish exports to the EU are from EUROSTAT and converted into local currency at current exchange rates. All data are in logs of the nominal local currency amounts. (Table 1) displays summary statistics.

Text Table 1: Summary Statistics of Main Variables

Variables	Observations	Mean	Standard deviation	Min.	Max.
Bank-specific					
Log (private-sector credit)	407	16.6	1.0	7.4	17.7
Log (government credit)	404	15.5	0.9	12.2	17.2
Log (short-term trade finance)	406	16.8	0.7	12.5	17.9
Log (reserves)	408	14.4	0.9	10.3	16.4
Common					
Log (fish exports)	70	14.9	0.3	14.1	15.7

I use the panel unit root tests of Levin, Lin, and Chu (2002) and Im, Pesaran, and Shin (2003) to test for nonstationarity in the three credit series and in the bank reserve series. The lag length of the augmented Dickey-Fuller regressions, which are the foundation of these panel unit root tests, is chosen on the basis of the AIC criterion. With the exception of trade credit, the tests reject the null hypothesis that these series contain unit roots for all banks. As the fish export series is common across banks, I use a simple augmented Dickey-Fuller test. The test also rejects the null hypothesis of a unit root. I therefore treat the entire dataset as stationary in the benchmark specifications, but revert to first differences as a robustness check.

B. Vector autoregressions

I estimate, for each of the six banks, reduced-form vector autoregressions of the following type:

$$\mathbf{y}_t = \boldsymbol{\alpha} + \boldsymbol{\beta}(L)\mathbf{y}_{t-1} + \boldsymbol{\gamma}\mathbf{x}_t + \boldsymbol{\varepsilon}_t \qquad (1)$$

where the vector $\mathbf{y}_t$ and $\mathbf{x}_t$contain the endogenous and exogenous variables, respectively, $\boldsymbol{\alpha}$ is a set of constants, $\boldsymbol{\beta}$ and $\boldsymbol{\gamma}$ are coefficients matrices, (L) is the lag operator, and $\boldsymbol{\varepsilon}_t$ is a vector or serially uncorrelated disturbances.

The endogenous variables in the $\mathbf{y}_t$ vector are the following: fish exports to the EU, bank reserves at the CBM, and one of the three types of bank lending—private-sector credit, government credit, or short-term trade finance credit (see Table 1). The exogenous $\mathbf{x}_t$ vector includes a dummy for the six months following the 2008 *coup d'état* (when economic activity ground to a standstill) and a simple linear time trend.

I estimate 18 specifications in total—three types of credit for each of the six banks. I use the AIC to select the optimal lag length of the endogenous variables from a maximum of 12, except for two specifications. In these cases, I have to restrict the number of lags to 8 to ensure that the VAR model satisfies standard stability requirements, i.e., that it is invertible so that impulse response functions can be calculated and interpreted.

I first test for Granger causality. Specifically, I test individual and joint exclusion restrictions on fish exports and bank reserves in the bank lending equations. That is equivalent to asking whether fish exports or bank reserves help predict any of the three types of bank lending. If monetary policy were effective, changes in fish exports should increase bank reserves, which in turn should affect credit. To aggregate the information from the bank-by-bank tests into a single test statistic, I calculate the Fisher (1932) statistic, which Maddala and Wu (1999) have popularized as "meta analysis". Calculated as $\lambda = -2\sum_{i=1}^{6}\log(\pi_i)$, the test statistic is distributed as χ^2 with 2(6) degrees of freedom.

Table 2 reports the results. The tests fail to detect a significant relationship between reserves and fish exports on the one hand, and private-sector credit and short-term trade credit on the other hand; the Fisher-statistic is insignificant at conventional levels of significance. However, the tests also indicate that fish exports and reserves jointly Granger-cause government credit. Most of these results, however, are due to the significant relationship between fish exports and government credit. In fact, only one bank displays a highly significant relationship, sufficient to render the aggregated Fisher-statistic significant as well. Any statistically significant association between government credit and fish exports is difficult to rationalize theoretically. In addition, given that Granger causality tests do not control for unobserved factors that drive both government credit and reserves, it is possible that the significant result is merely a statistical artifact.

To get a better handle on the effect of changes in reserves that are not due to other developments in the Mauritanian economy, I examine the impulse response functions of the structural VARs. Following the notation in Amisano and Giannini (1997), the short-run structural VAR that I estimate can be expressed as:

$$\mathbf{A}\left(\mathbf{I}-\mathbf{A_1}-\mathbf{A_2}L^2-\cdots-\mathbf{A_p}L^p\right)\mathbf{y}_t=\mathbf{A}\boldsymbol{\varepsilon}_t=\mathbf{B}\mathbf{e}_t$$

Where **A** and **B** are 3x3 matrices of parameters, L is the lag operator, $\mathbf{y}_t$ is the 3x1 vector of endogenous variables, $\boldsymbol{\varepsilon}_t$ is the 3x1 vector of structural innovations, and $\mathbf{e}_t$ is the 3x1 vector of the observed reduced-form innovations. To identify the unobserved structural observations from the observed reduced-form residuals, I place the following restrictions on the **A** and **B** matrices:

$$\mathbf{A}=\begin{bmatrix}1 & 0 & 0\\ a_{21} & 1 & a_{23}\\ 0 & a_{32} & 1\end{bmatrix}\text{ and }\mathbf{B}=\begin{bmatrix}b_{11} & 0 & 0\\ 0 & b_{22} & 0\\ 0 & 0 & b_{33}\end{bmatrix}$$

The first row is the fish exports equation, the second row is the equation for reserves, and the final row corresponds to the equation for credit. The identification scheme resembles a recursive ordering imposed by a standard Cholesky decomposition, with fish exports as the most exogenous variable, reacting only to its own structural innovations. But there are two key differences to a Cholesky ordering. First, reserves are allowed to depend contemporaneously on both fish exports and credit. Second, credit does not depend on fish exports.

Note that this identification strategy is not arbitrary; rather it reflects the structure of Mauritania's monetary policy framework. Fish exports are exogenous to all other variables because they depend almost entirely on fish captures and the world prices of Mauritanian fish varieties. Unexpectedly high fish exports can translate into an increase in bank reserves in the same period because of the repatriation requirement. The restriction that credit does react in the same period to fish shocks is grounded in the notion that banks typically need to exercise some due diligence before turning excess liquidity into credit.

Figures (1–3) depict the response of the six banks' lending activities to a structural innovation in the fish export equation. Across the three types of bank lending, credit displays hardly any reaction to the monetary policy shock—the impulse response functions are flat for most banks, regardless of the category of bank lending. On the other hand, and in line with my identification strategy, reserves tend to increase following a positive innovation to fish exports, though significantly so only in about a third of the cases.

Possibly, credit does not respond significantly because the VARs do not estimate precisely enough the positive association between reserves and fish exports. It could then be that credit would react to a monetary policy shock if a better measure of these shocks were available. To address this concern, I re-estimate (1) as a two-variable VAR, using only reserves and credit.

I find that the more parsimonious VAR model produces identical results to the three-variable VAR; therefore, I do not show the impulse response functions. Bank lending does not display a significant reaction to changes in reserves. This result holds regardless of the ordering of reserves and credit, for which there is not theoretical guidance. In any event, the reduced-form errors are only weakly correlated, so it turns out that the ordering does not matter.

Overall, the VARs do not uncover a robust and positive relationship between bank lending and monetary policy. Put another way, export-related changes in reserves do not subsequently lead to a change in credit. This result speaks to the limited effectiveness of the bank lending channel in the monetary transmission mechanism.

I now turn to an alternative empirical method for examining the effectiveness of monetary policy. The bank-by-bank VARs do not exploit the cross-sectional information common to the six banks. The next sub-section focuses on 2SLS panel models with fixed effects that also draw on the i-dimension of the panel dataset to estimate the relationship between reserves and credit.

C. 2SLS panels with fixed effects

The 2SLS panel models take the following form:

$$y_{it} = \alpha_i + \beta(L)\widehat{r_{it}} + \gamma coup_t + \theta t + \varepsilon_{it} \qquad (2)$$

$$\widehat{r_{it}} = \alpha_i + \beta fish\_export_{t-1} + \gamma coup_t + \theta t + \vartheta_{it} \qquad (3)$$

where y_{it} is one of the three types of bank lending, α_i is a bank-specific intercept, $coup_t$ is a dummy for the six-month period following the 2008 *coup d'état*, t is a linear time trend, $\widehat{r_{it}}$ is the predicted level of bank reserves from the first-stage regression (3), $fish\_export_t$ are Mauritania's fish exports to the EU, and ε_{it} and ϑ_{it} are error terms that may be serially correlated within banks but contemporaneously uncorrelated across banks. (L) denotes, as before, the lag operator. These variables are the same as in (Table 1) and in equation (1), with two important differences. The first difference relates to $\widehat{r_{it}}$. Instead of using the original reserve series to estimate the relationship between monetary policy and credit, 2SLS panels use the predicted value of reserves from a first-stage regression. The second difference is data frequency (see below).

Unlike VARs, fixed-effect panel models do not automatically address the potential endogeneity in the right-hand side variables. This is a concern because reserves and credit are simultaneously determined, sharing several identical determining factors (that is why the VAR specifications allow for reserves to have a contemporaneous impact on credit and vice versa). Agénor, Aizenman, and Hoffmaister (2004) and Saxegaard (2006) discuss bank-specific and economy-wide factors that affect banks' choice of reserve holdings. Applying this approach to Mauritania would suggest that examples of bank-specific determinants are (i) asset riskiness, (ii) risk aversion, (iii) and volatility of funding base, while the economy-

wide ones include (iv) institutional environment, (v) demand conditions, and (vi) competition among banks. These factors also have an effect on credit, but I cannot add them in the regressions as the data are unavailable.

To address the endogeneity bias, I use fish exports as an instrumental variable for reserves. Concretely, in the first-stage regressions (3), I regress reserves on fish exports lagged by one quarter and the exogenous control variables in (2). The predicted value of reserves from the first stage then enters (2) as an explanatory variable.[2] One way to think about this identification strategy is to split the variation in reserves into two parts: one part that results from variations in fish exports, and a second part that captures the variations due to all other factors. The 2SLS estimates only rely on the variation in reserves that is driven by fish exports and, therefore, most likely exogenous.

The second difference to the VARs is the frequency of the data. To capture the dynamics of the system, I transform the monthly series used for the VAR estimations into quarterly averages. Estimates of (2) and (3) are therefore based on quarterly data. The shorter frequency allows me to capture the dynamics of the monetary policy transmission mechanism in a panel setting. A single lag of reserves on the right-hand side is sufficient to estimate the dynamic impact on credit over a time period of six months.

The columns labeled "benchmark" in (Tables 2–4) present the estimation results of each of the three credit series. The point estimates of the βs range from -0.1 to 0.2, and are never statistically significant, not even jointly. For comparison, I also present the OLS estimates, which are always slightly larger than the 2SLS coefficients, sometimes changing the sign from negative to positive. In all but one specification for government credit, the OLS estimates are not significant either. The larger magnitude of the OLS estimates points to a small positive bias, the result of the positive correlation between reserves and omitted third variables that affect bank lending.

The 2SLS estimates are valid if fish exports are significantly related to reserves in the first-stage regressions. The bottom halves of (Tables 2–4) show two test statistics that suggest that the model is in fact well-identified. The Angrist and Pischke (2009) first-stage chi-squared Wald statistic rejects the null hypothesis of under-identification for each of the endogenous regressors at conventional levels of significance. Likewise, the Kleibergen-Paap (2006) LM statistic rejects the null hypothesis of joint under-identification at significance levels of just over 5 percent. The identification statistics look even stronger when I use excess reserves instead of total reserves as explanatory variable, as shown in (Table 5–7). The point estimates of the coefficient on reserves are quantitatively very similar to those in (Tables 2–4), but the p-values of the identification statistics are more significant. However, when using excess reserves, I lose observations with negative values that have no logarithmic representation.

[2] I use Schaffer's (2010) xtivreg2 command in STATA for the estimations.

The benchmark specifications are exactly identified. Angrist and Pischke (2009) emphasize that exactly identified models have the advantage of minimizing weak instrument bias. But exact identification also implies that I cannot formally test the exclusion restrictions on the instruments. However, when I add the square or another lag of reserves to the instrument list, Hansen's J-statistic is never significant, indicating that the instruments are uncorrelated with the error term in the bank lending equation and thus valid.

I experiment with various specifications as robustness checks, which I present in (Tables 2–7) on the right-hand side under the label "alternative/robustness". First, I add banks' balance sheet equity (capital) as an exogenous variable, although I recognize that it is unlikely to be strictly exogenous with respect to bank lending. The main argument for considering capital as exogenous is that it changes infrequently and so can be considered predetermined in the short run. Next, I specify (2) in differences to address concerns that one of the three credit series or reserves may be nonstationary for some banks. I also estimate a model in first differences that contains capital.

The alternative specifications lend further support to the conclusions from the benchmark specifications. The point estimates of the βs in the specifications with capital as an explanatory variable are very close to those obtained in the benchmark specifications. The coefficients in the differenced model are not directly comparable to the models in levels, but the signs and significance of the βs are identical, with two exceptions. Reserves appear significant in the first-differenced equation without lags, but the coefficient is of the wrong sign. Literally interpreted, they imply that an increase in reserve leads to a *reduction* in private-sector and government credit. However, given that this specification does not account for the endogeneity of reserves, the estimated coefficient and standard errors are likely to be invalid.

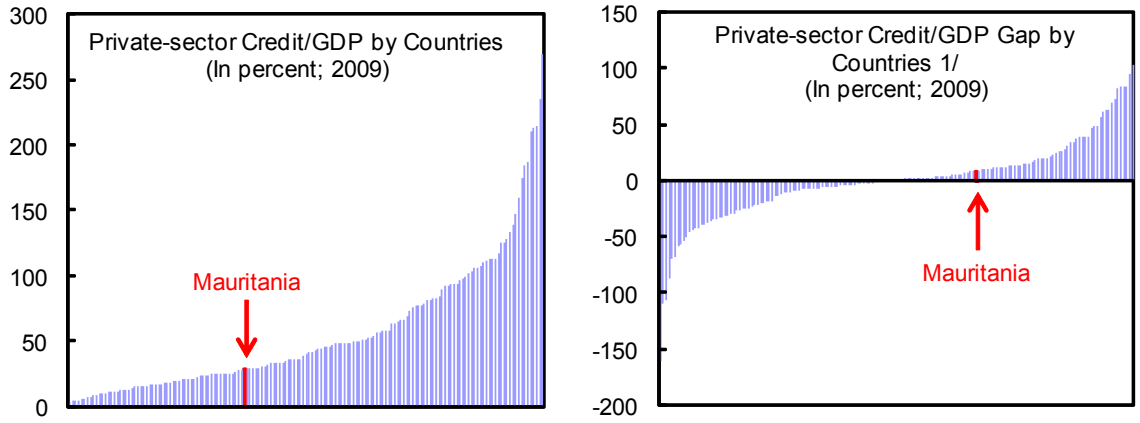
All told, the results of the panel models corroborate the results of the VARs in the previous section. Exogenous changes in reserves are not associated with a subsequent change in bank lending. This finding suggests that monetary policy in Mauritania has not been able to exert systematic influence on banks' activities; put differently, monetary policy has been ineffective over the sample period.

V. Policy Considerations

Why did the banks not react to monetary policy shocks? A straightforward answer could be that the Mauritanian banking sector is simply too shallow to mimic the behavior of more sophisticated banks in developed countries. However, this raises the question of how the shallowness of Mauritania's banking market compares internationally.

Mauritania's private-sector credit/GDP ratio was 29 percent in 2009 (including provisions; net private-sector credit/GDP was 21 percent), 11 percentage points lower than the global median across all countries. But Al-Hussainy et al. (2010) suggest that it is more informative to compare financial development indicators after controlling for country-specific structural characteristics. They calculate, for a large sample of countries, expected levels of private-sector credit/GDP that depend on countries' levels of GDP per capita and demographics. A positive gap between the actually realized and expected level of credit/GDP in a given country would suggest, for example, that its banking sector is deeper than could be expected given countries' structural underpinnings.

By this more nuanced metric, Mauritania performs rather well. In 2009, Mauritania's expected level of private-sector credit was only 20.4 percent, implying a positive gap of about 8.6 percent. Unless monetary policy is similarly ineffective in every country with a smaller credit gap, it is not straightforward to establish that structural size is the key constraint for monetary policy effectiveness.



1/ Private-sector credit/GDP gaps are defined as the difference between each country's realization and structural benchmark. Structural benchmarks are derived from cross-country regressions that explain credit as a function of levels of economic development and demographics. See Al-Hussainy et al. (2010).

Another reason to be wary of singling out financial underdevelopment as the key constraint is the difficulty of deriving policy advice. The literature on financial development suggests a variety of fundamental causes for financial underdevelopment, ranging from the origins of the legal system (La Porta et al., 1997), through social capital (Guiso, Sapienza, and Zingales, 2004), to rent-seeking by industrial and financial incumbents (Rajan and Zingales,

2003). These explanatory factors, however, are often outside the control of policymakers in the short run.

Instead, I focus on two key constraints—high loan concentration and the liquidity management framework—that not only figure prominently in the policy discussions that involved the IMF but are also in the purview of policymakers. I stay away from investigating to what extent these two constraints are merely symptoms of some other fundamental cause that may date back decades.

So far, I have referred to the effects of monetary shocks, without considering whether the sign of the shock could matter. However, there are both theoretical and practical reasons to believe that a monetary contraction will be more effective than a monetary easing in Mauritania. Khemraj (2010) presents a model with oligopolistic banks that raise lending rates following a negative monetary shock but do not lower them in response to a liquidity injection to protect oligopoly profits. On a practical level, the CBM could easily increase the required reserve ratio to a level that would create a system-wide liquidity shortage. Banks would then almost certainly have to cut back their lending activities.

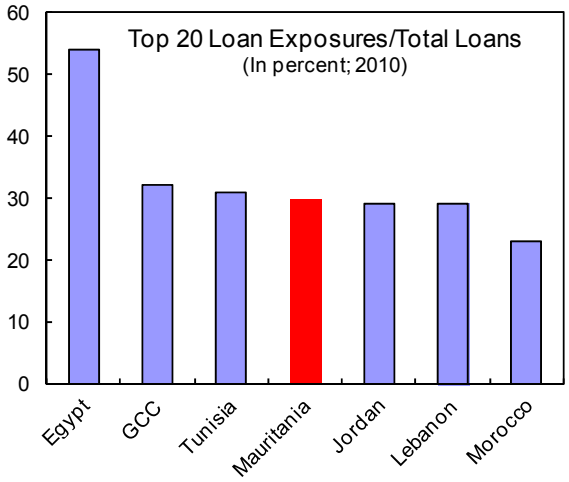
The discussion that follows focuses on the more relevant question of how to make monetary expansions more effective. But before proceeding, I stress that there is not a mechanistic relationship between the two highlighted constraints and the effectiveness of monetary stimulus. Easing some constraints while others still bind may not change final outcomes. In particular, there are likely to be other prerequisites for making monetary policy effective. Becerra, Cavallo and Scartascini (2012), building on Rajan and Zingales (2003), highlight the importance of the emergence of credit-intensive industries. In addition to lobbying for financial institutions that are more conducive to credit activity, these industries represent *effective* credit demand that monetary policy can affect.

A. Loan concentration

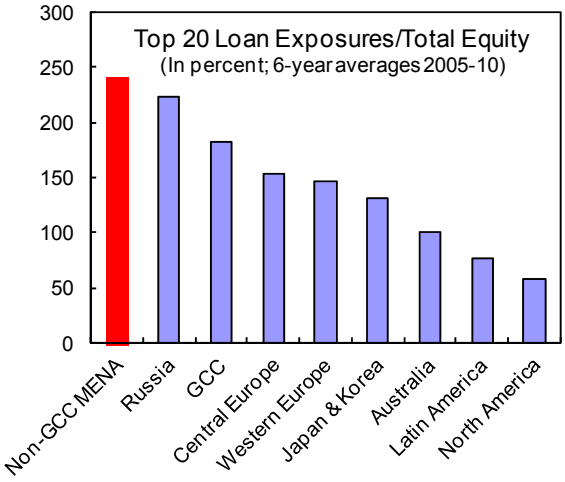
One key feature of Mauritanian banks is the high concentration of their loan portfolios. Rocha, Arvai, and Farazi (2011) use loan concentration ratios as an indicator of access to financial services. In particular, they emphasize that countries with high loan concentration fail to supply the broader economy with the credit necessary for private-sector development. But the negative effects of concentrated loan portfolios go beyond private-sector development—they may stop banks from transmitting monetary impulses to the wider economy.

At the end of 2010, the 20 biggest loans accounted for 30 percent of all outstanding loans in Mauritania. This composition reflects the origins of the Mauritanian banking sector. Historically, Mauritanian banks have focused on lending to parties affiliated with the banks' parent companies, the government, and state-owned enterprises. Short-term consumer lending has only recently become a more important credit category for banks. Concentration ratios in Mauritania are in line with those seen in neighboring countries in the MENA region;

however, this group of countries stands out as having the most highly concentrated loan portfolios worldwide.



Sources: Rocha, Arvai, and Farazi (2011); Central Bank of Mauritania; and IMF staff calculations.



Source: Rocha, Arvai, and Farazi (2011).

A large part of the Mauritanian economy is active in the informal sector and has had few relationships with banks. From the banks' perspective, it may be perfectly rational to refrain from lending to the informal economy: risk-adjusted returns may be too small, making credit rationing optimal and efficient (Stiglitz and Weiss, 1981). So while absolute credit demand may be high, as suggested by the World Bank's Doing Business Indicators (2012), the amount of *effective* (bankable) credit demand in the eyes of banks may be small.

Insufficient effective demand may therefore explain why monetary policy is ineffective. If banks are up against a binding ceiling of bankable customers and projects, demand will be perfectly inelastic: there may still be no marginal customer who becomes eligible for a loan following a positive monetary policy shock. In this case, loan concentration would be a symptom rather than a cause of monetary policy ineffectiveness.

But before concluding that a lack of demand alone explains high loan concentration, remember that the amount of effective credit demand facing banks is endogenous. It cannot be taken as given but rather depends on banks' risk management capabilities and their efforts of actively searching for new lending opportunities. Hauner (2009) refers to "lazy banks" in this context. Banks are lazy if they have become used to financing only a narrow range of known and low-risk clients, sufficient for earning steady returns. Arguably, this observation is pertinent in the Mauritanian context, where the sector evolved as financial service providers of parent commercial groups.

The banking supervisor in Mauritania has opted for a two-pronged strategy for addressing the problem of high loan concentration. On the one hand, the supervisor has tightened the definitions of related-party and single-party exposures. From February 2012, financial sector regulation considers companies belonging to the same mother group as a single entity,

implying that the cumulative exposure to a single group must now fall within the regulatory limits.

At the same time, the Mauritanian banking regulator now obliges banks to invest in appropriate risk management systems. This will ensure that banks build the capabilities necessary to assess lending opportunities to new clients instead of routinely disregarding this segment of the market. Early reactions of the banks suggest that this new piece of regulation will have a profound impact on their internal risk management systems.

B. Liquidity management framework

Banks' *raison d'être* is to engage in maturity transformation—borrowing short and lending long. In practice, however, they will only accept maturity mismatches if they can be reasonably sure to cover any liquidity shortfalls that may arise from unexpected liability withdrawals.

An average of 80 percent of banks' liabilities was in the form of unremunerated sight deposits over the sample period. A liability structure heavily skewed to short maturities is a double-edged sword for banks: it implies low funding costs but high refinancing risk. To what extent liquidity injections from a positive monetary policy shock represent viable funding for longer-term lending depends on banks' refinancing possibilities.

If banks harbor doubts about their ability to refinance assets at some point in the future, the rational course of action can be to accumulate excess liquidity (Laurens and others, 2005). This, in turn, is just another way of saying that monetary policy stimuli will not translate into more lending.

The two most common ways to refinance assets at short horizons in other countries are the interbank market and the central banks' refinancing facility. In Mauritania, accessing either market is not straightforward, which creates incentives for banks to plan their treasury conservatively and accumulate surplus liquidity at any point in time.

The interbank market remained shallow over the sample period. Reportedly, banks are generally wary of lending to each other, despite strict collateral requirements. They emphasize that there is little transparency about the true financial health of individual banks. In addition, given judicial uncertainty, banks are unsure as to whether they would be able to seize pledged collateral if their counterparty did not obey contractual repayment schedules. Similarly, banks rarely used the central banks' refinancing facility. In their eyes, the central bank retains some discretion about the decision of granting access to its refinancing window.

In light of the identified reasons for the malfunctioning of the short-term refinance options, two measures stand out for encouraging banks to use temporary liquidity surpluses for customer lending. First, there is scope for tightening transparency requirements. For example, regulation could require banks to publish audited financial statements (including

notes and management letter) on the banks' websites. Second, the central bank could make access to its refinance window fully automatic. This would also be an opportunity to review collateral requirements, particularly because the supply of T-bills has not grown in tandem with the wider economy in past few years. Widening requirements to high-quality customer loans would ease banks' worries about the ability to refinance these assets, making these loan categories more likely to attract injected liquidity.

VI. CONCLUSION

I did not find any evidence that would suggest that monetary policy was effective in Mauritania in the period 2006–11. This finding is in line with Mishra and Montiel (2012), who present the emerging consensus on the lack of monetary policy traction in low-income countries. However, unlike the papers surveyed by the authors, I tie the identifying assumption of the empirical models to the institutional features of the Mauritanian economy.

The main novelty of this paper is the empirical approach to identifying exogenous monetary policy shocks. In Mauritania, changes in bank reserves at the central bank are the most appropriate indicator of the monetary policy stance. Due to a repatriation requirement on export-related foreign exchange receipts, I am able to identify changes in reserves that are not related to domestic shocks that otherwise may confound empirical analyses of monetary policy effectiveness. Using a unique bank-level dataset, I show that these exogenous monetary policy shocks did not systematically affect bank lending—be it private-sector credit, government credit, or trade finance.

Repatriation-related policy changes are therefore akin to a natural experiment. And in principle, using export receipts as an exogenous signal of monetary policy is an appropriate strategy in countries where the three following conditions hold: (i) the exchange rate exhibits little short-term volatility; (ii) bank reserves are an appropriate indicator of the monetary stance; and (iii) repatriation requirements for export receipts are in place, establishing a positive link between exports and reserves.

Replicating the analysis in other countries would help in better pinpointing the causes of monetary policy ineffectiveness in low-income countries. The two explanations I propose in this paper are based on anecdotal evidence, and I did not attempt to quantify their importance. Needless to say, policy constraints will vary across countries, but ideally country authorities will be able to base their reform priorities on empirical results obtained in many low-income countries.

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Table 1: Granger Causality Tests

Explanatory variables	p-value of null hypothesis that explanatory variables do not help forecast credit
Pooled Fisher-test for private-sector credit	
Fish exports	0.45
Reserves	0.20
Fish exports & reserves	0.17
Pooled Fisher-test for government credit	
Fish exports	0.00***
Reserves	0.08*
Fish exports & reserves	0.01***
Pooled Fisher-test for government credit	
Fish exports	0.76
Reserves	0.33
Fish exports & reserves	0.70

Note: * p<0.10, ** p<0.05, *** p<0.01.

Table 2: Private-sector Credit Using Reserves

	Benchmark				Alternative/Robustness					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS in Levels	OLS in Levels	2SLS in Levels	2SLS in Levels	First Difference	First Difference	2SLS in First Difference	2SLS in First Difference	2SLS in Levels	2SLS in First Difference
Reserves	0.00	0.34	-0.07	0.24					-0.08	
	(0.06)	(1.04)	(-0.47)	(1.02)					(-0.56)	
Reserves (-1)	0.19		0.18						0.18	
	(1.27)		(0.57)						(0.58)	
∆*Reserves*					0.02	0.04	0.04	0.07		-0.03
					(0.52)	(0.71)	(0.16)	(0.54)		(-0.15)
∆*Reserves (-1)*					0.02		0.19			0.17
					(0.51)		(0.61)			(0.71)
Capital									0.03	
									(0.17)	
∆*Capital*										0.26**
										(2.69)
Observations	134	140	129	135	128	134	123	129	129	123
R-squared	0.52	0.37	0.49	0.36	0.02	0.01	-0.27	0.00	0.49	-0.25
					Underindentification tests					
Kleibergen-Paap LM statistic			3.64	3.67			2.61	3.36	3.63	2.90
p-value			0.06	0.06			0.11	0.07	0.06	0.09
Angrist-Pischke chi-squared statistic of *Reserves*			7.10	9.40			-	-	6.78	-
p-value			0.01	0.00			-	-	0.01	-
Angrist-Pischke chi-squared statistic of *Reserves (-1)*			4.26	-			-	-	4.45	-
p-value			0.04	-			-	-	0.03	-
Angrist-Pischke chi-squared statistic of ∆*Reserves*			-	-			3.47	7.48	-	2.17
p-value			-	-			0.06	0.01	-	0.14
Angrist-Pischke chi-squared statistic of ∆*Reserves (-1)*			-	-			8.95	-	-	8.59
p-value			-	-			0.00	-	-	0.00

Note: Observations are three-month averages over the period 2006–11. Cluster-robust *t* statistics in parentheses. The table presents OLS and 2SLS estimates of the impact of the log of reserves on the log of private-sector credit. The 2SLS estimates use the one period-lag of fish exports to the EU as instrument for reserves. Columns (1)–(5) specify the model in levels and include bank fixed-effects and a linear time trend. Columns (6)–(10) specify the model in first differences. All specifications include a dummy for the six months following the 2008 coup d'etat.

* p<0.10, ** p<0.05, *** p<0.01.

Table 3: Government Credit Using Reserves

	Benchmark				Alternative/Robustness					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS in Levels	OLS in Levels	2SLS in Levels	2SLS in Levels	First Difference	First Difference	2SLS in First Difference	2SLS in First Difference	2SLS in Levels	2SLS in First Difference
Reserves	0.14	0.23**	-0.05	-0.10					-0.05	
	(1.75)	(3.49)	(-0.18)	(-0.54)					(-0.20)	
Reserves (-1)	0.05		0.14						0.14	
	(0.85)		(0.29)						(0.29)	
∆*Reserves*					0.05	0.04	-0.27	-0.57		-0.18
					(1.98)	(1.17)	(-0.37)	(-0.67)		(-0.31)
∆*Reserves (-1)*					0.04		0.53			0.56
					(0.97)		(0.50)			(0.52)
Capital									0.01	
									(0.02)	
∆*Capital*										-0.36
										(-0.43)
Observations	134	140	129	135	128	134	123	129	129	123
R-squared	0.07	0.09	0.05	-0.04	0.01	0.01	-0.85	-0.73	0.05	-0.76
					Underindentification tests					
Kleibergen-Paap LM statistic			3.64	3.67			2.61	3.36	3.63	2.90
p-value			0.06	0.06			0.11	0.07	0.06	0.09
Angrist-Pischke chi-squared statistic of *Reserves*			7.10	9.40			-	-	6.78	-
p-value			0.01	0.00			-	-	0.01	-
Angrist-Pischke chi-squared statistic of *Reserves (-1)*			4.26	-			-	-	4.45	-
p-value			0.04	-			-	-	0.03	-
Angrist-Pischke chi-squared statistic of ∆*Reserves*			-	-			3.47	7.48	-	2.17
p-value			-	-			0.06	0.01	-	0.14
Angrist-Pischke chi-squared statistic of ∆*Reserves (-1)*			-	-			8.95	-	-	8.59
p-value			-	-			0.00	-	-	0.00

Note: Observations are three-month averages over the period 2006–11. Cluster-robust *t* statistics in parentheses. The table presents OLS and 2SLS estimates of the impact of the log of reserves on the log of government credit. The 2SLS estimates use the one period-lag of fish exports to the EU as instrument for reserves. Columns (1) –(5) specify the model in levels and include bank fixed-effects and a linear time trend. Columns (6)–(10) specify the model in first differences. All specifications include a dummy for the six months following the 2008 coup d'etat.

* p<0.10, ** p<0.05, *** p<0.01.

Table 4: Short-term Trade Finance Credit Using Reserves

	Benchmark				Alternative/Robustness					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS in Levels	OLS in Levels	2SLS in Levels	2SLS in Levels	First Difference	First Difference	2SLS in First Difference	2SLS in First Difference	2SLS in Levels	2SLS in First Difference
Reserves	-0.01	0.21	-0.09	0.20					-0.16	
	(-0.14)	(0.81)	(-0.37)	(0.46)					(-0.60)	
Reserves (-1)	-0.02		0.14						0.14	
	(-0.37)		(0.69)						(0.61)	
∆*Reserves*					0.05	0.08	0.06	0.29		0.01
					(1.38)	(1.20)	(0.28)	(0.74)		(0.05)
∆*Reserves (-1)*					0.02		-0.14			-0.15
					(0.70)		(-1.30)			(-1.20)
Capital									0.53	
									(1.04)	
∆*Capital*										0.23
										(1.98)
Observations	134	140	129	135	128	134	123	129	129	123
R-squared	0.45	0.33	0.41	0.32	0.03	0.01	-0.35	-0.06	0.44	-0.35
					Underindentification tests					
Kleibergen-Paap LM statistic			3.64	3.67			2.61	3.36	3.63	2.90
p-value			0.06	0.06			0.11	0.07	0.06	0.09
Angrist-Pischke chi-squared statistic of *Reserves*			7.10	9.40			-	-	6.78	-
p-value			0.01	0.00			-	-	0.01	-
Angrist-Pischke chi-squared statistic of *Reserves (-1)*			4.26	-			-	-	4.45	-
p-value			0.04	-			-	-	0.03	-
Angrist-Pischke chi-squared statistic of ∆*Reserves*			-	-			3.47	7.48	-	2.17
p-value			-	-			0.06	0.01	-	0.14
Angrist-Pischke chi-squared statistic of ∆*Reserves (-1)*			-	-			8.95	-	-	8.59
p-value			-	-			0.00	-	-	0.00

Note: Observations are three-month averages over the period 2006–11. Cluster-robust *t* statistics in parentheses. The table presents OLS and 2SLS estimates of the impact of the log of reserves on the log of short-term trade finance credit. The 2SLS estimates use the one period-lag of fish exports to the EU as instrument for reserves. Columns (1)–(5) specify the model in levels and include bank fixed-effects and a linear time trend. Columns (6)–(10) specify the model in first differences. All specifications include a dummy for the six months following the 2008 coup d'etat.

* p<0.10, ** p<0.05, *** p<0.01.

Table 5: Private-sector Credit Using Free Reserves

	Benchmark				Alternative/Robustness					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS in Levels	OLS in Levels	2SLS in Levels	2SLS in Levels	First Difference	First Difference	2SLS in First Difference	2SLS in First Difference	2SLS in Levels	2SLS in First Difference
Free Reserves	0.01	0.10	-0.05	0.07					-0.02	
	(0.12)	(0.71)	(-0.82)	(0.60)					(-0.36)	
Free Reserves (-1)	0.06		0.02						0.01	
	(0.68)		(0.20)						(0.12)	
∆*Free Reserves*					0.00	-0.02**	0.03	0.04		0.00
					(0.12)	(-3.97)	(0.33)	(0.59)		(0.00)
∆*Free Reserves (-1)*					-0.01		0.07			0.06
					(-0.34)		(0.57)			(0.58)
Capital									-0.12	
									(-0.92)	
∆*Capital*										0.29**
										(3.14)
Observations	87	108	82	98	72	87	67	82	82	67
R-squared	0.46	0.28	0.41	0.27	0.01	0.01	-0.10	-0.02	0.42	-0.04
					Underindentification tests					
Kleibergen-Paap LM statistic			4.22	3.64			2.83	2.69	4.39	2.70
p-value			0.04	0.16			0.09	0.10	0.04	0.10
Angrist-Pischke chi-squared statistic of *Reserves*			10.52	7.93			-	-	9.21	-
p-value			0.00	0.02			-	-	0.00	-
Angrist-Pischke chi-squared statistic of *Reserves (-1)*			8.86	-			-	-	9.79	-
p-value			0.00	-			-	-	0.00	-
Angrist-Pischke chi-squared statistic of ∆*Reserves*			-	-			4.26	5.46	-	3.39
p-value			-	-			0.04	0.02	-	0.07
Angrist-Pischke chi-squared statistic of ∆*Reserves (-1)*			-	-			5.30		-	4.94
p-value			-	-			0.02		-	0.03

Note: Observations are three-month averages over the period 2006–11. Cluster-robust *t* statistics in parentheses. The table presents OLS and 2SLS estimates of the impact of the log of free reserves on the log of private-sector credit. The 2SLS estimates use the one period-lag of fish exports to the EU as instrument for reserves. Columns (1)–(5) specify the model in levels and include bank fixed-effects and a linear time trend. Columns (6)–(10) specify the model in first differences. All specifications include a dummy for the six months following the 2008 coup d'etat.

* p<0.10, ** p<0.05, *** p<0.01.

Table 6: Government Credit Using Free Reserves

	Benchmark				Alternative/Robustness					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS in Levels	OLS in Levels	2SLS in Levels	2SLS in Levels	First Difference	First Difference	2SLS in First Difference	2SLS in First Difference	2SLS in Levels	2SLS in First Difference
Reserves	-0.01	0.03	-0.09	-0.05					-0.07	
	(-0.09)	(0.46)	(-0.53)	(-0.47)					(-0.37)	
Reserves (-1)	0.13		0.04						0.04	
	(1.08)		(0.19)						(0.19)	
∆*Reserves*					-0.11	-0.13*	-0.21	-0.27		-0.23
					(-1.96)	(-2.20)	(-0.99)	(-1.06)		(-1.10)
∆*Reserves (-1)*					0.14		0.13			0.12
					(1.60)		(0.68)			(0.62)
Capital									-0.05	
									(-0.14)	
∆*Capital*										0.11
										(0.43)
Observations	87	108	82	98	72	87	67	82	82	67
R-squared	0.09	0.03	0.06	0.08	0.19	0.09	0.13	-0.01	0.07	0.12
					Underindentification tests					
Kleibergen-Paap LM statistic			4.22	3.64			2.83	2.69	4.39	2.70
p-value			0.04	0.16			0.09	0.10	0.04	0.10
Angrist-Pischke chi-squared statistic of *Reserves*			10.52	7.93			-	-	9.21	-
p-value			0.00	0.02			-	-	0.00	-
Angrist-Pischke chi-squared statistic of *Reserves (-1)*			8.86	-			-	-	9.79	-
p-value			0.00	-			-	-	0.00	-
Angrist-Pischke chi-squared statistic of ∆*Reserves*			-	-			4.26	5.46	-	3.39
p-value			-	-			0.04	0.02	-	0.07
Angrist-Pischke chi-squared statistic of ∆*Reserves (-1)*			-	-			5.30	-	-	4.94
p-value			-	-			0.02	-	-	0.03

Note: Observations are three-month averages over the period 2006–11. Cluster-robust *t* statistics in parentheses. The table presents OLS and 2SLS estimates of the impact of the log of free reserves on the log of government credit. The 2SLS estimates use the one period-lag of fish exports to the EU as instrument for reserves. Columns (1)–(5) specify the model in levels and include bank fixed-effects and a linear time trend. Columns (6)–(10) specify the model in first differences. All specifications include a dummy for the six months following the 2008 coup d'etat.

* p<0.10, ** p<0.05, *** p<0.01.

Table 7: Short-term Trade Finance Credit Using Free Reserves

	Benchmark				Alternative/Robustness					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS in Levels	OLS in Levels	2SLS in Levels	2SLS in Levels	First Difference	First Difference	2SLS in First Difference	2SLS in First Difference	2SLS in Levels	2SLS in First Difference
Reserves	0.06	0.09	0.08	0.13					-0.03	
	(1.79)	(0.88)	(0.49)	(0.67)					(-0.19)	
Reserves (-1)	0.00		0.06*						0.09	
	(0.03)		(2.27)						(1.45)	
∆*Reserves*					0.03	-0.00	0.06	0.14		0.05
					(1.51)	(-0.14)	(0.58)	(0.72)		(0.48)
∆*Reserves (-1)*					-0.00		-0.02			-0.02
					(-0.02)		(-0.41)			(-0.54)
Capital									0.52	
									(1.18)	
∆*Capital*										0.10
										(0.73)
Observations	87	108	82	98	72	87	67	82	82	67
R-squared	0.43	0.29	0.42	0.29	0.03	0.00	0.02	-0.06	0.44	0.04
					Underindentification tests					
Kleibergen-Paap LM statistic			4.22	3.64			2.83	2.69	4.39	2.70
p-value			0.04	0.16			0.09	0.10	0.04	0.10
Angrist-Pischke chi-squared statistic of *Reserves*			10.52	7.93			-	-	9.21	-
p-value			0.00	0.02			-	-	0.00	-
Angrist-Pischke chi-squared statistic of *Reserves (-1)*			8.86				-	-	9.79	-
p-value			0.00				-	-	0.00	-
Angrist-Pischke chi-squared statistic of ∆*Reserves*			-	-			4.26	5.46	0.00	3.39
p-value			-	-			0.04	0.02	-	0.07
Angrist-Pischke chi-squared statistic of ∆*Reserves (-1)*			-	-			5.30		-	4.94
p-value			-	-			0.02		-	0.03

Note: Observations are three-month averages over the period 2006–11. Cluster-robust *t* statistics in parentheses. The table presents OLS and 2SLS estimates of the impact of the log of free reserves on the log of short-term trade finance credit. The 2SLS estimates use the one period-lag of fish exports to the EU as instrument for reserves. Columns (1)–(5) specify the model in levels and include bank fixed-effects and a linear time trend. Columns (6)–(10) specify the model in first differences. All specifications include a dummy for the six months following the 2008 coup d'etat.

* p<0.10, ** p<0.05, *** p<0.01.

Figure 1. Private-sector Credit: Structural Impulse Response Functions

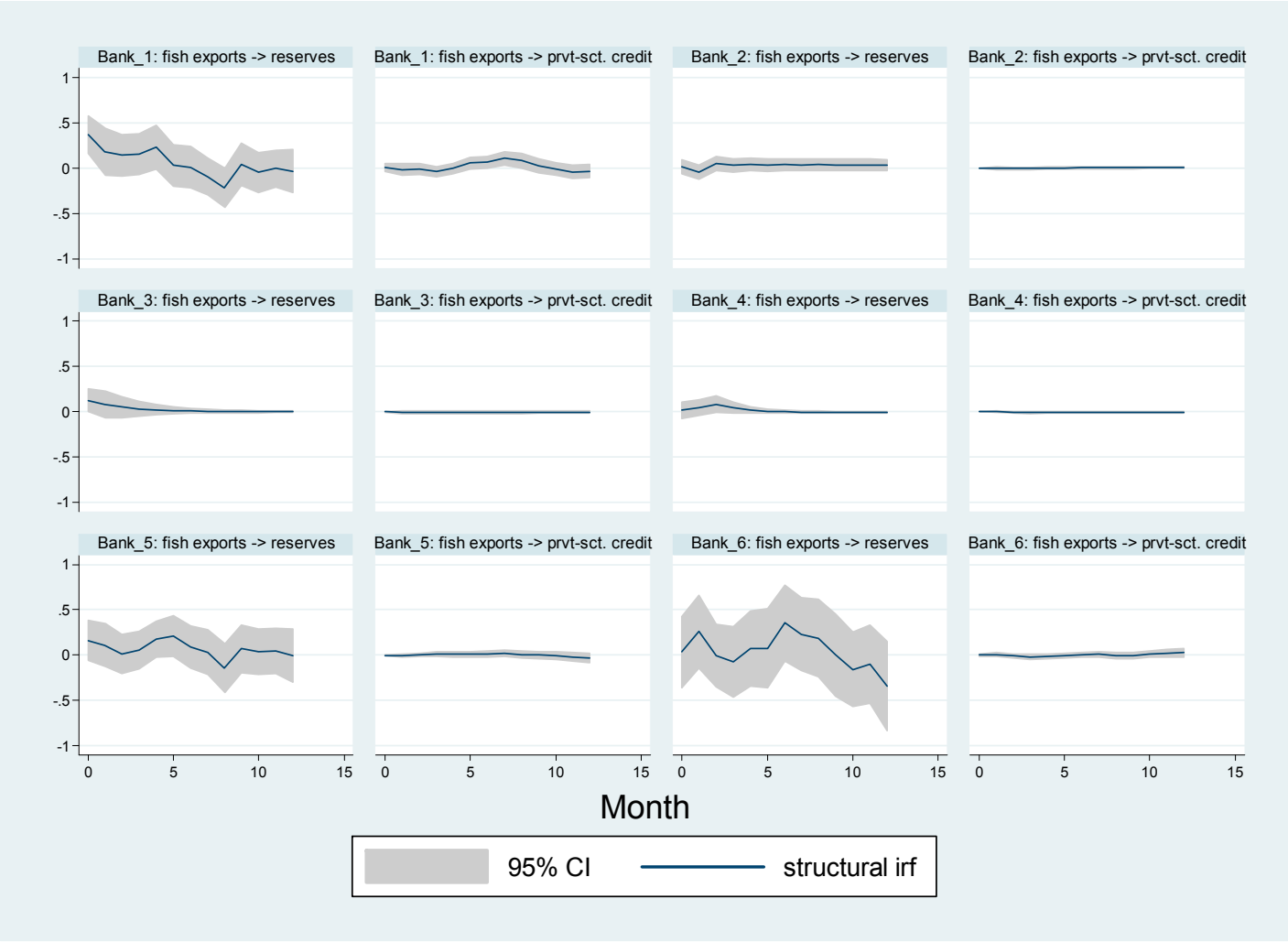

Figure 2. Government Credit: Structural Impulse Response Functions

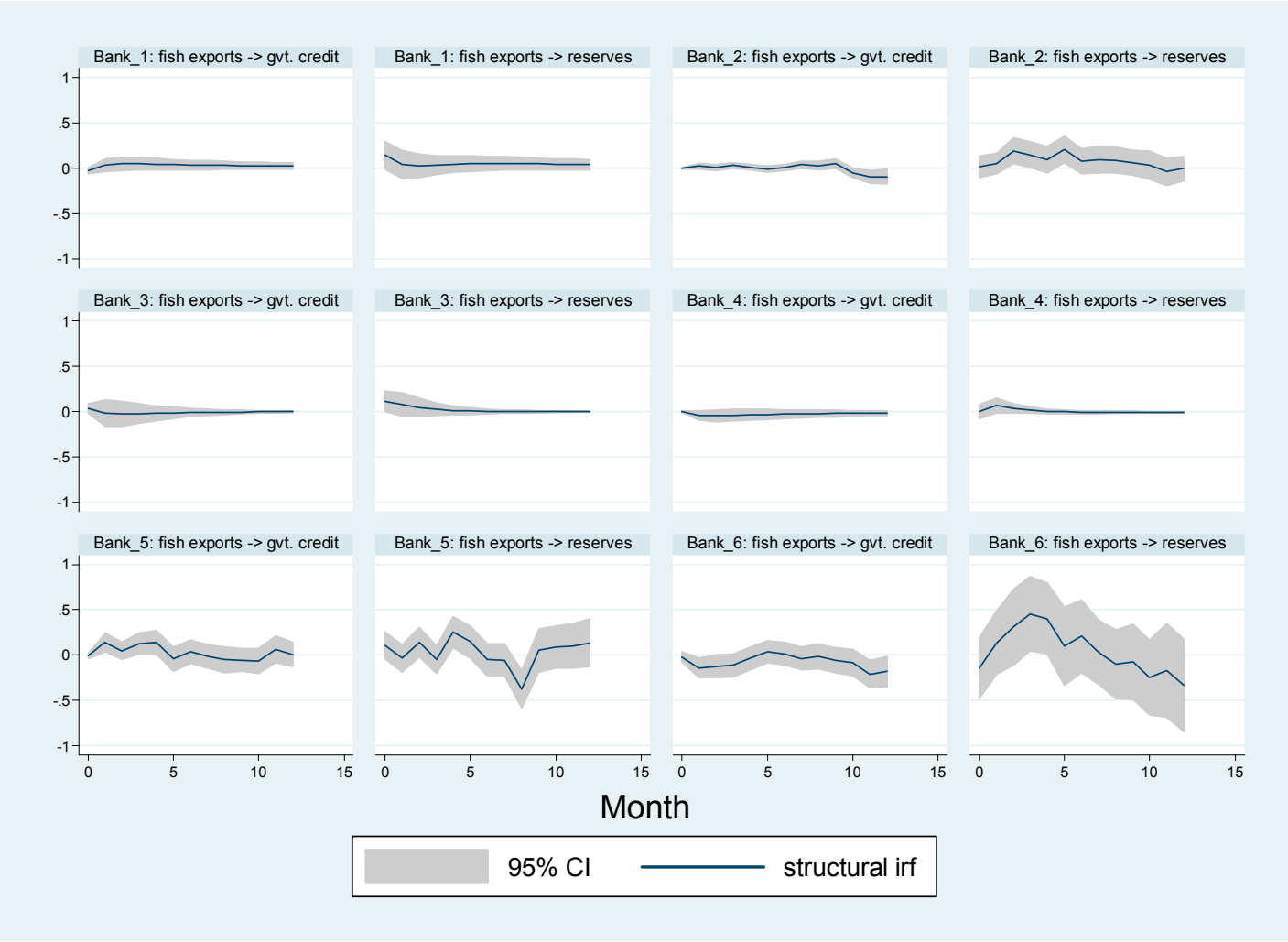

Figure 3. Short-term Trade Finance Credit: Structural Impulse Response Functions