Monetary Dilemmas in the West African Union

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Abstract

Formed in the aftermath of the Franc Zone, the West African Economic and Monetary Union offers a rare setting to examine monetary transmission in an understudied corner of the Trilemma – operating under a hard peg to the euro and binding capital controls. This study analyses how domestic monetary shocks propagate internally and how the WAEMU is affected by external spillovers from the European Central Bank and the Federal Reserve. Using monthly national data and bilateral VARs with state-of-the-art identification, the analysis uncovers marked sensitivity to both conventional and unconventional shocks.

Keywords: Monetary policy, Monetary Union, Trilemma, Exchange Rates.
JEL Classification: E5, F3, F4, C3.

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1 Introduction

The analysis of monetary policy spillovers has long been grounded in the Mundell-Fleming framework. The well-known Trilemma states that an economy cannot simultaneously achieve a fixed exchange rate, free capital flows, and independent monetary policy. A central insight of the framework is that the extent of spillovers is determined by three policy dimensions: the strength and channels of transmission of foreign policy to domestic conditions depend on which margins of adjustment are operative. For instance, with open capital flows, the flexible exchange rate provides a mechanism to partially absorb external shocks. Conversely, under a fixed exchange rate regime, the exchange rate channel of transmission is effectively shut down, whereas restrictions on capital mobility attenuate financial spillovers transmitted through cross-border financial flows. In both cases, an independent monetary policy can respond to domestic conditions.

Recent research has argued that the presence of dominant economies and currencies in a tightly integrated global economy can create additional channels for the propagation of shocks originating in major economies, and effectively reduce the Trilemma to a Dilemma in which open capital flows constrain monetary independence (see Rey, 2016). For example, monetary policy in the United States can affect the rest of the world through financial channels (see Farhi and Werning, 2014; Bruno and Shin, 2015; Miranda-Agrippino and Rey, 2020, among others), whereby a tightening of US financial conditions is mirrored abroad. Spillovers can also be transmitted through commodity prices, as weaker demand from the United States or the euro area may put downward pressure on commodity markets and generate further disinflationary effects in other economies (see Degasperi et al., 2026; Ider et al., 2024).

Existing empirical work on international monetary spillovers has largely focused on recipient economies characterised by high capital mobility. This leaves an important gap in the literature – much less is known about how spillovers operate in environments where both the exchange rate channel and capital flows are constrained. In this paper, we focus on one such case and aim to understand the domestic and international transmission of monetary policy in the West African Economic and Monetary Union (WAEMU).

The WAEMU is one of the four existing groups of countries issuing a common currency under a common central bank, the BCEAO (*Banque Centrale des États de l'Afrique*

de l'Ouest).[1] The monetary union comprises eight African countries whose currency, the West African franc of the African Financial Community (West African CFA franc), maintains a fixed peg with the euro. This institutional arrangement, which we survey in Sections 2 and 3, provides a distinctive empirical setting in which a group of economies simultaneously maintain a hard exchange rate peg along with restrictions on capital flows, a policy configuration that has become increasingly uncommon in the contemporary international monetary system. Within the Mundell-Fleming framework, these two policy corners secure monetary autonomy – as it is apparent by the relatively low correlation of the policy and inflation rates in the WAEMU and in the euro area.

Our empirical analysis proceeds in two steps. First, in Section 5, we study the domestic transmission of the BCEAO monetary policy to the West African economies. To this end, we estimate a VAR with a rich dataset of monthly aggregate WAEMU-wide economic and financial variables, and identify monetary policy shocks with a recursive identification. This approach assumes that while monetary policy can react to contemporaneous business cycle shocks, prices and the real economy respond to policy actions with a lag. In our setting, that lacks deep financial markets, more modern approaches that use high-frequency responses of asset prices to policy announcements are not feasible.[2]

Our results indicate that domestic monetary policy in the WAEMU has a relatively weak transmission to the real economy. A 100 basis point increase in the policy rate induces a 2% decline in industrial production over a six-month horizon, and a 1% contraction in prices – although these effects are only significant at the 68% level. The effects on financial variables are stronger and more persistent, with a 5% decline in banks' reserves and an increase in sovereign bond yields of almost 100 basis points. The index of the common stock market, based in Abidjan, contracts persistently, with a 15% adjustment over a two-year horizon. The interbank market responds only weakly to the policy

[1] The four monetary unions with a common central bank, which issues a regional currency, are the WAEMU, the Economic and Monetary Community of Central Africa (CEMAC), the euro area, and the Eastern Caribbean Currency Union (ECCU). The WAEMU and the CEMAC peg their respective currencies – the West African CFA franc, and the Central African CFA franc – at the same value against the euro and share a common historical path, and hence are often considered together as forming the common area of the CFA franc. These institutional arrangements are different from 'dollarisation,' where a country adopts the currency of another country with no shared monetary policy. In Southern Africa, several countries peg their currencies to the South African rand and also accept the rand as legal tender – however they do not have a common central bank.

[2] The recursive approach has been criticised and high-frequency methods preferred, when applied in advanced economies where monetary policy and financial variables are unlikely to respond in a recursive fashion. Yet, research in emerging markets where both state-of-the-art and recursive methods are possible, has shown that the two approaches deliver equivalent results (see Pirozhkova et al., 2024).

action – an indication of limited market efficiency, where part of the banking system is characterised by excess liquidity while others face shortages. This may reflect low trust across banking groups, requiring the central bank to provide liquidity to the system. Importantly, the weak transmission of BCEAO policy rates to the economy, together with the effective management of inflation in the area, suggests that the Bank complements interest-rate tools with coordination across fiscal authorities and other policy instruments.

Second, in Section 6, we analyse the international spillovers of the euro area (EA) and the United States (US) monetary policies. We do this by estimating bilateral VARs with monthly data for the WAEMU and one of the two large economies. Monetary policy shocks for the EA and the US are identified using external instrumental variables (IVs). In particular, we study the transmission to the WAEMU of: (i) conventional and unconventional ECB monetary policy using Ricco et al. (2024)'s informationally robust refinement of the high-frequency surprises of Altavilla et al. (2019); and (ii) US conventional and unconventional monetary policy, employing the informationally robust methodology of Miranda-Agrippino and Ricco (2021) which is based on the high frequency monetary surprises of Gürkaynak et al. (2005).

The empirical results indicate powerful spillovers from both conventional and unconventional ECB monetary policy. A 100 basis point tightening at the short end of the yield curve in the euro area causes a persistent decline in industrial production of roughly 5%, downward pressure on prices with an estimated 2% contraction, a decline in foreign reserves, an appreciation of the CFA franc against the dollar, and a 10% reduction in both imports and exports. The downward pressure on commodity prices due to the tightening in the euro area appears to reinforce the deflationary effects in the WAEMU. Unconventional monetary policy generates effects of similar direction and magnitude.[3] In both cases, domestic policy appears to lean against the external shock, but with limited effects.

Estimates from the bilateral VAR for the WAEMU and the United States suggest that conventional and unconventional contractionary US monetary policy shocks have similar effects on output and trade variables, but larger effects on commodity prices and, consequently, inflation in the area. Conventional US monetary policy shocks also exert a

[3]The Online Appendix also reports evidence from bilateral VARs estimated using country-level variables. We combine these results to obtain the responses of a 'median' WAEMU economy to monetary policy shocks, and find effects similar to those obtained with aggregate data, albeit with significant heterogeneity in output and price responses across countries.

substantial impact on the stock market. Domestic monetary policy tightens in response to the US shock, amplifying its overall contractionary effects. These findings point to a different transmission mechanism, operating through financial spillovers and commodity prices rather than a pure demand channel. Taken together, our results indicate the limited insulation provided by capital controls and a relatively independent monetary policy in a highly integrated global economy, and provide additional evidence for the debate on the Trilemma.

We interpret these findings through a modified Mundell-Fleming model featuring two large open economies – the euro area and the US – and one small open economy, the WAEMU. In the model, the WAEMU maintains a fixed exchange rate with the euro area which means that the demand and financial channels are operative. In contrast to the euro area, the US has an indirect flexible exchange rate with the WAEMU through the peg of the CFA franc with the euro. Hence, the response to contractionary US policy also incorporates indirect effect of the exchange rate. The stylised model interprets our findings as reflecting a relatively weak financial channel and a more powerful demand channel for euro area spillovers, possibly reinforced in its deflationary effects by a commodity price channel.

Related literature. This paper contributes to the understanding of the domestic transmission of monetary policy in the WAEMU. Two influential books providing an in-depth discussion of the policy framework of the WAEMU are Gulde and Tsangarides (2008) and Bassambié (2018). A few works have studied the domestic transmission of monetary policy shocks in the area. Kireyev (2015, 2016) find weak transmission of the policy rate on the money market rate, regional lending rates, and inflation. Sodokin et al. (2024) finds that monetary policy must be highly accommodative to stimulate private investment. These findings are in line with Mishra et al. (2012), who document weaker transmission of monetary policy in low income countries. Our approach on examining domestic transmission deviates from the older literature by adopting a Bayesian Vector Autoregression (VAR) model that explicitly accounts for dynamic interactions among endogenous variables and can efficiently incorporate a large set of WAEMU macroeconomic and financial variables.

The literature on monetary spillovers has expanded over the past decade, and especially on the impulse of the debate on the Trilemma cited above. A complete survey of

the literature far exceeds the scope of this paper.

The spillover effects of ECB policies have been extensively studied, particularly for non-euro area European economies.[4] Results in this literature generally indicate that contractionary euro area monetary policy shocks reduce industrial production in partner economies. Evidence on the response of prices to conventional policy shocks is more mixed, while unconventional policy shocks tend to generate declines in prices. Studies of financial transmission generally find limited effects on equity markets. Our findings – in a setting with a strong peg – corroborate the broad consensus that contractionary euro area policy, both conventional and unconventional, leads to a decline in industrial production abroad. We also find a relatively weak financial channel for ECB policy.

The literature on the US monetary policy spillovers is very large. The literature documents significant effects of US monetary tightening on both advanced economies and emerging market output and prices, with some studies emphasising the role of exchange rate regimes in shaping transmission (e.g. among many others Dedola et al., 2017, Degasperi et al., 2026 and Georgiadis and Jarociński, 2025). Results in this literature indicate a relatively weak consensus that US monetary policy shocks depress both output and prices abroad, with a powerful transmission to financial variables and commodity prices. However, the response of prices abroad is likely to strongly depend on the exchange rate regime.

Overall, the literature on both US and EA spillovers has not seemed yet to reach consensus on whether spillover effects depend on the exchange rate regime.[5,6]

[4]Among others, Potjagailo (2017), Corsetti et al. (2021), Burriel and Galesi (2018), Boeckx et al. (2017), Moder (2019), and Bluwstein and Canova (2018) examine the international transmission of conventional and unconventional monetary policy to the real economy. Falagiarda et al. (2015), Fratzscher et al. (2016), Kearns et al. (2018), and Ter Ellen et al. (2020) analyse the financial channel of euro area monetary policy. Ca' Zorzi et al. (2023) reports a stark asymmetry between the United States and the euro area, with the Fed having a significant impact on euro-area financial conditions and real activity, while ECB monetary policy shocks do not exert a comparable effect on the United States.

[5]For instance, for the US, Di Giovanni and Shambaugh (2008), Dedola et al. (2017), Aizenman et al. (2016), Degasperi et al. (2026) find that spillover effects depend on the exchange rate regime. Dedola et al. (2017) and Bhattarai et al. (2017) report that exchange rate flexibility does not materially influence spillover effects. More recently, Cesa-Bianchi et al. (2024) find that response of macroeconomic aggregates in countries with the most flexible exchange rate are similar to those with exchange rate pegs. Vicondoa (2019), Camara (2025) also find significant effect on EMs, but do not delve into differential effects across exchange rate regimes.

[6]For the euro area, Corsetti et al. (2021) show that conventional euro area monetary policy shocks generate similar effects in EU economies with flexible exchange rates and in pegged regimes, likely reflecting endogenous policy responses under inflation targeting. Also, Bluwstein and Canova (2018) does not find evidence of the exchange rate channel playing a role in the heterogeneous responses. Conversely, Cloyne et al. (2022) documents the importance of exchange rate regime for spillover effects originating from the euro area.

Against the background of the extant literature, our paper contributes to the debate by evaluating the international transmission of monetary policy on a unique set of economies whose currencies are pegged to the euro, along with a relatively financially closed economy. This unique feature captures an understudied side of the Trilemma, as opposed to the well studied case of flexible exchange rates and open capital flows. Our results indicate that economic interlinkages limit the insulation provided by closed capital flows and limit the ability of a relatively independent monetary policy to influence domestic conditions.

2 The West African and Economic Monetary Union

2.1 The CFA franc

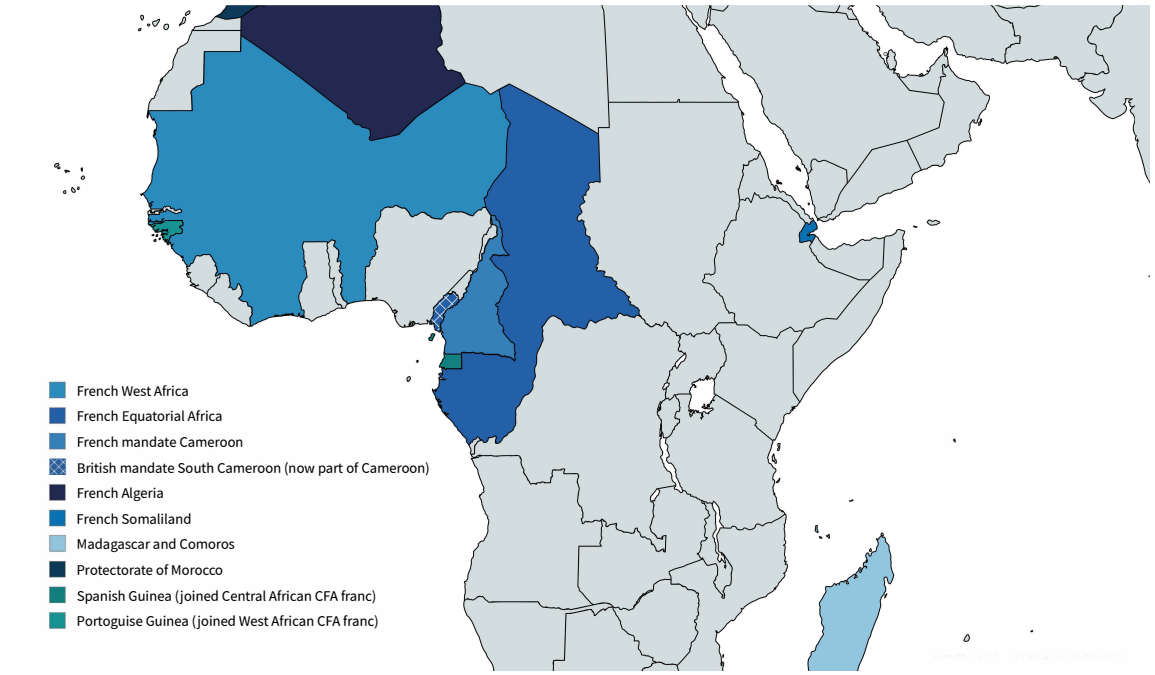
The CFA franc (*franc des Colonies Françaises d'Afrique*) was created during the final phase of colonial rule, alongside the CFP franc (*franc des Colonies Françaises du Pacifique*), in the aftermath of the Second World War and against the backdrop of the post-war weakness of the French franc. It formed part of France's efforts to reorganise its monetary system and to maintain economic ties with its overseas territories. The CFA franc was pegged to the French franc, with convertibility guaranteed by the French Treasury, thereby providing exchange rate stability and facilitating trade within the French empire. Initially, the currency covered most of French sub-Saharan Africa, as well as Madagascar and the Comoros (see Figure 1a).

Following France's ratification of the Bretton Woods Agreement in December 1945, the French franc was devalued in order to establish a fixed exchange rate with the US dollar. Separate currencies were introduced in the French colonies to prevent them from being subject to the full effects of this devaluation.[7] This arrangement facilitated imports from France while limiting exports to France.

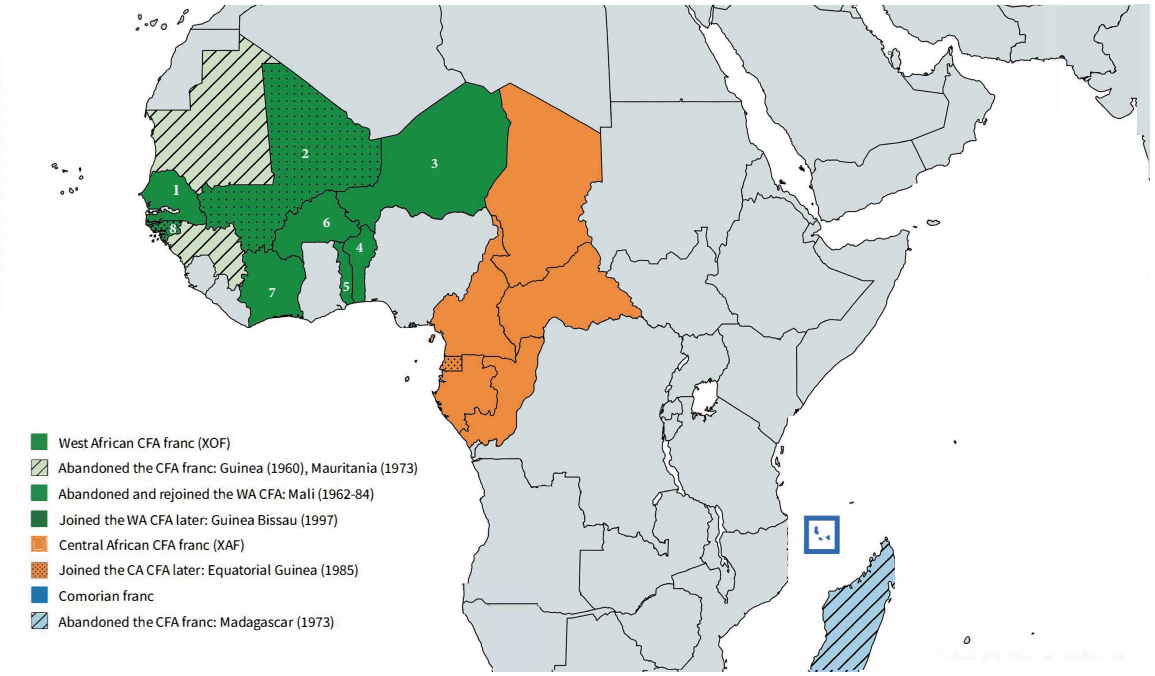
As decolonisation unfolded in the late 1950s and 1960s, most newly independent African states chose to remain within the CFA framework. The system was reorganised into two main monetary unions: West Africa, now the West African Economic and Monetary Union (WAEMU or UEMOA – i.e. *Union Économique et Monétaire Ouest Africaine*), and Central Africa, now the Economic and Monetary Community of Central Africa (CEMAC – *Communauté économique et monétaire de l'Afrique centrale*), each

[7]Before then, colonial francs were fully convertible at par with the franc of the metropolitan territory.

Figure 1: The CFA zone



(a) French colonies in Africa, and non-French colonies that joined the CFA franc.



(b) CFA currency unions and euro pegs

Note: Figure (a) displays French colonies in Africa, along with non-French territories that later joined one of the two CFA currency unions. Figure (b) illustrates the broader CFA monetary area pegged to the euro. It includes the two CFA currency unions – the West African CFA franc (XOF) and the Central African CFA franc (XAF) – as well as the Comorian franc, which is separately pegged to the euro. The countries that are currently part of the WAEMU are: (1) Senegal, (2) Mali, (3) Niger, (4) Benin, (5) Togo, (6) Burkina Faso, (7) Ivory Coast, (8) Guinea Bissau. The figure also traces the historical evolution of these monetary zones and of the former currency union of Comoros and Madagascar.

with its own central bank and issuing its own currency, namely the West African CFA franc (XOF) and the Central African CFA franc (XAF). The peg of the two currencies was (and remains) fixed at the same value against the French franc (and now the euro). A third CFA franc was created for Madagascar and the smaller island colonies in the region, the Madagascar–Comores CFA franc (XMCF).

Not all territories followed the same path (see Figure 1b). Several countries have left or joined the CFA system over time. Guinea exited immediately in 1960, while Mauritania left the CFA franc in 1973, with both countries introducing their own currencies. Mali left the CFA zone in 1962, introduced a national currency, and then rejoined WAEMU in 1984. Conversely, some countries joined later: Equatorial Guinea, despite being a former Spanish colony, joined CEMAC in 1985. Guinea-Bissau, a former Portuguese colony, adopted the CFA franc in 1997, becoming a WAEMU member, highlighting the perceived benefits of monetary stability. In the southern hemisphere, Madagascar left the Madagascar–Comores CFA franc (XMCF) in 1973 and introduced the Malagasy franc, reflecting a broader push for monetary sovereignty. The Comoros followed a different trajectory: after independence in 1975, it exited the CFA system but retained close monetary ties with France by creating the Comorian franc (KMF), which remains pegged to the euro under a separate cooperation agreement.[8,9] In 1975 and 1976, Réunion and Mayotte left the zone and adopted the French franc (subsequently the euro), becoming overseas departments of France.

The different 'legacy' CFA francs share similar institutional arrangements, and the two currency unions are pegged at the same value, and hence are often considered as a single monetary space. Yet they constitute separate monetary areas with distinct monetary authorities and diverging policy frameworks. This study focuses on the WAEMU, for which more detailed and publicly available data are available.

[8]Since 1979, Comoros has been in a monetary cooperation agreement with Paris. There is a system of fixed parity between the Comorian franc and the euro (previously the French franc). This is guaranteed by the Comorian central bank's operations account at the French Treasury. Sixty-five percent of the foreign exchange reserves of Comoros are held in euros in this account. When the ministers of finance of the CFA zone and France meet biannually, the Comorian finance minister also attends, and the arrangement between France and the Comoros is fundamentally the same as that between France and the CFA zone.

[9]Similar agreements, guaranteed by the Portuguese government as the former colonial power, are in place for the peg of the escudo of Cape Verde and of the dobra of São Tomé and Príncipe to the euro.

2.2 The Central Bank of West African States

The West African Economic and Monetary Union (WAEMU, or UEMOA in French, i.e. *Union Économique et Monétaire Ouest-Africaine*) has its roots in a 1962 treaty that established a pure monetary union among newly independent West African states.[10] This agreement codified the pre-existing CFA monetary architecture in the region, which was built upon four key features: first, a common currency (the West African CFA franc – renamed *franc de la Communauté Financière Africaine*), pegged initially to the French franc and subsequently to the euro from 1999; second, a shared central bank – the BCEAO, i.e. *Banque Centrale des États de l'Afrique de l'Ouest* – responsible for conducting monetary policy in the WAEMU; third, full convertibility of the currency into French francs, and later the euro, guaranteed by the French Treasury; and fourth, the centralisation of foreign exchange reserves at the central bank, which converts all inflows of foreign currency into domestic francs. The 1994 treaty expanded this framework into a full economic and monetary union by introducing supranational institutions such as a Commission and a Court of Justice to enforce common policies. It mandated the harmonisation of economic and budgetary policies, established a common market, and coordinated sectoral strategies. The founding members were Benin, Burkina Faso, Ivory Coast, Mali, Niger, Senegal, and Togo, with Guinea-Bissau joining in 1997 (see Figure 1b).

A key characteristic of the WAEMU is its fixed exchange rate, which has experienced only two devaluations over the course of its existence.[11] The institutional set-up of the WAEMU implies a highly stable exchange rate regime – backed by the French Treasury guarantee, a feature quantitatively confirmed by the assessment of the exchange-rate stability index of Aizenman et al. (2008), which assigns the WAEMU a value of 0.79 (higher values indicate greater stability).[12]

The strong exchange-rate commitment is accompanied by limited capital mobility,

[10] Territorially, the WAEMU largely overlapped with the broader regional organisation, the Economic Community of West African States (ECOWAS) – in French CEDEAO, i.e. *Communauté économique des États de l'Afrique de l'Ouest* – established in 1975. However, in 2024 the military governments of Niger, Burkina Faso, and Mali jointly announced their withdrawal from the bloc, after having been suspended following respective military takeovers in these countries.

[11] The peg has been highly stable over time, with only two devaluations. The currency was pegged to the French franc at CFA 1 = F 2 from 1948, becoming CFA 1 = NF 0.02 after the introduction of the new franc at 1 new franc = 100 old francs. In 1994 the currency was devalued by half to CFA 1 = NF 0.01. From 1999 onwards it has been pegged to the euro at €1 = NF 6.55957 = CFA 655.957.

[12] We compute the WAEMU index value as the average, over the sample period and across all member countries, of the country-level values reported in Aizenman et al. (2008).

centralisation of reserves, and restrictions on external exchangeability of the CFA franc. The Chinn and Ito (2008) index, which quantifies the degree of financial openness on a scale from 0 to 1 – where 0 indicates minimal openness – yields a value of 0.23, allowing the region to be classified as having low capital openness.[13,14] This assessment is corroborated by the capital control index of Fernández et al. (2015), which yields an average value of 0.72, indicating a high prevalence of capital controls.

2.3 The monetary policy framework

Let us now review the policy framework of the central bank (for a detailed discussion of the evolution of the policy framework, see the authoritative monographs of Gulde and Tsangarides, 2008 and Bassambié, 2018). In the early years of the WAEMU, the BCEAO primarily focused on providing liquidity on an individual basis to firms and banks, with quantitative limits on the credit provided and preferential rates applied to sectors deemed to be of priority. This microeconomic approach was progressively abandoned, starting with a reform in 1975, when the bank shifted towards macroeconomic management of the economy and adopted a quantity-based monetary policy framework in which liquidity was adjusted in response to conjunctural conditions across the union.[15] With the 1989 reform, and in line with developments at other central banks, the BCEAO gradually moved towards an interest-rate-based framework with a clearer focus on price stability and banking supervision, alongside the introduction of a system of required reserves in 1993.

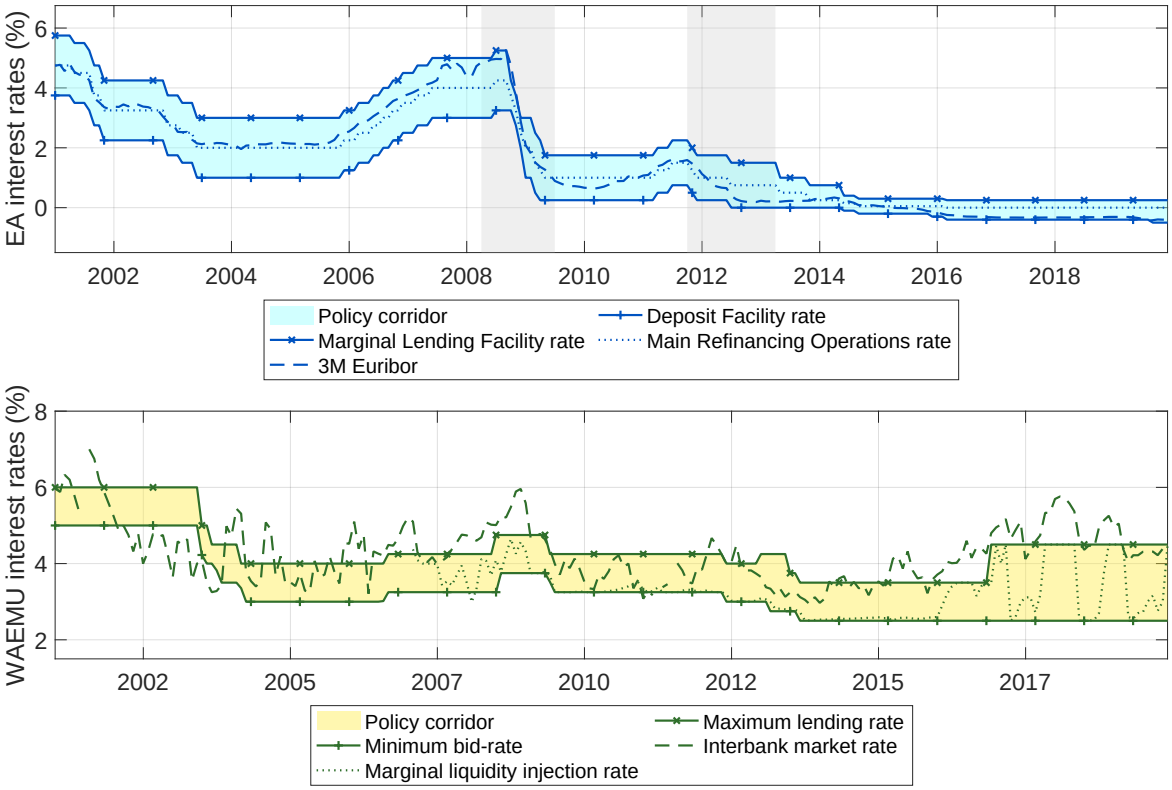
Liquidity was provided through the discount rate mechanism, repurchase agreements, and auctions of central bank bills, with the minimum bid rate (*taux minimum de soumission*) acting as a floor (Hernández-Catá and François, 1998). A pivotal moment was the sudden devaluation of the currency on 12 January 1994, undertaken in response to a prolonged deterioration in macroeconomic conditions, when the CFA franc was devalued by 50 percent against the French franc.

[13] Contrary to what is reported in some of the literature, capital outflows, including those directed towards Europe and France, are subject to authorisation and regulation.

[14] Chinn and Ito (2008) provide country-level data; to compute the aggregate WAEMU value, we first take the average over the sample period for each country and then average across the countries considered.

[15] The main instrument was the *concours global*, i.e. the global refinancing envelope through which the BCEAO provided liquidity to commercial banks. Rather than steering short-term interest rates, the central bank fixed an aggregate quantity of refinancing available to the banking system and allocated it administratively. In essence, this was a credit ceiling mechanism operating at the system-wide level, with bank-level allocations determined ex ante.

Figure 2: ECB and BCEAO policy and market interest rates



Note: This figure plots the policy corridor for the euro area and WAEMU along with the interbank market interest rate. The grey shades denote crisis periods of the Global Financial Crisis and the euro area debt crisis. Source: BCEAO and ECB.

The current framework, formalised in the revised WAEMU Treaty adopted in 2007 and implemented from April 2010, has aligned the BCEAO with the standards of modern central banking (see Kireyev, 2015 and Bassambié, 2018). The new treaty (i) formalised price stability as the primary objective of monetary policy, (ii) enhanced the institutional independence of the BCEAO, (iii) established the Monetary Policy Committee, and (iv) legally codified the use of indirect, market-based instruments as the core of the bank's operational framework. The fixed exchange rate regime was maintained.

The reformed liquidity framework operates through weekly and monthly auctions in which liquidity is allocated starting from the highest bidder and continuing until the pre-determined amount is exhausted. Two policy rates (*taux directeurs*) are used to steer liquidity: the minimum bid rate applied in auctions, and the maximum lending rate. The latter serves as the rate at which banks can borrow liquidity outside auctions, effectively acting as a ceiling on auction rates. The auctions generate two additional interest rates.

First, the marginal liquidity injection rate (*taux marginal*), which is the rate applied to the final allotment in the BCEAO's weekly auction. Second, the weighted average interest rate (*taux moyen pondéré*) of the bids serviced by the central bank.[16]

Figure 2 plots policy rates and interbank rates for the euro area and the WAEMU over the study period. The grey shaded areas denote the Global Financial Crisis and the euro area sovereign debt crisis. In the euro area, the ECB policy corridor is defined by the deposit facility rate as the floor and the marginal lending facility rate as the ceiling. Two observations are particularly important. First, a simple inspection of policy rates in the two areas reveals a low correlation, suggesting a degree of monetary policy independence of the BCEAO vis-à-vis the ECB. Second, there is a marked difference in interbank market behaviour across the two regions. In the euro area, the three-month interbank rate largely remains within the policy corridor, whereas the WAEMU interbank rate exhibits substantial volatility and lies outside the policy corridor for prolonged periods.

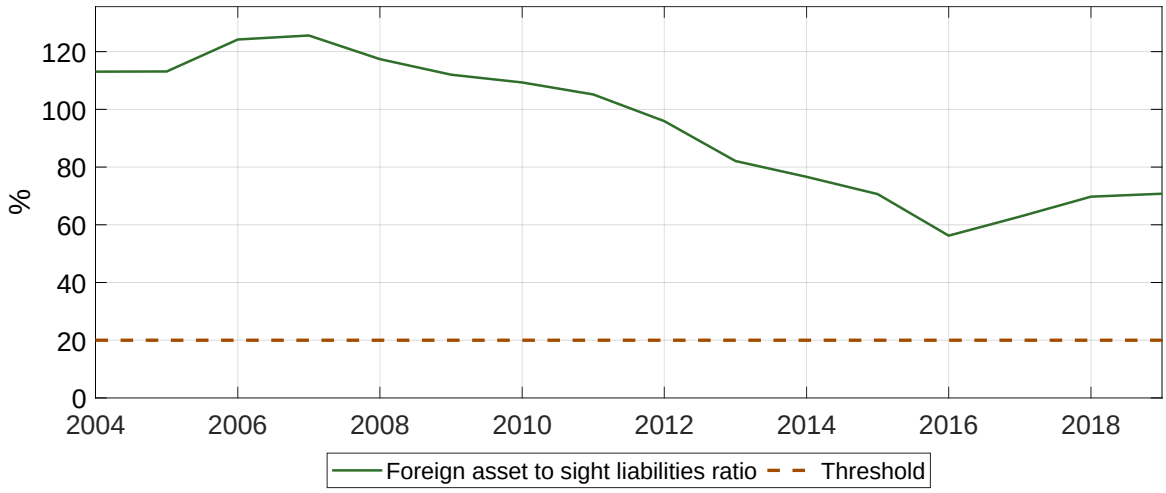
Since 2010, the BCEAO has explicitly used the interbank rate as its operating target. While this rate remained largely within the policy corridor during the first half of the 2010s, it subsequently overshot the marginal lending rate. This reflects the limited depth and segmentation of the WAEMU interbank market, with some banks holding excess liquidity while others face persistent shortages and therefore rely on central bank refinancing (see also Kireyev, 2015). Bank size plays an important role: larger banks participate actively in the interbank market but are generally reluctant to lend to smaller institutions due to elevated credit risk.[17]

The WAEMU operates at the corner of the monetary Trilemma characterised by a fixed exchange rate regime and restricted capital mobility. Hence, monetary policy autonomy under a peg is feasible as long as the bank maintains sufficient reserves. This requirement is enforced via treaty provisions on convergence and fiscal rules for member states: (i) the overall fiscal deficit of the general government (after grants) must not exceed 3% of GDP; (ii) public debt should not exceed 70% of GDP; (iii) government wage expenditures should not exceed 35% of current revenue; (iv) member states are prohibited from accumulating arrears to public creditors; and governments are prohibited from direct overdrafts at

[16]The WAEMU has a short-term interbank market for maturities of 1 day, 1 week, 1 month and 3 months. The markets for 1 month and 3 month maturities were established in 2011 and 2014, respectively. The BCEAO also calculates the weighted average rate based on all interbank activities. These rates are naturally higher than the money market rate in auctions. For our sample, the difference is roughly 50 basis points.

[17]IMF (2022) documents the geographical concentration of banks in Ivory Coast and Senegal.

Figure 3: WAEMU foreign asset coverage ratio



Note: This figure plots the ratio of the bank's average net foreign assets to average sight liabilities, along with the threshold level required under Article 76 of the Statues of the BCEAO. Source: BCEAO.

the BCEAO or central bank financing of deficits beyond authorised levels, except under emergency conditions defined in the Treaty. The BCEAO monitors compliance with fiscal rules and reports to the WAEMU Council of Ministers and the Monetary Policy Committee.[18]

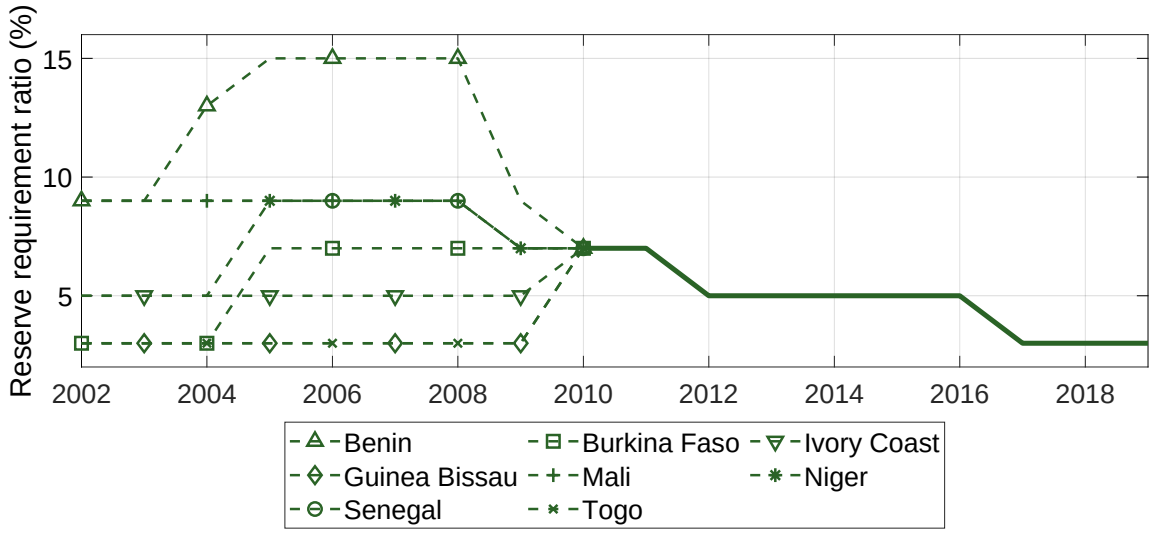
The bank monitors a statutory reserve coverage ratio as defined in Article 76 of the Statutes of the BCEAO. Specifically, over three consecutive months, the ratio between the bank's average net foreign assets and average sight liabilities – comprising money in circulation, bank reserves, and deposits of states and other public entities – must remain above 20%. Falling below this threshold requires the BCEAO to take measures to restore sufficient asset coverage of its liabilities. Figure 3 plots this ratio for the period 2004-2019 and shows that the ratio remained comfortably above the threshold level during the entire period.[19]

Consistent with the Trilemma implications and the level of reserves, WAEMU appears to retain a non-negligible degree of monetary policy autonomy. The monetary policy

[18]BCEAO coordination of the monetary-fiscal policy mix appears to be a key, albeit informal, component in managing the area's demand to stabilise the economy and control inflation.

[19]As a counterpart for the convertibility guarantee provided by the French Treasury, the member states of the CFA franc were required to centralise their foreign exchange reserves and deposit half of them with Banque de France. France also maintained a presence in the governing board of the central banks. These requirements were dropped in the France-WAEMU agreements of 2019 (which become effective in 2021) for the West African CFA franc. However, they remain unchanged for the Central African CFA franc.

Figure 4: WAEMU reserve requirement ratio



Note: This figure plots the reserve requirement ratio applicable to banks in member nations of the WAEMU. Source: BCEAO monthly statistics bulletin, May 2025.

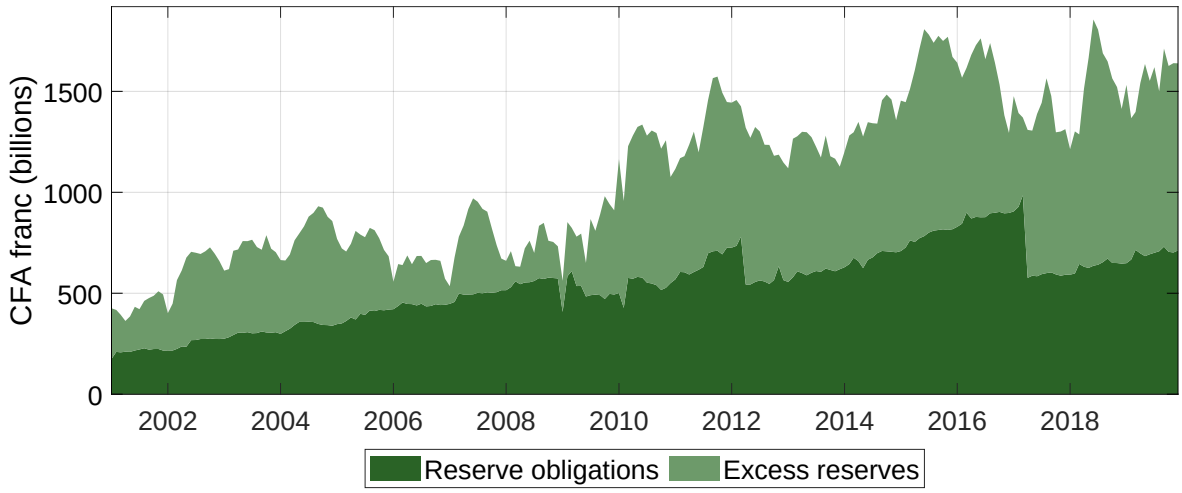
independence index of Aizenman et al. (2008) records a value of 0.59, placing the union in the top tercile of the global distribution.[20]

In addition to setting interest rates, the central bank also imposes on financial institutions a reserve requirement ratio on eligible deposits that broadly includes bank deposits, short-term credit, and gross external assets (Figure 4). Prior to December 2010, the reserve requirement ratio differed substantially across countries, reflecting country-specific liquidity conditions. However, this heterogeneity generated distortions (Kireyev, 2015), leading the BCEAO to impose a uniform rate across member states. In general, banks hold excess reserves at the BCEAO. Figure 5 shows that these accounted for more than half of total reserves on average over the period 2001-2019. However, excess reserves are unevenly distributed across the banking system and primarily reflects the reluctance of large banks to participate in the interbank market, leaving smaller banks dependent on liquidity provision by the central bank.

From the 1990s onwards, the BCEAO increasingly defined its policy objectives in terms of price stability. In the initial years of our sample, WAEMU inflation exhibited greater volatility, with a range of roughly 6 percentage points prior to the Global Financial Crisis

[20]The index is constructed such that higher values indicate greater independence, with 1 corresponding to the maximum degree. Considering the countries of interest in the most recent year available, WAEMU obtains a value of 0.59, placing it in the top tercile of the global distribution when countries are ranked by monetary policy independence, based on the average value over the sample period for each country.

Figure 5: WAEMU bank reserves (CFAF billions)



Note: This figure plots reserve obligations and excess reserves held at the BCEAO in a stacked area chart. Their combined height represents total bank reserves. Source: BCEAO and Kireyev (2015).

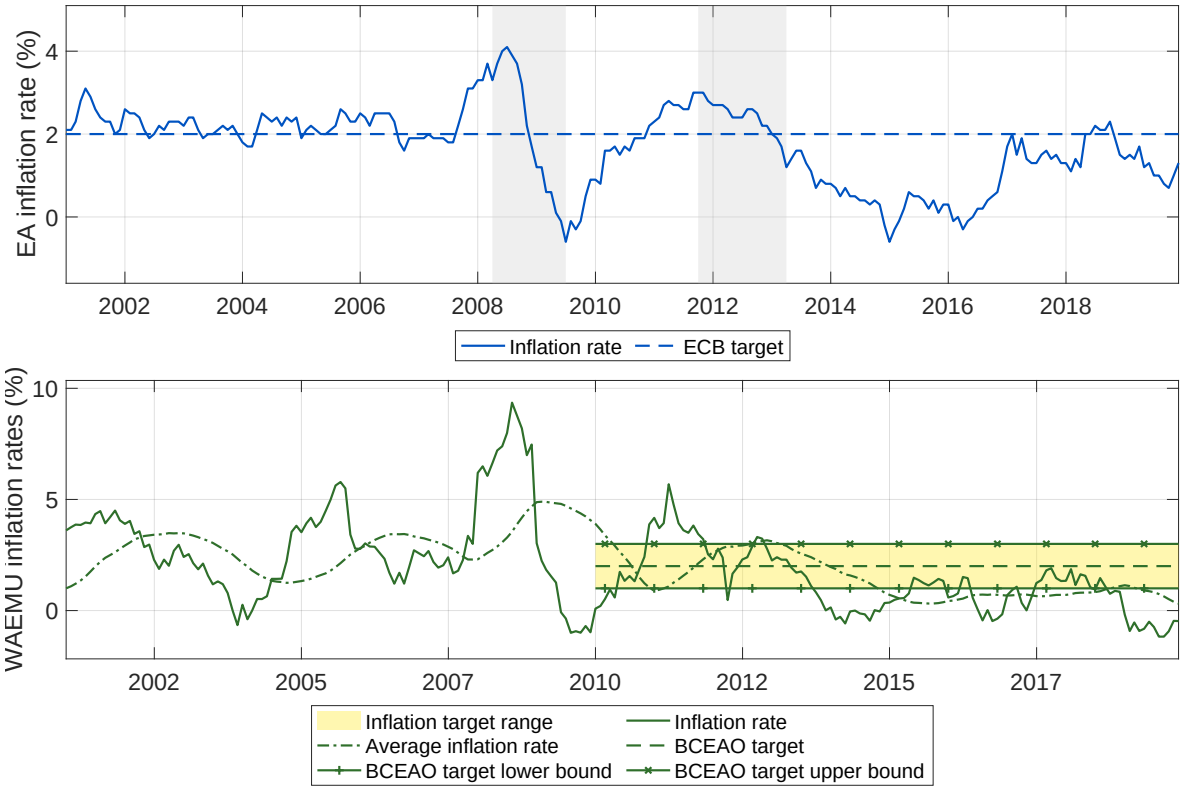
(see Figure 6). By contrast, inflation in the EA was relatively stable and close to 2% for most of this period. In 2010, the BCEAO shifted its policy objective to an inflation target band centred on an average rate of 2% over a two-year period, with a symmetric margin of 1%, alongside a secondary objective of sustainable economic growth. Over this period, the adoption of the inflation target coincided with smaller inflation peaks. The two-year average inflation rate in the WAEMU remained within the policy band for the majority of the period and never exceeded 3%.

3 The economies of the WAEMU

The countries of the West African Economic and Monetary Union (WAEMU) are characterised by low levels of income and human development by international standards, alongside a large and rapidly growing population. Taken together, the union comprises roughly 150 million inhabitants and generates an aggregate GDP of around USD 240 billion, placing it among the larger regional groupings in sub-Saharan Africa in demographic terms, but with a modest economic weight globally.[21] Per-capita income levels remain low across all member states: according to the IMF World Economic Outlook database, Ivory Coast and Niger remained respectively the richest and poorest WAEMU members

[21] Population and GDP data are from the BCEAO database.

Figure 6: WAEMU inflation rate



Note: This figure plots the inflation rate in the euro area and the WAEMU along with the target rate of the central bank. The grey shades denote crisis periods of the Global Financial Crisis and the euro area debt crisis. Source: BCEAO and Eurostat.

in 2025, ranking 143rd and 183rd worldwide in terms of GDP per capita.[22] Poverty rates are high throughout the union, and UNDP Human Development Index (HDI) values place WAEMU countries predominantly in the low human development category, reflecting limited educational attainment, low life expectancy, and constrained income levels, despite gradual improvements over time.

Institutional and political indicators paint a mixed picture. Political instability and episodes of military intervention in several member states in recent years (Niger, Mali, Burkina Faso) have weighed on institutional quality, while other countries have maintained relatively more stable electoral systems. Overall, WAEMU countries combine macroeconomic integration and monetary stability with persistent structural challenges in terms of income, poverty reduction, human development, and political institutions, underscoring the developmental constraints faced by the union. Against this background, the sound-

[22]The pattern was similar in 2019, when Ivory Coast ranked 148th and Niger 190th worldwide.

ness of its long-standing monetary arrangements and of the policymaking of the BCEAO appear particularly noteworthy.

WAEMU economies are characterised by a high reliance on agriculture and primary commodities, and a large informal sector. Economic activity is concentrated in agriculture, extractive industries, and low value-added services, with agriculture employing a substantial share of the labour force and contributing significantly to exports, particularly through cash crops such as cocoa, cotton, and cashew nuts. Industrialisation remains limited, with manufacturing largely confined to agro-processing and light industry, while services have expanded mainly in trade, transport, and telecommunications. Growth performance has been relatively robust over the past two decades, above the sub-Saharan African average, albeit volatile and highly exposed to external shocks, including commodity price fluctuations, climatic conditions, and regional security developments.[23]

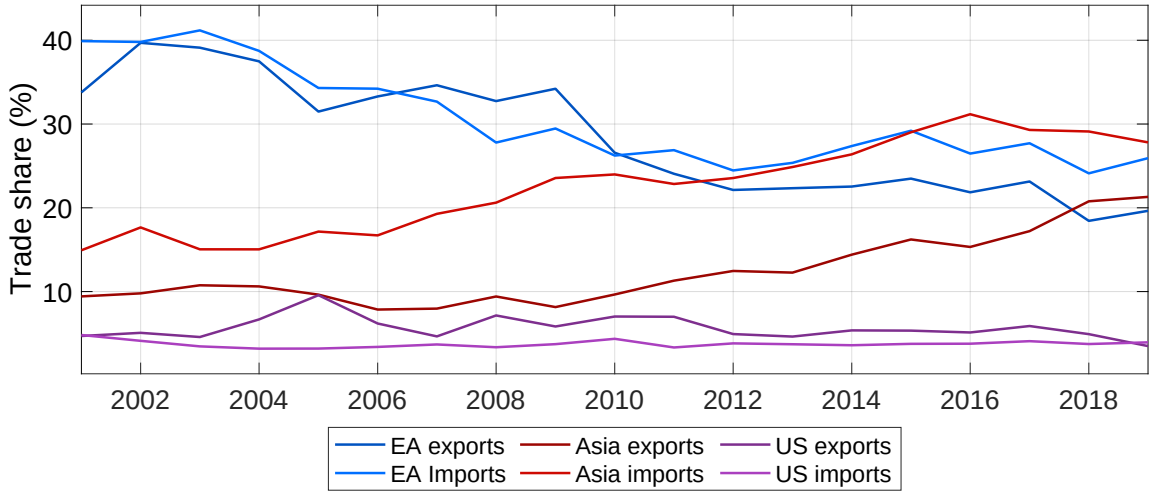
The union has established a customs union with a common external tariff and formally guarantees the free movement of goods, services, capital, and labour among member states. Intra-regional trade in goods, however, remains modest, accounting for a relatively small share of total trade, reflecting similar production structures, limited diversification, high transport costs, and persistent non-tariff barriers. Trade in services is somewhat more integrated, especially in transport, telecommunications, and banking, but regulatory heterogeneity and weak infrastructure continue to constrain deeper market integration.

Regional financial integration within WAEMU is among the most advanced in the world. WAEMU operates a shared interbank market, a regional government securities market, and a common stock exchange, based in Abidjan, the *Bourse Regionale des Valeurs Mobilieres* (BRVM), which serves all member states.[24] Cross-border banking groups play a central role in financial intermediation, facilitating regional capital flows and risk sharing. Nevertheless, financial markets remain shallow, segmented, and dominated by banks, with limited access to long-term finance and underdeveloped non-bank financial institutions.

[23]The average GDP growth rate of the WAEMU is 4.1% for the period 2002-2019, and 5.5% for the period 2010-19.

[24]The Banking Commission of the West African Monetary Union was created in 1990. In 1996, an agreement was signed by the Council of Ministers of the West African Monetary Union that established the Financial Markets Authority of the West African Monetary Union (in French *Autorité des Marchés Financiers de l'Union Monétaire Ouest Africaine*, AMF-UMOA). The Authority is a supranational markets regulator established in 1996 and based in Abidjan. It is the common securities authority for the eight countries of the WAEMU. Simultaneously, the member countries established the BRVM regional stock exchange.

Figure 7: EA share in WAEMU trade



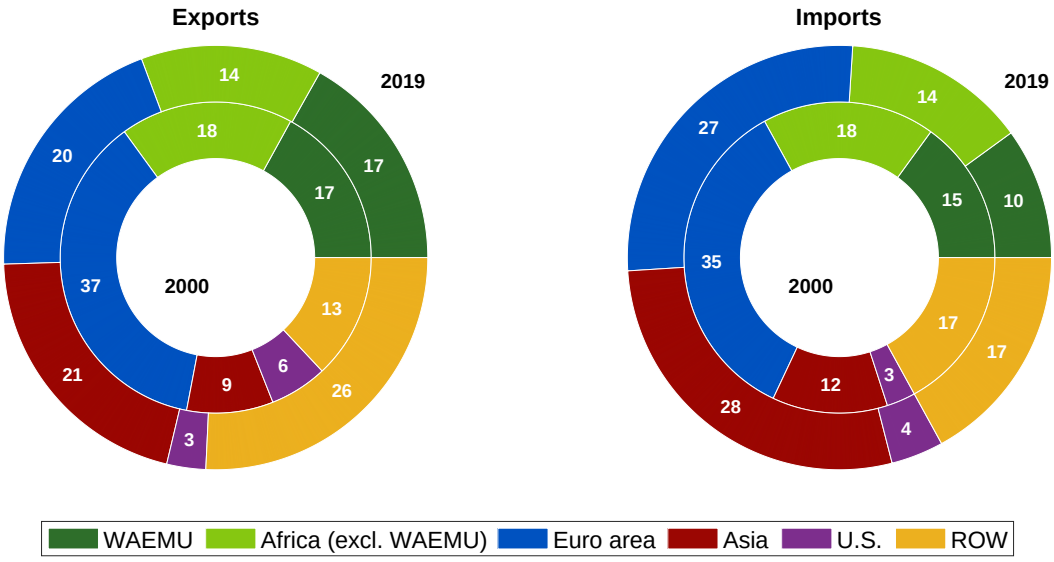
Note: This figure plots the annual share of exports and imports of the euro area, US, and Asia in total WAEMU trade. Source: Haver Analytics.

In 2012, the Council of Ministers of the West African Monetary Union authorised the BCEAO to establish a regional agency to support the issuance and management of public securities. The agency was formally created on 15 March 2013 under the name UMOA-Titres. Since its establishment, UMOA-Titres has coordinated the majority of government debt issuance across member states.

Member states' trade profiles indicate resource-rich export structures, with exports dominated by crude petroleum and agricultural commodities. In contrast, imports consist mainly of refined petroleum products, motor vehicles, and agricultural goods. WAEMU is characterised by relatively low trade openness by international standards, with a trade-to-GDP ratio of about 52% in 2019, well below that of advanced economies such as the European Union, where trade openness is around 90% (Hakobyan et al., 2025). Yet, its trade structure shows a limited intra-regional goods market integration, with a strong reliance on imports and exports outside the economic area.

Figure 7 shows that the annual euro area share in WAEMU exports and imports stood at about 40% in the early 2000s. Over the subsequent two decades, these trade shares declined, with a more pronounced reduction on the export side – this in conjunction with a surge of trade with Asia and China in particular. Despite this decline, the euro area remains an important trading partner for WAEMU, accounting for roughly 20% of exports

Figure 8: EA share in WAEMU trade



Note: This figure plots the annual share of exports and imports in WAEMU. The inner ring and outer ring show trade shares in the year 2000 and 2019 respectively. ROW is an abbreviation for rest of the world. Source: Haver Analytics.

and 26% of imports in 2019.

Figure 8 presents the percentage share of various geographical groupings in WAEMU trade. The inner ring and outer ring present statistics for 2000 and 2019 respectively. Export shares of the year 2000 show that euro area and Africa were the two major export destinations for WAEMU products. This has changed over the two decades. The euro area share has halved, yet it remains an important export destination for WAEMU. Exports to the US have also declined from 6% to 3%. Africa remains a major export destination in 2019, and Asia's share has more than doubled. Exports to other economies, captured by the share of the rest of the world (ROW), has also increased substantially. This points towards more diverse exporting relationships. The import shares paint a similar picture. In the year 2000, Africa and the euro area were the major importers to the WAEMU with a combined share of about 70%. However, over time, import shares of both these regions have declined to about 25% each. This decline is matched by an almost equivalent 16% point increase in share of Asian imports to WAEMU. We draw two conclusions from the trade shares. First, Asia has emerged as a major trade partner of WAEMU in the last twenty years. Second, the euro area continues to remain a major trade partner despite a decline in the share of trade with WAEMU. These observations suggest that the demand

channel for spillovers might play a role in the international transmission of ECB policy to WAEMU.

In terms of currency invoicing, the euro is the dominant currency in this monetary union (Boz et al., 2020). Six of the eight members of the union (excluding Ivory Coast and Senegal) predominantly trade in euros. In the period from 2016-2019, exports invoiced in euro stood at an average 75% while the share of US dollar invoicing in exports was just 8%. Similarly, import invoicing share was on average about 72% for the euro while it is about 11% for the US dollar.

4 Data and empirical methodology

In this paper, we present empirical evidence on both the domestic transmission of monetary policy in the WAEMU and the spillover effects arising from international monetary policy. To do so, we assemble a dataset that combines publicly available sources with several series kindly provided by the WAEMU central bank. The dataset includes economic, trade, financial, and monetary variables for WAEMU, both at the aggregate level and for each individual member state, as well as the corresponding variables for the euro area and the United States.

Our empirical strategy uses this dataset to estimate the effects of interest by identifying monetary policy shocks and applying state-of-the-art Bayesian dynamic models capable of handling large information sets. While for the domestic analysis, we rely on a recursive identification scheme, for the spillover analysis we use a high-frequency approach.

4.1 The dataset

Our dataset contains variables from three main economic regions: the WAEMU, the euro area, and the United States. Most of the data are publicly available and sourced from macroeconomic databases (e.g., the ECB and the IMF), as well as Datastream. In addition to these publicly available sources, we also rely on different series compiled by BCEAO's staff.

Specifically, the dataset includes fourteen WAEMU variables: industrial production, consumer price index, exports, imports, the bilateral exchange rate against the US dollar,

[25]The trade variables are smoothed seasonally adjusted by applying a 12-month forward moving average.

Table 1: The dataset

Variable	Sources	Log	RW	9	10	11	12	13	14	15	16	17	Online Appendix
WAEMU aggregate variables													
Industrial production	BCEAO	•	•	✓	✓		✓	✓		✓	✓	✓	✓
Consumer price index	BCEAO	•	•	✓	✓		✓	✓		✓	✓	✓	✓
Export	Haver	•	•					✓		✓	✓	✓	✓
Import	Haver	•	•					✓		✓	✓	✓	✓
Average money market rate	BCEAO		•	✓	✓			✓		✓	✓	✓	✓
Maximum lending rate	BCEAO			✓		✓		✓		✓	✓	✓	✓
Exchange rate	IMF IFS	•	•	✓			✓	✓		✓			✓
Stock price	Datastream	•	•	✓	✓		✓	✓		✓	✓	✓	✓
Minimum bid rate	BCEAO's staff				✓								
Government yields	UMOA-Titres and BCEAO's staff					✓							
Net foreign assets	BCEAO's staff	•							✓				✓
Reserve obligations	BCEAO's staff and Kireyev (2015)	•	•				✓						
Excess reserves	BCEAO's staff and Kireyev (2015)	•	•				✓						
Interbank rate	BCEAO						✓						
WAEMU country level variables													
Industrial production	BCEAO	•	•										✓
Consumer price index	BCEAO	•	•										✓
Export	Haver	•	•										✓
Import	Haver	•	•										✓
EA variables													
Industrial production	ECB	•	•					✓	✓	✓			✓
GDP deflator	Jarociński and Karadi (2020)	•	•					✓	✓	✓			✓
Exchange rate (dollars per euro)	ECB	•	•					✓	✓	✓			✓
Stock price	Datastream	•	•					✓	✓	✓			✓
Three-months OIS rate	Datastream							✓	✓	✓			✓
Ten-years OIS rate	Datastream									✓			✓
US variables													
Industrial production	FRED	•	•								✓	✓	✓
Consumer price index	FRED	•	•								✓	✓	✓
Unemployment rate	FRED										✓	✓	✓
One-year treasury yields	FRED		•								✓		✓
Ten-year treasury yields	FRED		•									✓	✓
Excess bond premium	Gilchrist and Zakrajšek (2012)		•								✓	✓	✓
Stock price	FRED	•	•								✓	✓	✓
Global variables													
Global commodity price index	FRED	•	•					✓			✓		✓

Note: This table reports the variables used in the different estimations, along with their sources and transformations (logarithm and/or random-walk prior). Variables included in each specification are indicated by a check mark in the corresponding column; numbers in the column headings refer to the corresponding figure.[25]

the maximum lending rate, the average money-market rate, the Abidjan stock market index, the government yields, net foreign assets, the minimum bidding rate, the interbank rate, reserve obligations and excess reserves. Additional exercises presented in the online appendix also rely on selected variables collected at the country level.

For the economies whose monetary policies we study in the spillover analysis, we assemble the following variables. For the euro area: industrial production, the GDP deflator, stock prices, the exchange rate, and the overnight index swap rate at both the three-month and ten-year maturities. For the United States: industrial production, the consumer price index, the unemployment rate, the one- and ten-years treasury yield, and the stock price index. We also include the excess bond premium constructed by Gilchrist and Zakrajšek (2012). Finally, we consider a global commodity price index.

All variables are collected at monthly frequency. The baseline sample spans January 2002 to December 2019.[26]

A persistent challenge in empirical research on African economies is the limited quality, coverage, and comparability of data, particularly in national accounts (see, for example, Jerven, 2013). Many countries face infrequent base-year updates, methodological breaks, and capacity constraints in statistical offices, which can lead to sizeable revisions and measurement error in key aggregates such as GDP, investment, and trade data. The large informal sector, subsistence production, and weak administrative records further complicate accurate measurement. As a result, cross-country comparisons and time-series analyses are subject to non-classical measurement error that can bias inference and obscure structural relationships. These limitations underscore the need for caution in the interpretation of results of statistical methods using macroeconomic and national accounting data. To mitigate these data limitations, we rely on monthly indicators from the central bank and various international sources, apply consistent transformations, and perform several robustness checks. In particular, we compare results obtained using aggregate WAEMU data with those based on country-level series. If idiosyncratic measurement error were driving the results, inconsistencies would emerge across these two approaches. Reassuringly, the country-level evidence reported in the Online Appendix is fully consistent with the aggregate results.

4.2 The empirical models

In our analysis, we consider three main empirical VAR models estimated with Bayesian techniques:

- A domestic VAR, of the form

$$y_t^{WA} = \sum_{p=1}^{12} A_p y_{t-p}^{WA} + \varepsilon_t^{WA}, \qquad \varepsilon_t^{WA} \sim \text{i.i.d.}, \mathcal{N}(0, \Sigma_\varepsilon^{WA}),$$

  which incorporates 12 lags of six aggregate WAEMU variables, and is used to study the transmission of WAEMU's own monetary policy.

[26] For the United States, the availability of a longer monetary policy shock series allows the sample to be extended backward in time.

- A bilateral VAR with aggregate variables for the WAEMU and the euro area,

$$\begin{pmatrix} y_t^{EA} \\ y_t^{WA} \end{pmatrix} = \sum_{p=1}^{12} \begin{pmatrix} A_p^{EA} & 0 \\ A_p^{WA,EA} & A_p^{WA} \end{pmatrix} \begin{pmatrix} y_{t-p}^{EA} \\ y_{t-p}^{WA} \end{pmatrix} + \begin{pmatrix} \varepsilon_t^{EA} \\ \varepsilon_t^{WA} \end{pmatrix}, \qquad \begin{pmatrix} \varepsilon_t^{EA} \\ \varepsilon_t^{WA} \end{pmatrix} \sim \text{i.i.d.}, \mathcal{N}(0, \Sigma_\varepsilon),$$

  which incorporates 12 lags of macroeconomic and financial variables for the euro area (i.e. EA) and the WAEMU (i.e. WA), as well as commodity prices, and is used to study monetary policy spillovers from the euro area. Asymmetric priors are adopted to effectively restrict to zero the coefficients capturing the response of euro area variables to economic conditions in the WAEMU. This amounts to a no-spillover condition from the WAEMU to Europe, consistent with a standard small-economy assumption.

- A bilateral VAR with aggregate variables for the WAEMU and the US, including commodity prices, used to study monetary policy spillovers from the US. The VAR specification follows the same structure as that adopted for the euro area.

For each of these specifications, in robustness exercises reported in the Online Appendix we also consider a model in which aggregate WAEMU variables are replaced by country-level indicators. In this approach, results from country-level VARs are aggregated to obtain median WAEMU-country dynamic responses. Specifically, we aggregate the bilateral VARs by computing the median response across countries, which we interpret as a median group estimator. While less efficient than the pooled estimator under dynamic homogeneity, this approach delivers consistent estimates of the average dynamic effects of shocks when dynamic heterogeneity is present (see Canova and Ciccarelli, 2013).[27]

4.3 Bayesian estimation and priors

The use of large information sets requires efficient big-data techniques to estimate the models. We adopt a Bayesian approach with informative Minnesota priors (Litterman, 1986). These are the most commonly used macroeconomic priors for VARs and formalise

[27] The estimation of posterior coverage bands for the parameters of interest relies on a standard Gibbs sampling algorithm. We aggregate country responses into 'median-economy' responses as follows: for each draw from the distribution of impulse responses of a given variable, we select one draw per country and compute the median across countries at each horizon. Repeating this procedure for all draws and variables yields structural impulse responses that can be interpreted as the response of the 'median' economy to the shock. The charts report the median, 68%, and 90% posterior coverage bands computed over these median draws.

the view that an independent random-walk model for each variable in the system provides a reasonable centre for prior beliefs about their time-series behaviour (see Sims and Zha, 1998).

As mentioned, in estimating the bilateral VAR models to restrict the response of the euro area and the US to West African shocks, we elicit asymmetric Minnesota priors, which break symmetry across VAR equations and allow for tighter priors on selected lags of specific regressors in particular equations. This enables us to rule out a direct response of the two larger areas – the US and the euro area – to economic developments in the WAEMU. These restrictions reduce parameter uncertainty and alleviate multicollinearity problems, which are particularly relevant when studying spillovers to the WAEMU.

The adoption of asymmetric priors complicates the estimation problem, making it infeasible to rely on a dummy-variable implementation of the priors. Instead, we employ the efficient methodology proposed by Chan (2022).[28] The tightness of the prior hyperparameters is estimated using the optimal prior selection approach proposed by Giannone et al. (2015).

5 Domestic transmission of monetary policy

Let us begin by discussing the transmission of domestic monetary policy. To do so, we rely on a recursive identification scheme. While this approach has known limitations in advanced economies, it may be more appropriate for emerging markets with shallow financial systems, where state-of-the-art identification strategies are often not feasible. Results in Pirozhkova et al. (2024) indicate that, for an open emerging economy with relatively developed financial markets, recursive identification delivers estimates that are virtually indistinguishable from those obtained using high-frequency methods. This likely reflects the lower predictability of policy decisions in a more volatile macroeconomic environment. While we cannot verify this result directly for the WAEMU, owing to the absence of a deep bond market, we postulate that a similar logic applies, or at least that estimates obtained from a traditional identification scheme provide a reasonable approximation of the true transmission of domestic monetary policy.

[28] Standard Minnesota priors are implemented as Normal–Inverse Wishart priors that impose symmetry across equations, as the coefficients in each equation share the same prior variance matrix. This implies that own lags and lags of other variables must be treated symmetrically.

Figure 9: Domestic transmission of monetary policy in WAEMU

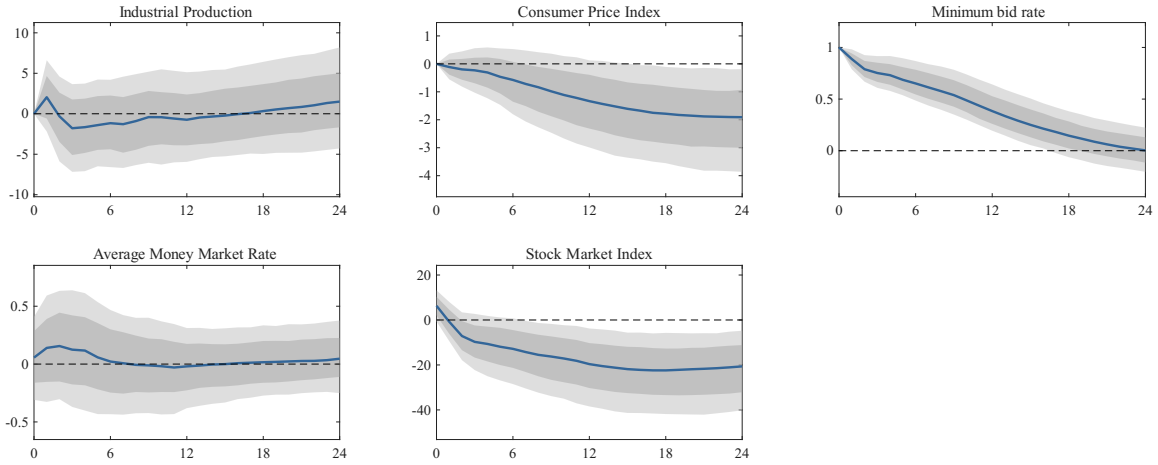
Note: The figure reports the IRFs to a domestic monetary policy shock, normalised to induce a 100 basis point increase in the maximum lending rate. The grey shaded areas are 68% and 90% posterior coverage bands. The sample considered is 2002:01-2019:12.

Following a 100 basis point increase in the maximum lending rate, the economy contracts: both industrial production and the consumer price index decline (Figure 9). The exchange rate vis-à-vis the US dollar does not react, consistent with the fixed exchange-rate regime with the euro. By contrast, the stock market index falls significantly, while the average money-market rate shows no meaningful response, indicating that pass-through to domestic money markets is weak and short-lived. These results are consistent with the findings of Kireyev (2015), who argues that, although WAEMU monetary policy shocks do affect inflation and other interest rates, the overall transmission is likely to be weak due to segmented financial markets.

Two factors are important to notice. First, in the WAEMU, as in most sub-Saharan African countries, food and energy prices constitute the bulk of the consumer price index (CPI) weights (see Ndulu and Masawe, 2015). Central banks have very limited ability to affect the price of these items that are mainly determined by international markets and supply conditions. Second, the transmission mechanism of changes in policy rates to aggregate demand is limited due to the very small and segmented interbank market as well as shallow financial markets (see also Mishra and Montiel, 2013).

The weak transmission of domestic monetary policy, coupled with relatively stable inflation close to target, may appear puzzling. This suggests that inflation control in the WAEMU relies on a broader set of instruments beyond policy rates. In particu-

Figure 10: Domestic transmission - minimum bid rate



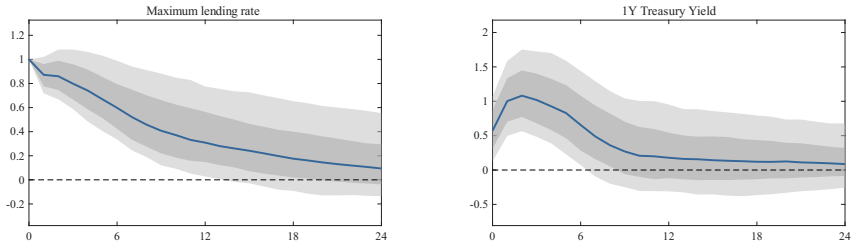
Note: The figure reports the IRFs to a domestic monetary policy shock, normalised to induce a 100 basis point increase in the minimum bid rate. The grey shaded areas are 68% and 90% posterior coverage bands. The sample considered is 2002:01-2019:12.

lar, the credibility of the fixed exchange-rate regime vis-à-vis the euro provides a strong nominal anchor, helping to stabilise inflation expectations in a context where domestic price dynamics are heavily influenced by external factors. Moreover, given the limited pass-through to money-market rates documented above, the BCEAO steers monetary conditions through liquidity injections and reserve requirements, but also through effective coordination of fiscal spending across member governments through the established framework of monetary-fiscal policy dialogue. These instruments play a central role in shaping credit and demand conditions and complement conventional policy rates, partly offsetting the limited effectiveness of standard interest-rate transmission channels. A systematic analysis of these mechanisms in the WAEMU is left for future research. For related discussions, see, for instance, Kireyev (2015).

As a robustness exercise, we consider an alternative monetary policy tool: the minimum bid rate (Figure 10). Results show that a 100 basis point increase in this rate generates impulse responses aligned with those obtained for the maximum lending rate, indicating that our conclusions regarding domestic monetary transmission are not sensitive to the choice of policy instrument.[29]

[29]To assess whether the recursive identification is in any way contaminated by euro area dynamics, we re-estimate the same domestic specification including euro area variables as the first and second variables in the ordering. The results, reported in Figure I of the Online Appendix, are unchanged relative to those presented above.

Figure 11: WAEMU domestic transmission - yield responses to policy tightening



Note: The figure reports the impulse response of the one-year government bond yield to a domestic monetary policy shock, normalised to induce a 100 basis point increase in the maximum lending rate. The grey shaded areas are 68% and 90% posterior coverage bands. The sample considered is 2012:01-2019:12.

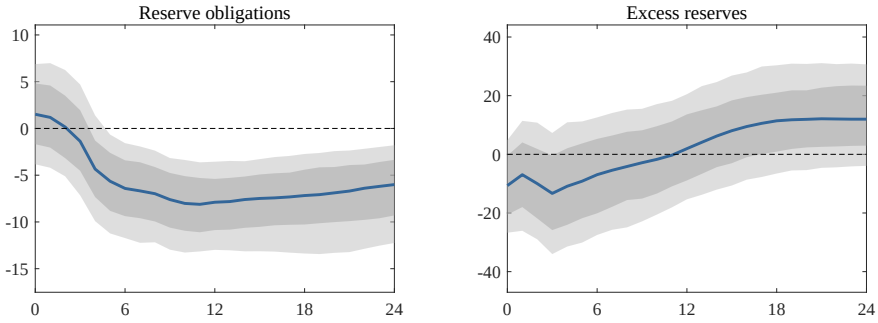
Up to this point, we have examined the domestic transmission of WAEMU's monetary policy and shown that the pass-through to money-market rates is limited. We now consider the transmission to the borrowing rates of the region's governments, a key channel of transmission of monetary policy. To provide empirical evidence for this mechanism, we use a unique dataset of government bond yields at issuance and denominated in CFA francs, which is compiled by the UOMA-Titres agency. As expected, the 100 basis point increase in the maximum lending rate induces an almost identical increase in one-year government bond yields traded in the primary market (Figure 11).[30]

We finally examine the response of bank reserves held with the central bank to a domestic monetary tightening. Total reserves consist of reserve obligations, determined by the reserve requirement ratio, and excess reserves. A 100 basis point increase in the maximum lending rate leads to a persistent decline in reserve obligations of roughly 6% in the medium to long run (Figure 12). This reflects a decline in activity and credit due to the tightening.[31] On the other hand, the response of excess reserves is negative on impact but insignificant. One potential explanation is the substantial share of excess liquidity in the banking system as shown in Figure 5. These funds are parked at the central bank as they are neither used to purchase government securities nor lent in the interbank market, potentially reflecting the limited extent of interbank lending and an overall scarcity of high-quality projects (see Kireyev, 2015).

[30]Due to availability of WAEMU yield data from 2012:01-2019:12, we estimate the VAR on a shorter sample.

[31]A decline in reserve obligations may also arise from a reduction in the other two components of reserve obligations – bank deposits and gross external assets – for a given level of reserve requirement ratio.

Figure 12: WAEMU domestic transmission - reserve responses to policy tightening



Note: The figure reports the impulse responses to a domestic monetary policy shock, normalised to induce a 100 basis point increase in the maximum lending rate. The grey shaded areas are 68% and 90% posterior coverage bands. The sample considered is 2002:01-2019:12.

6 International monetary spillovers

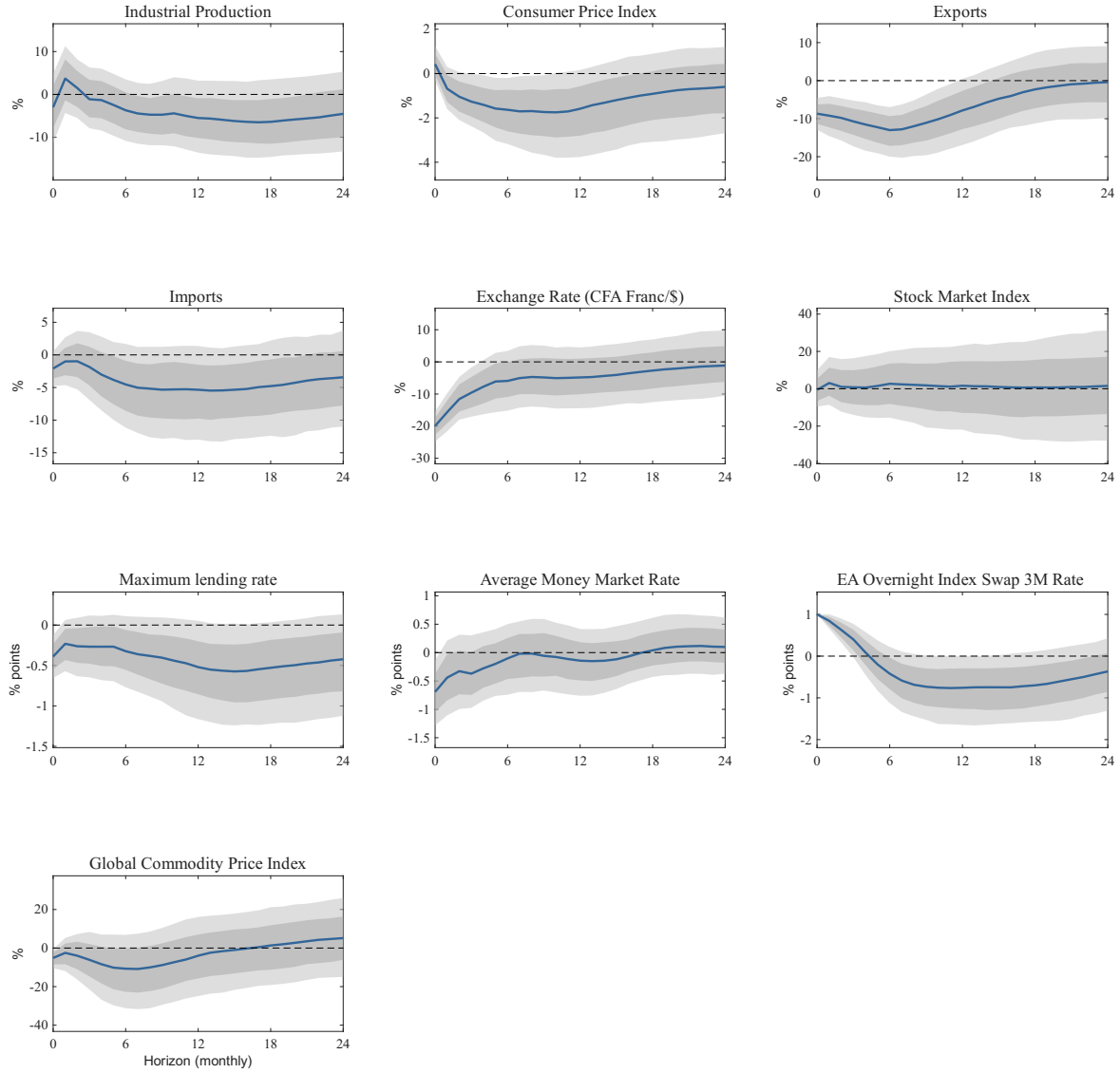
This section investigates the spillovers from US and euro area monetary policy actions to the WAEMU economy through four complementary empirical exercises. The first two examine the transmission of euro area monetary policy – conventional and unconventional respectively – to the WAEMU, using bilateral vector autoregression models that jointly include euro area and WAEMU variables capturing domestic economic activity, trade dynamics, and money market conditions. The next two exercises examine the response of WAEMU to US monetary policy shocks using a comparable specification. Together, these exercises provide a systematic assessment of the external monetary policy environment facing WAEMU and the channels through which global policy impulses propagate to the union.

6.1 Euro area conventional monetary policy spillovers

Following a conventional monetary policy tightening in the euro area, economic activity and prices in the European economy contract, while the WAEMU economy experiences a broad-based slowdown (Figure 13).[32] A monetary tightening that increases the euro area three-month overnight index swap (OIS) rate by 100 basis point leads to a decline in industrial production, although the estimates are only significant at the 68% level. Inflation also reduces, with the CPI falling by about 2 percent at its trough. The deflationary effects of euro area tightening are also transmitted to the WAEMU through a modest

[32]The impulse responses from the same VAR for the euro area are reported in the Online Appendix (Figure II).

Figure 13: Euro area conventional monetary policy – spillovers

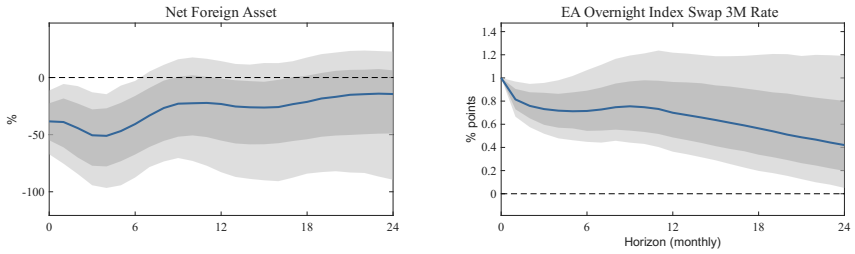


Note: The figure reports the IRFs to a conventional euro area monetary policy shock, normalised to induce a 100 basis point increase in the three-month OIS rate. The grey shaded areas are 68% and 90% posterior coverage bands. The sample considered is 2002:01-2019:12.

commodity price channel, reflected in the decline in global commodity prices, although the effect is significant only at the 68% confidence level.

Trade variables react in line with the contraction in external demand: exports decrease by around 10 percent at short horizons, mirroring the deterioration in the euro area and regional economic conditions. Imports also decline slightly, albeit the response is only significant at the 68% level, consistent with weaker domestic activity and lower demand for foreign goods. The exchange rate vis-á-vis the US dollar appreciates mechanically, as the fixed parity with the euro, combined with an appreciation of the euro against the

Figure 14: EA conventional monetary policy shock – spillovers on WAEMU NFA



Note: The figure reports the impulse response of WAEMU net foreign assets to a conventional euro area monetary policy shock, normalised to induce a 100 basis point increase in the three-month OIS rate. The grey shaded areas are 68% and 90% posterior coverage bands. The sample considered is 2004:01-2019:12.

dollar transmits the external monetary shock directly to the WAEMU currency.

Financial and money-market variables display only limited and generally insignificant responses. This muted reaction is consistent with the relatively shallow financial markets in the monetary union, where the transmission of external monetary shocks through asset prices and interest rates is typically weak.[33]

Following a foreign monetary tightening, an economy operating under a fixed exchange-rate regime should see a decline in its foreign reserves. Figure 14 reports the response of the WAEMU central bank's net foreign assets to a conventional 100 basis point monetary tightening in the euro area.[34] Consistent with this prediction, net foreign assets fall significantly following the shock, confirming a standard adjustment mechanism.

6.2 Euro area unconventional monetary policy spillovers

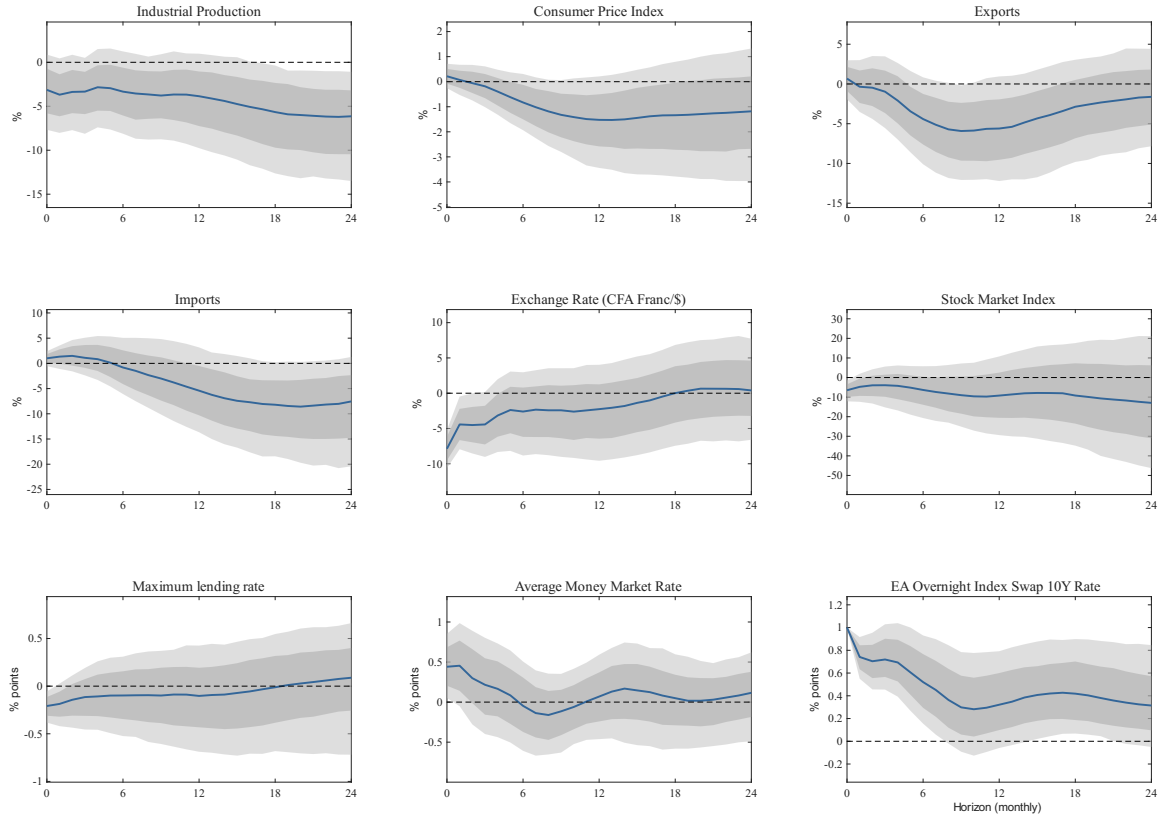
Having examined how the WAEMU economy responds to a conventional monetary tightening in the euro area, we now turn to the case of unconventional monetary policy measures (Figure 15). Estimates for this exercise are obtained by restricting the sample to the post-2008 environment, as unconventional monetary policy interventions were largely absent before this period.[35] The WAEMU economy contracts following an unconventional monetary tightening in the euro area. Exports weaken, displaying a decline similar to that

[33]Results discussed so far rely on aggregate data, the Online Appendix reports results obtained from country-level data – Guinea-Bissau is not included in these exercises due to limited data availability. The median response across countries, reported in Figure III in the Appendix, confirm the robustness of our findings when relying on disaggregated data.

[34]In the Online Appendix, Figure X shows the effects of an unconventional monetary policy shock. The results are qualitatively unchanged, confirming a negative response.

[35]Results for the euro area block are reported in Figure IV in the Online Appendix. Figures VI and VII of the Online Appendix report the results for QE – respectively for the WAEMU and the euro area – using the sample 2002:1–2019:12.

Figure 15: Euro area unconventional monetary policy – spillovers

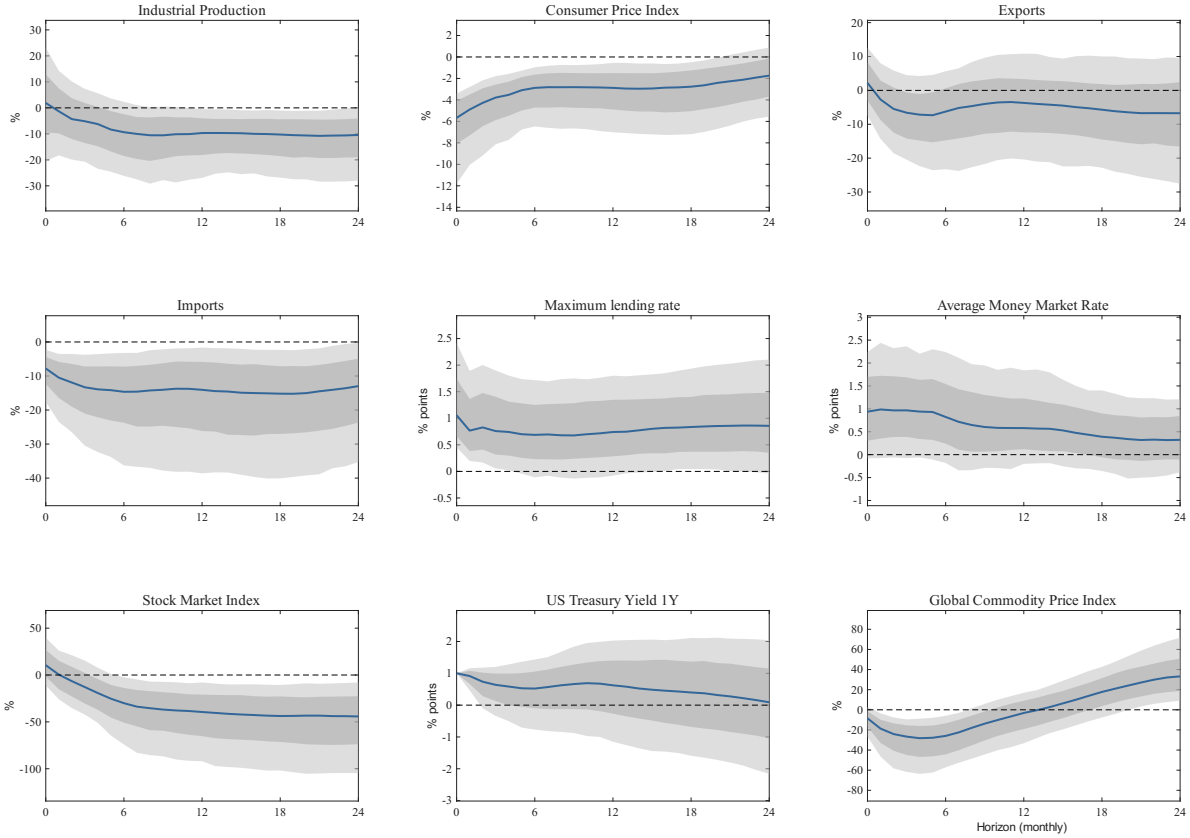


Note: The figure reports the IRFs to an unconventional euro area monetary policy shock, normalised to induce a 100 basis point increase in the ten-year OIS rate. The grey shaded areas are 68% and 90% posterior coverage bands. The sample considered is 2008:01-2019:12.

observed after a conventional shock. Imports also decline, consistent with a contraction in import-intensive demand components following tighter external financing conditions. Financial and money-market variables continue to show limited and mostly insignificant responses, consistent with the shallow depth of regional financial markets.[36]

Taken together, these findings show how monetary policy tightening in the euro area transmits to the WAEMU economy, providing evidence on the effects of international monetary policy when the domestic economy is linked to the source country through a hard peg.

Figure 16: US conventional monetary policy – spillovers



Note: The figure reports the IRFs to a conventional US monetary policy shock, normalised to induce a 100 basis point increase in the one-year US treasury yield. The grey shaded areas are 68% and 90% posterior coverage bands. The sample considered is 2000:01-2018:12.

6.3 US conventional monetary policy spillovers

A monetary tightening that increases the US one-year treasury rate by 100 basis point leads to a contraction in industrial production and a decline in inflation in the WAEMU (Figure 16).[37] Deflationary pressure in the WAEMU is also reinforced by a strong commodity-price channel. In particular, contractionary US monetary policy shocks generate disinflationary effects in commodity markets, as reflected in the downward adjustment of the global commodity price index, in line with the findings of Degasperi et al. (2026) for commodity and oil prices.

While exports display no significant variation, imports fall sharply. The muted reaction of exports is consistent with the fact that the US is not among WAEMU's main trading

[36]When repeating the exercise using country-level WAEMU data, results are confirmed (see Figure V in the Online Appendix). The main difference emerges in the inflation dynamics, for which the estimates are largely insignificant.

[37]Results for the US block are reported in Figure VIII in the Online Appendix.

partners, and therefore the foreign-demand channel documented earlier is absent in this context. The decline in imports, by contrast, can be rationalised by the pricing structure of internationally traded goods: since many imported goods are priced in US dollars, a US monetary tightening – by appreciating the dollar – raises the domestic-currency cost of imports for WAEMU countries, thereby compressing import demand.

Turning to financial and money-market variables, we observe a negative response of the stock market index, which is more pronounced than in the euro area case. This pattern is consistent with the literature on the financial channel of US monetary policy, which shows that movements in US financial conditions – particularly during episodes of monetary tightening – tend to be transmitted globally, synchronising stock prices and other financial variables across countries (Rey, 2015). As for money-market conditions, both the maximum lending rate and the average money-market rate increase following a US monetary tightening. This reaction might reflect a general tightening of global financial conditions: higher US interest rates make external financing more expensive and reduce global liquidity, putting upward pressure on domestic short-term rates even in economies with relatively shallow financial markets such as in the WAEMU.

Our results are also in line with Degasperi et al. (2026), who document that US monetary policy has sizeable global effects across both advanced and emerging economies, a conclusion consistent with the spillovers we identify for the WAEMU.[38]

Overall, the evidence shows that international monetary policy shocks generate non-negligible spillovers to a small open economy such as the WAEMU, and the main difference between US and euro area shocks arises in the response of domestic financial markets: US monetary tightening produces stronger financial effects, highlighting the financial-conditions channel emphasised in the literature.

6.4 US unconventional monetary policy spillovers

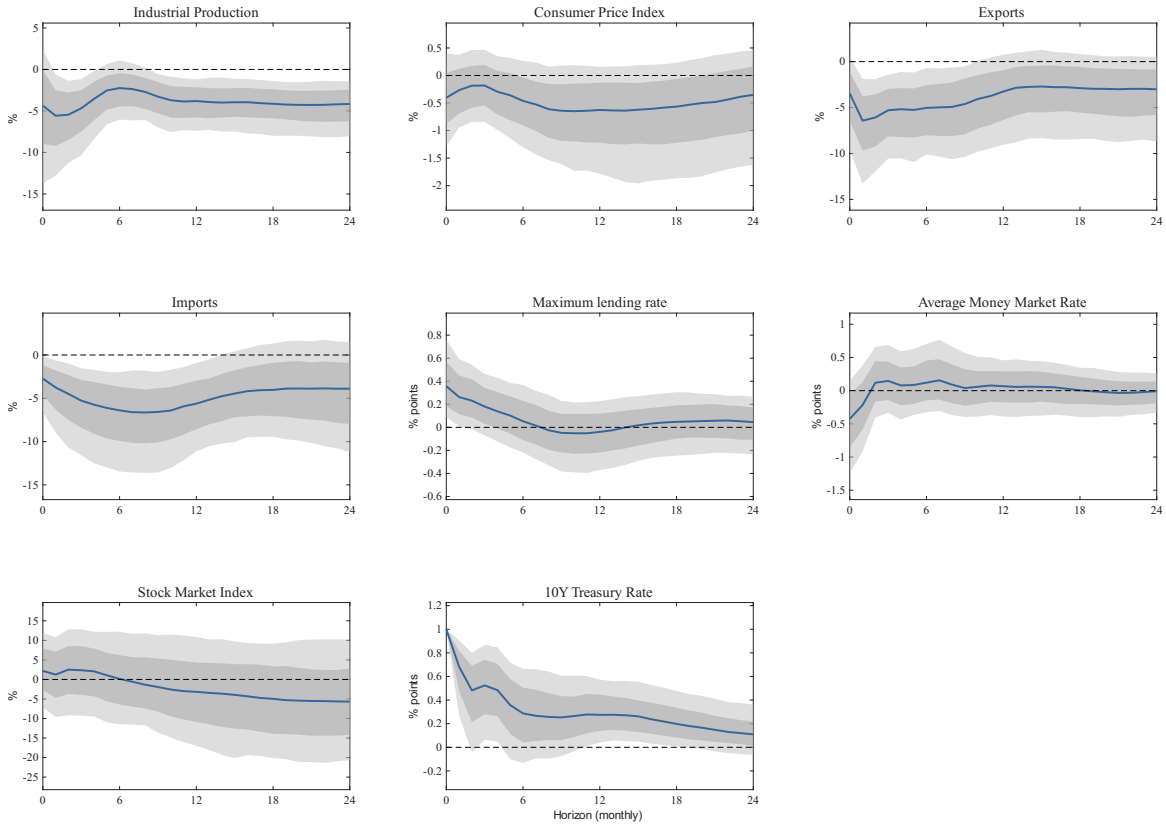
We conclude by examining the response of the WAEMU economy to an unconventional monetary policy tightening in the US (the IRFs for the post-2008 sample are shown in Figure 17).[39,40] Overall, the pattern of responses is similar to that observed in the

[38] Results using median-median country-level responses are also reported in the Appendix (Figure IX).

[39] The instrument is constructed by correcting the QE IV of Swanson (2021) for information effects, following the methodology proposed by Miranda-Agrippino and Ricco (2021).

[40] Results for the US block are reported in Figure XI in the Online Appendix. Figures XIII and XIV in the Online Appendix report the QE results – respectively for the WAEMU and the US – using the

Figure 17: US unconventional monetary policy – spillovers



Note: The figure reports the IRFs to an unconventional US monetary policy shock, normalised to induce a 100 basis point increase in the ten-year OIS rate. The grey shaded areas are 68% and 90% posterior coverage bands. The sample considered is 2008:01-2018:12.

conventional monetary policy case, with quantitative tightening in the US exerting contractionary effects on the WAEMU.

7 A stylised model of spillovers to the WAEMU

The empirical analysis shows that monetary policy decisions taken in the euro area and in the United States generate sizeable spillovers to WAEMU economies. To interpret the mechanisms through which external shocks propagate to the WAEMU, we assess our empirical findings through the lens of a Mundell-Fleming framework, building on the approach of Degasperi et al. (2026), which draws on Blanchard (2017) and Gourinchas (2018). The model features four transmission channels through which external monetary shocks can affect a small open economy: demand, exchange rates, financial conditions,

2000:1–2018:12 sample. The exercise using country-level WAEMU data is reported in Figure XII in the Online Appendix.

and commodity prices.

We extend the stylised model of Degasperi et al. (2026) in two ways. First, we add a second large economy, reflecting the presence of the euro area and the United States as the two major economies in the world, and towards which the WEAMU has different exchange rate arrangements. Second, and related, we introduce an effective exchange rate for the WAEMU, defined as a weighted sum of the bilateral exchange rates with the United States and the euro area. This modification allows us to explicitly account for how a small open economy – such as the WAEMU – responds to monetary tightening in a large economy under two alternative exchange rate regimes. Operationally, this extension is implemented through a parameter θ, which represents the weight placed on the fixed exchange rate with the euro area.

We consider a three-country setup consisting of a domestic small open economy and two large foreign economies. Their macroeconomic interactions are summarised by the following system of equations:

$$\begin{aligned}
Y &= \underbrace{\xi - c(I - \Pi^e)}_{\text{domestic demand}} + \underbrace{a_{EA}(Y^{EA} - Y) + b_{EA}(\bar{E}^{EA} + \Pi^{EA} - \Pi)}_{\text{EA net export}} - \underbrace{f_{EA}(\bar{E}^{EA} + \Pi^{EA} - \Pi)}_{\text{EA financial spillovers}} \\
&\quad + \underbrace{a_{US}(Y^{US} - Y) + b_{US}(E^{US} + \Pi^{US} - \Pi)}_{\text{US net export}} - \underbrace{f_{US}(E^{US} + \Pi^{US} - \Pi)}_{\text{US financial spillovers}}, \quad (1) \\
Y^{EA} &= \xi^{EA} - c_{EA}(I^{EA} - \Pi^{e,EA}), \quad (2) \\
Y^{US} &= \xi^{US} - c_{US}(I^{US} - \Pi^{e,US}), \quad (3) \\
\Pi &= eY + mE + hC, \quad (4) \\
\Pi^{EA} &= e_{EA}Y^{EA} + hC, \quad (5) \\
\Pi^{US} &= e_{US}Y^{US} + hC, \quad (6) \\
C &= l(Y^{EA} + Y^{US}), \quad (7) \\
E &= \theta\bar{E}^{EA} + (1 - \theta)E^{US}, \quad (8) \\
E^{US} &= \underbrace{d_{US}(I^{US} - I^{EA}) + E^{e,US}}_{\text{UIP}} + \underbrace{g_{US}I^{US} + \chi_{US}}_{\text{risk premia}}, \quad (9)
\end{aligned}$$

where all lowercase letters denote non-negative parameters, all variables are expressed as deviations from their steady-state values, and the superscript e denotes expectations.[41] The domestic variables are expressed without superscripts, while the foreign economy's

[41] Expectational variables are considered to be at equilibrium and hence equal to zero in deviation from the steady state, when solving the model, i.e. $E^{e,US} = 0$.

variables have superscripts EA and US, respectively for the euro area and the United States. Similarly, parameters related to each one of the two foreign economies are designated with subscripts. The exchange rate E^X denotes the domestic currency price of one unit of currency of country $X \in \{EA, US\}$. The nominal effective exchange rate E is a trade-weighted sum of the fixed nominal exchange rate with the euro – hence fixed and equal to zero in deviation from the steady state, i.e. $\bar{E}^{EA} = 0$ – and the exchange rate against the dollar. The latter is determined by the interest rate differential between the US and the euro area, its expected value, i.e. $E^{e,US}$, as implied by uncovered interest parity, and by a risk-premium term that depends on the US interest rate and an independent shock χ_{US}.

Domestic output, Y is driven by domestic demand, net exports, and financial spillovers, with domestic demand increasing in the demand shifter ξ and decreasing in the domestic real interest rate $R = I - \Pi^e$. Net exports, rise with foreign output Y^X and with the real exchange rate

$$\epsilon = E + \Pi^X - \Pi, \tag{10}$$

for $X = \{EA, US\}$, and fall with domestic output. Financial spillovers, following Gourinchas (2018), affect domestic absorption and depend negatively on the real exchange rate. In the case of the WAEMU, they capture in a stylised manner the effects of an appreciation of the euro or the dollar on lending conditions and risk premia domestically, that can spillover the pricing of risk in the WAEMU sovereign bond market or the banking sector. Their intensity is governed by the parameter f_i, and the model reduces to the standard Mundell-Fleming when $f_i = 0$. Foreign output, Y^X, depends positively on a foreign demand shifter ξ^X and negatively on the foreign real interest rate $I^X - \Pi^{e,X}$.

Domestic inflation, Π, follows a static Phillips curve: it is increasing in the domestic output gap, the exchange rate, and the commodity price C. The latter captures direct spillovers from global commodity and oil markets into domestic headline inflation – a decline in demand in the US or the euro area is known to affect global commodity prices and hence inflation across several economies (see Degasperi et al., 2026 for a discussion of the commodity channel, and Ider et al., 2024 for an application to the euro area).[42] We assume a common value for h across countries. This choice reflects the assumption

[42] Under local-currency pricing, foreign inflation Π^X depends on foreign output but is independent of the exchange rate.

that commodity prices have a similar weight and impact on the headline inflation of the different economies.

7.1 Domestic monetary policy

Before analysing foreign spillovers, let us briefly consider the domestic policy transmission under the peg. The effects of a change to the domestic policy rate on the domestic interest rate, under the peg are given by

$$\frac{\partial Y}{\partial I} = -\frac{c}{\psi}\,, \qquad \frac{\partial \Pi}{\partial I} = -\frac{ec}{\psi}, \tag{11}$$

where $\psi \equiv 1 + a_{EA} + a_{US} + e(b_{EA} + b_{US} - f_{EA} - f_{US})$. As documented in Section 5, the transmission of domestic monetary policy in the WAEMU is relatively weak, possibly due to structural frictions such as shallow financial markets and segmented interbank lending (see also Mishra and Montiel, 2013). Through the lens of our stylised model, these frictions are captured by a low value for the parameter c, which mutes the responsiveness of domestic demand to interest rate changes. Furthermore, we assume that:

$$\psi = 1 + a_{EA} + a_{US} + e(b_{EA} + b_{US} - f_{EA} - f_{US}) > 0. \tag{12}$$

This condition holds if $b_{EA} + b_{US} - f_{EA} - f_{US} > 0$. In other words, the positive effect of the real channels through net exports (b_{EA} and b_{US}) must be stronger than the negative effect of the financial channels (f_{EA} and f_{US}) on domestic activity, which seems reasonable to assume in an economy with relatively shallow financial markets. Otherwise, the transmission of domestic monetary policy becomes 'perverse' and produces the opposite effects.[43]

7.2 Spillovers from the euro area

Solving equations (1-9), allows us to examine more closely how the domestic economy adjusts within this framework after a tightening of euro area monetary policy and abstracting from the domestic monetary policy response. The responses when one sets to

[43] The Online Appendix reports the precise threshold values for f_{EA} and f_{US}, together with the corresponding responses of the domestic economy as the parameters vary.

zero the indirect effects via the US are

$$\frac{\partial Y}{\partial I^{EA}} = \frac{1}{\psi} c_{EA}[-a_{EA} - e_{EA}(b_{EA} - f_{EA})], \tag{13}$$

$$\frac{\partial \Pi}{\partial I^{EA}} = e\frac{\partial Y}{\partial I^{EA}} - c_{EA}hl \tag{14}$$

We begin by examining how a monetary tightening in the euro area affects domestic output (13). Let us consider the baseline Mundell-Fleming framework (i.e. $f_{EA} = 0$ and $h = 0$). The numerator of the equation then reduces to $-c_{EA}a_{EA} - e_{EA}c_{EA}b_{EA}$, which captures the real trade channel through which a monetary contraction affects domestic activity. The leading term (i.e. $-c_{EA}a_{EA}$) is the direct foreign demand channel. The second term (i.e. $-e_{EA}c_{EA}b_{EA}$) represents the negative effect through the change in the real exchange rate between the euro area and the WAEMU due to the difference in the inflation rates. The sign of these two terms determines the classic transmission mechanism, that is, whether a tightening in the euro area is expansionary or contractionary for the domestic economy, absent other channels. In our case, the direct foreign demand channel is negative, as discussed in our empirical section, and the second channel amplifies this contraction via expenditure switching. Given the hard peg, falling euro area inflation leads to a real appreciation of the CFA franc. This loss of competitiveness depresses WAEMU net exports, consistent with the export slowdown documented in Figure 13. Financial spillovers add a term $c_{EA}e_{EA}f_{EA}$ which captures the relative appreciation of the real exchange rate. This is the only positive term, which can potentially change the sign of the spillovers for large values of f_{EA}, i.e. $f_{EA} > \bar{\bar{f}}_{EA} = a_{EA}/e_{EA} + b_{EA}$.[44]

[44] Taking also into account the indirect effects operating through the US economy, one obtains

$$\frac{\partial Y}{\partial I^{EA}} = \frac{1}{\psi}\{c_{EA}[-a_{EA} - e_{EA}(b_{EA} - f_{EA})] \tag{15}$$
$$- d_{US}[(b_{US} - f_{US}) + m(\theta - 1)(b_{EA} + b_{US} - f_{EA} - f_{US})]\},$$

$$\frac{\partial \Pi}{\partial I^{EA}} = e\frac{\partial Y}{\partial I^{EA}} - c_{EA}hl + d_{US}m(\theta - 1). \tag{16}$$

as compared to the Mundell-Fleming benchmark, the additional term $-d_{US}b_{US}$ captures the indirect contractionary effect on domestic output arising from the US trade channel: the rise in the EA interest rate depresses the dollar via UIP, which appreciates the WAEMU currency vis-à-vis the dollar and reduces exports to the US. Two further channels operate through the same dollar movement but in the opposite direction, partially offsetting this contraction. First, a financial channel, captured by $+d_{US}f_{US}$: the dollar depreciation eases financial conditions for WAEMU, relaxing risk premia and lending conditions. Second, an exchange rate channel, captured by $-d_{US}m(\theta-1)(b_{EA}+b_{US}-f_{EA}-f_{US}) = d_{US}m(1-\theta)(b_{EA}+b_{US}-f_{EA}-f_{US}) > 0$: the dollar depreciation lowers the cost of dollar-denominated imports, reducing domestic inflation and stimulating real absorption. The net indirect effect through the US therefore depends on whether the contractionary trade channel $-d_{US}b_{US}$ dominates these two expansionary channels.

Turning to price responses in Eq. (14), the first term reflects the transmission from the real to the nominal side of the economy through the Phillips curve. This is the only term arising from the classic channels and aligns the sign of the response of prices to the output response. Importantly, a second term captures the downward pressure on domestic inflation resulting from lower global commodity prices, a dynamic illustrated by the empirical evidence in Figure 13.[45] Hence, the response of domestic prices to an increase in the euro area policy rate is negative, provided that the overall effect on domestic output is contractionary. A monetary tightening in the euro area lowers domestic inflation through two distinct mechanisms: first, the decline in domestic economic activity eases internal price pressures; second, the drop in global commodity prices directly reduces headline inflation.[46]

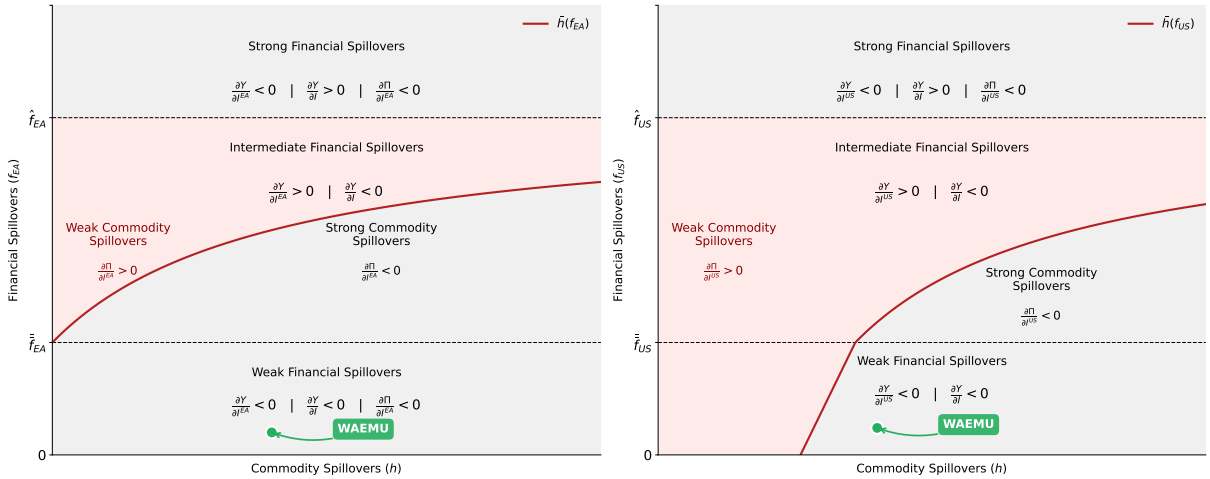
Overall, while euro area monetary tightening can in principle affect the WAEMU economy through different channels, foreign demand emerges as the main driver of the contractionary effects. Moreover, the commodity-price channel exerts further downward pressure on inflation. The exchange-rate channel becomes more relevant once third-economy effects are incorporated, reinforcing the negative impact on output.

A graphical representation of the model is in Figure 18a. It shows how the domestic economy's responses to external and internal monetary contractions vary depending on threshold values of the parameters f_{EA} and h, which capture the financial and commodity channels, respectively. Let us provide here a brief summary of the figure, while details on derivations are reported in the Online Appendix. The bottom left corner represents the scenario when there is no financial and commodity spillovers. For weak financial spillovers, negative effect through foreign demand dominates. As financial spillovers increase beyond the threshold $\bar{\bar{f}}_{EA}$, the real exchange rate appreciates due to lower Π^{EA} and has a positive effect on domestic output via the financial channel. It is also interesting to note that when financial spillovers are stronger than the threshold $\hat{f}_{EA}$, domestic tightening becomes expansionary. Hence, the threshold values of the parameter f_{EA} may, in principle, generate different responses of domestic output to external and internal monetary tightening. Turning to the commodity price channel, we find that the commodity parameter h

[45] When considering the US, a third term represents the direct impact of the depreciation of the dollar on import prices, arising from the interest rate differential (d_{US}), pass-through to domestic inflation (m), and weighted by the degree of exchange rate flexibility ($1-\theta$).

[46] A third mechanism is the appreciation of the domestic currency vis-à-vis the US dollar – driven by the interest rate differential – lowers the cost of imported goods (i.e., the term $\theta - 1$ is negative).

Figure 18: Domestic responses and spillovers from monetary policy shocks



(a) EA spillovers

(b) US spillovers

Note: The figure maps the analytical responses of domestic output and inflation to monetary tightenings in the euro area (Panel a) and the US (Panel b) across the parameter space defined by financial (f) and commodity (h) spillovers. The horizontal lines denote critical thresholds for financial spillovers. In Panel (a), intermediate financial spillovers from the euro area ($\bar{\bar{f}}_{EA} < f_{EA} < \hat{f}_{EA}$) overpower the trade channel, generating a domestic boom and introducing an inflation trade-off governed by the threshold curve $\bar{h}(f_{EA})$. In Panel (b), the parameter space shares the same three-region structure as Panel (a): weak financial spillovers are contractionary for output, intermediate spillovers can generate a domestic boom, and strong spillovers restore the contractionary regime. However, unlike the euro area case, the depreciation of the domestic currency vis-à-vis the dollar introduces imported inflation across all output regions. Consequently, the threshold curve $\bar{h}(f_{US})$ spans the baseline contractionary region as well, illustrating that a net drop in prices requires global commodity prices to fall sufficiently to offset the exchange rate effect. The circular markers indicate the empirical position of the WAEMU, characterised by relatively shallow financial markets (low f) and high sensitivity to global commodity prices (high h), ensuring a standard contractionary and deflationary response to both shocks.

has a unique threshold and matters only if there are intermediate financial spillovers. In other regions, such as when financial spillovers are weak, commodity spillovers are strong enough to drive down domestic inflation. Based on our empirical results for the IRFs to a contractionary monetary policy shock in the euro area, the WAEMU is likely to be in the region of weak financial and strong commodity price spillovers.

7.3 Spillovers from the US

Solving equations (1-9), it is also possible to obtain expressions for the responses of output and inflation to a change in the Fed's monetary policy stance. Abstracting from the

indirect real exchange rate feedback driven by domestic inflation, the responses are:[47]

$$\frac{\partial Y}{\partial I^{US}} = \frac{1}{\psi}\{c_{US}[-a_{US} - e_{US}(b_{US} - f_{US})] + (d_{US} + g_{US})(b_{US} - f_{US})\}, \tag{17}$$

$$\frac{\partial \Pi}{\partial I^{US}} = e\frac{\partial Y}{\partial I^{US}} - c_{US}hl - (d_{US} + g_{US})m(\theta - 1). \tag{18}$$

We begin by examining how a monetary tightening in the US affects domestic output (17). Let us consider the baseline Mundell-Fleming framework (i.e., $f_{US} = 0$ and $h = 0$). The numerator of the equation simplifies to $-c_{US}a_{US} - c_{US}e_{US}b_{US} + (d_{US} + g_{US})b_{US}$. The first two terms capture the demand-reducing effect of a US economic slowdown and the associated drop in US prices. Conversely, the third term, $(d_{US} + g_{US})b_{US}$, is positive; it captures the expenditure-switching channel, as the appreciation of the dollar (driven by the interest rate differential and higher risk premia) depreciates the domestic currency and boosts net exports. Thus, the sign of the baseline transmission on domestic output depends on whether the drop in foreign demand outweighs the export boost from the weaker currency. Ultimately, the sign of the net impact on domestic output hinges on whether the contraction in foreign demand dominates the export stimulus from a weaker currency. As illustrated in Figure 16, we find that the overall effect is negative. Notably, the IRFs do exhibit a slight positive response in exports, confirming that the model's expenditure-switching channel is active despite being overshadowed by the drop in foreign demand.

Once financial spillovers are reintroduced, additional channels become active. The direct financial spillover term $-(d_{US} + g_{US})f_{US}$ captures the tightening of domestic financial conditions caused by the appreciation of the dollar and places downward pressure on domestic output. However, as in the euro area case, an indirect channel $c_{US}e_{US}f_{US}$ operates in the opposite direction: lower US prices compress the real exchange rate, which through the financial channel partially offsets the contraction. The net effect of finan-

[47] Taking into account the full indirect feedback effects operating through domestic inflation and the euro area peg, the complete output response is:

$$\frac{\partial Y}{\partial I^{US}} = \frac{1}{\psi}\{c_{US}[-a_{US} - e_{US}(b_{US} - f_{US})] + (d_{US} + g_{US})[(b_{US} - f_{US}) + m(\theta - 1)(b_{EA} + b_{US} - f_{EA} - f_{US})]\}.$$

The additional term $m(\theta - 1)(b_{EA} + b_{US} - f_{EA} - f_{US})$ captures how the depreciation of the effective exchange rate alters domestic inflation, which in turn modifies the real exchange rate and feeds back into domestic absorption and net exports.

cial spillovers on output therefore depends on which force dominates. When the direct tightening channel prevails – i.e., $(d_{US} + g_{US}) > c_{US}e_{US}$ – financial spillovers reinforce the contractionary effects of the US tightening. For sufficiently large values of f_{US}, however, the indirect channel can dominate and generate a domestic expansion, as illustrated by the intermediate region in Figure 18b. Yet, as evidenced by Figure 16, which shows strong contractionary effects on domestic economic activity, this indirect channel appears too weak in an economy like the WAEMU to offset the others channels.

Turning to the price responses in Eq. (18), the first term reflects the transmission from the real to the nominal side of the economy through the Phillips curve. The second term captures the deflationary effect of lower global commodity prices. Finally, the third term represents the direct impact of the depreciation of the domestic currency vis-à-vis the dollar. Arising from the interest rate differential (md_{US}) and higher risk premia (mg_{US}), and scaled by the degree of exchange rate flexibility $(\theta - 1)$, this term is positive and generates upward pressure on domestic import prices.

Unlike the euro area, the theoretical response of domestic prices to an increase in the US policy rate is ambiguous: the decline in domestic economic activity and the drop in global commodity prices ease internal price pressures, whereas the depreciation of the exchange rate might lead to inflation. In the context of the WAEMU, however, the empirical evidence shows a decline in WAEMU inflation (Figure 16). The deflationary impact of a pronounced drop in global commodity prices, combined with weaker domestic demand stemming from the US economic slowdown, dominates the inflationary pressures of currency depreciation.

As in the case of the euro area, Figure 18b provides a graphical summary of the results. It shows how the domestic economy's responses to external and internal monetary contractions vary depending on the values of the parameters f_{US} and h, which capture the financial and commodity channels, respectively. The bottom left corner represents the scenario when there is no financial and commodity spillovers. In the case of financial spillovers, there are thresholds on f that dictate the response of domestic output to a US monetary policy shock, just like in the case of the euro area. It is important to stress that locating the WAEMU in the region of weak financial spillovers ($f_{US} < \bar{\bar{f}}_{US}$) does not imply that this channel is inactive. As highlighted in our empirical analysis, the direct financial squeeze from tighter global conditions, captured by $-(d_{US} + g_{US})f_{US}$, plays a

important role in depressing domestic output.[48] Moving to commodity spillovers, the threshold on h leads to a similar conclusion – greater commodity price spillover results in a negative response of domestic inflation as the effect of contractionary US monetary policy dampens commodity prices. Based on our empirical results for the IRFs to a contractionary monetary policy shock in the US, the WAEMU is likely to be in the region of weak financial and strong commodity price spillovers.

7.4 Reserves and monetary independence

In the previous section, we have abstracted from the domestic policy response. However, under a fixed exchange rate regime, external imbalances – as for example due to changes to foreign monetary policy – must be accommodated through either domestic policy or reserve adjustments to sustain the peg. Because the WAEMU maintains capital controls (i.e. it has imperfect capital mobility), the central bank retains a degree of limited monetary independence, allowing it to use interest rates to control domestic inflation, while absorbing external shocks through its foreign reserves.

To formalise this problem, we can consider the following equations capturing respectively equilibrium in the money market, and the balance of payments (BoP) condition:

$$R + D = \mu Y - vI, \tag{19}$$

$$R = NX^{EA} + NX^{US} + \kappa^{US}(I - I^{US}) + \kappa^{EA}(I - I^{EA}). \tag{20}$$

In Eq. (19), D denotes domestic credit to financial institutions and R denotes foreign reserves, both in deviations from their steady state. The parameters μ and v capture the responsiveness of money demand to income and the interest rate, respectively. Eq. (20) is the balance of payments (BoP) condition. The parameters $\kappa^i > 0$ denote the degree of capital mobility, towards the euro area and the US.

A higher interest rate in either large economy results in an interest rate differential, capital outflows, and a BoP deficit. By equating the internal money market and the external BoP, we observe the core Trilemma trade-off:

$$\mu Y - vI - D = NX^{EA} + NX^{US} + \kappa^{US}(I - I^{US}) + \kappa^{EA}(I - I^{EA}) \tag{21}$$

[48] The theoretical constraint simply requires that overall financial integration remains low enough that the indirect expansionary effects do not overtake this direct contractionary force.

Solving this equilibrium condition for the domestic interest rate yields:

$$I = \frac{\mu Y - (NX^{EA} + NX^{US}) + \kappa^{US} I^{US} + \kappa^{EA} I^{EA} - D}{\kappa_{US} + \kappa_{EA} + \upsilon}. \tag{22}$$

Equation (22) illustrates the BCEAO's limited monetary independence. If capital mobility were perfect ($\kappa^{US} \to \infty$, $\kappa^{EA} \to \infty$), the domestic interest rate would be forced to exactly match the foreign rate ($I = I^{int}$). Conversely, in the theoretical extreme of completely closed capital accounts ($\kappa^{US} = \kappa^{EA} = 0$), direct capital flight is halted, granting the central bank near-total autonomy to set domestic rates. However, this autonomy remains strictly bounded by the available reserves. Any policy that sustains domestic demand will increase imports, drain foreign reserves to finance the trade deficit, and eventually threaten the peg. Therefore, under any degree of capital mobility, independent monetary policy under a peg is only feasible as long as the central bank maintains strictly positive foreign reserves.

8 Conclusion

This paper examines the domestic and international transmission of monetary policy to the WAEMU, with a particular focus on spillovers originating from the euro area and the US. The combination of a credible fixed exchange rate regime and limited capital mobility provides a unique setting to assess spillovers in an under-explored corner of the Trilemma. In principle, these institutional features imply a degree of insulation from global monetary conditions.

Using a VAR-based empirical framework, we find that domestic policy has weak effects on output and prices, but strong effects on one-year government yields and equity prices. Turning to spillovers, monetary policy shocks originating in advanced economies transmit to the WAEMU in economically and statistically significant ways. Despite the region's fixed exchange rate arrangement and restricted capital account, external shocks affect domestic financial conditions and real activity. US spillovers operate more strongly through financial variables than those originating in the euro area.

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