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Sovereign debt, monetary policy, private sector credit and banking stability in developing countries

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À ma famille

RÉSUMÉ

L'objectif de cette thèse est d'analyser les effets des instruments de politique économique sur la dynamique du crédit et la stabilité bancaire dans les pays en développement. Le premier chapitre de la thèse étudie la relation entre l'exposition des banques à la dette souveraine et leurs prêts au secteur privé dans la région de l'Union Économique et Monétaire Ouest-Africaine (UEMOA). En utilisant un ensemble de données en panel de 136 banques sur la période 2001-2017, nous trouvons des preuves d'une relation négative entre les détentions de titres souverains par les banques et leur crédit au secteur privé dans l'UEMOA. Dans le deuxième chapitre, nous examinons si la perception des contraintes financières des gestionnaires des entreprises change après un changement de politique monétaire. Notre analyse montre que les gestionnaires sont plus susceptibles de signaler des contraintes financières plus élevées après une augmentation du taux directeur dans les pays en développement. Les résultats suggèrent que cet ajustement est symétrique (pour un assouplissement ou un resserrement), mais n'est perceptible que lorsque le changement dépasse 150 points de base. Nous montrons enfin que les entreprises les plus sensibles sont celles ayant une relation de crédit préalable. Le troisième chapitre analyse l'impact des changements du taux directeur sur la prise de risque bancaire dans les pays africains. Pour ce faire, nous nous appuyons sur un panel de 537 banques africaines sur la période 2000-2020. Nos résultats suggèrent un impact positif de la politique monétaire accommodante sur la prise de risque bancaire en Afrique. Cependant, les analyses mettent en évidence l'importance des différences régionales, les banques d'Afrique Sub-saharienne présentant des réactions distinctes par rapport à leurs homologues d'Afrique du Nord.

Mots-clé: Dette souveraine, Politique monétaire, Crédit privé, Stabilité bancaire, Pays en développement

ABSTRACT

The aim of this thesis is to analyze the effects of economic policy instruments on credit dynamics and bank stability in developing countries. The first chapter of the thesis examines the relationship between banks' exposure to sovereign debt and their lending to the private sector in the West African Economic and Monetary Union (WAEMU) region. Using a panel data set of 136 banks over the 2001-2017 period, we find evidence of a negative relationship between banks' holdings of sovereign securities and their credit to the private sector in the WAEMU region. In the second chapter, we examine whether firm managers' perceptions of financial constraints change after a change in monetary policy key rate. Our analysis shows that managers are more likely to report higher financial constraints following an increase in the policy rate. The results suggest that this adjustment is symmetric (for a loose or a tight monetary policy stance) but is only noticeable when the change exceeds 150 basis points. We finally show that the most sensitive firms are those with a prior credit relationship. The third chapter examines the impact of changes in the monetary policy key rate on bank risk-taking in African countries. To do so, we rely on a panel of 537 African banks over the 2000-2020 period. Our findings document a positive impact of a loose monetary policy on bank risk-taking in Africa. However, the analyses highlight the importance of regional differences, with banks in Sub-Saharan Africa exhibiting distinct reactions compared to their counterparts in North Africa.

Key-words: Sovereign debt, Monetary policy, private credit, Developing countries

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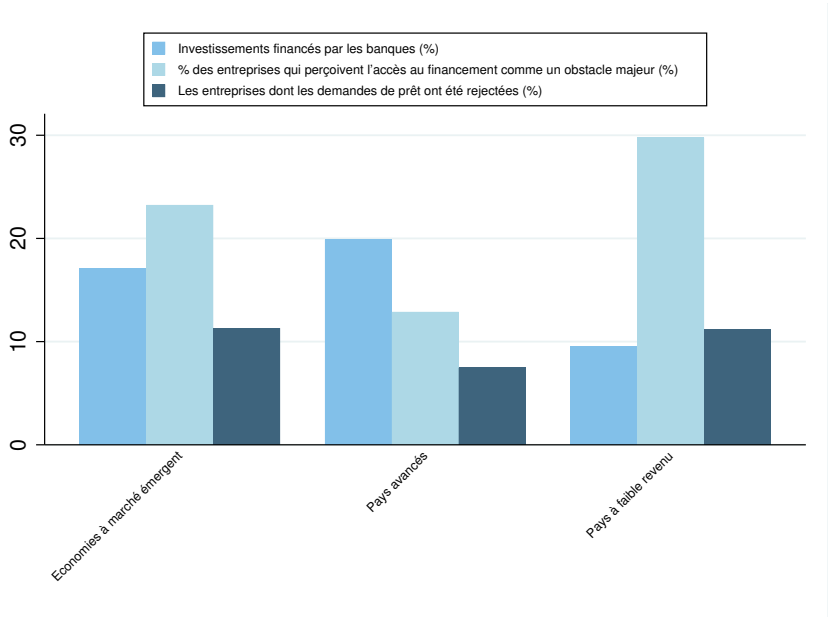
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INTRODUCTION GÉNÉRALE

0.1 Contexte

L'accès au financement reste l'obstacle majeur pour de nombreux entrepreneurs. Cette contrainte est particulièrement importante dans les pays à revenu faible et intermédiaire (PRFI), où les infrastructures financières peuvent être moins développées et les services financiers moins accessibles pour les entreprises. De nombreuses entreprises signalent que l'accès aux services financiers constitue un obstacle majeur à leurs activités dans les pays en développement (PVD). Les figures 1 et 2 montrent une grande disparité entre les pays à différents niveaux de développement et par région. D'abord par niveau de développement, 29,75% des entreprises dans les pays à faible revenu (PFR) déclarent la finance comme obstacle majeur et sévère contre 12,88% pour les entreprises des pays avancés.[1]

Figure 1: Contrainte financière par niveau de développement économique.



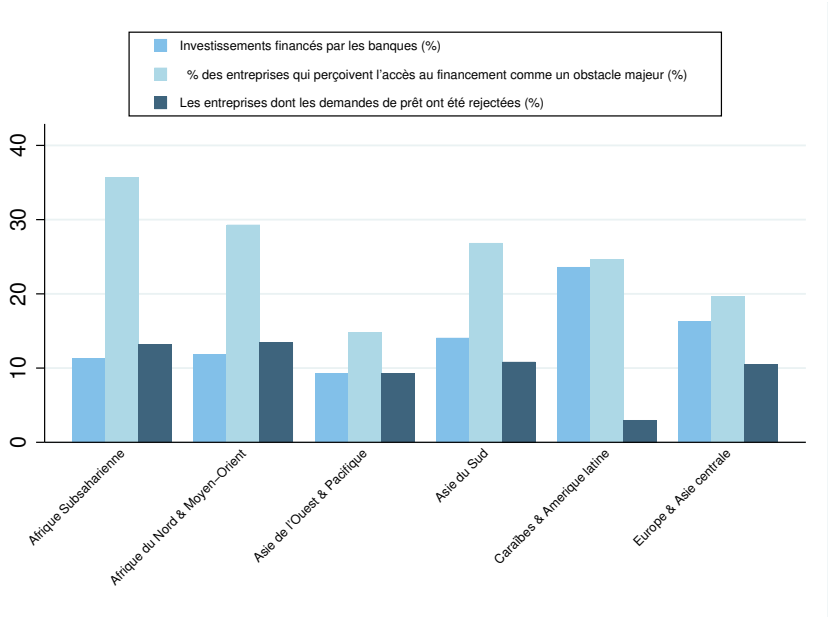
Sources: Enterprise Surveys, World Bank (2006-2021).

Cette disparité est également évidente entre les régions, avec l'Afrique Sub-saharienne en tête, où environ 35,72% des entreprises déclarent que l'accès au financement est un obstacle majeur à leurs activités (figure 2). D'autres régions comme l'Asie du Sud (34,8%) et l'Asie de

[1]Seulement 9,4% des entreprises reportent un financement bancaire de l'investissement dans les pays à faible revenu (PFR) contre à peu près 20% pour les pays avancés.

l'Est et du Pacifique (33,8%) font également face à des défis significatifs en matière d'accès au financement. En revanche, les pays d'Europe et d'Asie Centrale ont le taux le plus bas, avec 19,2% des entreprises signalant des contraintes financières majeures. Une autre identification de la contrainte financière des entreprises par Islam et Rodriguez Meza (2023) montre que 30% des entreprises dans le monde font face à des contraintes financières.[2] [3]

Figure 2: Contrainte financière par région géographique.



Sources: Enterprise Surveys, World Bank (2006-2021).

Des programmes sont mis en place afin d'accélérer le processus d'inclusion financière dans les pays en développement et de permettre un meilleur accès aux services financiers, dans le but de promouvoir le développement économique.[4] Cependant, il est essentiel de comprendre les déterminants du financement du secteur privé dans ces pays à travers l'effet des politiques économiques, qui peuvent favoriser ou contraindre le financement de ce secteur. L'objectif

[2]Tombe dans cette catégorie toute entreprise qui n'est pas soumise à une contrainte financière. Ces entreprises sont celles qui n'ont aucune difficulté d'accès au crédit où n'en ont pas besoin. Elles correspondent aux entreprises qui n'ont pas fait de demande de crédit car elles ont suffisamment de fonds propres ou dont la demande de crédit à été intégralement acceptée.

[3]Ces contraintes varient d'une région à une autre, avec les entreprises africaines enregistrant le taux le plus élevé 48%, suivi par les entreprises d'Asie du Sud (34,8%) et d'Asie de l'Est et du Pacifique (33,8%). Les pays d'Europe et d'Asie Centrale ont le plus faible taux avec 19,2%.

[4]À cet effet, la Société financière internationale (*International Finance Corporation*) investit des milliards de dollars par an pour permettre aux entreprises d'accéder au financement dans les PVD.

de cette thèse est d'analyser le rôle des politiques économiques sur le financement du secteur privé dans les pays en développement à travers l'étude de la politique budgétaire (le financement du déficit sur le marché domestique) et de la politique monétaire (variations du taux directeur de la Banque Centrale).

L'introduction générale de cette thèse est structurée autour de deux points. La section 0.2 est consacrée à la revue de la littérature portant sur les effets du financement domestique du déficit public et de la politique monétaire sur le financement du secteur privé, et celle portant sur l'impact de la politique monétaire sur la stabilité bancaire. La structuration et la présentation de la thèse font l'objet de la section 0.3.

0.2 Dette souveraine, politique monétaire, financement du secteur privé et stabilité bancaire dans les pays en développement

0.2.1 Politique budgétaire, dette souveraine et financement du secteur privé

La stratégie de réduction de la dette externe par les pays émergents et en développement au profit du financement domestique fait peser un risque sur le financement du secteur privé dans ces pays en raison d'un effet d'éviction sur le marché de fonds prêtables eu égard à la structure de leurs systèmes financiers. La part de la dette domestique dans l'ensemble de la dette des économies émergentes et en développement est passée de 31% à 46% de 2000 à 2020 (IMF, 2021).[5] Sur la période 2008-2016, l'exposition des banques dans les économies émergentes et en développement est passée de 8,2% à 11,8% (Bouis, 2019).[6] Selon le Fonds monétaire

[5]Depuis 2007, la dette intérieure a doublé passant d'environ 15% du PIB à 30% du PIB dans les pays émergents (EMs) et de légèrement moins de 10% du PIB à environ 20% du PIB dans les pays à faible revenu (LICs) (IMF, 2021).

[6]Il existe une forte disparité entre les pays.

international (FMI) un niveau record a été atteint en 2021 avec 17% de l'actif bancaire dans les pays émergents (Deghi *et al.*, 2022). Si cette réorientation du financement du déficit budgétaire vers l'économie domestique peut sembler bénéfique pour ces gouvernements en réduisant par exemple l'exposition aux risques de change et à la fuite des capitaux, elle comporte néanmoins des risques pour le financement du secteur privé en évinçant ce dernier sur le marché de fonds prêtables.

La question de l'éviction du secteur privé par le secteur public a été longtemps débattue dans la littérature économique mais elle reste toujours d'actualité (Diamond, 1965; Friedman, 1978; Aschauer, 1989). La crise de la dette souveraine en Europe a ravivé le débat sur l'exposition des banques à la dette publique sur leurs prêts.[7] Ce débat reste pertinent dans les pays en développement en raison du système financier qui est peu profond et étroit. Blinder *et al.* (1973) distingue l'éviction réelle et l'éviction financière du secteur privé par le gouvernement. L'éviction réelle concerne l'effet direct de l'augmentation des investissements publics sur l'investissement privé. L'éviction financière se réfère à l'effet de l'emprunt du gouvernement sur le financement privé, entraînant une hausse des taux d'intérêt et réduisant la demande de fonds par le secteur privé, ou diminuant le volume de crédit privé (Emran et Farazi, 2009). Ce canal de transmission implique une augmentation des taux d'intérêt due à l'emprunt public, impactant l'investissement privé via le coût du capital. Il est plus manifeste dans les pays à système financier développé et taux d'intérêt flexibles. Baldacci et Kumar (2010) et Aisen et Hauner (2013) ont démontré une corrélation significative entre dette publique et taux d'intérêt, surtout en cas de déficits élevés. Eu égard à la structure du système financier dans les pays en développement, les investigations empiriques sur le canal du taux ont montré un effet limité du financement du déficit public sur le taux d'intérêt.[8]

[7] Les travaux portant sur la dette domestique dans les pays développés comme ceux de l'Europe et des États-Unis portent sur le risque ou l'effet de la matérialisation du défaut souverain sur le financement du secteur privé (Popov et Van Horen, 2013; Bottero *et al.*, 2020).

[8] Les études sur les pays en développement et certains marchés émergents, comme au Népal (Pandit *et al.*, 2005) et au Pakistan (Mukhtar et Zakaria, 2008), ont montré un lien faible, voire non significatif, entre les déficits budgétaires et les taux d'intérêt. Kelikume (2016) a constaté pour les pays de l'Afrique Sub-saharienne que les taux d'intérêt sont peu sensibles aux variations des déficits budgétaires. Ceci renforce l'idée que dans

Cependant, la dette publique intérieure peut impacter significativement le crédit au secteur privé sans passer par les fluctuations des taux d'intérêt du marché (Emran et Farazi, 2009). Ce canal de transmission, nommé canal de crédit ou quantitatif, agit sur le volume de fonds.

Toutefois, les conclusions des études empiriques sur le canal quantitatif dans les économies émergentes et en développement restent mitigées. Certaines recherches montrent une relation inverse entre la dette publique intérieure et le crédit au secteur privé (Christensen, 2005; Mbate, 2013; Shetta et Kamaly, 2014; Faye et Thiam, 2015; Lidiema, 2017; Bouis, 2019). Cependant, d'autres études ont réfuté cette hypothèse (IMF, 2005; Omodero *et al.*, 2019; Benayed et Gabsi, 2020). Par exemple, Omodero *et al.* (2019) ont constaté que la dette publique intérieure a un impact positif sur le crédit privé au Nigeria. Certaines études n'ont trouvé aucune relation significative (Maana *et al.*, 2008; Takyi et Obeng, 2013).

0.2.2 Politique monétaire et financement du secteur privé

Les premiers travaux dans les pays développés ont permis de mettre en exergue les canaux par lesquels la politique monétaire est transmise à l'économie. Ces canaux diffèrent dans leur focalisation sur le taux d'intérêt, le crédit, le taux de change et les prix des autres actifs (Taylor, 1995). En général, la littérature identifie quatre canaux pour la transmission de la politique monétaire : le canal du taux d'intérêt, le canal des autres prix des actifs, le canal du crédit et le canal des anticipations (Mishkin, 1995).

Le principal canal de transmission des impulsions monétaires se fait par les fluctuations des taux d'intérêt sur le marché des capitaux, puis sur la demande globale. La fonctionnalité du canal du taux d'intérêt suppose une substituabilité parfaite entre les sources de financement, où le taux d'intérêt des prêts bancaires suit la même tendance que celui des marchés financiers (Bernanke et Blinder, 1988). Ce canal de transmission est faible dans les pays à faible revenu où le système du marché des capitaux est embryonnaire ou inexistant. Le canal de

les économies basées sur le système bancaire, le canal des taux d'intérêt est faible, voire inexistant, en raison d'un faible développement financier dans de nombreux pays africains.

transmission le plus plausible pour les pays avec une structure financière peu développée est celui du crédit bancaire. En lien avec les hypothèses sous-jacentes qui sont fortes (Kashyap et Stein, 1994)[9] des facteurs limitent l'efficacité de ce mécanisme de transmission comme montré par les résultats décevants de la littérature empirique sur ces pays.

Les premiers travaux sur les effets de la politique monétaire dans les pays en développement ont montré des effets limités des actions monétaires sur les agrégats macroéconomiques. Selon Mishra *et al.* (2012); Mishra et Montiel (2013) et Mishra *et al.* (2014), le manque de résultats dans ces pays peut être expliqué par des facteurs structurels et méthodologiques.[10] La structure du système financier des pays à revenu faible entrave la transmission de la politique monétaire via le canal du taux d'intérêt, le canal des autres actifs et le manque d'indépendance des Banques Centrales qui rend inefficace le canal des anticipations.

Ces résultats mitigés peuvent aussi être attribués aux techniques d'estimation ou "déficiences méthodologiques" selon Mishra et Montiel (2013). Partant d'une revue de la littérature sur les travaux empiriques dans les pays en développement dans différentes régions du monde, les auteurs estiment que les modèles employés dans ces études comportent un certain nombre de

[9]Tout d'abord, il n'y a pas de substituabilité parfaite du côté des passifs entre les prêts et l'émission de titres pour certaines entreprises. En effet, il est bien connu que certaines entreprises, en particulier les petites, n'ont généralement pas accès aux marchés financiers en raison d'imperfections financières. Par conséquent, ces entreprises dépendent des prêts bancaires. Elles ne peuvent pas substituer d'autres sources de financement aux prêts bancaires. Deuxièmement, les actions de la Banque Centrale ont un effet réel sur l'offre de prêts bancaires. Cette hypothèse suggère que certaines banques sont sensibles aux variations de leurs réserves. Ainsi, une baisse de la liquidité bancaire sous une politique monétaire restrictive amène les banques à rétablir leur ratio de liquidité en vendant des titres, en émettant des certificats de dépôt ou en augmentant leur taux d'intérêt et en réduisant le volume de leurs prêts. Un changement des réserves bancaires par la Banque Centrale ne peut pas être réalisé par une réorganisation des portefeuilles de titres des banques en raison des coûts de transaction et des frais (Kashyap et Stein, 1994). Kashyap et Stein (1994) soulignent que la prime que les banques doivent payer sur les marchés des certificats de dépôt dépend de leur taille et de leur santé financière. Ainsi, les banques de petite taille et moins solides seront plus sensibles aux impulsions monétaires. La seule option pour ces banques en cas de contraction monétaire sera d'augmenter le taux d'intérêt ou de réduire leur volume de prêts. Troisièmement, la non-neutralité de la monnaie, en d'autres termes, les prix ne s'ajustent pas instantanément. Cependant, la fonctionnalité de ce canal de transmission nécessite un système bancaire compétitif et peu liquide.

[10]Les facteurs tels que la taille du secteur financier, le faible développement des marchés monétaire et interbancaire, la taille du marché de fonds propres, le manque de concurrence dans le secteur bancaire, la faible indépendance des Banques Centrales, la faible qualité des institutions et des régulateurs, parmi d'autres facteurs (voir Mishra *et al.* (2012)).

manquements notamment en termes de spécifications. Par exemple, ces auteurs soulignent la non prise en compte de l'ouverture économique en plus de la non-correction du biais d'endogénéité des actions monétaires.

Les récents travaux avec des données granulaires provenant des registres de crédit arrivent à montrer un effet de la politique monétaire sur l'offre du crédit bancaire dans certains pays en développement. Par exemple, Abuka *et al.* (2019) mettent en évidence un fort canal du crédit bancaire dans le cas de l'Ouganda, un pays en développement, en utilisant des données affinées provenant du registre du crédit. L'utilisation de microdonnées permet aux auteurs d'identifier l'effet de la politique monétaire sur le volume et le prix du crédit bancaire. Berg *et al.* (2019) arrivent à des conclusions similaires pour l'Ouganda et trois autres pays de l'Afrique de l'Est (Kenya, Tanzanie et Rwanda). Il est à noter que ces travaux bien que riches et informatifs s'intéressent à un changement drastique de politique monétaire sur l'offre de crédit. En plus, leurs travaux sont plus spécifiques à se concentrant sur un seul ou un groupe de pays d'une même région.

0.2.3 Politique monétaire et stabilité bancaire

Parmi les menaces qui peuvent entraver l'offre de crédit, l'instabilité financière occupe une importante place. Durant les périodes de crises, l'accès aux services et l'utilisation des services financiers s'en trouvent fortement perturbés. Demirgüç-Kunt *et al.* (2006) montrent que le crédit diminue substantiellement après une crise bancaire. Les pays à revenu faible et intermédiaire connaissent en moyenne plus de crises que les pays à revenu élevé (Laeven et Valencia, 2020). Ces auteurs, se basant sur des critères afin de définir des crises bancaires, ont détectés 151 crises bancaires à travers le monde sur la période 1970-2017.[11] Ces crises ont

[11] L'identification d'une crise bancaire est basée sur deux critères. Premièrement, il faut qu'il ait d'importants signes de difficultés financières dans le système bancaire tels que des retraits massifs de fonds, d'importantes pertes dans le système et/ou des liquidations des banques. Deuxièmement, il faut qu'il ait d'importantes mesures d'intervention en réponse à d'importantes dans le système bancaire. Cependant, le premier critère peut être retenu pour identifier une crise si les pertes observées sont importantes (voir Laeven et Valencia (2020)).

majoritairement été détectées et plus sévères dans les pays à revenu faible où le coût médian des crises est de 10% contre 6% dans le pays à revenu élevé.

La littérature identifie un certain nombre de déterminants de crises bancaires parmi lesquels la prise de risque des banques. La crise financière de 2007-2009 a donné lieu à un débat visant à identifier les sources de cette crise financière mondiale. Des investigations empiriques ont situé le rôle de la politique monétaire comme déterminant de la prise des risques des banques. Selon Borio et Zhu (2012), le maintien durable des taux d'intérêt à de bas niveaux peut amener les banques à accroître le volume des prêts destinés aux emprunteurs à risque dans leurs portefeuilles de créances par le biais du "canal de la prise de risque". Les travaux empiriques comme ceux de Jiménez *et al.* (2014) et Ioannidou *et al.* (2015) (en utilisant des registres de crédit), ou de Delis et Kouretas (2011) (en employant des données bancaires) ont mis en exergue l'existence de ce nouveau canal de transmission dans les pays développés. L'étude d'un lien étroit entre la politique monétaire et la prise de risque de banques dans le contexte des pays émergents est sans doute celle de Chen *et al.* (2017). Ces auteurs utilisent de données de 1000 banques couvrant 29 pays émergents sur la période 2000-2012. Ils trouvent que durant les périodes de relâchement monétaire, les banques augmentent leur prise de risque et ces résultats restent robustes en utilisant différentes mesures de la politique monétaire et différentes méthodologies économétriques. Étant donnée l'existence de différences dans les pratiques monétaires, les auteurs ont pris en compte les différents instruments monétaires tels que les taux des réserves obligatoires en plus des taux directeurs. Par ailleurs, Sarkar et Sensarma (2019) ont entrepris le même exercice en ce qui concerne le système bancaire indien. Leur échantillon comportait 89 banques sur la période 1999-2000 et 2001-2016. Ils ont mis en exergue que la politique monétaire expansionniste augmente le risque défaut en particulier celui des banques étrangères et des banques du secteur privé.

Contrairement aux pays développés et émergents, peu d'études ont porté sur les pays en développement, notamment sur les économies africaines qui ont connu des sévères crises

bancaires durant les années 80-90 et plus récemment au Nigeria (en 2008), deuxième plus grande économie africaine. Quelques travaux ont étudié la prise des risques des banques africaines en lien avec la concurrence (Akande *et al.*, 2018; Borauzima et Muller, 2023). Ces études ont conclu sur l'impact négatif de la concurrence bancaire sur les indicateurs Z-score, les prêts non performants et les provisions pour pertes sur prêts.

0.3 Structure et présentation de la thèse

La présente thèse contribue à la littérature sus-exposée (voire ci-dessous les contributions en détail), en examinant le rôle du financement de la dette domestique et de la politique monétaire sur la dynamique du crédit au secteur privé dans les pays en développement ainsi que le risque qu'une politique monétaire pourrait avoir sur la stabilité du système bancaire à travers la prise de risques des banques dans ces pays. Les travaux abordés dans le cadre de cette thèse s'articulent autour de trois chapitres.

Le premier chapitre cherche à analyser l'exposition des banques à la dette souveraine sur le crédit au secteur privé. En prenant la région de l'Union Économique et Monétaire Ouest Africaine (UEMOA) comme échantillon d'étude, l'objectif de ce chapitre est de déterminer l'effet de la détention de titres souverains par les banques sur le crédit privé et d'analyser par ailleurs les caractéristiques bancaires qui tendent à atténuer ou accentuer cet effet.

Le deuxième chapitre poursuit l'analyse du crédit dans les pays en développement, mais en analysant l'instrument monétaire de la politique économique. Ce chapitre examine le rôle de la politique monétaire sur le crédit au secteur privé en adoptant une approche qualitative. Plus spécifiquement, dans cette étude, nous cherchons à déterminer comment la perception de la contrainte financière des firmes évolue après un changement de politique monétaire dans les pays en développement.

Le troisième et dernier chapitre de la thèse aborde la question de la stabilité du système

financier, une condition *sine qua non* pour la dynamique en termes de fourniture et d'accès au financement. Nous cherchons à analyser l'effet de la politique monétaire sur la stabilité bancaire à travers l'analyse de la prise de risques des banques pour les économies africaines. Cette analyse permet donc de déterminer s'il y a un *trade-off* entre le soutien à l'économie et la stabilité du système bancaire dans les pays en développement.

Chapitre 1: Banks exposure to sovereign debt and credit to the private sector in WAEMU

Motivation et contribution

La motivation de ce chapitre est de mieux comprendre l'effet du financement domestique du déficit public dans les pays en développement sur le financement du secteur privé. Il contribue au débat sur l'effet de la dette publique domestique d'au moins de deux manières. Une première contribution de ce chapitre est d'enrichir la littérature sur l'impact de l'exposition des banques à la dette souveraine sur leur activité de financement du secteur privé dans les pays en développement à revenu faible et intermédiaire, en utilisant des données bancaires riches en informations. Les premiers travaux sur les pays en développement, notamment africains, ont eu recours à des données macroéconomiques (Christensen, 2005; Mbate, 2013; Shetta et Kamaly, 2014; Faye et Thiam, 2015; Lidiema, 2017; Omodero *et al.*, 2019; Benayed et Gabsi, 2020). En recourant à de telles données, nous pouvons mesurer avec plus de précision l'effet de la détention des titres souverains par les banques sur le crédit au secteur privé. Une deuxième contribution est d'analyser les caractéristiques des banques qui peuvent atténuer ou renforcer l'effet de leur exposition sur leurs prêts au secteur privé. Nous sommes les premiers à analyser de telles caractéristiques bancaires en lien avec la détention de la dette souveraine dans les pays en développement.

Données et stratégie empirique

Pour examiner l'effet de l'exposition des banques sur le crédit privé, nous utilisons des données

du bilan bancaire que nous avons collectées à la main grâce aux rapports de la Commission Bancaire de l'UEMOA sur le bilan et les comptes de résultat des institutions financières de la région sous format PDF sur la période 2001-2017. Ces données sont bien plus riches que celles de Bankscope ou Fitch Connect car, premièrement, elles contiennent toutes les banques qui ont été et sont en exercice pour toute la période d'analyse, contrairement à ces dernières qui contiennent moins de 75% de banques de la région (Kanga *et al.*, 2020). Deuxièmement, la variable d'intérêt est absente pour une grande partie des banques dans ces bases. Ces deux raisons valident le choix de l'utilisation des rapports de la Commission Bancaire afin de constituer notre base de données. Notre analyse porte sur un panel de 138 banques de l'UEMOA sur la période 2001-2017. Les données macro-économiques proviennent de la base de données de la BCEAO et de *World Governance Indicators* de la Banque mondiale pour la qualité de la régulation (Kaufmann *et al.*, 2011).

Pour capter l'exposition des banques à la dette souveraine, nous utilisons l'encours de titres de placements des banques. Nous n'avons pas la proportion exacte de la part de titres publics dans l'ensemble de titres détenus par les banques. Nous faisons ainsi une hypothèse selon laquelle les titres détenus par les banques sont essentiellement publics ou constitués principalement de titres souverains. Nous postulons cette hypothèse en nous basant sur les rapports de la Commission bancaire de la région, qui déclarent que les titres de placements des banques de la région sont essentiellement constitués de Bons du Trésor et d'obligations des États membres de l'Union. Dans ces rapports, les Autorités des Marchés Financiers de l'UMOA (AMF-UMOA) soulignent que les banques de la région constituent la base d'investisseurs sur les marchés de capitaux.[12]

Le crédit au secteur privé est mesuré par le ratio du crédit à la clientèle non-financière au total de l'actif bancaire. Le modèle est augmenté de variables bancaires telles que la taille

[12]Pour garantir l'exactitude de cette mesure, nous avons analysé les montants de fonds levés sur le marché financier régional sur toute la période d'étude. Cette analyse révèle que la part de fonds levés par les gouvernements est de loin la plus importante.

de la banque (total de l'actif bancaire), la capitalisation (ratio de fonds propres au total de l'actif), la liquidité (dépôts de la clientèle non-financière au total de l'actif) et la marge bancaire (le ratio de revenus provenant de prêts au total de prêts), qui peuvent influencer l'offre de crédit bancaire. Nous incluons également des variables macroéconomiques telles que le niveau de concurrence au sein du secteur bancaire, le taux de croissance, le niveau d'inflation, l'exposition des banques à la Banque Centrale et la qualité de la régulation.[13]

La technique des moindres carrés généralisés (GMM - *Generalized Method of Moments*) de Arellano et Bover (1995); Blundell et Bond (1998) est utilisée en raison du caractère dynamique du modèle économétrique. Cette méthode nous permet aussi de résoudre le biais d'endogénéité.

Résultats

Les résultats économétriques montrent qu'une exposition accrue des banques à la dette souveraine réduit significativement leur crédit privé dans la région de l'UEMOA. Le secteur public évince le secteur privé sur le marché du crédit régional à travers une fuite vers des actifs plus sûrs que représentent les titres souverains. Ces résultats sont en ligne avec ceux précédemment trouvés avec des données macroéconomiques sur les pays de l'Afrique Subsaharienne (Christensen, 2005) et sur un ensemble de pays des marchés émergents et en développement (Bouis, 2019).

La richesse de nos données nous permet d'analyser les caractéristiques bancaires qui atténuent ou accentuent l'effet négatif de la détention de titres souverains sur le crédit privé. Plus spécifiquement, nous augmentons notre modèle de base en incluant des termes d'interaction de l'exposition des banques à la dette souveraine avec un ensemble de caractéristiques : la structure de propriété, la capitalisation et la taille de la banque.

[13]La qualité de la régulation capacité du gouvernement à formuler et appliquer des politiques et des réglementations adaptées qui favorisent le développement du secteur privé.

Premièrement, la catégorisation des banques selon qu'elles soient domestiques ou étrangères (pan-africaines ou du reste du monde) montre que l'effet d'éviction est plus important pour les banques étrangères que pour les banques domestiques. En d'autres termes, lorsque les banques étrangères sont exposées aux titres souverains, elles réduisent plus drastiquement leur crédit au secteur privé que leurs homologues domestiques. Une analyse sous-dimensionnelle souligne que cet effet est particulièrement prononcé chez les banques étrangères, notamment porté par les banques pan-africaines. En revanche, les banques étrangères d'origine française, qui constituent la majorité des banques d'origine non africaine, atténuent l'effet négatif de la détention de la dette souveraine sur leur crédit au secteur privé.

Par ailleurs, les résultats suggèrent que les banques qui respectent l'exigence de capital minimum mise en place par le régulateur ou qui sont mieux capitalisées (c'est-à-dire celles qui se trouvent au-dessus de la médiane) atténuent l'impact négatif de la détention de titres souverains sur leur crédit privé. En d'autres termes, les banques qui ne respectent pas le capital réglementaire réduisent davantage leur crédit au secteur privé lorsqu'elles détiennent plus de titres souverains dans leurs bilans. Ces résultats sont similaires pour la taille des banques. En effet, les résultats montrent que les banques de grande taille, selon la définition de la Commission bancaire de la région, atténuent l'effet d'éviction, contrairement aux banques de petite taille qui renforcent davantage cet effet.

Il apparaît de ces analyses d'hétérogénéité que les caractéristiques des banques sont importantes dans l'explication de l'ampleur de l'effet de la détention de la dette souveraine sur le crédit au secteur privé. Plus précisément, les banques pan-africaines et les banques de petite taille, qui ne sont pas forcément les moins capitalisées, ainsi que les banques qui ne respectent pas l'exigence minimale du capital réglementaire, réduisent davantage leur crédit à la clientèle financière lorsqu'elles sont exposées à la dette souveraine.

Chapitre 2: Do firms react to monetary policy in developing countries?

Motivation et contribution

La transmission de la politique monétaire reste un champ à explorer dans les pays en développement. La nécessité de mieux comprendre comment les agents économiques, notamment les firmes dans notre contexte, réagissent à une variation de l'instrument de politique monétaire dans ces pays motive ce travail. Notre contribution à la littérature sur la politique monétaire dans les pays en développement est multiple. Contrairement aux travaux susmentionnés, notre analyse s'intéresse à la réaction des emprunteurs. Nous cherchons à déterminer comment réagissent les potentiels emprunteurs (entreprises) après un changement du taux directeur de la Banque Centrale pour un panel de pays en développement. Ensuite, nous contribuons à la littérature en introduisant une nouvelle approche dans l'identification de la politique monétaire afin de réduire le biais d'endogénéité de cette dernière. Enfin, ce travail analyse un ensemble de caractéristiques de l'entreprise et des structures financières, économiques et institutionnelles du pays qui peuvent influer sur l'ampleur de l'effet de la politique monétaire sur la perception de la contrainte financière.

Données et stratégie empirique

Afin de déterminer l'effet de la politique monétaire sur la perception de la contrainte financière des entreprises, nous combinons des données d'enquêtes provenant de *Enterprise Surveys* de la Banque mondiale (WBES) et des données sur la politique monétaire collectées à la main via les rapports et les communiqués sur les sites internet des Banques Centrales.[14] L'échantillon d'analyse porte sur 63 pays en développement.

La variable "perception" est la réponse à la question d'enquête sur la perception du gestion-

[14]Nous cherchons dans ces documents la date exacte du changement du taux directeur de la Banque Centrale qui est essentielle pour notre identification empirique (jour, mois et année).

naire de l'entreprise concernant l'accès au financement comme obstacle à leurs activités.[15] Nous identifions la politique monétaire par le taux directeur de l'institution d'émission. Notre modèle de base est augmenté des variables de contrôle telles que : la taille de l'entreprise (nombre d'employés, en logarithme), l'âge de l'entreprise (durée entre la date de l'entretien et l'année de création rapportée dans le WBES, en logarithmes), l'expérience du gestionnaire en années. Nous incluons également un ensemble de variables binaires pour savoir si l'entreprise est détenue par une femme; si elle est étrangère ou étatique; si elle est dans le secteur manufacturier; si elle fait partie d'une entreprise multi-établissements, et son statut juridique (coté en bourse, partenariat, entreprise individuelle). Enfin, nous contrôlons également les exportateurs, définis comme les entreprises qui envoient une partie de leur production à l'étranger.

Nous adoptons l'approche développée par Depetris-Chauvin *et al.* (2020) pour notre identification. Cette technique consiste à comparer des unités enquêtées juste avant et après un événement. Ainsi, cette approche nous permet d'analyser l'effet de la politique monétaire sur les entreprises après un changement de taux directeur de la Banque Centrale en comparant celles qui ont été enquêtées juste après un changement de politique à celles qui ont été enquêtées juste avant, en prenant une fenêtre de deux mois afin de comparer des entreprises évoluant dans les mêmes conditions macroéconomiques.

Résultats

Le principal résultat est que la perception de la contrainte financière des entreprises change après une variation non nulle du taux directeur de la politique monétaire dans les pays en développement. Cependant, le résultat est significatif lorsque la variation est importante, c'est-à-dire à partir de 100 points de base. Il ressort que l'effet est symétrique. Autrement dit,

[15] La question suivante est posée : *"Dans quelle mesure l'accès au financement est-il un obstacle aux opérations actuelles de cet établissement ?"*. Cinq réponses qualitatives sont possibles pour les répondants, à savoir : le financement n'est pas un obstacle, un obstacle mineur, un obstacle modéré, un obstacle majeur et un obstacle très majeur.

la perception de la contrainte financière augmente lorsque la variation du taux est positive, ce qui dénote une politique monétaire restrictive, et elle diminue en revanche lorsque la politique monétaire est accommodante. Ces résultats sont en ligne avec ceux de Abuka *et al.* (2019) et Berg *et al.* (2019) portant sur des pays en développement sur l'offre du crédit bancaire.

Par ailleurs, en examinant l'hétérogénéité entre les firmes, les résultats montrent que les caractéristiques de ces dernières jouent un rôle dans leur perception après un changement de politique monétaire. En effet, nous avons trouvé que la taille, l'âge, le genre du propriétaire et le lien de l'entreprise avec le système financier amplifient ou atténuent leur perception. Les estimations du modèle des interactions montrent que la perception de la contrainte financière après un changement de politique monétaire augmente avec l'âge de la firme ainsi que sa taille. Ces résultats peuvent s'expliquer par le fait que les entreprises les plus anciennes et grandes interagissent plus avec le système financier que les jeunes entreprises ou les petites firmes qui sont souvent exclues du système financier (Beck *et al.*, 2006; Hyytinen et Pajarinen, 2008). En plus de ces caractéristiques, le fait que la firme ait déjà une relation avec le système financier augmente sa perception de la contrainte financière après un changement de politique monétaire. En revanche, la perception est renforcée lorsque le genre du propriétaire est masculin. Ce résultat rejoint la littérature sur la discrimination du genre dans la finance dans les pays en développement (Asiedu *et al.*, 2012).

Les spécificités des pays permettent également de déterminer l'efficacité de la politique monétaire ou encore l'intensité de la transmission des signaux monétaires. Les résultats montrent que le niveau de développement financier, de concurrence et de liquidité permettent d'accentuer ou d'atténuer l'impact de la politique monétaire dans les pays en développement. D'abord, le niveau de développement financier amplifie l'effet de la variation du taux directeur sur la perception, avec un effet seuil. Par ailleurs, en ligne avec la littérature, nous avons trouvé que la perception est plus importante dans les pays avec un secteur bancaire plus compétitif (moins concentré), ce qui dénote une meilleure transmission de la politique

monétaire (Mishra *et al.*, 2014). Nos résultats corroborent les conclusions de Saxegaard (2006) sur l'inefficacité de la politique monétaire dans un environnement bancaire sur-liquide. En prenant les transferts reçus des migrants comme un proxy de la sur-liquidité, nous parvenons à démontrer que l'efficacité de la politique monétaire est amoindrie avec les transferts reçus des migrants qui rendent le système financier sur-liquide (Barajas *et al.*, 2018).

Chapitre 3 : Monetary policy and risk-taking in Africa

Motivation et contribution

Nonobstant une littérature grandissante sur la prise de risques des banques en lien avec la politique monétaire dans les pays avancés et des marchés émergents, elle reste silencieuse sur les pays en développement. Cette analyse est une grande importance dans ces pays qui connaissent en moyenne plus de crises bancaires comparativement aux pays à revenu élevé. Ce chapitre vise à examiner l'effet de la politique monétaire sur la prise de risques bancaires dans les pays d'Afrique. Elle contribue à la littérature existante sur le lien entre la politique monétaire et la prise de risques en analysant ce canal de transission des effets de la politique monétaire dans le contexte des pays en développement, notamment africains.

Données et stratégie empirique

Pour répondre à la problématique posée, ce chapitre mobilise des données de 537 banques provenant de 43 pays africains. Les données sur les bilans des banques proviennent de Fitch Connect, celles sur les taux proviennent de la base de données du Fonds monétaire internationale (FMI) sur les statistiques financières internationales (IFS- *International Financial statistics*) et des bases de la BM (*WGI*, *Deposit Insurance Dataset*).

Pour mesurer la prise de risque bancaire, nous utilisons l'indicateur Z-score. D'autres indicateurs inhérents à la qualité de l'actif bancaire sont utilisés, tels que les ratios de prêts non-performants et de provisions pour perte sur prêts, ainsi que le ratio des actifs à risque

au total des actifs.

Les taux directeurs des Banques Centrales sont utilisés afin d'identifier la politique monétaire. Cette variable est prise en différence. Une variation positive stipule un resserrement de la politique monétaire, tandis qu'une variation négative correspond à une politique monétaire accommodante. Nous incluons des variables de contrôle au niveau bancaire telles que la taille de la banque (logarithme de l'actif total), la capitalisation (ratio de fonds propres au total de l'actif), la diversification (ratio des revenus hors intérêts sur le total des revenus d'exploitation), l'efficience (ratio des dépenses sur le revenu total), la rentabilité (ratio des bénéfices avant impôts sur le total des actifs). Au niveau macroéconomique, nous incluons le niveau de concurrence (la part de cinq plus grandes banques dans l'actif bancaire), le niveau de développement financier, l'inflation, la croissance du PIB, l'indice des prix des matières premières, le transfert d'argent de migrants, l'existence d'une assurance dépôt et la qualité de la régulation.

La principale technique d'estimation utilisée est la méthode des effets fixes afin de tenir compte des effets inobservés aux niveaux individuel (banque) et pays, en plus de l'inclusion des effets fixes temporels. La méthode des variables instrumentales est aussi utilisée pour tester la robustesse des résultats à la présence éventuelle de l'endogénéité.

Résultats

Les résultats des estimations économétriques suggèrent l'existence du canal de la prise de risque dans les pays africains. Une baisse du taux directeur (variation négative) détériore l'indicateur de solvabilité bancaire. Ces résultats corroborent les conclusions des études menées dans d'autres régions du monde (Altunbas *et al.*, 2010; Jiménez *et al.*, 2014; Chen *et al.*, 2017; Brana *et al.*, 2019). Il est à noter que l'existence de ce canal de transmission de la politique monétaire est significative en Afrique Sub-saharienne et non en Afrique du Nord. Ces résultats sont robustes face à l'utilisation d'indicateurs alternatifs de la qualité du

bilan bancaire (prêts non-performants, provisions pour perte sur prêts, et actifs risqués), au changement de spécification en adoptant un modèle dynamique et à l'utilisation de techniques d'estimations alternatives, y compris le traitement d'un potentiel problème d'endogénéité en recourant à l'approche des variables instrumentales.

L'analyse de l'hétérogénéité des banques et des spécificités des pays montre que les caractéristiques des banques, la structure du système financier et le pouvoir du régulateur ont une influence sur l'ampleur et le lien entre la politique monétaire et la prise de risque des banques en Afrique.

Concernant les caractéristiques bancaires telles que la taille, la capitalisation, l'efficience bancaire et la structure de propriété (domestique versus étrangère), nous avons constaté que la taille de la banque amplifie l'effet du canal de la prise de risque. Ce résultat suggère que les grandes banques ont tendance à prendre plus de risques durant une période de politique monétaire expansionniste que leurs homologues de petite taille. En revanche, l'efficience et la structure de propriété étrangère de la banque réduisent la probabilité de défaut bancaire. La capitalisation (ratio de fonds propres au total de l'actif) réduit l'exposition des banques aux actifs risqués durant une période de politique monétaire accommodante.

Deuxièmement, les caractéristiques des pays, notamment la structure du système financier via la compétition au sein du secteur bancaire, la profondeur financière et l'existence d'une assurance de dépôts explicite, ainsi que la qualité de la régulation selon Kaufmann *et al.* (2011), modulent également l'ampleur du lien entre la politique monétaire et la prise de risque en Afrique.

Plus spécifiquement, la variable de concentration construite à partir des parts de marché de trois grandes banques suggère que l'effet d'une politique monétaire expansionniste sur la prise de risque est d'autant plus important lorsque le système bancaire devient moins compétitif (plus concentré). Concernant la profondeur financière, captée par l'indice de développement

financier, nous avons constaté que l'ampleur de l'effet de la politique monétaire sur la prise de risque des banques est d'autant plus importante lorsque la profondeur du système financier augmente. Cependant, la qualité de la régulation permet de réduire la prise de risque lorsque le taux directeur de la Banque centrale diminue.

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Chapter 1

Banks exposure to sovereign debt and credit to private sector in WAEMU

1.1 Introduction

Access to credit by the private sector is widely recognized as a key determinant of economic growth, especially in developing countries (King and Levine, 1993). Increasing credit to this sector can improve productivity and ultimately lead to economic growth. However, many businesses in developing countries face a significant challenge in accessing financing. In Africa, access to finance is one of the two most cited obstacles affecting business operations, with 19.6% of firms citing it as an obstacle after infrastructure (UNECA, 2020).

One of the threats to private sector financing is the domestic financing strategy of sovereign deficit in these countries. In past years, many governments in developing countries have reduced their external indebtedness and increased their domestic financing (Hauner, 2009).[1] Over the 2008-2016 period, banks' exposure to sovereign debt increased from 8.2 percent to 11.8 percent of their total assets in emerging markets and developing economies (EMDEs) (Bouis, 2019). This recent development of domestic public debt revives the debate on its impact on private sector financing. However, the literature is not conclusive on the impact of domestic deficit financing on private sector credit.

Two strands emerged from the literature on banks' exposure to sovereign debt on their credit to the private sector: the "lazy banks" view (Hauner, 2008) and the "safe assets" view (Kumhof and Tanner, 2005). According to the "lazy banks" view (Hauner, 2008; Emran and Farazi, 2009), high levels of government borrowing may cause banks to be lazier in seeking new profitable projects, so they will reduce their lending to the private sector, which represents a higher risk of default compared to government, which subsequently crowds out small and medium-sized enterprises from the market. On the other hand, according to the "safe assets" holding government securities by banks can improve financial development by increasing the credit supply, known as the crowding-in effect (Kumhof and Tanner, 2005).

[1] It should be noted that this decrease in external debt accompanies an increase in internal debt. For example, in low-income countries, external debt has fallen from 72 percent of GDP in 1996 to 23 percent in 2011 (Bua et al., 2014)

Similar dichotomous conclusions have been found in the empirical literature. While there are studies that support the positive relationship between domestic debt and financial development (IMF, 2005; Omodero et al., 2019), there are some studies that found domestic debt to be inversely related to private credit (see De Bonis and Stacchini, 2013; Christensen, 2005; Bouis, 2019, among others) or not bonded (Takyi and Obeng, 2013).

Despite a growing literature on the nexus between banks' exposure to government securities and their credit to the private sector, the empirical literature is scant in the context of developing countries, as pointed out by Bouis (2019). The literature has been focused mainly on the banking sector of developed countries (predominantly the U.S. and Europe). Developing countries' banking sector, specifically the West African Economic and Monetary Union (WAEMU) region, has received relatively little attention.[2] The WAEMU region represents an interesting case of study for analyzing the link between sovereign debt and private lending for the following reasons. Firstly, the share of public securities has doubled in banks' total assets from 2003 to 2017, increasing from 6 percent to 20 percent in this region (see Table A5 in Appendix).[3] This dynamic is not without risk for the development of the private sector in a bank-based economy, i.e., banks are the principal source of finance for businesses and households in this region, as in many developing countries. In such an environment, extensive banks' exposure to sovereign debt may reduce banks' lending to the private sector.[4]

The second motivation for this paper is that these analyses have mainly ignored bank characteristics (size, capitalization, ownership structure, etc.). The lack of heterogeneity analyses in

[2]The West African Economic and Monetary Union (WAEMU) is composed of eight (8) countries: Benin, Burkina Faso, Côte d'Ivoire, Guinea Bissau, Mali, Niger, Senegal, and Togo. These countries share a single currency under the authority of a central bank (BCEAO), which is responsible for the monetary policy. The financial and banking systems are subject to the same regulations. In addition, they share a financial market in which more than 80% of securities issue is public.

[3]Domestic debt refers to funds raised internally by the government; it is measured here by securities held by banks in this region, and private credit refers to credit granted by banks to their non-financial customers.

[4]Private sector investment is the most crucial determinant of economic growth in the West African Economic and Monetary Union (WAEMU), according to Nubukpo (2007), who show that the private investment variable appears, in the short and long term, to have the most significant impact on WAEMU economic growth.

these studies can be explained by the macroeconomic nature of their data. However, the banking literature emphasizes that bank characteristics matter to capture the overall effect as they react differently. Moreover, the existing studies on bank-level data used mainly Bankscope.[5] This database covers less than 75% of banks in the region (see Kanga et al. (2020)). So, we use hand-collected bank-level data, which are more informative than Bankscope ones.

This study extends and contributes to the literature on the nexus between sovereign debt and bank lending in at least two ways. For the first contribution, we analyze the relationship between sovereign debt and credit to the private sector in a set of developing countries based on bank-level data. Given the importance of banks in the financing of economic activity in a rudimentary financial market system, the drainage of bank liquidity to the central government can induce a decrease in funds available for lending to the private sector with adverse consequences for the private sector growth (Christensen, 2005), particularly for small and medium-sized enterprises which generally do not have access to other sources of financing and are credit constrained (Beck and Demirguc-Kunt, 2006). Considering the structure of the markets, which is composed mainly of small and medium-sized enterprises (SMEs) within the region, this may deprive the economies of potential growth gains that the private sector can generate. This paper responds to the above demand for additional knowledge for policymakers and fills existing research gaps using bank-level data.

For the second contribution, we investigate whether the impact of sovereign debt on private credit in the WAEMU region is sensitive to bank features. The region's banking system is heterogeneous in origin, size, and capital. Before the 2000s, public banks dominated the regional banking sector with a special connection with national governments. Indeed, one of the leading causes of the banking crises between 1980 and 1995 was non-performing loans to public and para-public enterprises, mainly by public banks (Caprio and Klingebiel, 1996).

[5] Gennaioli et al. (2018) have used data from Bankscope in order to analyze the effect of sovereign default in 191 countries over the 1998-2012 period. They document a negative and statistically significant relationship between a bank's bond holdings and its lending during defaults.

Reforms following these crises reduced the number of state-owned banks. These policies have transformed the ownership structure of banks through the presence of foreign capital banks, especially Pan-African banks. For example, the arbitrage of banks in reallocating their assets between government securities and private sector credit may differ between domestic and foreign banks. In addition to ownership structure, banks operating in the region are disparate in size and capitalization. Ignoring their specificities can lead to misguided policy recommendations. This paper then analyzes the effects of holding government securities across different types of banks in terms of origin, size, and capitalization. Our study is one of the few works that analyze the specificities of the banking sector.

We use hand-collected data from 136 banks from 8 countries of WAEMU over the 2001-2017 period and employ the system GMM estimation strategy to overcome some potential endogeneity issues in the empirical model. Our results suggest that banks' exposure to sovereign debt harms their lending to the private sector in the WAEMU region. These findings suggest that an increase in banks' government security holdings leads to a decline in credit extended to the private sector, indicating a quantitative crowding out in the credit market in this region. Yet, the investigation by income level of countries shows that the negative effect of security holdings is more significant in low-income countries (LICs) than in middle-income countries (LMICs). These results hold using alternative measures of credit and securities and estimation techniques. Concerning banks characteristics, the results show that the extent of crowding out is more significant for foreign banks (Pan-African banks). In addition, the crowding-out effect stems from small and less capitalized banks.

The rest of the paper is structured as follows. Section 1.2 presents the related literature on sovereign debt and credit to the private sector, following which we develop our research hypotheses. Section 1.3 introduces the specification of the empirical model and the empirical strategy. Section 1.4 is devoted to the data presentation and descriptive statistics. Section 1.5 and Section 1.6 report the result of our baseline model and robustness checks, respectively.

Finally, Section 1.7 presents the effects of security holdings on private credit by considering banking heterogeneity. Section 1.8 concludes.

1.2 Related Literature and hypotheses development

1.2.1 Literature review

In many developing countries, banks' increasing exposure to sovereign debt has reignited the debate on its impact on private-sector credit. While this debate is topical, it is not new. The crowding out of the private sector by the public sector is not a recent area of investigation by academicians (Diamond, 1965; Blinder et al., 1973; Friedman, 1978; Aschauer, 1989). Given the negative consequences of a decline in credit on production, several economic theories have been mobilized to understand the factors that can negatively affect the latter.

Two types of crowding-out are identified in the literature: the real and financial crowding out of the private sector by the government (Blinder et al., 1973; Friedman, 1978). The former refers to so-called direct crowding out. This is the effect of increasing public investment on private sector investment -gross fixed capital formation-. This crowding out occurs when the government undertakes activities that the private sector could provide. The latter refers to the effect of government borrowing on private financing. In this case, the government competes with the private sector in the credit markets. More specifically, the financial or indirect crowding out effect is that an increase in government borrowing may induce an increase in interest rates, leading to lower demand for funds by the private sector or reducing the volume of private credit.[6]

[6]Several theories can explain the shift from private sector financing by banks to public securities. The trade-off between sovereign securities and credit to the private sector can be explained by financial repression, where the government can take restrictive or encouraging measures to make banks hold their securities (Bouis, 2019), but also by the high credit risk of the private sector that could push banks to take refuge in safe assets. The purchase of government securities by banks could also result from a decrease in private sector demand for credit during periods of recession - crises or wars - (Becker and Ivashina, 2018; Bouis, 2019; De Bonis and Stacchini, 2013; Gennaioli et al., 2018), which leads to lower government tax revenues and, consequently, to increased financing needs and higher public debt.

This channel works through a rise in interest rates resulting from public borrowing. The resulting upward pressure in interest rates will reduce any private investments, which are interest rates elastic (Blinder et al., 1973). This mechanism is more likely to be functional in countries where the financial system is developed, and interest rates are not rigid to rise or fall. For instance, Baldacci and Kumar (2010), for a panel of 31 developed and emerging countries from 1980-2008, concludes that public debt significantly impacts long-term interest rates.[7] The finding of Baldacci and Kumar (2010) is corroborated by Aisen and Hauner (2013) using data on 60 advanced and emerging countries. These authors found evidence of a positive impact of the budget deficit on interest rates. Yet, the effect is significant when public deficit or debt is high, mostly domestically financed and financial openness is low. In addition, the effect is larger when interest rates are liberalized and when the domestic sector is less developed.

However, observing this transmission channel in developing countries can be challenging. According to Emran and Farazi (2009), this approach is more applicable when the banking sector is liberalized, and market forces determine interest rates. However, in developing countries, the banking system has often been subject to government interventions, and the central bank frequently sets interest rates administratively. Several studies examining the interest rate channel in developing and emerging market countries have found either no significant link or a weak relationship between sovereign debt and interest rates (Akinboade, 2004; Pandit et al., 2005; Mukhtar and Zakaria, 2008; Kelikume, 2016, among others).[8] For instance, Akinboade (2004) investigated the impact of budget deficits on interest rates in South Africa using the Granger causality method and concluded that budget deficits do not affect interest rates. Similarly, Kelikume (2016), analyzing a panel of 18 Sub-Saharan

[7] The magnitude of the impact depends on several institutional and structural conditions. More specifically, they found that economies with structurally high domestic savings and systems that rely on bank financing more than capital markets for funding investments can absorb an increase in public bond supply compared to countries with low saving ratios.

[8] Evidence from these studies, Pandit et al. (2005) in Nepal and Mukhtar and Zakaria (2008) in Pakistan, showed a positive but statistically insignificant relationship between budget deficits and interest rates.

African countries, found that interest rates are insensitive to changes in budget deficits. These findings reinforce the hypothesis that developing countries' interest rate channels are weak or nonfunctional.

Nevertheless, domestic government debt can significantly affect the volume of credit extended to the private sector even if interest rates are not determined by the market. When interest rates are rigid, the effect of domestic public debt is transmitted through adjustments in the volume of credit (Emran and Farazi, 2009). Emran and Farazi (2009) argues that even if the banking system sector is liberalized, the impact of government borrowing can still passed through credit availability, especially in less developed credit markets where credit rationing may be more prevalent. This transmission mechanism, known as the credit or quantitative channel, depends on the endogenous response of banks, which may either reduce or limit new loan extensions.

The empirical literature on the quantitative channel of financial crowding out has yielded inconclusive results. In the case of Emerging Market and Developing Economies (EMDEs), some studies have found an inverse relationship between domestic public debt and private sector credit (Christensen, 2005; Emran and Farazi, 2009; Mbate, 2013; De Bonis and Stacchini, 2013; Shetta and Kamaly, 2014; Lidiema, 2017; Bouis, 2019). Christensen (2005) specifically identifies a significant negative effect of domestic debt on private credit. He documents that a 1% increase in domestic credit to the central government, as a percentage of money supply, leads to a 0.15% reduction in private credit. Based on a panel of 60 developing countries, Emran and Farazi (2009) document a negative relationship between banks' claims on the government and the credit to the private sector. More recently, Bouis (2019) shows that higher banks' holdings of government debt are associated with a lower credit growth to the private sector based on a large panel of EMDEs. On the contrary, several studies have challenged this hypothesis (IMF, 2005; Omodero et al., 2019; Benayed and Gabsi, 2020). For example, Omodero et al. (2019) finds that domestic debt positively impacts private credit

in Nigeria. Other studies have found no significant effect of domestic public borrowing on credit (Maana et al., 2008; Takyi and Obeng, 2013).

Our study stands out from the above extensive literature on the impact of domestic public debt on credit by employing bank-level data. These data offer the advantage to accurately quantify the effect of banks' exposure to sovereign debt on their lending. The richness of our data allows us to extend the analysis by examining the characteristics of banks that may influence the magnitude of the sovereign debt effect on private credit.

1.2.2 Hypotheses development

Two views have been proposed in the literature. First, banks can adopt the "safe assets" behavior, especially those with a high credit risk exposure; since sovereign debt allows them to neutralize or compensate for such exposure, they will therefore be more inclined to take more risk by maintaining or increasing lending (Kumhof and Tanner, 2005). Second, according to Hauner (2008), the "lazy banks" model assumes that a high level of government borrowing can make banks lazier in seeking new profitable projects, so they will reduce their lending to the private sector, which represents a higher risk of default. The predominant finding in EMDEs is a negative impact of domestic debt on financial development (Hauner, 2008; Emran and Farazi, 2009; Bouis, 2019, among others). We argue that banks in the WAEMU region behave similarly to banks in other developing countries, as they operate in comparable environments. Moreover, in the context of the WAEMU region, sovereign securities are tax-exempt with interest rates around 6-7%. They are zero-risk weighting in the calculation of regulatory capital and admitted by the Banque Centrale des Etats de l'Afrique de l'Ouest (BCEAO) in its refinancing operations. Also, sovereign debt is supposed to have a zero risk of default, unlike private credit. In light of the literature and the advantages associated with these securities, banks may reduce their private credit and increase their sovereign exposure.[9]

[9]The Banque Centrale de l'Afrique de l'Ouest (BCEAO) is the central bank of the WAEMU region. This institution has been in charge of implementing the common monetary policy in the region and, in general, the supervision of the banking system since 1962. As Article 8 of its statutes states, the primary objective

However, the magnitude of the impact can vary between countries based on their financial development and income levels (Ismihan and Ozkan, 2012). These authors highlight that the effect of sovereign debt is less significant when the financial system is developed. Aisen and Hauner (2013) have empirically demonstrated that the crowding-out effect of budget deficits is more meaningful when the financial sector is less developed. We therefore argue that the magnitude of sovereign debt holding by banks on private credit can differ across countries, given the structure of the WAEMU region. Indeed, 6 out of 8 countries are low-income countries (LICs), according to the World Bank's classification. Additionally, these two middle-level income countries concentrate more than 40% of banks in the region. Based on the literature and the country's characteristics, we argue that the financial level will mitigate the crowding-out effect.

Therefore, we postulate the following hypotheses :

H1a: Banks' sovereign debt exposure has a negative effect on private sector credit in WAEMU.

H1b: The negative effect of banks' security holdings on private credit is higher in LICs than in LMICs.

The magnitude and the effect (positive or negative) of banks' sovereign debt exposure on their lending activity may depend on their characteristics in terms of ownership, size, and capitalization structures. Hypotheses *H2*, *H3*, and *H4* take into account this heterogeneity.

Ownership structure can be an influential factor in banks' decisions to hold sovereign securities. Ongena et al. (2019) argue that domestic banks hold more state securities than their foreign counterparts, especially state-owned banks, and those that receive central government support or have politicians on the board (De Marco and Macchiavelli, 2016). Based on the theory of financial repression - moral suasion - the government can encourage domestic banks to invest in public securities compared to foreign banks (Ongena et al., 2019). Therefore,

of BCEAO is to maintain price stability.

a domestic bank (mainly state ones) may have other incentives than profit-seeking to hold government securities and thus reduce its lending activity (Gennaioli et al., 2018). Yet, we have no knowledge of any form of implicit or explicit repression in this region. However, given these securities' relatively low default risk, foreign banks can hold them more than domestic banks because of their access to international capital markets.[10] It should be noted that foreign banks are heterogeneous in terms of origin within the region. We have two main blocks: Pan-African and non-Pan-African banks, which are mainly French. Thus, the effect of their exposure to sovereign debt on private credit could be different depending on their origin. Pan-African banks bear more risk and are less profitable (ROA) (see Kanga et al. (2021)) than their peers, mainly French. We argue that Pan-African banks may behave as lazy banks by acquiring sovereign debt to reduce their risk exposure and improve their profitability. Conversely, foreign banks from France could invest in sovereign debt and take more risk on the one hand. Several studies on African countries have shown that foreign banks from developed countries engage in "cherry picking" by granting loans to large corporations (Beck et al., 2014; Kanga et al., 2019). Therefore, we expect these banks to not reduce their lending activities even if they hold sovereign bonds. Consequently, we postulate that French foreign banks mitigate the crowding-out effect in the region.

Given the high proportion of Pan-African banks among foreign banks, we initially expect that the crowding-out effect will be magnified by foreign banks. Pan-African banks will drive this effect. On the other hand, French banks mitigate this effect. Based on the literature and WAEMU context, we postulate the following hypotheses :

H2a: The negative effect of sovereign security holdings on private credit is higher for foreign banks than domestic banks in WAEMU.

H2b: The negative effect of sovereign security holdings on private credit is mitigate by foreign

[10]We define a bank as foreign if a foreign entity holds more than 50% of the bank's equity capital. The same definition holds for all ownership structures.

French banks.

Small banks experience more financial constraints than large banks in accessing external financial resources (Kashyap and Stein, 1994). Furthermore, unlike large banks (mainly foreign banks), small banks do not have the advantage of internal capital markets to obtain funding (Stein, 1997; Cetorelli and Goldberg, 2012). Consequently, the funds allocated for financial investments cannot be readily replaced in the financial markets due to their size. As a result, small banks are compelled to curtail their lending activities in this case. For example, a large bank may invest in government securities and maintain its lending activities. Based on these frictions and the comparative advantages of large banks, we postulate the hypothesis that :

H3: The effect of sovereign security holdings on private credit is lower for large banks.

The effect of banks' exposure to sovereign debt on lending activities may be influenced by their capitalization level. Specifically, well-capitalized banks can tend to play the cautious card, so the better a bank is capitalized, the more it prefers to hold low-risk assets instead of banks with higher leverage (Delis and Kouretas, 2011). Therefore, well-capitalized banks "flight to quality", unlike undercapitalized banks, which may hold sovereign securities because of regulatory capital requirement (Rodrigues et al., 1993). However, the literature is inconclusive, as some postulate that well-capitalized banks tend to undertake risky activities for a higher return on investment. Gong et al. (2018) provide evidence that bank risk is positively associated with the capital ratio. In the context of WAEMU, Kanga et al. (2020) document a positive link between bank capitalization and profitability. They explain this result by the fact that well-capitalized banks have less need to borrow to develop the share of risky assets such as loans due to their capital serving as a cushion. We therefore argue that being a well-capitalized bank reduces the adverse effect of sovereign debt exposure on loans. Based on the literature and WAEMU context, we formulate the following hypothesis :

H4: The negative effect of security holdings on private credit is lower for well-capitalized banks.

1.3 Empirical model and Estimation strategy

1.3.1 Empirical specification

This paper analyzes the effect of banks' exposure to sovereign debt on private sector credit. To do so, we specify our baseline econometric model as follows:

$$Credit_{ijt} = \alpha_0 + \beta_1 Credit_{ij(t-1)} + \beta_2 Securities_{ijt} + \gamma Bankcaract'_{ijt} + \phi Macro'_{jt} + \theta QualityInst'_{jt} + \varepsilon_j + \zeta_t + \epsilon_{ijt} \quad (1.1)$$

where $Credit_{ijt}$ stands for credit to the private sector as the ratio of loans to total assets of bank i, in country j in time t. The introduction of the lagged dependent variable ($Credit_{ij(t-1)}$) responds to the concern to control for unobserved characteristics of loans granted by banks in previous periods that have an impact on loan growth in the current period ($\beta_1 > 0$) (Beutler et al., 2020). $Securities_{ijt}$ represents the ratio of securities in bank i total assets, in country j in year t. The coefficient of interest is β_2. Based on the literature on the nexus between banks' holdings of sovereign securities and private sector credit, the expected effect is negative ($\beta_2 < 0$) to assert *H1a*. The hypothesis *H1a* suggests that when banks invest more in sovereign securities, it reduces the amount of funds available for the private sector, all other things being equal. This hypothesis could be verified in the WAEMU region, as shown in Figure 1.2 on the dynamics of private credit and securities in the banks' balance sheets. $Bankcaract$, $Macro$, and $QualityInst$ stand for bank characteristics, macroeconomic environment and the institutional quality which can affect bank lending.

The variables ε_j and ζ_t represent the unobserved country and time effects. The variable ϵ_{ijt} defines the idiosyncratic error term. Banks are clustered.

When focusing on the differential impact of sovereign debt holding on private credit of different categories of banks in terms of ownership structure, size, and capitalization, interaction terms represented by $Bankcaract \times Securities$ are introduced in Equation (1.2). The use of interaction terms has some advantages, such as the gain of degrees of freedom.

$$\begin{aligned} Credit_{ijt} = \alpha_0 + \beta_1 Credit_{ij(t-1)} + \beta_2 Securities_{ijt} + \gamma Bankcaract'_{ijt} \\ + \eta Bankcaract'_{ijt} \times Securities + \phi Macro'_{jt} + \theta QualityInst'_{jt} \\ + \varepsilon_j + \zeta_t + \epsilon_{ijt} \end{aligned} \tag{1.2}$$

According to the hypotheses, foreign banks tend to decrease their credit availability when they hold securities ($\eta < 0$). Conversely, when banks are large and have adequate capital, they can either have a crowding-in effect ($\eta > \beta_2$) or reduce the negative impact of sovereign debt on private sector credit ($\eta > 0$ and $\eta < \beta_2$).

The control variables used are based on theoretical and empirical considerations. We use three sets of control variables: banking, macroeconomic, and institutional.

Bank level variables

We introduce a bunch of bank characteristics that can affect bank lending activity. First, we control for bank size (Size), which is the natural logarithm of bank assets in millions of CFA francs. According to the literature on bank size, large banks, because of their size and diversification, have access to better financing terms and grant more credit (Berger and Udell, 2006). If some empirical studies support this view (Allen and Paligorova, 2015; Rabab'ah, 2015), others find adverse effects between the two variables (Vo, 2018). We expect a negative impact of bank size on credit in the WAEMU region due to the lack of collateral combined with weak creditors rights (Altunbas et al., 2009; Berger and Black, 2011; Fungáčová et al., 2014).

Bank capitalization (CAP), measured as a share of total assets, matters in bank lending activity. Some argue that well-capitalized banks are more able to absorb shocks that degrade their portfolios without having to reduce the volume of their assets because they have access to unsecured financing (Allen and Paligorova, 2015) contrary to undercapitalized banks, which in the event of similar shocks will be forced to readjust their balance sheets on the asset side (Olokoyo, 2011), on the one hand. On the other hand, well-capitalized banks may be cautious in lending in an environment where creditors' rights are limited. They will lend small amount of credit than the under-capitalized banks, whose owners have little to lose in the event of bankruptcy. However, Kanga et al. (2020) uncover the positive link between bank capitalization and its performance in the WAEMU region. We therefore expect a positive impact of bank capitalization on lending.

Banks often raise their liquidity by developing the asset side of their balance sheet concerning the deposits they receive from non-financial customers, which lower costs than other liabilities. Since this allows banks to increase lending volume (Olokoyo, 2011), a rise in liquidity (LIQ), proxied by the ratio of bank deposits to total assets, is expected to affect private credit positively.

Another bank variable that can explain fluctuations in the supply of private credit is non-performing loans (De Bonis and Stacchini, 2013). During episodes of high non-performing loans (NPLs), banks reduce their lending (Kim and Sohn, 2017), preferring to take refuge in safe assets such as sovereign debt (Ogawa and Imai, 2014). Since data on non-performing loans are not publicly available, the loan loss provisions ratio is used as proxy, as in the literature Houston et al. (2010); Bougatef and Mgadmi (2016); Chen et al. (2017); Bley et al. (2019). Loan loss provisions (LLP) represent the funds set aside by the bank to cover unexpected losses caused by impaired loans. An increase in the amount of impaired loans results in an increase in the amount of accrued allowances. We expect that an increase in banks' LLP would hurt bank credit.

The bank interest rate (INT) is the rate served to non-financial customers. We have calculated this interest rate by dividing the interest income generated by bank lending activity by the outstanding bank credit to non-financial customers. This measure of the bank interest rate is commonly used in the banking literature when the average bank's interest rate is unknown (Delis and Kouretas, 2011). The interest rate is assumed to be negatively related to bank credit since the latter represents the cost of capital, the increase in which leads to a decrease in the demand for credit by firms and households.

The banking literature identifies banking competition within the banking sector as a determinant of bank lending. According to this literature, banks can use their market power to limit lending (Braggion et al., 2017). Thus, a less concentrated banking environment should allow for a greater allocation of resources (Dell'Ariccia and Marquez, 2006; Vo, 2018). Nevertheless, the early study of Leon (2015) found that the competition alleviates, on the contrary, the credit constraints in developing countries. Therefore, we expect a negative impact of bank concentration on private credit. We use the Herfindahl-Hirschman Index (HHI), the sum of the squares of market shares of banks within the country's banking sector, to capture the effect of banking competition.

We consider the macroeconomic environment in which banks operate and which is likely to influence their behavior in terms of lending; the vector $Macro$ represents these variables.

Economic growth is measured by the natural logarithm of real gross domestic product (GDP). According to Djankov et al. (2007), growing economies tend to have a growing demand and supply of credit. Inflation (INFLAT), the percentage change in the consumer price index, reflects the idea that an increase in the general price level reduces the return on loans and hence the supply of credit (Boyd et al., 2001).

The volume of bank credit responds to monetary policy (Bouis, 2019; Roulet, 2018). Indeed, during expansionary monetary conditions, banks increase their lending volume (Bernanke

et al., 1988). Different variables are used in the literature to identify monetary policy impulses, notably the ratio of total central bank assets to nominal GDP (Brei et al., 2013), the interbank rate (Roulet, 2018) or central bank claims on banks relative to total banking system assets (Bouis, 2019), which indicates bank liquidity stress. We use the latter indicator to identify the monetary policy, as the two former variables can be problematic. Firstly, the ratio of central bank assets to nominal GDP can include the exposition of other financial institutions besides deposit banks, thus amplifying the effect. Secondly, because of the interbank market segmentation, the interbank rate may underestimate the actual exposition of banks to the central bank. The expected impact of central bank claims (CBclaims) on lending is positive.

The quality of the regulator represents the quality of institutions. According to Levine (1997), the institutional framework, seen in terms of efficiency in contract enforcement and legal protection of creditors, affects financial development. The regulatory quality (RQ) measures perceptions of the government's ability to formulate and implement sound policies and regulations that enable and promote private sector development as defined by Kaufmann et al. (2011). According to the literature, this variable should positively affect private credit.[11] We, therefore, expect that a well-regulated legal framework will have a positive effect on the volume of bank credit. The data on the regulator quality (RQ) comes from the World Bank's Worldwide Governance Indicators (Kaufmann et al., 2011).[12]

1.3.2 Estimation strategy

The econometric specification below is characterized by a dynamic structure that specifies the dependent variable $Credit_{ijt}$ to be partially dependent on its value in the previous period

[11] If banks have no recourse against defaulting borrowers, borrowers will have less incentive to repay their loans, which may make banks more cautious in their lending activity (Daumont et al., 2004)

[12] Other variables are used in the literature, such as the occurrence of banking crises or wars that can reduce both demand and supply of credit. Since the 1990s, no period of the banking crisis has been detected in the WAEMU from the database constructed by Laeven and Valencia (2018), and periods of war, one of the criteria of which is 1,000 deaths per year, do not apply to the countries of the zone either.

($Credit_{ijt-1}$).

The usual estimation approaches for panel data, such as the pooled ordinary least squares method (hereafter OLS) or the fixed effects method, are no longer appropriate since $Credit_{it-1}$ is not totally exogenous but weakly exogenous (predetermined). More specifically, the use of OLS is consistent for the static model, whether effects are fixed or random. On the contrary, this estimation technique becomes inconsistent for dynamic panel data with individual effects. It does not correct for the resulting correlation bias between the lagged endogenous variable and the error term. The resulting bias is known as a dynamic panel bias or the Nickell's bias (Nickell, 1981).[13] It also does not take into account the unobserved heterogeneity contained in the error term. One solution to this problem involves taking the first differences of Equation (1.1). The first difference transformation removes both the constant term and the individual effect. However, the endogeneity issue remains. Also, some regressors- bank-level variables- can be endogenous.

To address the endogeneity arising from the dynamic specification of the equation, from some control variables and the reverse causality, we use the Generalized Method of Moments (GMM) panel estimator proposed by Arellano and Bond (1991) and Blundell and Bond (1998). This method relies on first-differencing to remove the individual fixed effects and uses appropriate lags of the right-hand side variables as internal instruments. We therefore use the lags of the lagged dependent variable as instruments. Moreover, one might worry about the reverse causality between security holdings and private credit. Indeed, the holding by banks of securities can result from the lack of credit demand. We take into account this possible endogeneity issue by instrumentalize this variable. The lags of the *Securities* variable are also used as instruments. All bank-level variables are introduced in the model

[13] Nickell (1981) shows that this bias arises because of the demeaning process which subtracts the individual's mean of y and each X from the respective variable creates a correlation between the explanatory variables and the error. He demonstrate that the inconsistency $\hat{\alpha}$ as $N \to +\infty$ is of order of T^{-1}. It can be substantial for a small T ($plim_{n\to\infty}\hat{\alpha}_{LSDV} \neq \alpha$). As much as $T \to \infty$, the bias becomes insignificant. Judson and Owen (1999) find that the bias may be equal to as much 20% of the true value of the coefficient of interest with a time dimension T as large as 30.

with one lag to mitigate the endogeneity.

Two estimators can be used to estimate our model, difference or system GMM (Blundell and Bond, 1998; Arellano and Bover, 1995).[14] The latter estimator combines the first-difference equations with the level equations in which the variables are instrumented by their first differences. Unlike the system GMM, in the presence of series with high persistence, the first difference GMM technique becomes inconsistent (Roodman, 2009).

The system GMM estimator consistency depends on the instruments validity and the absence of autocorrelation in the error terms. The hypothesis tests most commonly associated with GMM are the Sargan for the difference GMM or Hansen test for the system GMM of instrument validity and the tests for first and second-order serial correlation, namely *m1* and *m2*. The null hypothesis of the Hansen test is the instrument exogeneity. The *m2* test is asymptotically distributed as a standard normal under the null hypothesis of no second-order serial correlation.

1.4 Data

1.4.1 Variables and sources

We use hand-collected bank-level data from all WAEMU countries over 2001-2017. These bank-level data come from the balance sheets and income statement statistics of banks and financial institutions published by the Banking Commission.[15][16] Macroeconomic data come from annual reports of the Banque de France on the franc zone, the BCEAO databases, the

[14] Thus, the first-difference GMM estimator of Arellano and Bond (1991) consists in taking for each period the first difference of the equation to be estimated to eliminate specific effects (unobserved heterogeneity) and then instrument the explanatory variables of the first-difference equation by their level values lagged by one period or more. In contrast, the system-GMM estimator combines the first-difference equations with the level equations in which the variables are instrumented by their first differences.

[15] The banking commission was established in 1990 to supervise the banking sector activity and ensure its integration.

[16] The production of public data by the Banking Commission on the balance sheet of banks operating in the WAEMU began in 2000 and on the income statement in 2003. Our dataset stopped in 2017 because of changes in the production of banking data by the Banking Commission in the fiscal year 2018.

World Development Indicators (WDI), and the World Governance Indicators(WGI) of the World Bank (Kaufmann et al., 2011) for the institutional quality.

For data cleaning purposes, we only use monetary institutions, i.e., those that receive customer deposits and do the lending business. Therefore, we have eliminated other non-monetary institutions, including investment and leasing banks. We also include banks that have ceased operations to avoid selection bias (Delis and Kouretas, 2011). We winsorize each accounting variable at the top and bottom 1% to reduce the effects of outliers. We ended up with an unbalanced panel of 136 banks over the 2001-2017 period.

1.4.1.1 Institutional background

In the wake of the financial liberalization process during the 1980s and 1990s, many African countries, in the middle of the 1990s, have increasingly relied on public securities issues to cover their resource needs. The development of this method of financing has been encouraged by stricter supervision and the cessation of direct advances to governments by central banks. In the franc zone, issuance of sovereign debt securities in local currency has grown significantly, mainly in the WAEMU region (Magnan-Marionnet, 2016).

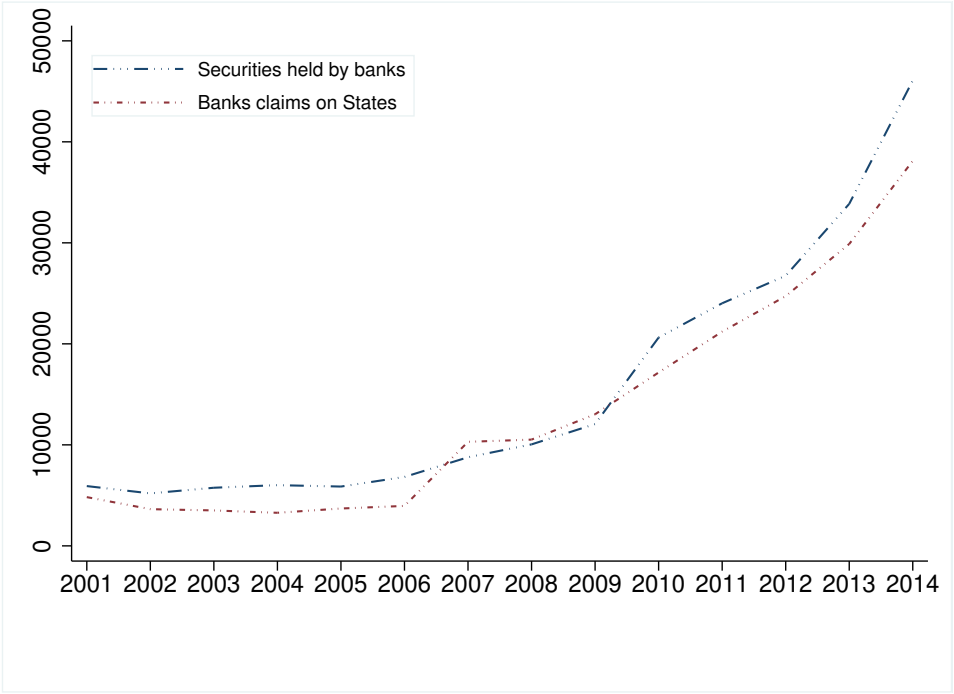
In the context of the WAEMU region, the creation of a regional financial market, the Bourse Régionale des Valeurs Mobilières (BRVM), aimed to complement and strengthen the inter-bank and money markets- monetary policy tools - and allow the financing of private and public investments - (CREPMF, 2018).[17] This market offers member states the possibility of issuing bonds by syndication through public offerings. Since 2001, the region's countries have also been able to issue bills (with a maturity of up to two years) and treasury bonds (with a maturity of more than two years). To revitalize the public securities market and provide States with all the necessary support, a regional agency to support the issuance and management of the WAEMU State members' public securities was created, called "UMOA-

[17]The BRVM is headquartered in Abidjan (Côte d'Ivoire), and it started its operations in 1998

Titres". In collaboration with the Central Bank, the UMOA-Titres agency organizes auctions at the regional level.[18]

The regional financial market is highly integrated by sovereign debt. For instance, in the bonds market, the share of government bonds was more than 94%

Figure 1.1: Evolution of securities held by banks and banks' claims on the States (in millions of CFA francs).



Source: The figure reports the evolution of banks' loans and securities ratios over the years. The data to compute loans and securities ratios were obtained from the banking commission of WAEMU for the first variable and the BCEAO for the latter variable.

We therefore assume that the outstanding securities held by financial institutions (banks) are sovereign debt. We are aware of the imperfect nature of this proxy to capture the sovereign debt fully. However, we believe that this indicator can account for the crowding-out(in) effect by assuming that banks, in addition to sovereign securities, subscribe to the securities of large companies and thus crowd out(in) small and medium-sized companies and households in the

[18]The Governor of the BCEAO established the UMOA-Titres (UT) agency on March 15, 2013, based on a decision taken by the Council of Ministers. The institution was created to assist member states in mobilizing resources on the capital markets to finance their economic development policies at reduced costs.

bank credit market. Therefore, we refer to sovereign debt as the securities held by banks. It is measured by securities holdings to total assets (*Securities*).

Table A1 reports the definitions and measures of variables used in the main regressions. Additional variables used in the robustness checks section are reported in Table A3.

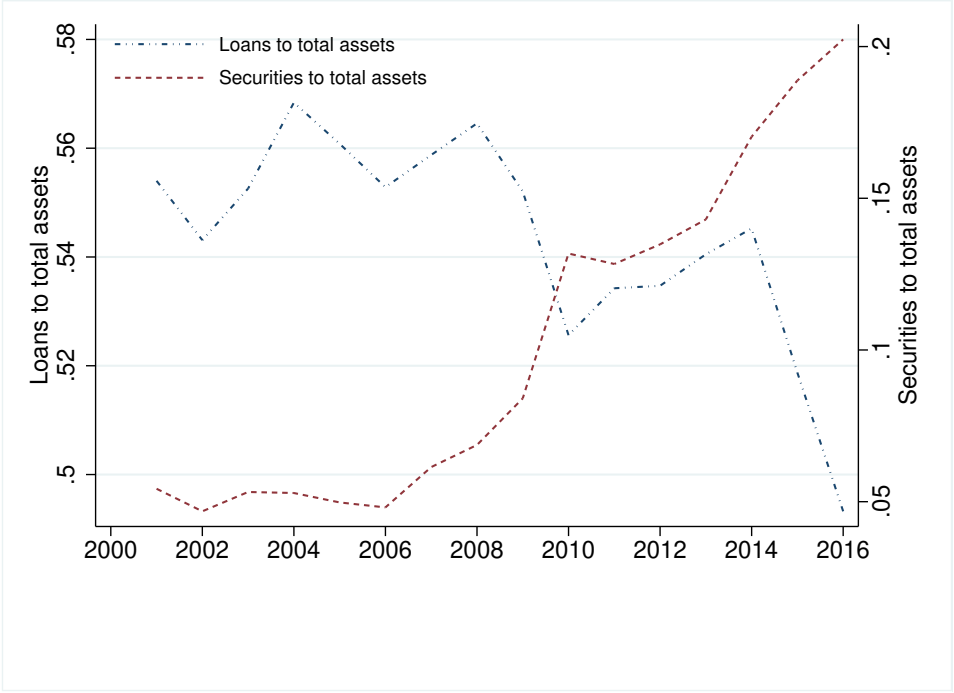
1.4.2 Descriptive statistics

The descriptive statistics presented in Table 1.1 provide an overview of the data used in this paper. The dependent variable (loans to total assets) has an average of 55% in total assets, which shows the intensity of lending activity in the banks' balance sheets in this region. However, with a dispersion of 15%, this also indicates a significant heterogeneity among banks in this region in terms of allocation of financial resources with a maximum of 84%. This disparity is also found in their activity of purchasing marketable securities. The ratio of bank investment in securities represents 12% in average of their assets, with a deviation from the average of 12%.

Figure 1.2 reports the dynamic of private and public debt in banks' total assets. Over the 2000-2017 period, it shows a decrease in the ratio of credit to total assets and a significant increase in the share of public securities. The rise in domestic public borrowing in WAEMU is due to the decision of the BCEAO to end the direct financing of fiscal deficits of Public Treasuries in 2010, which led to recourse by the public treasuries to public savings. The amount of securities issued on the markets by the public sector almost doubled in 2010 compared to 2009 (see Figure A2).

Côte d'Ivoire and Senegal dominate the banking system in the WAEMU region in terms of the number of banks and market share. In 2017, 42.3% of banks in the Union were localized in these countries, with a market share of 50.3% of the regional banking sector (Bancaire, 2017). Moreover, these two countries are classified as middle-income countries, unlike the

Figure 1.2: Evolution of private credit and securities held by banks (as a percentage of total bank assets).



Source: The figure reports the evolution of banks' loans and securities ratios over the years. The data for computing loans and securities ratios were obtained from the banking commission of WAEMU.

other countries of the community, which are low-income countries.

The banking sector in the WAEMU region is dominated by foreign banks, representing more than 72% of the banks operating in the region, with a national representation of only 28%, which indicates the importance of foreign banks in the provision of financial services. These foreign banks are mainly Pan-African (57%) and French banks (11%). Public Banks represent 9% of the banking industry.

The correlation matrix in Table A2 illustrates a negative and statistically significant correlation between bank security holdings and private sector credit. However, it is important to emphasize that the interpretation of this relationship should be approached with caution due to the potential presence of reverse causality. For instance, an increase in government security holdings could be a result of either a bank portfolio management choice or, con-

versely, a decline in demand for credit from the private sector, prompting banks to seek alternative investment options such as securities. However, this is unlikely in developing countries, where credit is mostly rationed due to market imperfections. Additionally, the correlation coefficients between the control variables are relatively low, indicating a low risk of multicollinearity among variables.

Table 1.1: Descriptive statistics.

	Full Sample					LICs		LMICs		Comp.(LMCs and LICs)	
	Obs.	Mean	SD.	Min.	Max	Mean	SD.	Mean	SD.	Diff.	P-value
Credit	1350	0.55	0.15	0.07	0.84	0.55	0.14	0.56	0.15	-0.01	0.43
Securities	1350	0.12	0.12	0.00	0.51	0.11	0.11	0.13	0.13	-0.01**	0.03
Size	1350	11.42	1.19	8.10	13.77	11.25	1.18	11.72	1.17	-0.48***	0.00
CAP	1350	0.11	0.13	0.01	0.86	0.12	0.15	0.09	0.10	0.03***	0.00
LIQ	1350	0.85	0.12	0.25	1.47	0.85	0.12	0.85	0.12	0.00	0.58
LLP	1350	0.02	0.04	0.00	0.35	0.02	0.05	0.02	0.04	0.00	0.35
HHI	1350	0.15	0.05	0.09	0.34	0.17	0.05	0.12	0.03	0.05***	0.00
Public bank	1350	0.10	0.30	0.00	1.00	0.13	0.33	0.05	0.22	0.07***	0.00
Private bank	1350	0.90	0.30	0.00	1.00	0.87	0.33	0.95	0.22	-0.07***	0.00
Domestic banks	1350	0.28	0.45	0.00	1.00	0.26	0.44	0.30	0.46	-0.03	0.17
Foreign bank	1350	0.72	0.45	0.00	1.00	0.74	0.44	0.70	0.46	0.03	0.17
Pan-African bank	1350	0.57	0.50	0.00	1.00	0.66	0.47	0.40	0.49	0.27***	0.00
Foreign bank out-Africa	1350	0.18	0.38	0.00	1.00	0.11	0.31	0.30	0.46	-0.19***	0.00
French bank	1350	0.11	0.31	0.00	1.00	0.09	0.28	0.14	0.35	-0.05***	0.00
INT	1350	0.08	0.03	0.00	0.23	0.09	0.03	0.08	0.03	0.01***	0.00
GDP	1350	4.68	2.92	-4.20	11.85	4.83	2.53	4.44	3.47	0.39**	0.03
Inflation	1350	1.14	3.55	-10.93	9.18	1.09	3.75	1.23	3.19	-0.14	0.48
CBclaims	1350	3.10	1.64	0.30	7.16	2.79	1.60	3.62	1.58	-0.83***	0.00
RQ	1350	-0.51	0.27	-1.20	-0.05	-0.55	0.25	-0.45	0.29	-0.10***	0.00

Notes: This table reports the number of observations, the mean, and the standard deviation of the variables. The variables are as follows: Credit is the ratio of loans to total assets, and Securities is the ratio of securities held by banks to total assets. See Table A1 for control variable definitions.

1.5 Main results

Table 1.2 presents the results of the estimates of Equation (1.1). We first estimate the full sample without time and country fixed effects (column 1). Then we include the time effects (column 2) and country effects (column 3) separately to identify the impact of these two

unobserved effects on the model. We finally estimate Equation (1.1) by including the time and country effects (column 4).

Before discussing the results, the specification tests indicate that the dynamic model is valid due to the significativity of the lagged dependent variable. Indeed, the lagged dependent variable appears significant in all models (columns 1-4), showing the persistence of private credit on banks' balance sheets and the importance of lending from the past to the present period. Furthermore, Hansen Test of the over-identifying restriction for all models indicates that the instruments are valid, so we failed to reject the null hypothesis of instrument exogeneity. Also, the p-value of the auto-correlation test of order 2 (m2) is above 10% in all specifications, indicating no serial correlation in our model.

The estimation of Equation (1.1), which does not account for unobserved country and time effects, shows a negative relationship between banks' holdings of sovereign securities and credit extended to the private sector in the WAEMU region (as shown in column 1). However, when we include the time effect (column 2) and the country effect (column 3), the results remain robust and even higher. This suggests that unobserved time-specific and country-specific factors shape the relationship between banks' exposure to sovereign securities and their credit supply to the private sector. Specifically, failing to account for these effects leads to underestimating the impact of security holdings on bank credit, as indicated in column 1. Therefore, the subsequent analysis considers time and country effects to obtain consistent and accurate results. We will only interpret the specifications considering these unobserved effects for the rest of the study.

The result in column 4 of Table (1.2) shows a negative relationship between sovereign securities and private sector credit. The estimate is statistically significant at the 1% level after controlling year and country fixed effects. This finding suggests that an increase in bank security holdings leads to a decline in credit extended to the private sector, which may indicate the presence of a quantitative crowding out in the WAEMU region credit market. This result

validates the *H1a* of a crowding-out effect in the WAEMU region. This finding is consistent with some early studies on SSA countries (Christensen, 2005; Mbate, 2013) and recent work in EMDEs (Bouis, 2019). Furthermore, the estimate seems economically significant. One standard deviation increase in banks' security holdings induces a decrease of 0.072 in bank lending.[19] In terms of percentage, one standard deviation increase in banks' security holdings reduces the private credit by 13.1%.[20] This reduction is sizable for the private sector growth.

The subsamples are represented by groups of income, i.e., middle-income and low-income countries, respectively (columns 5 to 12). Given the disparity between the countries of the region regarding financial development and income level, the impact of domestic debt can differ between the two groups. Therefore, we run the estimation for the different sub-panels and the full sample. The effect is significant in both subgroups of countries but slightly higher in low-income countries. More specifically, we find that bank exposure to sovereign debt reduces more significantly the lending to the private sector in LICs (-0.635) compared to LMICs (-0.567) (as shown in columns 8 and 12). These results are consistent with our hypothesis *H1b*. The difference between the two groups can be explained by their financial development level. According to Ismihan and Ozkan (2012), the lower the financial depth, the greater the degree of public borrowing's crowding out of credit to the private sector. However, since LMICs banking is more exposed to sovereign debt than LICs, one standard deviation in security holdings reduces the credit to the private sector 13.2%[21] in LMICs and 12.7%[22] in LICs.

In addition, some bank-level, macroeconomic and institutional control variables affect private sector credit significantly. Bank capitalization level is negatively and significantly related to private credit in low-income countries (column 12), showing that well-capitalized banks are those that grant less credit than their counterparts. As predicted, LLPs have a negative and

[19] -0.603*0.12=-0.072
[20] -0.072/0.55=-0.131
[21] -0.567* 0.13=-0.074 0.074/0.56 = -0.132
[22] -0.635*0.11= 0.07 0.074/0.55= -0.127

significant impact. According to Kim and Sohn (2017), banks tend to reduce their credit availability as the level of non-performing or impaired loans in their portfolio increases. The decline in the volume of credit can be explained by the decline of liquidity due to the removal of non-performing assets from the balance sheet or to a general distrust of banks in borrowers. We also find that the concentration of the banking sector, as measured by the HHI, has a negative and significant link with private sector credit in LMICs and a positive link in LICs. The cost of capital (INT) negatively and significantly impacts credit.

Concerning other macroeconomic variables, economic growth represented by GDP and inflation have the expected signs but are insignificant. The insignificance of inflation may be explained by the fact that it varied summarily in WAEMU countries during the review period. Over the 2000-2017 period, average inflation was 1.23% in the zone. This low level can be explained by the explicit objective of the BCEAO monetary policy, which has an inflation target of 2%, like that of the European Central Bank (ECB), whose currency serves as the anchor. The central bank's claims on the private sector are negatively and significantly related to private credit (column 4). Thus, during episodes of liquidity stress, banks reduce their volume of credit (Bouis, 2019). The assurance by creditors of the respect of their rights, captured by the regulator power, stimulates credit supply in LICs.

Table 1.2: Effect of banks' sovereign debt exposure on private Credit in WAEMU

	Full Sample				Lower-middle income countries (LMICs)				Low-income countries(LICs)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Credit_{t-1}	0.382***	0.383***	0.372***	0.385***	0.323***	0.321***	0.342***	0.347***	0.404***	0.397***	0.392***	0.384***
	(0.061)	(0.061)	(0.060)	(0.060)	(0.087)	(0.085)	(0.088)	(0.088)	(0.068)	(0.068)	(0.060)	(0.059)
Securities	-0.595***	-0.598***	-0.596***	-0.603***	-0.606***	-0.602***	-0.572***	-0.567***	-0.598***	-0.594***	-0.607***	-0.635***
	(0.060)	(0.060)	(0.059)	(0.059)	(0.101)	(0.103)	(0.102)	(0.103)	(0.080)	(0.077)	(0.078)	(0.077)
Size	0.006	0.002	0.006	0.002	0.009	0.008	0.011	0.010	0.006	0.005	-0.006	-0.008
	(0.006)	(0.006)	(0.006)	(0.006)	(0.009)	(0.010)	(0.010)	(0.010)	(0.008)	(0.008)	(0.007)	(0.007)
CAP	-0.050	-0.075	-0.051	-0.074	-0.036	-0.041	0.003	-0.002	-0.052	-0.056	-0.122**	-0.131**
	(0.053)	(0.056)	(0.054)	(0.058)	(0.106)	(0.109)	(0.113)	(0.112)	(0.060)	(0.061)	(0.059)	(0.061)
LIQ	-0.031	-0.038	-0.024	-0.036	-0.013	-0.015	-0.009	-0.008	-0.030	-0.025	-0.042	-0.034
	(0.038)	(0.038)	(0.040)	(0.039)	(0.063)	(0.063)	(0.069)	(0.067)	(0.047)	(0.047)	(0.041)	(0.042)
LLP	-0.334***	-0.337***	-0.376***	-0.338***	-0.265**	-0.262**	-0.231*	-0.218*	-0.428***	-0.435***	-0.404***	-0.412***
	(0.096)	(0.093)	(0.105)	(0.094)	(0.131)	(0.131)	(0.131)	(0.129)	(0.118)	(0.119)	(0.101)	(0.103)
Macroeconomic variables												
HHI	-0.279***	-0.189*	-0.255*	0.035	-0.087	-0.020	-0.584**	-0.451*	-0.391***	-0.428**	-0.011	0.786**
	(0.105)	(0.106)	(0.149)	(0.167)	(0.212)	(0.221)	(0.256)	(0.269)	(0.141)	(0.200)	(0.160)	(0.337)
INT	-0.761***	-0.767***	-0.848***	-0.777***	-0.845***	-0.845***	-0.869***	-0.950***	-0.708***	-0.738***	-1.067***	-1.053***
	(0.115)	(0.114)	(0.122)	(0.116)	(0.248)	(0.246)	(0.274)	(0.292)	(0.122)	(0.125)	(0.183)	(0.185)
GDP	0.000	-0.000	0.001	-0.000	0.002*	0.002	0.002	0.004	-0.002*	-0.002*	-0.003**	-0.003**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Inflation	-0.001	-0.000	-0.001	-0.000	-0.001	-0.001	0.003	0.003	-0.001	-0.001	-0.001	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.005)	(0.005)	(0.001)	(0.001)	(0.001)	(0.001)
CBclaims	-0.007***	-0.005**	-0.006***	-0.006**	-0.013***	-0.015***	-0.011	-0.026*	-0.003	-0.004	0.004	0.003
	(0.002)	(0.002)	(0.002)	(0.003)	(0.004)	(0.003)	(0.009)	(0.015)	(0.003)	(0.003)	(0.005)	(0.005)
Institutional variable												
RQ	-0.014	-0.002	-0.171***	-0.020	-0.034	-0.011	-0.008	0.076	-0.011	-0.038	0.063**	0.070**
	(0.016)	(0.017)	(0.048)	(0.020)	(0.025)	(0.028)	(0.036)	(0.059)	(0.020)	(0.028)	(0.026)	(0.035)
Constant	0.504***	-5.294**	0.428***	-7.699**	0.468***	0.480***	0.462***	0.551***	0.511***	0.522***	0.691***	0.587***
	(0.092)	(2.521)	(0.106)	(3.161)	(0.168)	(0.172)	(0.173)	(0.186)	(0.122)	(0.135)	(0.116)	(0.133)
Observations	1350	1350	1350	1350	495	495	495	495	855	855	855	855
Country FE	No	No	Yes	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Year FE	No	Yes	No	Yes	No	No	Yes	Yes	No	No	Yes	Yes
No. of instruments	46	47	53	54	46	46	61	62	46	51	62	67
AR1 (p-value)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AR2 (p-value)	0.64	0.61	0.77	0.61	0.87	0.86	0.85	0.80	0.58	0.59	0.57	0.54
Hansen-J (p-value)	0.13	0.14	0.15	0.14	0.32	0.24	0.51	0.46	0.19	0.20	0.13	0.13

Notes: This table shows the impact of security holdings on banks' private credit. The dependent variable is private credit, measured by the ratio of loan to total, and the variable of interest is bank securities, which is the ratio of securities to total assets. The regression is first made on the full sample (columns 1 to 4), then on middle-income countries (columns 5 to 8) and low-income countries (columns 9 to 12). The estimation method used is the system GMM. Credit and Securities variables have been instrumentalized by their lags. Robust standard errors are reported in parentheses.

*** Statistical significance at the 1% level

**Statistical significance at the 5% level

* Statistical significance at the 10% level.

1.6 Robustness checks

In this section, we conduct several robustness checks to ensure the validity of our findings. Firstly, we use alternative metrics of bank loans to the private sector to overcome a possible denominator effect. Secondly, we employ alternative proxies for government debt, specifically Treasury bills and outstanding bonds. Thirdly, we use various estimation techniques to strengthen the reliability of our results.

1.6.1 Alternative measures of private credit

We use alternative measures of private credit instead of the ratio. Indeed, the credit and securities ratios represent two significant components of bank assets, so when total assets change, for example, securities, another component must change, leading to biased results. For this reason, we also verify whether our results are robust by replacing the ratio of credit to total assets with the logarithm of outstanding credit to the private sector. The natural logarithm of bank credit is commonly used in the banking literature (Becker and Ivashina, 2018; Bottero et al., 2020) when you regress a significant component of a balance sheet on one another. We also use two alternative bank lending measures as applied by Gennaioli et al. (2018). We take the change in loans divided by total assets and the growth rate of loans (see Equation (1.3))).[23]

$$\frac{Credit_{i,j,t} - Credit_{i,j,t-1}}{\text{Total assets}_{i,j,t}} \quad \text{and} \quad \Delta Log(Credit_{i,t,j}) \tag{1.3}$$

Table 1.3 presents the estimation results using these alternative metrics. The use of these alternative metrics does not change the overall conclusion that bank's security holdings significantly reduce their lending to private credit (columns 1 to 3). These results further support the validity of our previous conclusions and provide robust evidence for our hypothesis (*H1a*) that banks' security holdings harm private credit.

[23]It is computed as the log of loans outstanding in year t minus the log of loans outstanding in year $t-1$.

Table 1.3: Effect of banks' sovereign debt exposure on private credit: using alternative measures of private credit.

	Full sample			Lower-middle countries (LMICs)			Low-income countries (LICs)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Logcredit(proxy-1)$_{t-1}$	0.227**			0.898***			0.642***		
	(0.108)			(0.190)			(0.111)		
Credit(proxy-2)$_{t-1}$		0.165***			0.124**			0.098*	
		(0.057)			(0.051)			(0.052)	
Credit(proxy-3)$_{t-1}$			0.193***			0.119**			0.131***
			(0.061)			(0.058)			(0.043)
Securities	-0.483*	-0.258***	-0.478**	-0.774*	-0.429**	-0.795*	-0.897**	-0.231***	-0.312**
	(0.287)	(0.093)	(0.237)	(0.415)	(0.180)	(0.447)	(0.389)	(0.060)	(0.153)
L.Size	0.648***	0.011	0.034	0.041	0.030	0.100**	0.235**	-0.034***	-0.076***
	(0.108)	(0.021)	(0.057)	(0.215)	(0.025)	(0.044)	(0.115)	(0.008)	(0.019)
CAP	-0.192	0.467	1.076	0.670	0.804**	1.661***	-1.154**	-0.133**	-0.323**
	(0.246)	(0.294)	(0.792)	(0.693)	(0.336)	(0.505)	(0.571)	(0.063)	(0.155)
LIQ	0.111	1.100**	2.114**	0.318	0.490*	0.114	-0.790**	-0.044	-0.150
	(0.154)	(0.423)	(1.020)	(0.443)	(0.255)	(0.281)	(0.307)	(0.041)	(0.095)
LLP	-1.174**	-0.969***	-2.390**	-1.948	0.039	1.778*	-2.350*	-0.035	0.339
	(0.531)	(0.341)	(0.922)	(1.452)	(0.475)	(0.990)	(1.277)	(0.110)	(0.251)
Macroeconomic variables									
HHI	0.014	0.395	1.092*	-3.838*	0.088	0.334	1.389	0.479	1.221
	(0.522)	(0.284)	(0.619)	(2.029)	(0.485)	(1.005)	(1.014)	(0.379)	(0.763)
INT	-5.516***	-1.973***	-5.202***	-10.638***	-2.711***	-6.162***	-5.206***	-1.546***	-3.070***
	(0.655)	(0.327)	(0.704)	(1.675)	(0.450)	(0.874)	(0.827)	(0.305)	(0.665)
GDP	0.003	0.003	0.004	0.034***	0.012***	0.024***	0.006	0.001	0.002
	(0.003)	(0.002)	(0.004)	(0.008)	(0.003)	(0.008)	(0.004)	(0.002)	(0.004)
Inflation	-0.004	-0.001	-0.003	-0.023	-0.012***	-0.022*	-0.005	-0.001	-0.002
	(0.004)	(0.002)	(0.005)	(0.014)	(0.004)	(0.013)	(0.004)	(0.002)	(0.003)
CBclaims	-0.029*	0.002	0.003	-0.070	-0.046***	-0.081**	-0.001	-0.000	0.000
	(0.016)	(0.011)	(0.024)	(0.042)	(0.017)	(0.036)	(0.020)	(0.005)	(0.010)
Institutional variable									
RQ	0.106	0.048	0.216**	0.287	0.076	0.285	0.101	0.049	0.141
	(0.075)	(0.045)	(0.095)	(0.220)	(0.094)	(0.191)	(0.168)	(0.060)	(0.120)
Constant	1.816***	-0.951	-33.696*	51.790*	-0.401	-0.496	2.464***	0.577***	1.322***
	(0.377)	(0.598)	(19.069)	(27.954)	(0.463)	(0.843)	(0.873)	(0.140)	(0.266)
Observations	1345	1183	1183	492	413	413	853	770	770
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of instruments	69	67	67	63	62	62	68	66	65
AR1 (p-value)	0.00	0.00	0.00	0.02	0.00	0.01	0.00	0.00	0.00
AR2 (p-value)	0.68	0.60	0.63	0.35	0.75	0.21	0.74	0.85	0.82
Hansen-J (p-value)	0.21	0.12	0.19	0.84	0.42	0.78	0.10	0.20	0.32

Notes: This table shows the impact of securities on banks' private credit. The dependent variable is private credit measured by in logarithm, Credit-2 ($\frac{Credit_{i,j,t}-Credit_{i,j,t-1}}{\text{Total assets}_{i,j,t}}$), and Credit-3 ($\Delta Log(Credit_{i,t,j})$. The main independent variable is bank securities, the securities to total assets ratio. The regression is first made on the full sample (columns 1-3), then on middle-income countries (columns 4-6) and low-income countries (columns 7-9). All the independent variables are lagged to reduce the endogenous bias due to inverse causality. The estimation technique used is the system GMM.

*** Statistical significance at the 1% level

**Statistical significance at the 5% level

* Statistical significance at the 10% level.

1.6.2 Alternative proxies for sovereign exposure

We use alternative proxies for banks' exposure to sovereign debt to understand better the relationship between domestic debt and bank lending activity. Specifically, we utilize data on outstanding government securities for each country as a proxy for domestic public debt to account for measurement error. These variables are macroeconomic data in contrast to *Securities*, which is bank-level data. The lack of knowledge on the proportion of sovereign securities held by banks in *Securities* variable means that the results can only be interpreted as the effect of banks' security holdings on bank lending activity.[24] We also use the outstanding amount of Treasury bills and bonds issued by the country members of the WAEMU region.[25]

Sovereign securities have two components: Treasury bills and bonds, in % of GDP. We aim to check whether domestic borrowing by governments does not deprive the private sector of funds on the bank credit markets. The results in Table 1.4 (column 1) show that government securities, in general, harm private credit. These findings support *H1a*; therefore, the public domestic debt negatively impacts bank lending in the WAEMU region. The two composed of sovereign security debt are negatively related to banks' loans to the private sector (columns 2 and 3). The estimation results also document that domestic government security outstanding negatively affects the banks' credit to the private either in LMICs or LICs (columns 4 and 7).

More specifically, the results reveal that the negative impact of sovereign securities on bank credit to the private sector is driven by both short-term and long-term sovereign securities. However, the magnitude of this impact is higher for short-term securities (Treasury bills) and

[24]While data on securities held by banks can provide insight into the amount of securities held by banks, it does not provide information on the types of entities holding the securities, such as the state or private sector. However, reports from the Banking Commission from 2000 to 2017 indicate that public securities predominate in banks' balance sheets compared to private securities.

[25]It is worth noting that due to data unavailability for certain countries in specific years, our findings may not fully capture all potential effects. The data was obtained from the Banque de France's reports on the CFA franc zone and the BCEAO's annual reports.

is only significant for banks in Lower and Middle-Income Countries (LMICs). This finding may appear counter-intuitive as it could be expected that countries with a higher level of financial development would have the capacity to offset the adverse effects of holding sovereign securities on private credit. However, banks in LMICs are more exposed to sovereign debt as the governments of those countries issue, on average, more government securities than LICs peers (Table A4, in Appendix), which may explain the higher crowding-out effect in LMICs compared to banks in LICs.

Table 1.4: Effect of domestic sovereign debt outstanding on private credit: Treasury bills and government bonds.

	Full Sample			Lower-middle income (LMICs)			Low income(LICs)		
	(1) Credit	(2) Credit	(3) Credit	(4) Credit	(5) Credit	(6) Credit	(7) Credit	(8) Credit	(9) Credit
$Credit_{t-1}$	0.615***	0.648***	0.558***	0.406***	0.531***	0.455***	0.456***	0.495***	0.560***
	(0.080)	(0.074)	(0.088)	(0.111)	(0.110)	(0.113)	(0.080)	(0.084)	(0.128)
Gvt securities	-0.511***			-0.789**			-0.538***		
	(0.131)			(0.308)			(0.172)		
Tresory bills		-0.220*			-1.012**			-0.145	
		(0.111)			(0.474)			(0.141)	
Bonds			-0.255**			-1.861			-0.220
			(0.115)			(1.393)			(0.132)
Size	-0.013*	-0.011	-0.017**	-0.001	0.003	-0.001	-0.033***	-0.033***	-0.037***
	(0.007)	(0.007)	(0.008)	(0.013)	(0.012)	(0.013)	(0.009)	(0.010)	(0.013)
CAP	-0.030	-0.026	-0.147*	-0.056	-0.014	-0.074	-0.128	-0.123	-0.230**
	(0.079)	(0.081)	(0.082)	(0.136)	(0.133)	(0.136)	(0.090)	(0.098)	(0.102)
LIQ	-0.052	-0.049	-0.074	-0.005	-0.024	-0.028	-0.030	-0.030	-0.085*
	(0.050)	(0.053)	(0.050)	(0.080)	(0.075)	(0.082)	(0.055)	(0.058)	(0.049)
LLP	-0.007	0.058	0.045	-0.071	0.080	-0.011	-0.259*	-0.188	-0.028
	(0.129)	(0.134)	(0.141)	(0.203)	(0.238)	(0.227)	(0.141)	(0.136)	(0.134)
Macroeconomic variables									
HHI	0.477**	0.210	-0.123	0.391	0.407	-0.495	1.098***	0.866**	0.866*
	(0.212)	(0.209)	(0.348)	(0.334)	(0.505)	(1.327)	(0.406)	(0.384)	(0.511)
INT	-0.435	-0.306	0.223	-0.066	0.239	0.439	-0.724	0.137	0.714
	(0.271)	(0.261)	(0.280)	(0.281)	(0.863)	(0.401)	(0.651)	(0.723)	(0.744)
GDP	-0.003	0.001	0.001	-0.009	-0.010	0.000	-0.003	-0.001	-0.010***
	(0.002)	(0.002)	(0.001)	(0.006)	(0.007)	(0.006)	(0.002)	(0.003)	(0.003)
Inflation	-0.001	0.001	-0.001	0.003	0.007	0.004	0.000	0.000	0.002
	(0.002)	(0.002)	(0.001)	(0.004)	(0.009)	(0.005)	(0.002)	(0.003)	(0.003)
CBclaims	-0.005	-0.008	-0.013**	0.001	-0.001	-0.008	0.001	0.014	0.017
	(0.005)	(0.006)	(0.006)	(0.026)	(0.039)	(0.028)	(0.008)	(0.011)	(0.010)
Institutional variable									
RQ	0.069**	0.032	0.035	0.051	-0.054	0.308**	0.229***	0.147**	0.251***
	(0.027)	(0.025)	(0.030)	(0.085)	(0.126)	(0.127)	(0.065)	(0.070)	(0.094)
Constant	0.457***	0.383***	0.629***	0.431*	0.315	0.028	0.760***	0.639***	0.763***
	(0.122)	(0.120)	(0.142)	(0.233)	(0.486)	(0.336)	(0.166)	(0.182)	(0.235)
Observations	1089	1024	830	427	397	388	662	627	442
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of instruments	64	64	60	57	56	55	62	62	60
AR1 (p-value)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AR2 (p-value)	0.47	0.57	0.51	0.35	0.33	0.40	0.92	0.50	0.47
Hansen-J (p-value)	0.23	0.16	0.09	0.40	0.51	0.53	0.21	0.21	0.15

Notes: This table reports the impact of securities on private credit. The dependent variable is credit, measured by the ratio of loans to total assets. The main independent variables are the Gvt securities (government securities outstanding to GDP), Treasury bills (treasury bills outstanding to GDP), and Bonds (government bonds outstanding to GDP). Columns 1 to 3 represent the full sample, columns 4 to 6 the lower-middle-income countries (LMICs) and columns 7 to 9 the low-income countries (LICs). We used the system GMM estimation technique.

*** Statistical significance at the 1% level

**Statistical significance at the 5% level

* Statistical significance at the 10% level.

1.6.3 Alternative methods of estimation

Fixed effects and pooled ordinary least squares (OLS) techniques are used to test the robustness of our results (Table 1.5), although they can be limited and inconsistent. Estimates by these methods corroborate the results of the system GMM and show that private credit in middle-income countries is less affected by securities than in low-income countries.

The standard linear regression methods use the average relationship between a set of regressors and the independent variable based on the conditional mean function $E(Y/X)$. This method provides only a partial view of the relationship, as we might be interested in describing the relationship at different points in the conditional distribution of Y. We, therefore, use the quantile regression technique on panel data, which allows us to investigate if the relationship between securities holdings and private credit differs throughout the distribution of the latter (Koenker and Hallock, 2001).

Table A7 displays the estimation results and indicates that security holdings negatively and significantly impact the private sector credit at all three bank size quantile levels (25th, 50th, and 75th). These results are consistent with those reported in the mean regression models. As we can see, the impact differs at different quantile points. The coefficient at the 25th percentile (-0.252) is lower than those at the 50th (-0.326) and 75th (-0.443). These results suggest that banks with extensive lending activity strongly reduce their credit in response to their security holdings. This higher impact at the larger quantile can be explained by the fact that the dynamic banks, which grant more credit, have a liquidity constraint or risk switching. So, when they increase their security holdings, they will be obliged to reduce their lending.

Table 1.5: Effect of banks' sovereign debt exposure on private credit using alternative estimators.

	Full Sample		Lower-middle income (LMCs)		Low income(LICs)	
	Fixed Effects	OLS	Fixed Effects	OLS	Fixed Effects	OLS
Credit_{t-1}	0.414***		0.368***		0.430***	
	(0.032)		(0.054)		(0.040)	
Credit_{t-1}						
Logcredit_{t-1}		0.201***		0.159***		0.234***
		(0.034)		(0.039)		(0.055)
Logcredit_{t-1}						
Securities	-0.484***	-1.148***	-0.469***	-1.097***	-0.476***	-1.124***
	(0.039)	(0.093)	(0.072)	(0.150)	(0.046)	(0.134)
Size	-0.001	0.811***	-0.012	0.843***	-0.005	0.758***
	(0.011)	(0.040)	(0.022)	(0.055)	(0.010)	(0.063)
CAP	0.012	-0.101	-0.026	-0.092	-0.005	-0.148
	(0.054)	(0.203)	(0.170)	(0.457)	(0.047)	(0.178)
LIQ	0.023	0.029	0.118*	0.249	-0.028	-0.091
	(0.049)	(0.110)	(0.069)	(0.181)	(0.060)	(0.123)
LLP	-0.799***	-2.433***	-1.023***	-3.673***	-0.720***	-2.085***
	(0.070)	(0.352)	(0.183)	(0.579)	(0.058)	(0.319)
HHI	0.099	-0.011	-0.356	-1.011*	0.687**	1.448**
	(0.168)	(0.379)	(0.267)	(0.524)	(0.284)	(0.672)
INT	-0.873***	-2.418***	-1.019***	-2.848***	-0.949***	-2.498***
	(0.127)	(0.339)	(0.290)	(0.671)	(0.169)	(0.439)
GDP	-0.002**	-0.003	0.002	0.003	-0.002*	-0.002
	(0.001)	(0.002)	(0.002)	(0.005)	(0.001)	(0.003)
Inflation	-0.000	-0.000	0.001	-0.005	-0.001	-0.000
	(0.001)	(0.002)	(0.003)	(0.006)	(0.001)	(0.003)
CBclaims	-0.006	-0.007	-0.031**	-0.051	0.003	0.006
	(0.005)	(0.012)	(0.015)	(0.037)	(0.005)	(0.014)
RQ	0.010	0.030	0.106*	0.182	0.018	-0.001
	(0.022)	(0.070)	(0.057)	(0.149)	(0.040)	(0.127)
Observations	1350	1350	495	495	855	855
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table reports the impact of security holdings on private credit. The dependent variables are the ratio of private Credit (Credit) and the logarithm of private Credit (LogCredit). We use fixed effects and pooled ordinary least squares (POLS or OLS) methods.

*** Statistical significance at the 1% level

**Statistical significance at the 5% level

* Statistical significance at the 10% level.

1.7 Heterogeneity analyses

Because of the heterogeneity of banks, their exposure to sovereign debt can have differentiated effects according to their characteristics. These differentiated effects are analyzed by introducing interaction terms: $Bankcarat \times Securities$ (see Equation (1.2)). $Bankcaract$ stands for bank characteristics that we are interested in. Our heterogeneity analyses focus on the following bank characteristics: ownership structure, size, and capitalization. We aim to determine how these characteristics shape the relationship between banks' exposure to sovereign debt and private sector credit *(H2-H4)*. The overall effect will be the sum of the $Securities$ coefficient and the interaction term coefficient ($Bankcaract \times Securities$).

1.7.1 Ownership structure

In this subsection, we seek to examine the relationship between bank ownership structure and security holdings on private credit. Specifically, we hypothesize that the effect of security holdings on private credit will vary between domestic and foreign banks, as well as between the different types of foreign ownership.

Table 1.6 reports a comparative analysis of variable means between banks based on their ownership structure, i.e., domestic versus foreign. It highlights the superior lending activity of domestic banks compared to their foreign peers. Nevertheless, foreign banks hold, on average, more securities in their portfolio (12.4%) than domestic banks (10.4%). This difference is statistically significant (see Table 1.6 at column 5). In line to test our *H2a*, we interact a dummy variable, which takes one if the bank is foreign and zero otherwise, with banks' securities ($Foreign\ bank \times Securities$).[26] To avoid the multicollinearity problem, we introduce the ownership structure separately. Table 1.8 reports the estimates of Equation (1.2). We find a negative effect of banks' exposure to securities on their private credit for the full sample (column 1). The coefficient of the interaction term ($Foreign\ bank \times Securities$) is negative

[26]Because of the small size of samples for specific ownership structures, we analyze only, in this case, the interaction terms of the combined effect of security holdings and banks' ownership type.

and statistically significant. This finding suggests that the adverse effect of security holdings on lending activity to the private sector is higher or foreign than domestic banks (see column 1 and 2 of Table 1.8). Put it differently, being a foreign bank amplifies the adverse effect of security holdings on the private sector credit. The overall *Securities* coefficient is -0.551.[27]

Table 1.6: Comparison test results for the subsamples of Domestic banks versus Foreign banks.

	Domestic banks		Foreign banks		Comparison test	
	Obs.	Mean	Obs.	Mean	Diff.	P-value
Credit	374	0.568	976	0.547	-0.021**	0.026
Securities	374	0.104	976	0.124	0.019***	0.007
Size	374	11.448	976	11.410	-0.038	0.589
CAP	374	0.088	976	0.114	0.026***	0.000
LIQ	374	0.853	976	0.848	-0.005	0.579
LLP	374	0.023	976	0.015	-0.008**	0.016
Public banks	374	0.356	976	0.001	-0.355***	0.000
Private banks	374	0.644	976	0.999	0.355***	0.000
Domestic banks	374	1.000	976	0.000	-1.000	.
Foreign banks	374	0.000	976	1.000	1.000	.
INT	374	0.082	976	0.082	-0.000	0.935
GDP	374	4.805	976	4.638	-0.167	0.363
Inflation	374	1.334	976	1.068	-0.266	0.200
CBclaims	374	3.333	976	3.007	-0.325***	0.001
RQ	374	-0.526	976	-0.510	0.016	0.318

Notes: This table compares the mean values of variables in the subsamples of Domestic banks versus Foreign banks. Comparison tests are performed using the t-test (with unequal variance).
*** Statistical significance at the 1% level
**Statistical significance at the 5% level
* Statistical significance at the 10% level.

Foreign banks are diverse in terms of origin and characteristics. We have Pan-African banks and foreign banks from other regions worldwide, mainly France. A foreign bank is defined as a Pan-African bank when at least 50% of its capital is held by an African entity. On the contrary, a foreign bank whose capital (50% at least) is held by a non-Afrian entity is declared as a foreign bank other than Pan-African. Table 1.7 reports the difference in mean tests between Pan-African and other foreign banks. The results indicate that Pan-African banks hold a higher percentage of securities on their balance sheets (13.1%) compared to

[27] -0.480 -0.099*0.72=-0.557

their peers from other regions worldwide (9%). Other notable differences have also been observed regarding bank size, capitalization, and liquidity. The estimation in column 4 of Table 1.8 with the interaction term (*Pan-African bank* × *Securities*) is negative (-0.143) and statistically significant at 1% level. This finding indicates that the negative effect of security holdings on private sector credit is higher for Pan-African banks than their peers. This supports the hypothesis *H2b* and suggests that Pan-African banks decrease their lending to the private sector more than other foreign banks when holding securities. The overall effect of security holdings on the credit of Pan-African banks is -0.625. We did find any evidence of the no-Pan-African ownership and security holdings (*No Pan-African bank* × *Securities*) on the private credit.

Table 1.7: Comparison test results for the subsamples of Pan-African banks versus No Pan-African banks.

	Pan-African banks		No Pan-African banks		Comparison test	
	Obs	Mean	Obs.	Mean	Diff.	P-value
Credit	750	0.533	237	0.588	0.056***	0.000
Securities	750	0.131	237	0.090	-0.042***	0.000
Size	750	11.324	237	11.727	0.403***	0.000
CAP	750	0.122	237	0.086	-0.036***	0.000
LIQ	750	0.858	237	0.823	-0.035***	0.000
LLP	750	0.017	237	0.013	-0.003*	0.080
Public banks	750	0.029	237	0.000	-0.029***	0.000
Private banks	750	0.971	237	1.000	0.029***	0.000
Domestic banks	750	0.055	237	0.000	-0.055***	0.000
Foreign banks	750	0.945	237	1.000	0.055***	0.000
INT	750	0.083	237	0.077	-0.007***	0.001
GDP	750	4.770	237	4.510	-0.259	0.269
Inflation	750	0.940	237	1.278	0.339	0.177
CBclaims	750	2.943	237	3.450	0.507***	0.000
RQ	750	-0.523	237	-0.457	0.066***	0.001

Notes: This table compares the mean values of variables in the subsamples of Pan-African banks versus No Pan-African banks. Comparison tests are performed using the t-test (with unequal variance).
*** Statistical significance at the 1% level
**Statistical significance at the 5% level
* Statistical significance at the 10% level.

Finally, we introduce the interaction term of security holdings with the French ownership structure (*French bank* × *Securities*). The coefficient of the interaction term in column 10 of Table 1.8 is positive and statistically significant. This is an interesting result. This finding suggests that French ownership of banks mitigates the crowding-out effect of bank exposure to securities on private credit. The overall effect of banks' exposure to sovereign securities on private sector credit for French banks in this region is found to be -0.358, indicating that the crowding-out effect is lower for French banks than their peers in the region. One possible explanation for this result is that French banks may have implemented strategies or have access to resources that allow them to effectively manage their exposure to sovereign securities while still maintaining their lending to the private sector. Another explanation can be that domestic and French banks may have more knowledge of the credit market than Pan-African banks. Therefore, Pan-African banks may prefer to hold more safe assets and limit their exposure to risk borrowers on the credit market due to asymmetric and screening costs to potential borrowers.

1.7.2 Bank size

We seek to examine the relationship between bank size and security holdings on private credit. Specifically, we hypothesize that the impact of security holdings on private credit will vary between large and small banks. To test this hypothesis, we create two metrics to classify banks into large and small groups. The first metric is based on the Banking Commission classification. The WAEMU Banking Commission classifies banks into three categories : (i) large banks with total assets larger than 200 billion CFA francs, (ii) medium-sized banks with total assets between 100 billion CFA francs and 200 billion CFA francs, and (iii) small banks with total assets less than 100 billion CFA francs. We classify them into two groups instead of three - large and small banks.[28] Small banks are made up of banks with total assets of less than 100 billion CFA francs and large banks with more than 100 billion CFA

[28]The choice of two subgroups instead of three is due to the low number of observations in each sample according to this classification.

francs. We create a second metric based on the median. This metric is constructed by taking banks above the median of the size variable as large banks and below the median as small banks.

Table 1.9 presents the results of the comparative analysis between large and small banks. The statistical results demonstrate a significant difference between the two groups. On the one hand, small banks lend more to the private sector than their larger counterparts. On the other hand, large banks are more heavily involved in securities trading than their small-sized counterparts, as indicated by both classifications (Panel A and Panel B).

Table 1.10 documents the estimation results with interaction terms. The findings indicate a negative effect of large banks' security holdings on private credit (columns 1 and 4), consistent with previous research such as Kanga et al. (2021), which found that larger French banks tend to lend to larger corporations and wealthier clients compared to their Pan-African peers. However, the estimate of the interaction term ($Large\ bank \times Securities$) reveals a positive and significant coefficient. This suggests that large banks help to mitigate the negative impact of banks' security holdings on private credit. The overall coefficient of *Securities* is lower (-0.512). There is a slight difference between the overall coefficients of the two measures (-0.517 for median classification). This result supports the "safe assets" view and hypothesis (*H3*), which posits that large banks tend to hold more safe assets such as sovereign debt, which in turn helps them to mitigate the negative impact of securities holdings on private credit.

Table 1.8: Effect of banks' sovereign debt exposure on private credit accounting for ownership structure heterogeneity.

	Foreign bank			Pan-African bank			No Pan-African bank			French bank		
	Full sample	LMICs	LICs	Full sample	LMICs	LICs	Full sample	LMICs	LICs	Full sample	LMICs	LICs
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$Credit_{t-1}$	0.338***	0.331***	0.384***	0.319***	0.337***	0.308***	0.307***	0.337***	0.332***	0.386***	0.308***	0.356***
	(0.063)	(0.103)	(0.060)	(0.073)	(0.121)	(0.063)	(0.063)	(0.090)	(0.062)	(0.064)	(0.095)	(0.060)
Securities	-0.480***	-0.346**	-0.789***	-0.482***	-0.439***	-0.486***	-0.568***	-0.534***	-0.578***	-0.510***	-0.521***	-0.564***
	(0.074)	(0.154)	(0.166)	(0.076)	(0.102)	(0.081)	(0.056)	(0.082)	(0.059)	(0.053)	(0.084)	(0.059)
Foreign bank × Securities	-0.099*	-0.242**	0.194									
	(0.055)	(0.106)	(0.153)									
Pan-African bank × Securities				-0.143***	-0.178**	-0.123*						
				(0.052)	(0.068)	(0.069)						
No Pan-African bank × Securities							0.037	-0.329*	0.220***			
							(0.122)	(0.180)	(0.061)			
French bank × Securities										0.230***	0.265**	0.186***
										(0.063)	(0.102)	(0.053)
Size	-0.013*	0.010	-0.024***	0.005	0.021	-0.019***	-0.012	0.014	-0.020***	0.001	0.006	-0.013*
	(0.007)	(0.011)	(0.008)	(0.008)	(0.014)	(0.007)	(0.008)	(0.010)	(0.006)	(0.007)	(0.011)	(0.007)
CAP	-0.111	0.023	-0.217***	0.144	0.306	-0.147**	-0.127	0.010	-0.181***	0.036	-0.030	-0.142**
	(0.067)	(0.125)	(0.065)	(0.094)	(0.183)	(0.061)	(0.118)	(0.108)	(0.055)	(0.116)	(0.115)	(0.059)
LIQ	0.082*	-0.028	0.017	0.250**	0.371**	0.008	0.076	0.022	-0.018	0.170	0.004	-0.026
	(0.047)	(0.069)	(0.061)	(0.098)	(0.152)	(0.038)	(0.141)	(0.071)	(0.039)	(0.151)	(0.065)	(0.041)
LLP	-0.821***	-0.306*	-0.506***	-1.388***	-1.161***	-0.779***	-0.768***	-0.332**	-0.539***	-0.380***	-0.243*	-0.419***
	(0.110)	(0.154)	(0.170)	(0.179)	(0.322)	(0.125)	(0.151)	(0.144)	(0.108)	(0.126)	(0.134)	(0.104)
Macroeconomic variables												
HHI	-0.025	-1.117*	0.708**	0.222	-0.354	0.577*	-0.048	-0.606**	0.618*	0.225	-0.400	0.851**
	(0.194)	(0.559)	(0.334)	(0.208)	(0.332)	(0.339)	(0.212)	(0.295)	(0.330)	(0.186)	(0.259)	(0.323)
INT	-0.572***	-0.796**	-0.655***	-0.940***	-1.161**	-0.634***	-0.553***	-0.581	-0.658***	-1.005***	-0.939***	-0.971***
	(0.159)	(0.327)	(0.187)	(0.161)	(0.451)	(0.200)	(0.169)	(0.360)	(0.192)	(0.165)	(0.303)	(0.169)
GDP	0.000	0.005	-0.001	0.000	0.004	-0.001	-0.001	0.005**	-0.001	-0.001	0.004*	-0.003**
	(0.001)	(0.004)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)
Inflation	-0.002	0.005	-0.002*	-0.002*	-0.002	-0.002	-0.001	-0.001	-0.002*	-0.001	-0.000	-0.002
	(0.001)	(0.006)	(0.001)	(0.001)	(0.004)	(0.001)	(0.001)	(0.003)	(0.001)	(0.001)	(0.003)	(0.001)
CBclaims	-0.010*	0.002	-0.002	-0.006	-0.036***	-0.002	-0.010**	-0.027*	-0.002	-0.008	-0.032**	0.003
	(0.005)	(0.027)	(0.006)	(0.005)	(0.013)	(0.007)	(0.005)	(0.014)	(0.006)	(0.005)	(0.013)	(0.006)
Institutional variable												
RQ	-0.139***	0.122	0.002	-0.186***	0.062	-0.002	-0.020	0.058	0.011	0.021	0.069	0.057
	(0.050)	(0.076)	(0.048)	(0.066)	(0.078)	(0.047)	(0.027)	(0.064)	(0.046)	(0.023)	(0.064)	(0.036)
Constant	0.546***	0.509**	0.678***	0.144	0.158	0.677***	0.619***	0.488**	0.637***	0.301	0.650***	0.558***
	(0.129)	(0.223)	(0.158)	(0.188)	(0.305)	(0.138)	(0.219)	(0.200)	(0.126)	(0.210)	(0.203)	(0.125)
Observations	1345	492	853	1345	492	853	1345	492	853	1345	492	853
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of instruments	71	49	68	71	65	69	70	65	69	70	65	69
AR1 (p-value)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AR2 (p-value)	0.46	0.89	0.34	0.32	0.87	0.34	0.34	0.76	0.40	0.77	0.91	0.44
Hansen-J (p-value)	0.19	0.15	0.21	0.25	0.63	0.16	0.31	0.45	0.18	0.25	0.58	0.19

Notes: This table shows the effect of security holdings on banks' private credit based on their ownership structure. The dependent variable is private credit, measured by the loans to total assets ratio. The main independent variable is bank securities to total assets ratio. In columns 1 to 3, we introduce the following interaction term: *Foreign bank* × *Securities*. In columns 4 to 6, we introduce the following interaction term: *Pan-African bank* × *Securities*. In columns 7 to 9, we introduce the following interaction term: *No Pan-African bank* × *Securities*. In columns 10 to 11, we introduce the following interaction term: *French bank* × *Securities*. The estimation technique used is the system GMM.

*** Statistical significance at the 1% level

**Statistical significance at the 5% level

* Statistical significance at the 10% level.

Table 1.9: Comparison test results for the sub-samples of large versus small banks.

	Large banks		Small banks		Comparison test	
	Obs.	Mean	Obs.	Mean	Diff.	P-value
Credit	665	0.538	685	0.566	0.028***	0.000
Securities	665	0.166	685	0.072	-0.094***	0.000
Size	665	12.397	685	10.472	-1.926***	0.000
CAP	665	0.042	685	0.169	0.127***	0.000
LIQ	665	0.867	685	0.833	-0.035***	0.000
LLP	665	0.014	685	0.021	0.008***	0.001
Public banks	665	0.080	685	0.118	0.039**	0.018
Private banks	665	0.920	685	0.882	-0.039**	0.018
Domestic banks	665	0.275	685	0.279	0.004	0.881
Foreign banks	665	0.725	685	0.721	-0.004	0.881
INT	665	0.077	685	0.087	0.010***	0.000
GDP	665	4.934	685	4.442	-0.492***	0.002
Inflation	665	0.484	685	1.781	1.297***	0.000
CBclaims	665	2.828	685	3.359	0.530***	0.000
RQ	665	-0.467	685	-0.560	-0.094***	0.000
	Large banks		Small banks		Comparison test	
	Obs.	Mean	Obs.	Mean	Diff.	P-value
Credit	699	0.554	651	0.551	-0.004	0.660
Securities	699	0.144	651	0.091	-0.053***	0.000
Size	699	12.268	651	10.510	-1.758***	0.000
CAP	699	0.039	651	0.179	0.140***	0.000
LIQ	699	0.864	651	0.834	-0.030***	0.000
LLP	699	0.012	651	0.023	0.011***	0.000
Public banks	699	0.092	651	0.108	0.016	0.328
Private banks	699	0.908	651	0.892	-0.016	0.328
Domestic banks	699	0.300	651	0.252	-0.049**	0.046
Foreign banks	699	0.700	651	0.748	0.049**	0.046
INT	699	0.078	651	0.087	0.009***	0.000
GDP	699	4.671	651	4.698	0.027	0.864
Inflation	699	1.075	651	1.214	0.140	0.471
CBclaims	699	2.892	651	3.318	0.426***	0.000
RQ	699	-0.461	651	-0.571	-0.109***	0.000

Notes: This table compares the mean values of variables in the subsamples of large banks versus small banks. Comparison tests are performed using the t-test (with unequal variance).
*** Statistical significance at the 1% level
**Statistical significance at the 5% level
* Statistical significance at the 10% level.

Table 1.10: Effect of banks' sovereign debt exposure on private credit accounting for size heterogeneity: large and small banks.

	Banking Commission classification			Scores above and below median size		
	Full sample	LMICs	LICs	Full sample	LMICs	LICs
	(1)	(2)	(3)	(4)	(5)	(6)
Credit_{t-1}	0.280***	0.287***	0.338***	0.315***	0.319***	0.316***
	(0.070)	(0.090)	(0.065)	(0.064)	(0.086)	(0.062)
Securities	-0.827***	-0.326*	-0.609***	-0.690***	-0.382*	-0.646***
	(0.165)	(0.173)	(0.079)	(0.095)	(0.194)	(0.111)
Large banks	-0.190**	0.049	-0.060***			
	(0.091)	(0.034)	(0.016)			
Large banks × Securities	0.630*	-0.421*	0.149*			
	(0.332)	(0.222)	(0.083)			
Large banks				-0.104**	0.062*	-0.113**
				(0.049)	(0.037)	(0.056)
Large banks × Securities				0.332*	-0.372	0.290
				(0.179)	(0.267)	(0.220)
CAP	-0.260***	-0.100	-0.134***	-0.193***	-0.041	-0.203***
	(0.094)	(0.094)	(0.050)	(0.069)	(0.097)	(0.073)
LIQ	-0.054	0.019	-0.026	-0.040	0.013	-0.030
	(0.048)	(0.076)	(0.041)	(0.045)	(0.073)	(0.044)
LLP	-0.379***	-0.297**	-0.434***	-0.481***	-0.345*	-0.417***
	(0.100)	(0.146)	(0.107)	(0.098)	(0.178)	(0.110)
Macroeconomic variables						
HHI	0.081	-0.429	0.806**	-0.065	-0.669**	0.733**
	(0.197)	(0.257)	(0.333)	(0.196)	(0.276)	(0.340)
INT	-1.111***	-0.706*	-1.070***	-0.780***	-0.750**	-1.113***
	(0.164)	(0.362)	(0.181)	(0.147)	(0.329)	(0.183)
GDP	-0.002*	0.004*	-0.003**	-0.001	0.005**	-0.002
	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)
Inflation	-0.001	0.000	-0.002	-0.001	0.003	-0.002
	(0.001)	(0.003)	(0.001)	(0.001)	(0.004)	(0.001)
CBclaims	-0.011*	-0.029**	0.003	-0.013**	-0.029*	-0.002
	(0.006)	(0.014)	(0.006)	(0.006)	(0.015)	(0.007)
Institutional variable						
RQ	0.019	0.056	0.049	0.011	0.189**	0.060
	(0.027)	(0.064)	(0.036)	(0.026)	(0.093)	(0.043)
Constant	0.816***	0.372**	0.557***	0.713***	0.174	-9.624*
	(0.121)	(0.158)	(0.082)	(0.091)	(0.163)	(5.672)
Observations	1350	495	855	1350	495	855
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
No. of instruments	70	64	69	70	63	68
AR1 (p-value)	0.00	0.00	0.00	0.00	0.00	0.00
AR2 (p-value)	0.11	0.64	0.48	0.49	0.58	0.72
Hansen-J (p-value)	0.26	0.56	0.15	0.13	0.42	0.20

Notes: This table shows the effect of security holdings on banks' private credit. The dependent variable is private credit, measured by the loans to total assets ratio. The main independent variable is bank securities to total assets ratio. The estimates of interaction terms in columns 1 to 3 are based on the Banking Commission categorization and in columns 4 to 6 on the median categorization. The estimation technique used is the system GMM.

*** Statistical significance at the 1% level

**Statistical significance at the 5% level

* Statistical significance at the 10% level.

1.7.3 Bank capitalization

To test our hypothesis that well-capitalized banks reduce less their lending to the private sector when they hold sovereign debt than their under-capitalized peers, we use an interaction term with *Securities* and a dummy variable that identifies the status of the bank's

capitalization (*Well capitalized*×*Securities*). The dummy variable is constructed by ranking banks based on their compliance with the capital regulations set by the Banking Commission of the WAEMU region. From 2000 to 2015, the minimum capital threshold for banks in the WAEMU region underwent two significant changes. Initially, the threshold was set at 1 billion CFA francs, but in 2008, it was raised to 8 billion CFA francs. Following the 2008 global financial crisis, there was renewed interest in the minimum capital requirement for banks and its impact on financial system stability. As a result, the WAEMU Council of Ministers decided to raise the minimum capital requirement to 10 billion CFA francs in 2015. Therefore, for each period, the dummy variable takes one whether a bank meets the minimum capital requirement set by the regulatory authority, zero otherwise. In addition to the dummy variable based on regulatory compliance, we create a second dummy variable by ranking banks based on their equity-to-assets ratio (Equity/TA), with a value of one indicating that a bank's capitalization is above the median for the banking sector. Using these two metrics, we can accurately identify and differentiate between well-capitalized and under-capitalized banks in our sample.

Table 1.11 displays the results of comparison tests between well-capitalized and under-capitalized banks. The results indicate that the two groups exhibit significant statistical differences in their characteristics. Specifically, on average, under-capitalized banks tend to extend more credit than their well-capitalized counterparts. Additionally, well-capitalized banks have a higher ratio of securities to total assets, with a value of 17.4% as compared to 8.6% for under-capitalized banks. These preliminary results suggest that well-capitalized banks tend to adopt a more cautious approach, with low leverage, limiting their credit to the private sector, representing a higher risk, and lending to the best risk. Furthermore, the two groups differ in size and liquidity, as shown in Table 1.11.

Table 1.12 presents the econometric results of the relationship between a bank's level of capitalization and its lending to the private sector. As indicated by the results, being well-

capitalized is negatively correlated with private credit. This suggests that well-capitalized banks tend to grant less credit to the private sector and prefer to hold low-risk assets such as government debt. However, the coefficient of the interaction term between bank capitalization and banks' securities is positive (column 1 of Table 1.12). This suggests that well-capitalized banks help to mitigate the negative impact of security holdings on credit extended to the private sector. The overall coefficient effect is -0.473 (regulatory categorization). The overall coefficient for the median proxy is -0.145 (see column 4 of Table 1.12).

These findings provide support for hypothesis *H4*, which posits that well-capitalized banks tend to "flight to quality" by holding more low-risk assets such as sovereign debt, but at the same time, their exposure to sovereign debt creates room for more risk assets and raises their private sector financing activity. Overall, these results suggest that well-capitalized banks tend to balance their lending to the private sector and their holdings of low-risk assets to maintain their risk exposure level.

Table 1.11: Comparison test results for the subsamples of well-capitalized banks versus under-capitalized banks.

	Well-capitalized banks		Under-capitalized banks		Comparison test	
	Obs.	Mean	Obs.	Mean	Diff.	P-value
Credit	491	0.521	859	0.571	0.050***	0.000
Securities	491	0.174	859	0.086	-0.088***	0.000
Size	491	12.149	859	11.004	-1.145***	0.000
CAP	491	0.107	859	0.107	-0.000	0.973
LIQ	491	0.847	859	0.851	0.004	0.543
LLP	491	0.022	859	0.015	-0.007***	0.007
Public banks	491	0.077	859	0.112	0.034**	0.034
Private banks	491	0.923	859	0.888	-0.034**	0.034
Domestic banks	491	0.236	859	0.300	0.064***	0.010
Foreign banks	491	0.764	859	0.700	-0.064***	0.010
INT	491	0.078	859	0.084	0.006***	0.000
GDP	491	5.407	859	4.271	-1.136***	0.000
Inflation	491	-0.230	859	1.926	2.156***	0.000
CBclaims	491	2.746	859	3.299	0.553***	0.000
RQ	491	-0.470	859	-0.539	-0.069***	0.000
	Well-capitalized banks		Under-capitalized banks		Comparison test	
	Obs.	Mean	Obs.	Mean	Diff.	P-value
Credit	633	0.548	717	0.557	0.009	0.257
Securities	633	0.096	717	0.138	0.042***	0.000
Size	633	10.564	717	12.176	1.613***	0.000
CAP	633	0.189	717	0.035	-0.154***	0.000
LIQ	633	0.823	717	0.873	0.050***	0.000
LLP	633	0.024	717	0.012	-0.012***	0.000
Public banks	633	0.098	717	0.100	0.002	0.880
Private banks	633	0.902	717	0.900	-0.002	0.880
Domestic banks	633	0.235	717	0.314	0.078***	0.001
Foreign banks	633	0.765	717	0.686	-0.078***	0.001
INT	633	0.084	717	0.080	-0.004***	0.008
GDP	633	4.692	717	4.677	-0.015	0.923
Inflation	633	1.214	717	1.078	-0.136	0.484
CBclaims	633	3.178	717	3.027	-0.151*	0.093
RQ	633	-0.560	717	-0.473	0.087***	0.000

Notes: This table compares the mean values of variables in the subsamples of well-capitalized banks versus undercapitalized banks. Comparison tests are performed using the t-test (with unequal variance).

*** Statistical significance at the 1% level

**Statistical significance at the 5% level

* Statistical significance at the 10% level.

Table 1.12: Effect of banks' sovereign debt exposure on private credit accounting for capitalization heterogeneity: well-capitalized and under-capitalized.

	Regulatory capital requirement categorization			Scores above and below median capitilizattion		
	Full sample	LMICs	LICs	Full sample	LMICs	LICs
	(1)	(2)	(3)	(4)	(5)	(6)
$Credit_{t-1}$	0.371***	0.304***	0.370***	0.415***	0.332***	0.407***
	(0.060)	(0.103)	(0.066)	(0.065)	(0.085)	(0.065)
Securities	-0.602***	-0.716***	-0.658***	-0.885***	-0.595**	-0.796***
	(0.065)	(0.198)	(0.135)	(0.145)	(0.233)	(0.138)
Well capitilized banks	-0.042***	-0.093	-0.054			
	(0.015)	(0.071)	(0.057)			
Well capitilized banks × Securities	0.129**	0.244	0.202			
	(0.054)	(0.216)	(0.198)			
Well capitilized banks				-0.177***	-0.082	-0.107**
				(0.057)	(0.099)	(0.048)
Well capitilized banks × Securities				0.600***	0.148	0.438**
				(0.209)	(0.296)	(0.195)
Size	0.008*	0.018**	0.004	0.021***	0.020	0.007
	(0.004)	(0.008)	(0.006)	(0.006)	(0.013)	(0.006)
LIQ	-0.008	-0.016	0.010	-0.046	-0.016	-0.003
	(0.034)	(0.051)	(0.046)	(0.039)	(0.053)	(0.047)
LLP	-0.348***	-0.215	-0.466***	-0.214	-0.186	-0.365***
	(0.106)	(0.149)	(0.116)	(0.132)	(0.137)	(0.138)
Macroeconomic variables						
HHI	0.160	-0.583*	0.842**	0.109	-0.511	0.974***
	(0.181)	(0.342)	(0.330)	(0.195)	(0.321)	(0.327)
INT	-0.948***	-0.955***	-0.961***	-1.026***	-1.053***	-0.972***
	(0.144)	(0.283)	(0.173)	(0.139)	(0.292)	(0.165)
GDP	-0.001	0.004*	-0.003**	-0.002**	0.003	-0.003**
	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)
Inflation	-0.001	0.000	-0.002	-0.001	-0.001	-0.002
	(0.001)	(0.003)	(0.001)	(0.001)	(0.003)	(0.002)
CBclaims	-0.009*	-0.032***	0.003	-0.009	-0.036**	0.004
	(0.005)	(0.012)	(0.006)	(0.006)	(0.014)	(0.006)
Institutional variable						
RQ	0.020	0.072	0.061*	0.026	0.069	0.064*
	(0.023)	(0.063)	(0.035)	(0.023)	(0.062)	(0.036)
Constant	0.485***	0.264*	0.338***	0.467***	0.164	0.290**
	(0.073)	(0.134)	(0.123)	(0.076)	(0.129)	(0.118)
Observations	1345	492	853	1345	492	853
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
No. of instruments	71	64	68	70	64	68
AR1 (p-value)	0.00	0.00	0.00	0.00	0.00	0.00
AR2 (p-value)	0.59	0.93	0.56	0.23	0.97	0.24
Hansen-J (p-value)	0.12	0.42	0.25	0.25	0.51	0.35

Notes: This table shows the effect of security holdings on banks' private credit. The dependent variable is private credit, measured by the ratio of loans to total assets. The main independent variable is the ratio of bank securities to total assets. The estimates with interaction terms in columns 1 to 3 are based on the regulatory capital requirement compliance categorization and in columns 4 to 6 on the median categorization. The estimation technique used is the system GMM.

*** Statistical significance at the 1% level

**Statistical significance at the 5% level

* Statistical significance at the 10% level.

1.8 Conclusion

In light of increasing deficits and the need for funding for development, many countries are turning to their national savings to meet these demands. This paper examines the impact of banks' sovereign security holdings on their lending activity. To do so, we use an unbalanced panel of 136 banks over the 2001-2017 period in the WAEMU region.

The results showed that banks' exposure to public securities reduced their credit to the private sector. The magnitude of this effect depends on the income level of countries. By classifying countries by income level group, the heterogeneity analysis indicates that security holdings have a higher impact in LICs (-0.635) than LMICs (-0.567). For robustness checks, we used alternative measures of private credit to overcome the denominator effect between banks' securities and loans; our results hold and become more meaningful than those found by the credit ratio. In addition, using macroeconomic data as proxies for sovereign securities, represented by government securities (bonds and treasury bills), we uncover that the outstanding government securities harm private credit. Other estimators showed the adverse effect of banks' sovereign debt exposure on lending to the WAEMU region's private sector. The crowding-out effect can be either implicit financial repression or "lazy banks" behavior by the portfolio rebalancing mechanism.

The heterogeneity analyses based on bank characteristics showed that the adverse effect is higher and more significant among foreign banks than their domestic peers. Moreover, the findings indicate that large and well-capitalized banks' exposure to sovereign securities harms less the private sector credit, which is even more significant with French banks. These results can suggest the presence of a "safe-assets" view within the regional banking system and, therefore, mitigate the crowding-out effect.

These results have implications for regulating banks' government security holdings in the region. As noted by Bouis (2019), banks' appetite for sovereign debt can be a source of

concern despite the optimal response to a deteriorating quality of private credit. Indeed, higher exposure of banks to sovereign debt can harm credit to the private sector in the event of a government default. This risk is nonexistent in the region where some countries are experiencing security crises (Burkina-Faso, Mali, and Niger).[29] Therefore, the supply of financial services can be hampered in the event of a sovereign default (Bottero et al., 2020).

Another concern is the weak credit market institutions, i.e., legal and institutional imperfections, that make lending to the private sector more risky (Kumhof and Tanner, 2005). As proposed by Djankov et al. (2007), one way to channel bank credit to the private sector in such environment is to reinforce the creditor's rights by reforming credit reporting systems and the effectiveness of collateral and bankruptcy laws. Nevertheless, improving the institutional environment for financial development is unlikely to improve credit for the private sector in many developing countries as long as the government absorbs an essential part of the bank's resources. In the long run, it is necessary for the financing of development to create a financial environment that enables the funding of both the private and public sectors by reducing the trade-off between the two sectors regarding opportunity and risk. As a recommendation, enhancing the investor base is necessary to deepen the private and public securities demand and banks' lending activity to SMEs and encourage firms to issue on the regional or international financial markets for large companies. Also, enhancing the investor base should be assisted by dissemination efforts to encourage firms to issue bonds or treasury bills on the regional financial market. As with governments, an agency similar to UMOA-Titres could be created for businesses.

Considering the fact that well-capitalized and larger banks mitigate the crowding-out effect, regulatory authorities should implement mechanisms to prioritize these banks and serve undercapitalized and small banks last during public debt issuances in the regional financial market.

[29]The WAEMU Securities Agency has declared three defaults of payment of the Malian government since the beginning of 2022 due to the multidimensional crisis in the country.

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Table A1: Definition and measure of variables.

Variables	Calculation	Signs	Sources
	Bank level		
Credit	Loans to total assets		BCEAO
Securities	Government securities to total assets	-	BCEAO
Size	Logarithm of total assets		BCEAO
Liquidity (LIQ)	Customer deposits to total assets		BCEAO
LLP	Loan loss reserves to total loan	-	BCEAO
Capitalisation (CAP)	Equity to total assets	+/-	BCEAO
Interest rate (INT)	Interest income generated by bank lending activity divided by bank credit to customers	-	BCEAO
HHI	Sum of the squares of market shares of banks within the country banking sector:	-	BCEAO
Public bank	Dummy equal to 1 if at least 50% of the capital is held by the State, 0 otherwise	-	BCEAO
National bank	Dummy equal to 1 if at least 50% of the capital is held by nationals, 0 otherwise	*?*	BCEAO
Foreign bank	Dummy equal to 1 if bank domestic status = 0, 0 otherwise	*?*	BCEAO
Pan-African banks	Dummy equal to 1 if cross-border Pan-African bank status = yes, 0 otherwise	*?*	BCEAO
French bank	Dummy equal to 1 if at least 50% of the capital is held by a French individual or entity, 0 otherwise	+	BCEAO
Large bank	Dummy equal to 1 if the total assets of the bank is greater than 100 billion CFA francs, 0 otherwise	+	BCEAO
Well-capitalized bank	Dummy equal to 1 if the bank has more capital than the minimum required by the regulator, 0 otherwise	**?**	BCEAO
	Macroeconomic variables		
GDP	Gross domestic growth rate	-	BCEAO
Inflation	Growth rate of the consumer price index	-	BCEAO
CBclaims	Claims of the Central Bank on the private sector, in percentage of GDP	-	IFS
	Institutional quality		
RQ	Regulatory quality index	+	WGI

Table A2: Correlation matrix.

	(1)														
	Credit	Securities	Size	CAP	LIQ	LLP	Public banks	Private banks	Domestic banks	Foreign banks	INT	GDP	Inflation	CBclaims	RQ
Credit	1														
Securities	-0.398***	1													
Size	0.127***	0.428***	1												
CAP	-0.292***	-0.199***	-0.691***	1											
LIQ	0.262***	0.124***	0.294***	-0.517***	1										
LLP	-0.224***	-0.0952***	-0.194***	0.378***	-0.0396	1									
Public banks	-0.0209	-0.0887***	-0.0554*	0.0343	-0.0280	0.163***	1								
Private banks	0.0209	0.0887***	0.0554*	-0.0343	0.0280	-0.163***	-1	1							
Domestic banks	-0.0707**	-0.0126	0.0279	-0.00657	-0.00627	0.0998***	0.708***	-0.708***	1						
Foreign banks	0.0707**	0.0126	-0.0279	0.00657	0.00627	-0.0998***	-0.708***	0.708***	-1	1					
INT	0.0239	-0.0566*	-0.0791***	0.0603**	0.117***	0.137***	0.00498	-0.00498	0.00422	-0.00422	1				
GDP	-0.0485	0.201***	0.108***	0.0199	0.0459	-0.0230	0.0274	-0.0274	0.0806***	-0.0806***	0.00961	1			
Inflation	0.0770***	-0.284***	-0.177***	0.0400	-0.0327	0.0207	-0.00537	0.00537	-0.0144	0.0144	0.0907***	-0.209***	1		
CBclaims	-0.0598**	-0.214***	-0.208***	0.0940***	-0.177***	0.0339	0.0427	-0.0427	0.0675**	-0.0675**	-0.172***	-0.118***	0.0456	1	
RQ	0.156***	0.0487	0.204***	-0.201***	0.0991***	-0.144***	0.0944***	-0.0944***	0.0662**	-0.0662**	-0.262***	0.154***	-0.105***	-0.255***	1
Observations	1129														

* $p < 0.1$, ** $p < .05$, *** $p < 0.01$.

Table A3: This table summarizes the definition of additional variables and data sources.

Variables	Calculation	Sources
	Bank level	
LogCredit	The natural logarithm of loans to total assets	BCEAO
Credit-2	Variation in loans divided by total assets ($\frac{Credit_i,j,t-Credit_i,j,t-1}{\text{Total assets}_i,j,t}$)	BCEAO
Credit-3	Growth rate of loans in logarithm ($\Delta Log(Credit_i,t,j$)	BCEAO
Public bank	1 if at least 50% of the capital is held by the State otherwise 0	BCEAO
National bank	1 if at least 50% of the capital is held by nationals otherwise 0	BCEAO
Foreign bank	1 if national banks = 0 otherwise 0	BCEAO
Pan-African banks	1 if cross-border Pan-African bank status = yes, 0 otherwise	BCEAO
French bank	Takes the value 1 if at least 50% of the capital is held by a French individual or legal entity	BCEAO
Large bank	1 if the total assets of the bank is greater than 100 billion otherwise 0	BCEAO
Well-capitalized bank	1 if the bank has more capital than the minimum required by the regulator otherwise 0	BCEAO
	Macroeconomic variables	
Gvt securities	Government securities outstanding to GDP	BCEAO
Treasury bills	Treasury bills outstanding, in percentage of GDP	BCEAO
Bonds	Government bonds outstanding to GDP	BCEAO

Table A4: Summary statistics of additional variables.

	Full Sample		LMICs		LICs		Comp.(LICs and LMCs)	
	Mean	SD.	Mean	SD.	Mean	SD.	Diff.	P-value
Logcredit(proxy-1)	10.61	1.46	10.44	1.43	10.89	1.49	-0.45***	0.00
Credit-2	0.07	0.14	0.07	0.13	0.07	0.15	0.00	0.86
Credit-3	0.19	0.37	0.18	0.34	0.21	0.42	-0.03	0.22
Gvt securities	0.08	0.08	0.08	0.09	0.09	0.07	-0.01	0.13
Bonds	0.06	0.07	0.07	0.07	0.06	0.06	0.00	0.55
Tresory bills	0.04	0.04	0.04	0.04	0.03	0.05	0.01**	0.02
Well capitilized banks	0.70	0.46	0.64	0.48	0.79	0.41	-0.15***	0.00
Large banks	0.47	0.50	0.41	0.49	0.56	0.50	-0.15***	0.00

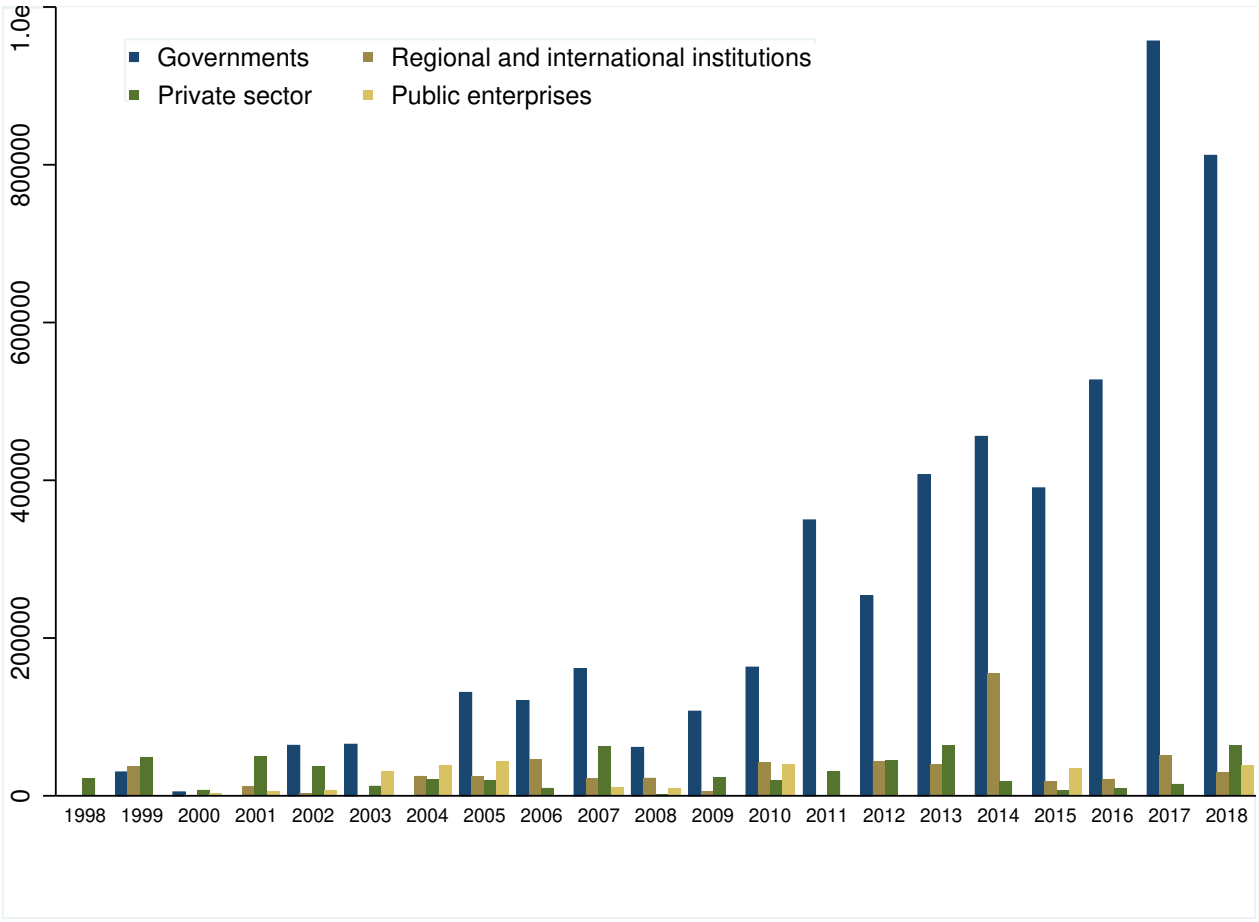
Notes: This table reports the additional variables used in robustness checks. These variables are as follows: Credit is the logarithm of total loans, Credit-2 ($\frac{Credit_i,j,t-Credit_i,j,t-1}{\text{Total assets}_i,j,t}$), Credit-3 ($\Delta Log(Credit_i,t,j)$. The macroeconomic data are the Gvt securities (government securities outstanding, in percentage of GDP), Treasury bills (Treasury bills outstanding, in percentage of GDP), and Bonds (government bonds outstanding, in percentage of GDP).
*** Statistical significance at the 1% level
**Statistical significance at the 5% level
* Statistical significance at the 10% level.

Table A5: Evolution of the securities holdings in banks' total assets by country, 2003-2017.

	Benin	Burkina Faso	Cote d'Ivoire	Guinea-Bissau	Mali	Niger	Senegal	Togo	WAEMU
2003	0.06	0.08	0.12	0.02	0.04	0.12	0.06	0.02	0.06
2004	0.03	0.07	0.13	0.02	0.05	0.11	0.12	0.01	0.07
2005	0.05	0.04	0.22	0.03	0.03	0.09	0.09	0.03	0.07
2006	0.04	0.03	0.11	0.02	0.03	0.08	0.05	0.07	0.05
2007	0.05	0.04	0.18	0.02	0.03	0.06	0.07	0.09	0.07
2008	0.10	0.05	0.12	0.05	0.04	0.04	0.13	0.07	0.07
2009	0.12	0.06	0.09	0.06	0.03	0.15	0.08	0.05	0.08
2010	0.14	0.17	0.14	0.10	0.09	0.15	0.09	0.15	0.13
2011	0.18	0.17	0.06	0.11	0.07	0.17	0.08	0.13	0.12
2012	0.18	0.18	0.08	0.13	0.06	0.17	0.11	0.14	0.13
2013	0.18	0.19	0.14	0.14	0.06	0.14	0.10	0.16	0.14
2014	0.18	0.20	0.19	0.19	0.11	0.18	0.16	0.15	0.17
2015	0.23	0.22	0.10	0.22	0.14	0.20	0.16	0.16	0.18
2016	0.19	0.24	0.17	0.22	0.12	0.23	0.22	0.17	0.20
2017	0.21	0.24	0.15	0.20	0.13	0.23	0.28	0.18	0.20
Average	0.13	0.13	0.13	0.10	0.07	0.14	0.12	0.11	0.12

Notes: This table reports the evolution of banks' securities (as the ratio of total assets) over the period 2003-2017 by country. The data for computing the ratio of securities to total assets were obtained from the banking commission of WAEMU.

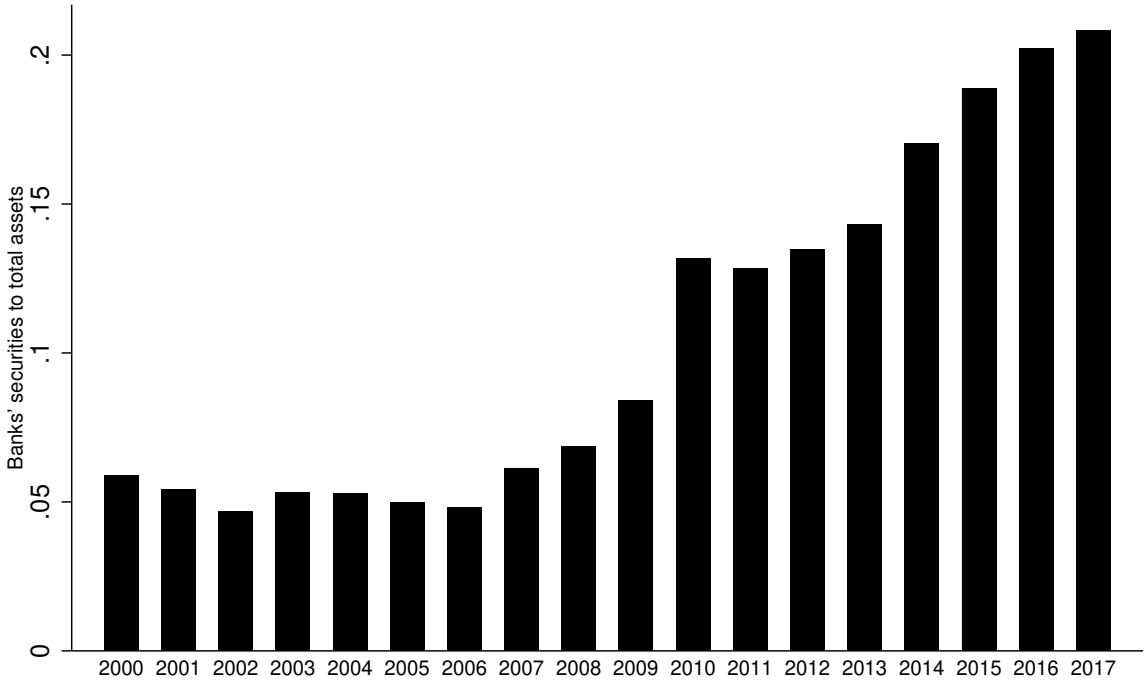
Figure A1: Breakdown by category of issuers on the bonds market from 1998 to 2018 (in millions of CFA francs).



Source: The data were from the CREPMF.The figure reports the volume of funds raised by each category of issuers in the regional financial market.

The Conseil Régional de l'Epargne Publique et des Marchés Financiers (CREPMF) is an organ of the West African Monetary Union (WAMU), created in 1996 and whose mission is the protection of savings invested in securities and in any other investment giving rise to a public savings call in all member states of the Union.

Figure A2: Dynamic of securities in the banks balance sheet (as the ratio of total assets).



Notes: This figure reports the evolution of banks' securities (as the ratio of total assets) over the period 2000-2017. The data were obtained from the banking commission of WAEMU.

Table A6: Comparison test results for the subsamples of French banks versus No French banks.

	French banks		No French banks		Comparison test	
	Obs.	Mean	Obs.	Mean	Diff.	P-value
Credit	146	0.621	1204	0.544	-0.077***	0.000
Securities	146	0.104	1204	0.120	0.016**	0.033
Size	146	12.321	1204	11.311	-1.010***	0.000
CAP	146	0.043	1204	0.115	0.071***	0.000
LIQ	146	0.842	1204	0.851	0.009*	0.079
LLP	146	0.015	1204	0.018	0.003	0.110
Public banks	146	0.000	1204	0.111	0.111***	0.000
Private banks	146	1.000	1204	0.889	-0.111***	0.000
Domestic banks	146	0.000	1204	0.311	0.311***	0.000
Foreign banks	146	1.000	1204	0.689	-0.311***	0.000
INT	146	0.078	1204	0.083	0.004*	0.052
GDP	146	4.640	1204	4.689	0.050	0.843
Inflation	146	1.257	1204	1.128	-0.129	0.661
CBclaims	146	2.954	1204	3.115	0.161	0.260
RQ	146	-0.413	1204	-0.526	-0.113***	0.000

*Notes:*This table compares the mean values of variables in the subsamples of French banks versus No French banks Comparison tests are performed using the t-test (with unequal variance).
*** Statistical significance at the 1% level
**Statistical significance at the 5% level
* Statistical significance at the 10% level.

Table A7: Impact of sovereign security holdings on private credit (Quantile regression).

	Full Sample			Lower-middle income (LMICs)			Low income(LICs)		
	Q(0.25)	Q(0.50)	Q(0.75)	Q(0.25)	Q(0.50)	Q(0.75)	Q(0.25)	Q(0.50)	Q(0.75)
Credit_{t-1}	0.706***	0.637***	0.521***	0.680***	0.605***	0.535***	0.706***	0.644***	0.513***
	(0.037)	(0.032)	(0.026)	(0.045)	(0.044)	(0.037)	(0.033)	(0.036)	(0.036)
Securities	-0.279***	-0.340***	-0.446***	-0.227***	-0.351***	-0.430***	-0.295***	-0.339***	-0.475***
	(0.051)	(0.036)	(0.021)	(0.056)	(0.054)	(0.037)	(0.065)	(0.035)	(0.044)
Size	-0.004	-0.013***	-0.012***	0.014	0.003	-0.003	-0.015**	-0.021***	-0.027***
	(0.004)	(0.004)	(0.004)	(0.009)	(0.006)	(0.006)	(0.007)	(0.004)	(0.008)
CAP	-0.067	-0.086*	-0.019	0.090	0.044	0.086	-0.147**	-0.102**	-0.086
	(0.059)	(0.050)	(0.039)	(0.163)	(0.094)	(0.100)	(0.068)	(0.051)	(0.056)
LIQ	-0.001	0.032	0.027	0.145**	0.150***	0.088*	-0.095	0.008	-0.019
	(0.063)	(0.026)	(0.027)	(0.072)	(0.049)	(0.048)	(0.058)	(0.035)	(0.036)
LLP	-0.488***	-0.385***	-0.482***	-0.216	-0.468***	-0.323**	-0.512**	-0.481***	-0.617***
	(0.163)	(0.089)	(0.062)	(0.231)	(0.133)	(0.161)	(0.210)	(0.119)	(0.093)
HHI	-0.021	0.039	-0.191	-0.132	-0.116	-0.410	0.082	0.295	0.140
	(0.213)	(0.181)	(0.154)	(0.309)	(0.215)	(0.283)	(0.284)	(0.203)	(0.321)
INT	-0.537***	-0.614***	-0.652***	-1.115***	-0.974***	-0.895***	-0.416***	-0.534***	-0.503***
	(0.187)	(0.076)	(0.137)	(0.379)	(0.230)	(0.151)	(0.130)	(0.193)	(0.183)
GDP	0.001	0.001	-0.001	0.003*	0.004**	0.003	-0.001	-0.001	-0.000
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.003)	(0.001)	(0.001)	(0.002)
Inflation	0.000	-0.000	-0.000	-0.001	-0.002	-0.002*	0.001	0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.003)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
CBclaims	-0.001	-0.005**	-0.004**	-0.019***	-0.015***	-0.016**	0.006**	-0.001	-0.002
	(0.004)	(0.002)	(0.002)	(0.006)	(0.005)	(0.006)	(0.003)	(0.003)	(0.004)
RQ	-0.014	-0.003	-0.023	0.016	0.006	0.045	-0.011	-0.032	-0.052
	(0.024)	(0.018)	(0.014)	(0.041)	(0.033)	(0.037)	(0.059)	(0.037)	(0.037)
Observations	1350	1350	1350	495	495	495	855	855	855
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table reports the estimation results for the impact of bank's sovereign debt exposure on bank loan. The raw data were obtained from the BCEAO and the World Bank World Development Indicators, and World Governance Indicators databases. The dependent variable is the ratio of private credit (bank loan). Sovereign debt exposure is captured by the ratio of securities on total assets. The estimations are performed using quantile regression with heteroskedasticity-robust standard errors in parentheses. In each sample, the first column is for the 25% quintile, the second column for the 50% quintile and the third column for the 75% quintile.

*** Statistical significance at the 1% level

**Statistical significance at the 5% level

* Statistical significance at the 10% level.

Chapter 2

Do firms react to monetary policy in developing countries?[1]

[1]This chapter is co-authored with Florian Léon.

2.1 Introduction

The major upheavals in the global economy have led to a resurgence of inflation and a renewed focus on monetary policy in both developed and developing countries. Despite much work, the transmission channels of monetary policy in developing countries are still unclear. Central banks are expected to affect real activity mainly through the bank lending channel.[1] However, the limited development of banking markets means that many firms and households do not rely on bank loans to finance their investments. As a result, a change in credit conditions does not affect these economic agents. In addition, banks are less sensitive to changes in the money market for several reasons. The lack of competition gives banks room to adjust their interest rates and margins, reducing the impact of monetary policy (Mishra et al., 2014). Moreover, banks do not need to borrow because they have excess liquidity due to large exogenous deposits, such as remittance flows (Barajas et al., 2018), or because they convert a limited amount of deposits into loans due to a lack of investment opportunities. Finally, foreign banks, which are numerous in developing countries (Claessens and Van Horen, 2014), can resort to other financial resources than those provided by the money market when needed, especially for foreign banks.

A large body of empirical work has attempted to assess the impact of monetary policy (the bank lending channel) in developing countries, with mixed results. The first generation of papers, based on macroeconomic time series, documents a weak or non-existent bank lending channel in developing countries. However, these works face data and methodological shortcomings, as highlighted by Mishra and Montiel (2013). A second generation of papers

[1] According to the literature, monetary policy affects aggregate activity through four possible channels (Taylor, 1995): the bank lending channel; the asset price channel; the interest rate channel and the exchange rate channel. In developing countries, there is a consensus that the main transmission channel is the bank lending (or credit) channel (Mishra and Montiel, 2013). Indeed, financial systems in these countries are predominantly bank-based. Capital market systems are embryonic or non-existent, which limits the influence of the asset price channel. In addition, the functioning of the interest rate channel assumes perfect substitution between sources of finance, and the interest rate on bank loans is assumed to follow the same trend as the interest rate in financial markets. Finally, the exchange rate channel is less likely to play a role in developing countries due to the inflexibility of the exchange rate (Mishra et al., 2012).

has used natural experiments and more granular data to better understand how monetary policy might affect economic activity. Their findings challenge the conventional wisdom. For example, Abuka et al. (2019) use microdata from a credit registry to examine the bank lending channel in Uganda after a sharp monetary contraction. They document that the bank lending channel is effective. Using credit registry data, the authors identify the effect of monetary policy on bank lending decisions and credit conditions after a change in monetary policy. They document that access to credit and credit conditions tightened after a monetary policy contraction in Uganda. Using a narrative approach, Berg et al. (2019) provide a similar conclusion for Uganda and three other East African countries (Kenya, Tanzania and Rwanda). Recent evidence thus provides some support for the effectiveness of monetary policy in developing countries. However, these studies focus on specific (dramatic) events. The impact of the bank lending channel may be reduced for more moderate interventions and is certainly context-dependent. For example, it is recognised that the bank lending channel is more effective in countries with good institutions, deep banking markets and sufficient levels of competition (Mishra et al., 2014).

Our work proposes to shed new light on the question of the effectiveness of the bank lending channel by adopting a new approach based on the reaction of borrowers to monetary policy. Our aim is not to test directly whether changes in monetary policy affect economic activity. We do, however, examine whether a change in monetary policy affects managers' perceptions of their credit constraints. We expect that if the bank lending channel is effective, managers will be more likely to report a higher credit constraint after a tightening of monetary policy (and vice versa after an easing). The mechanisms at play in our framework are as follows: i) a change in the policy rate is expected to affect commercial banks' lending policies; ii) managers adjust their perceptions to these expected changes in lending decisions. As a result, the absence of a relationship can be explained by the fact that a change in monetary policy does not affect commercial banks and/or that a change in lending conditions does not affect managers' perceptions of their credit constraints.

To examine the relationship between monetary policy and perceptions of credit constraints, we combine data from the World Bank Enterprise Surveys (WBES) and a hand-collected database on changes in monetary policy rates in developing countries. The final sample includes 29,012 firms from 63 countries and 177 events (an event is defined as a change in the key policy rate). To ensure identification, we adapt the approach initiated by Depetris-Chauvin et al. (2020), which consists of examining how perceptions differ between units surveyed just before and just after the event. We compare how the average perception of credit access as a barrier differs between the two groups according to the direction (increase vs. decrease) and magnitude (in basis points) of the change in monetary policy. We restrict our analysis to firms surveyed 60 days before and 60 days after a monetary policy change. The intuition behind limiting the window around the event is to improve identification. Monetary policy is endogenous in nature and responds to economic conditions. By restricting the sample to firms surveyed just before and just after a change, we expect that these firms face a more or less similar macroeconomic context.

The basic results can be summarised as follows. A change in monetary policy affects managers' perceptions of credit constraints in developing countries. The effect of a policy rate change is symmetric, as it occurs in the expected direction for both hikes and cuts (perceptions increase after a hike and decrease after a cut). However, the impact of monetary policy only occurs when the change is substantial, i.e. more than 100-150 basis points. The marginal effect is not anecdotal: a 150 basis point increase in the policy rate raises perceptions by about a quarter of a standard deviation of the measure of credit access perceptions. An event study model yields two additional results. First, the effect of monetary policy occurs mainly in the first month after the event and fades away thereafter. Second, there is no clear evidence of an anticipation effect, as perceptions do not change just before a monetary policy change and there is no trend in the pre-treatment period.

The empirical results are robust to a number of sensitivity tests, including changes in the

measurement of the dependent and interest variables, in the econometric model used, or in the sample considered. Two robustness tests are of particular interest. First, we change the window retained before and after the event by using alternative numbers of days (30, 45, 75 and 90). Our analysis based on these different windows confirms all the results reported above (including those based on the event study model). Second, we carry out falsification tests. There is no reason for a change in monetary policy to affect other constraints such as energy, corruption or political instability. To confirm that monetary policy changes only affect credit constraints, we run the baseline model but change the dependent variable by considering other constraints. Empirical results confirm that monetary policy changes only affect perceptions of credit constraints but not other constraints.

We then exploit the richness of our sample to examine heterogeneity in the estimated relationship. According to our framework, monetary policy changes will affect managers' perceptions if (i) lenders (banks) are sensitive to monetary policy changes and (ii) borrowers (non-financial corporations) are sensitive to banks' lending decisions. We therefore examine whether firm- and country-level characteristics can affect the relationship between monetary policy changes and managers' perceptions of credit constraints.

We first examine the moderating effect of firm-level characteristics, assuming that not all firms are likely to be equally sensitive to a change in monetary policy. We document that larger, older and non-female-owned firms are more sensitive to a change in monetary policy. One possible explanation is that these firms are more likely to be linked to the financial sector (Beck et al., 2006; Asiedu et al., 2013) and are therefore more sensitive to a change in credit conditions. We test this hypothesis directly by distinguishing between firms that already have a credit relationship and other firms. We show that both groups of firms adjust their perceptions after a change, but the sensitivity is twice as high for firms with a credit relationship. In other words, these results suggest that a change in monetary policy has a stronger effect on the credit conditions for future loans of firms with a previous banking

relationship than on the likelihood of obtaining a loan for unconnected firms. In other words, monetary policy is more effective in influencing the intensive margin (credit terms) than the extensive margin (access to credit at any terms).

We then exploit the cross-country structure of our database to shed light on the debate on factors affecting monetary policy transmission (Mishra and Montiel, 2013; Mishra et al., 2014). We first document that managers are more responsive to monetary policy changes in countries with moderately developed financial systems, in line with the findings of Ma and Lin (2016). In addition, the results suggest that transmission is stronger in more competitive markets, but there is no effect of the share of foreign-owned banks. Moreover, managers are less sensitive in countries with a high degree of remittances, a result consistent with Barajas et al. (2018). A high level of remittances leads to excess liquidity of banks, making them less sensitive to changes in the money market. Finally, we examine the role of central bank credibility using different measures of its independence. There is no effect of central bank independence when we rely on the *de jure* indicator (Romelli, 2022). However, *de facto* measures (Cukierman, 1992; Dreher et al., 2008, 2010) suggest that managers are more likely to react when central banks are more independent, in line with previous literature on the relationship between central bank independence (credibility) and monetary policy effectiveness.

Our study contributes to the literature on the effectiveness of monetary policy in developing countries. We propose a new approach to shed light on this issue. Unlike previous work, we do not examine how monetary policy affects intermediate targets (interest rate, monetary aggregates, credit supply) or final outcomes (output and prices). We acknowledge that this is a limitation of our work, which focuses exclusively on perceptions. Nevertheless, our work is informative for understanding the role of the bank lending channel in developing countries and provides three main contributions to the literature.

The main contribution of our paper is to pay special attention to the reaction of poten-

tial borrowers after a change in monetary policy. Existing papers focus on the supply side (banks) and do their best to control for demand factors. However, a non-negligible impact of monetary policy may be transmitted through a change on the borrower side (in response to supply). Indeed, the lack of credit to firms in developing countries is mainly due to borrower discouragement (Brown et al., 2011; Léon, 2015), which is influenced by firms' perception of their ability to borrow on acceptable terms. An easing (or tightening) of monetary policy can stimulate (or slow) economic activity through access to credit by reducing (or increasing) borrower discouragement. Our paper is the first to examine monetary policy from borrowers' perspective in developing countries. By adopting such a perspective, we are also able to examine which groups of firms are more sensitive to monetary policy, which is a blind spot in the literature.

Second, we provide a new way of identifying the impact of monetary policy. A major challenge for work on the impact of monetary policy is to find an appropriate identification strategy. Monetary policy is endogenous in nature and responds to macroeconomic conditions; isolating the impact of monetary policy is rather complex. We address this issue by adapting the methodology developed by Depetris-Chauvin et al. (2020), which consists of comparing firms surveyed just before and just after an event (assuming that other conditions are unchanged across groups).[2] In our paper, identification relies on the assumption that macroeconomic conditions are similar across groups, as we restrict our analysis to a window of at most four months (−60 to +60 days). We document that changing the window does not change our conclusions.

Third, our work also exploits the cross-country dimension of our database. In line with previous international studies (Mishra et al., 2014; Barajas et al., 2018), we are therefore able to investigate country-level characteristics that moderate or accentuate the relationship between monetary policy changes and perceptions of credit constraints. In particular, we

[2] Depetris-Chauvin et al. (2020) examines the influence of national team football matches on national sentiment in Africa.

confirm previous findings on the role of financial systems (financial development, competition, liquidity). We also find that the de facto independence of central banks plays an important role.

Our work also contributes to the literature on the determinants of credit access and terms in developing countries. A large number of papers have examined individual and firm-level variables (Beck and Demirguc-Kunt, 2006; Asiedu et al., 2012, 2013). Another strand of work has focused on country characteristics, mainly the structure of banking markets (Beck et al., 2004; Clarke et al., 2006; Léon, 2015) or institutional factors (Beck et al., 2006; Qian and Strahan, 2007; Delis et al., 2020). However, to our knowledge, there is limited analysis of the direct impact of (short-term) policies on firms' access to credit in developing countries. While several papers have examined the crowding out effect of fiscal policy in developing countries (Cavallo and Daude, 2011; Huang et al., 2020), there is surprisingly little knowledge on how changes in monetary policy affect non-financial firms' credit perceptions and behavior. We document that monetary policy does affect firms' perceptions of credit access, but only when changes are sufficiently important. We also document that the effect is symmetric. Finally, evidence from advanced countries suggests that not all firms are equally affected by tight monetary conditions (Bougheas et al., 2006). We partially confirm this finding for developing countries.

The paper is organised as follows. Sections 2.2 and 2.3 present the data and methodology, respectively. Section 2.4 discusses the main empirical results. Section 2.5 presents the analysis of heterogeneity. The last section concludes.

2.2 Data

Our analysis focuses on the first stage of the monetary policy transmission channel. Changes in monetary policy must first change agents' expectations in order to influence their behavior.

Therefore, our paper examines how a change in monetary policy affects firms' perceptions of financial obstacles. To do so, we combine firm-level surveys with a hand-collected database on monetary policy changes in developing countries.

We manually collect information on monetary policy changes for developing countries using information provided by central banks (press releases, monetary policy bulletins, etc.). We focus on changes in central banks' policy rates (as the vast majority of central banks rely on market instruments). We identify a change if the key policy rate has changed. For each event[3], we obtain information on the exact date, the previous policy rate and the new policy rate. The amplitude of the change is the difference between the former rate and the new rate (in basis points).

We match the monetary policy data with the firm survey data extracted from the World Bank Enterprise Surveys (hereafter WBES). The WBES is a firm-level survey of a representative sample of private companies, covering more than 180,000 firms operating in 154 countries at the time of extraction (October 2022). The WBES provides harmonised questionnaires across countries. In addition to information on performance and behavior, the WBES contains two key pieces of information for our analysis. First, interviewers ask managers to quantify the importance of several obstacles, including access to credit, to running their business. As explained below, we use this measure as our main dependent variable. Second, we have information on the exact date of the interview.

The analysis combines both WBES and monetary policy data. A major challenge in analyzing the impact of monetary policy is its endogeneity, as short-term economic policy (fiscal or monetary) responds to macroeconomic conditions. In order to identify the effect of monetary policy, we have to limit our analysis to firms operating in a similar environment. We therefore restrict the sample to companies surveyed within a 60-day window before and after a monetary policy change. The choice of timing (60 days) is driven by the need to incorporate

[3]In the rest of the paper, an event is defined as a change in monetary policy.

a sufficient number of firms, on the one hand, and to avoid comparing firms operating in macroeconomic conditions that are too different, on the other. By keeping 60 days before and 60 days after, we have a maximum of four months (120 days) between two interviewed firms. We test different windows in robustness checks.

Based on the previous procedures, we identify 52,732 firms that were surveyed in the 60-day window around a monetary policy change. We have dropped firms where there is an overlap between two monetary policy changes in order to retain only a unique identification. This procedure allows us to identify only one monetary policy change for each firm included in the final sample.[4] Without the exclusion of overlapping firms, the status of treated firms (i.e. observed after a change) could be blurred if the firm was also interviewed just before another event. This procedure implies a large reduction in the sample with the exclusion of 22,961 firms. Of the remaining 29,771 firms, we dropped 578 firms because we do not have information on the dependent variable (no response or do not know). Finally, we dropped 172 firms from two countries because we lack information on the change in the policy rate. Our final sample consists of 29,012 firms from 63 countries (96 surveys) and 177 events. Table A3 in the appendix shows the main elements of the final sample composition by country.

[4]To make things more concrete, imagine a country where firms were interviewed on 1 January 2019 and 31 December 2019 and had two policy changes on the following dates: 12 March 2019 and 5 June 2019. We identify the window for both policy changes. For the first policy change (03/12/19), the window is from 12 January 2019 to 10 May 2019. For the second policy change (06/05/19), the 60-day window is from 3 April 2019 to 3 August 2019. Our approach is as follows. First, we drop firms that are surveyed outside the identified windows. In the example, we therefore drop firms surveyed before 12 January and after 5 August. We then restrict the sample to firms that are linked to only one monetary policy. Firms interviewed between 5 April and 12 May belong to the window of both monetary policy changes (post period for the first policy and pre period for the second). We therefore exclude these firms. Our final sample for this hypothetical case thus includes firms surveyed between January 12 and April 5 for the first policy change (which occurred on March 12) and firms surveyed between May 12 and August 5 for the second event (which occurred on June 5, 2019).

2.3 Methodology

2.3.1 Baseline model

To estimate the impact of monetary policy changes on managers' perceptions of financial obstacles, we adapt the approach originally developed by Depetris-Chauvin et al. (2020). This approach consists of comparing units surveyed shortly before and after a specific event (matches for the previous paper and monetary policy change here). In our study, we exploit the intensity of the treatment (change in the policy rate). The estimated model is a difference-in-difference with continuous treatment as follows:

$$Y_{i,e,d} = \delta_e + \beta_0 Post_{e,d} + \beta_1 Post_{e,d} \times \Delta IR_e + \gamma \mathbf{X}_i + \varepsilon_{i,e,d} \tag{2.1}$$

where i, e, and d denote the firm, the event (defined as a change in the policy rate), and the date of the interview (day), respectively.[5] The dependent variable ($Y_{i,e,d}$) is the firms' perception of access to finance as an obstacle to the current operation of the establishment (question *k30* in the WBES). Firms' responses range from 0 (no obstacle) to 4 (very serious obstacle), so the score increases as the perception of credit constraints as an obstacle increases.

To examine how changes in monetary policy affect the perception of credit constraints as a barrier, we use a difference-in-differences framework. $Post_{e,d}$ is an indicator variable that takes the value of one if a firm is surveyed in the 60 days after the monetary policy change and zero if the firm is surveyed in the 60 days before. Our main variable of interest is the interaction between the $Post_{e,d}$ dummy and the amplitude of the monetary policy change (ΔIR_e), measured by the variation in basis points of the central bank's policy rate. We expect the coefficient associated with the interaction (β_1) to be positive: when the policy

[5] We do not provide a subscript for country because events (e) encapsulate the country indicator even in a common currency union. For example, if the Central Bank of West Africa (BCEAO) changes its policy rate on 15 October 2022, we consider that there is one event per country and we compare firms around the same event in the same country. In other words, we do not compare Senegalese firms surveyed before the event with Malian firms surveyed after the event, but only Senegalese firms surveyed before and after the event.

rate rises, firms are more likely to face (or expect to face) difficulties in accessing finance. The reverse is true if the central bank is easing monetary policy by reducing its policy rate. Furthermore, we expect that the effect of a change in monetary policy depends not only on the sign of the change (increase versus decrease) but also on the intensity of the change. For small changes in policy rates, we do not expect managers to react strongly. However, the larger the change, the greater the effect (both up and down).

The monetary policy fixed effects (δ_e) allow us to restrict our comparison to respondents interviewed before a monetary policy change with those in the same country but interviewed a few days later. The inclusion of monetary policy dummies is essential for our identification strategy (see below). We also control for heterogeneity across firms by including a set of individual-level control variables ($\mathbf{X}_i$). These variables control for firm *Size* (number of employees, in logarithms) and firm *Age* (length of time between the date of the interview and the year of establishment reported in the WBES, in logarithms). We also include the manager's experience in years (*Experience*). We also add a set of dummies for whether the firm is owned by a woman (*Female*); whether it is foreign-owned (*Foreign*) or state-owned (*State*); whether it is in manufacturing (*Manufacturing*); whether it is part of a multi-plant firm (*Multi-plant*). We also control for exporters (*Export*), defined as firms that send part of their production abroad. We also add three dummies to take into account the different legal status: *listed*, *partnership*, *sole proprietorship*. Finally, we also control for the average value of other obstacles reported by the manager. Some managers are naturally more pessimistic and are more likely to report facing high obstacles on each dimension (finance, electricity, corruption, etc.). There is no reason to believe that the proportion of pessimists is correlated with the monetary policy calendar. However, to avoid such a problem, we control for the average of other obstacles in order to have a proxy for the degree of individual pessimism[6]

[6]We acknowledge that the concept of pessimism is not necessarily the most appropriate one. To measure the average of other obstacles, we take into account 14 perceptions to calculate the average index: business licence, corruption, court, crime, electricity, political instability, labour regulation, land, tax administration, tax rate, telecommunications, trade regulation, transport and labour skills. All constraints are constructed using the same Likert scale (from 0 'no constraint' to 4 'very serious constraint'). It should be noted that

This approach allows us to obtain a measure of financial constraints net of other constraints (Cazals and Léon, 2023). The list of variables is presented in the appendix (table A4). Standard errors are clustered at the treatment level, which is the event here.

2.3.2 Heterogeneity analysis

In a second step of the analysis, we examine whether reactions to monetary policy changes are conditional on individual and country-level characteristics. To do this, we estimate a triple difference model as follows:

$$\begin{aligned} Y_{i,e,d} = \delta_e &+ \beta_0 Post_{e,d} \\ &+ \beta_1 Post_{e,d} \times \Delta IR_e \\ &+ \beta_2 Post_{e,d} \times D_{i/c} \\ &+ \beta_3 Post_{e,d} \times \Delta IR_e \times D_{i/c} + \gamma \mathbf{X}_i + \varepsilon_{i,e,c,d} \end{aligned} \tag{2.2}$$

where $D_{i/c}$ is a firm-level (indexed i) or country-level (indexed c) characteristic. We control for firm-level characteristics in the set of unit-level control variables ($\mathbf{X}_i$) and for country-level characteristics by adding event dummies (δ_e). We also control for the interaction between the post-treatment period and the individual/country characteristics ($Post_{e,d} \times D_{i/c}$). We expect the firm or country characteristics to mitigate (or exacerbate) the impact of monetary policy when $\beta_2 < 0$ (or $\beta_2 > 0$).[7]

2.3.3 Identification strategy

Our identification strategy relies on the quasi-random nature of the timing of monetary policy changes relative to the timing of the WBES interviews. Of course, neither the timing nor the

four business constraints are not included due to a lack of observations: macroeconomic instability, zoning restrictions, restrictions on opening hours and restrictions on pricing and markups.

[7]It should be noted that we also include the interaction between $\Delta IR_e \times D_i$ when using firm-level characteristics. This interaction is not estimated for country-level characteristics as it is absorbed by the event fixed effects (both ΔIR_e and D_c are time-invariant for firms surveyed for the same event e).

amplitude of monetary policy changes is exogenous. In fact, this is the main challenge when economists try to assess the effects of monetary policy, because monetary policy (like other short-term policies) is inherently endogenous. To get around this difficulty, we compare firms that operate over a short period of time and are therefore expected to operate in quasi-similar macroeconomic conditions. By comparing firms observed just before and just after a monetary policy change, we expect that the difference is only due to this event. A change in the policy rate is rarely decided overnight because of the very rapid deterioration in economic indicators. The precise timing is often determined by institutional factors (such as the calendar of the Monetary Policy Committee).[8]

In line with existing work using a similar approach (Depetris-Chauvin et al., 2020; Guo and An, 2022; Cazals and Léon, 2023), we first present balance tests. The aim is to compare the characteristics of the firms surveyed before and after the event. We expect firms to be similar in terms of their observable characteristics. In columns (1) and (2) of Table A1, we report the means of these covariates for the managers interviewed before and after the changes, respectively. To ensure that we are comparing firms referring to the same event, we regress each of these variables on the $Post_{i,e,d}$ dummy, controlling for monetary policy fixed effects and clustering the standard errors at the event level. The coefficients and p-values are reported in columns (3) and (4). We reject the existence of statistical differences between the two groups at the 5% level for all observable characteristics except sole proprietorship.

Another threat to our empirical approach is that firms surveyed just before a monetary policy change are likely to anticipate the forthcoming change and therefore adjust their perceptions before the event. It should be noted that the anticipation effect is likely to introduce an attenuation bias, as firms surveyed before a monetary policy change have adjusted their perceptions. This risk may therefore render our results statistically insignificant from zero, even if the monetary policy change affects managers' perceptions of financial constraints.

[8] As shown in the Results section, we also provide evidence of the absence of anticipation effects.

Below, we document that there is limited evidence for the existence of an anticipation effect.

2.4 Results

2.4.1 Descriptive statistics

We first present the basic descriptive statistics in Table 2.1. The average score for perception is 1.38 (sd = 1.30). A third of the enterprises report that access to credit is not an obstacle to their activity, while a quarter report that it is a serious or very serious obstacle.

The distribution of companies according to the date of the event is fairly balanced, with 51% of companies interviewed after a change in monetary policy. The distribution of companies by type of change is also fairly balanced, with 46% of companies referring to a restrictive monetary policy. On average, we see an interest rate change of minus 12 basis points. However, the overall average is not very meaningful as it combines cuts and hikes. We take a closer look at the distribution of policy rate changes (at the monetary policy level). Of the 177 events considered, there were 69 hikes and 109 cuts. For the hikes, the average increase in the policy rate is 98 basis points. For the cuts, the average reduction in absolute terms is 83 basis points.

We then examine simple mean differences for the perception of access to credit as a constraint for firms surveyed before and after a monetary policy change, before running our baseline model. The first column of Table 2.2 reports the mean value of the perception of financial constraints for firms surveyed before an event, and the second column reports the same information for firms surveyed after an event. Column (3) shows the difference between the mean and column (4) the corresponding p-value from a t-test. The last column shows the number of observations. We first consider all events (both increases and decreases). Since positive and negative changes are relatively well distributed, there is no reason to observe a difference between firms surveyed before and after a change. We confirm this prediction. We

Table 2.1: Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Dependent variables					
Scale	23,751	1.381	1.299	0	4
Dummy	23,751	0.223	0.416	0	1
Treatment					
Post	23,751	0.491	0.500	0	1
Hike	23,751	0.496	0.500	0	1
Δ(IR)	23751	-3.667	147.561	-425	625
Control variable					
Size	23,751	3.317	1.309	0	8.497
Age	23,751	2.704	0.729	0	5.165
Female	23,751	0.291	0.454	0	1
Manager Exp.	23,751	2.629	0.756	0	3.912
Foreign	23,751	0.069	0.254	0	1
State	23,751	0.010	0.101	0	1
Listed	23,751	0.046	0.210	0	1
Partnership	23,751	0.207	0.405	0	1
Sole Prop.	23,751	0.302	0.459	0	1
Multiplant	23,751	0.153	0.360	0	1
Export	23,751	0.219	0.414	0	1
Manufacturing	23,751	0.563	0.496	0	1
Other Const.	23,751	1.181	0.772	0	4

The table reports summary statistics of variables used in the baseline model. See Table A4 for the variable definitions. Firms data come from the World Bank Enterprise Survey (WBSE). Data on monetary policy are hand-collected from reports of Central banks.

then decompose episodes of increases (panel B) and decreases (panel C). For both, we first consider all events. We then consider thresholds in terms of the amplitude of the change. Panel B shows that even if firms surveyed after a policy hike report higher levels of financial constraints, the difference is not statistically significant. However, as we focus on increases in the policy rate of more than 100 basis points, we document a statistical difference across firms. Firms surveyed after a hike report higher levels of constraints. Interestingly, the absolute differences increase with the threshold. In Panel C, we apply the same exercise to cuts. The results are paradoxical. We do not observe a statistical difference for all episodes of policy rate cuts, even when firms surveyed after an event report a lower value for constraints

(as expected). However, when we consider a higher value for changes, we see a paradox: firms surveyed after the event report higher constraints (whereas we should see a negative difference).

Table 2.2: Mean differences (t-test)

	Before	After	Diff	p-value	Obs.
	(1)	(2)	(3)	(4)	(5)
All	1.428	1.419	-0.009	0.578	29,021
Hike (Δ(IR) >0)	1.370	1.375	0.005	0.812	13,412
Hike (Δ(IR) >50)	1.425	1.447	0.022	0.471	7,775
Hike (Δ(IR) >100)	1.523	1.625	0.102	0.009	5,046
Hike (Δ(IR) >150)	1.209	1.452	0.243	0.000	2,207
Hike (Δ(IR) >200)	1.171	1.359	0.188	0.004	1,829
Cut (Δ(IR) <0)	1.476	1.458	-0.018	0.408	15,609
Cut (Δ(IR) <-50)	1.560	1.532	-0.028	0.279	10,745
Cut (Δ(IR) <-100)	1.524	1.629	0.105	0.001	6,829
Cut (Δ(IR) <-150)	1.465	1.947	0.482	0.000	4,025
Cut (Δ(IR) <-200)	1.337	1.831	0.494	0.000	2,530

The table reports mean differences across groups according to their date of interview (before or after the event). The column (1) (respectively, column (2)) reports the average of perception of credit constraints for firms surveyed before (resp. after) the event. The column (3) computes the difference between two groups and column (4) the associated p-value of test of mean difference. The column (5) displays the number of observations.

2.4.2 Baseline results

We then run the baseline model shown in equation 2.1. Column 1 of Table A2 shows the results from a parsimonious model that includes only interest rate variables ($Post_{e,d}$ and $Post_{e,d} \times \Delta IR_e$) and event fixed effects (δ_e). The second column shows our preferred specification including firm-level control variables. Both models show a positive and statistically significant coefficient associated with the interaction between the $Post_{e,d}$ dummy and ΔIR_e, as expected. Firms are more likely to report greater difficulties in accessing credit after a significant change in monetary policy (and vice versa).

Figure 2.1 plots the marginal effect of $Post_{e,d}$ for different values of ΔIR_e. Changes in

monetary policy only have an effect on perceptions of financial constraint when the change exceeds 100-150 basis points. Note that this threshold is not common without being rare. For cuts and hikes, we observe that about a quarter of the events imply a change in rates of more than 100 points in absolute terms. Interestingly, we see a symmetric impact for cuts and hikes.

To measure the marginal effect of a monetary policy change, we can see that a monetary policy change implying a change in the interest rate of 150 basis points will increase the level of perception by 0.34, which is about a quarter of the standard deviation (within event). The same reduction will reduce the perception by 0.19. This effect is far from anecdotal, as it is stronger than the impact of firm-level variables (such as foreign ownership or manufacturing).

We confirm these results using a slightly different model. Instead of using a continuous measure, we create two dummies. First, we create a variable equal to one if the change is an increase in the policy rate ($Hike_e$). The second dummy takes the value one if the (absolute) rate change exceeds a threshold c ($\mathbb{1}[|\Delta(IR_e)| > c]$). We then interact both dummies with $Post_{e,d}$ dummy and with each other in a triple difference model.[9] The four coefficients shown in Table 2.3 give the effect for the four groups of firms surveyed after an event. The coefficient associated with $Post_{e,d}$ shows the effect for firms experiencing a cut below the threshold (in absolute terms). Coefficient associated with the double interaction $Post_{e,d} \times Hike_e$ shows the effect for firms experiencing a hike below the cutoff. Coefficient associated with the second double interaction $Post_{e,d} \times \mathbb{1}[|\Delta(IR_e)| > c])$ indicates the effect to be surveyed after a change in monetary policy for reductions above the threshold. Finally, the triple interaction ($Post_{e,d} \times Hike_e \times \mathbb{1}[|\Delta(IR_e)| > c]$) is the effect for firms facing a hike above the threshold. We consider five different thresholds (c): 50, 100, 150, 200 and 250 basis points.

[9] In addition to the triple interaction ($Post_{e,d} \times Hike_e \times \mathbb{1}[|\Delta(IR_e)| > c]$), we control for variable in levels with the inclusion of event fixed effects and $Post_{e,d}$ and for two double interactions ($Post_{e,d} \times Hike_e$ and $Post_{e,d} \times \mathbb{1}[|\Delta(IR_e)| > c]$). The double interaction between $Hike_e \times \mathbb{1}[|\Delta(IR_e)| > c]$ is deleted as it is absorbed by the event fixed effects.

Table 2.3: Effect of different thresholds of monetary policy changes

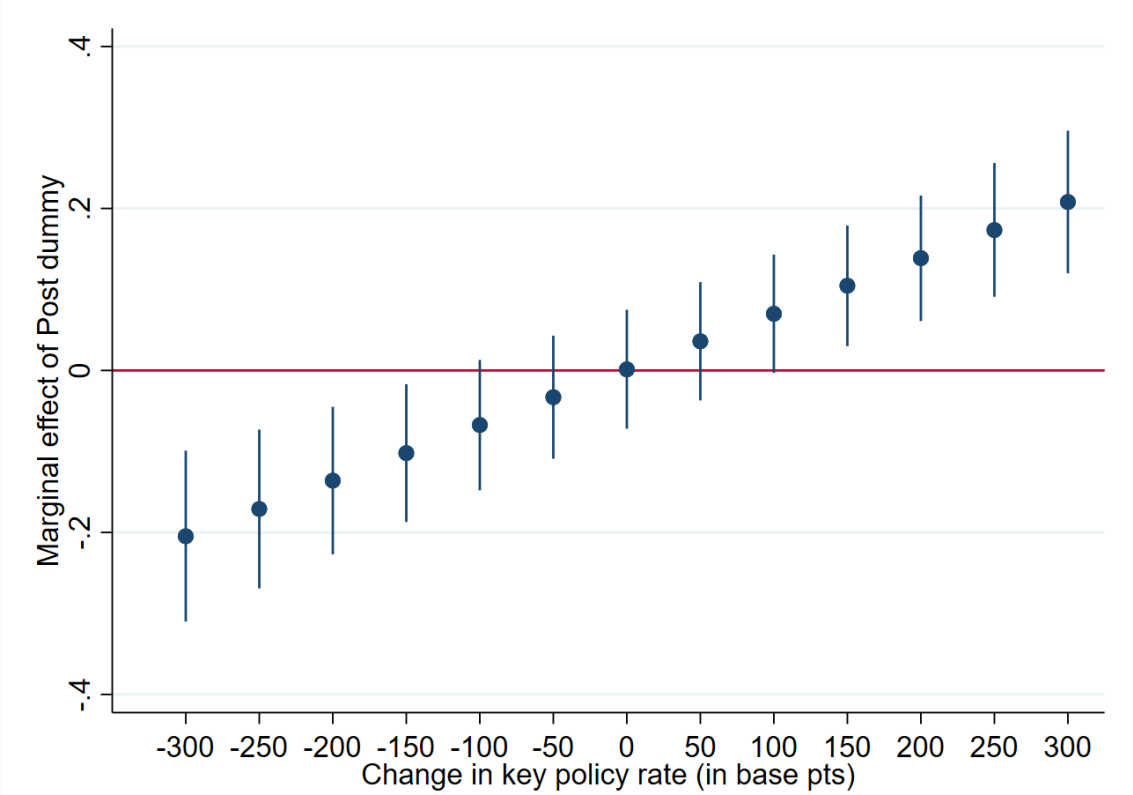
$\Delta(\text{IR}) > \lvert c \rvert$ with $c \longrightarrow$	50	100	150	200	250
Post	-0.077	-0.057	-0.060	-0.067	-0.069
	(-1.08)	(-0.81)	(-0.95)	(-1.10)	(-1.15)
Post*Hike	0.133	0.122	0.127	0.140*	0.139*
	(1.36)	(1.40)	(1.59)	(1.85)	(1.84)
Post*Threshold	-0.032	-0.128	-0.190***	-0.182***	-0.167***
	(-0.29)	(-1.59)	(-2.98)	(-2.97)	(-2.81)
Post*Hike*Threshold	0.113	0.249**	0.340***	0.363***	0.410***
	(0.82)	(2.12)	(3.24)	(3.09)	(5.10)
Obs	23,751	23,751	23,751	23,751	23,751
R2	0.301	0.301	0.301	0.301	0.301

The table reports the estimates of Eq.2.1 upon different thresholds (50, 100, 150, 200 and 250) to identify major changes in monetary policy. The dependent variable is the perception of access to finance as an obstacle by the manager. *Post* id a dummy equal to one if the firm was surveyed after the event, *Hike* is a dummy equal to one if key policy rate increase (0 for a decrease) and *Threshold* equal to one if the increase was above (in absolute terms) c. All estimates are based on OLS regressions technique using fixed effects. Robust t-value in parentheses are clustered at the event level. *, ** and *** refer to statistical significance at 10%, 5% and 1% respectively.

The results document that there is no impact of monetary policy when the change in the policy rate is 50 basis points. We begin to observe a positive impact on perceptions for hikes above 100 basis points in column (2), although there is no difference for cuts. Above a change of 150 basis points (columns 3 to 5), we document a change in perceptions for both hikes (increase in perceptions) and cuts (decrease in perceptions) for firms that support such a dramatic change. However, there is a limited effect for firms with a change below these thresholds (we see a small effect for hikes because, as the thresholds increase, we include firms that have experienced a substantial hike in the 'control' groups).

Finally, we examine how monetary policy affects perceptions over time, relative to the time of the event. So far, we have considered the period before and after the event as a whole. However, we might expect monetary policy to have a limited temporal impact or to act with a lag. In addition, a major concern about our identification is the absence of an anticipation

Figure 2.1: Marginal effect of Post dummy per level of change in monetary policy

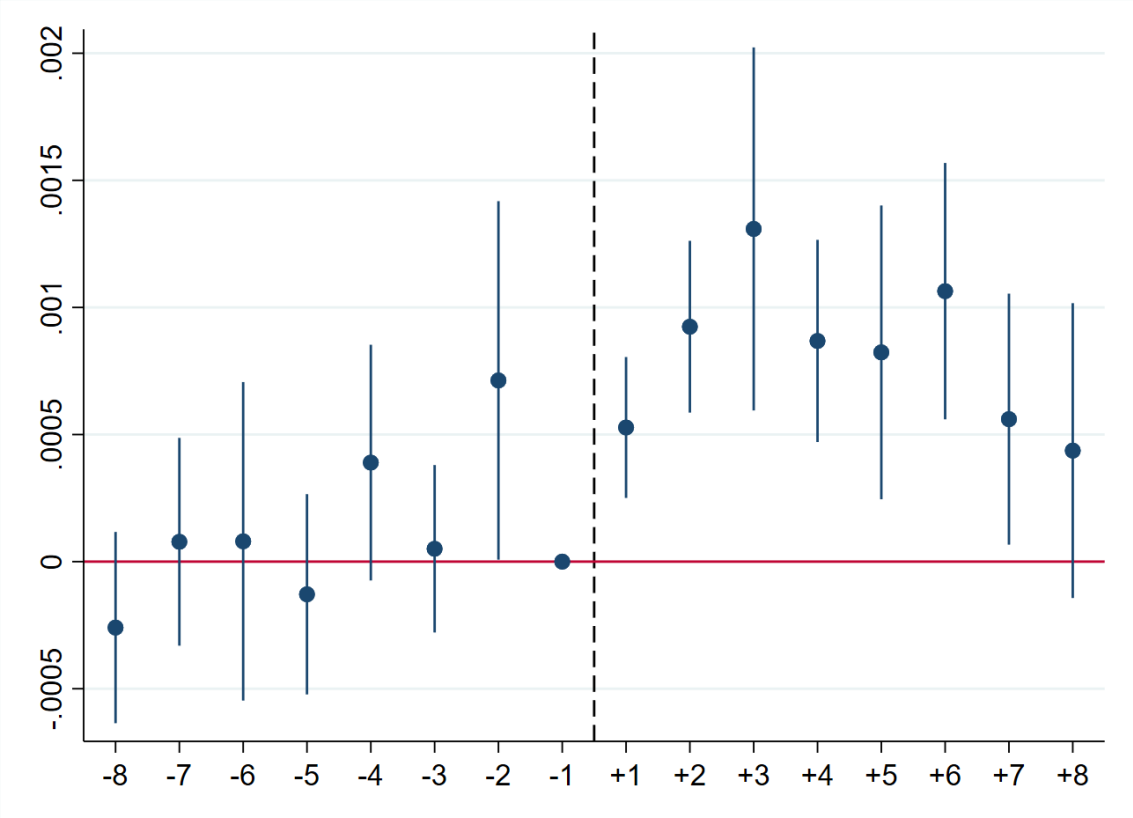


The figures displays the marginal effect of *Post* dummy for different values of $\Delta(IR_e)$. Models also include event fixed effects, *Post* dummy and firm-level control variables (Size, Age, Experience, Female, Foreign, State, Manufacturing, Multi-plant, Export, Listed, Partnership, Sole Proprietorship, Mean_Constraints). Standard errors are clustered at the event level

effect. As expected above, the anticipation effect leads to a damping bias. However, it is interesting to see whether firms anticipate monetary policy changes. To address these different points, we conduct an event study. Instead of just using a $Post_{e,d}$, we interact the policy rate change ($\Delta(IR_e)$) with week dummies before and after the event. As is common in event studies, we exclude the week immediately preceding the event. Figure 2.2 plots the results. The effect of monetary policy is mainly present up to six weeks after the event and then diminishes. The maximum impact is three weeks after the event. Turning to the weeks preceding the monetary policy change, we do not see a clear anticipation effect. Coefficient associated with the second week just before the event is positive and statistically significant at the 5% level. However, contrary to what is observed for the post-treatment period, the

coefficients associated with other weeks are close to zero and never statistically significant. Moreover, we see no trend in the pre-treatment period, confirming that we do not expect an anticipation effect (Miller, 2023).

Figure 2.2: Effect of monetary policy change by week



The figures displays the coefficients associated with the interaction between week dummies and key policy rate change $\Delta(IR_e)$. Models also include event fixed effects, *Post* dummy and firm-level control variables (Size, Age, Experience, Female, Foreign, State, Manufacturing, Multi-plant, Export, Listed, Partnership, Sole Proprietorship, Mean_Constraints). Standard errors are clustered at the event level

2.4.3 Robustness checks

We run a series of sensitivity tests to confirm our main baseline model before examining heterogeneity across firms and countries in the following section. The results of the robustness checks are reported in the Appendix. We first examine whether our results are driven by the window retained for analysis (60 days). We compile data using other windows ranging from 30 to 90 days. We then rerun our baseline model for each window[10] and confirm our main findings as shown in Table 2.4. Figure 2.3 also shows the effect of the monetary policy change by week for each window using the event study approach. The results are very similar to those in the baseline. In particular, we see no anticipation effect and observe an increase in the perception of credit access as a barrier in the six weeks following the monetary policy change, with a peak after three weeks.

Table 2.4: Alternative windows

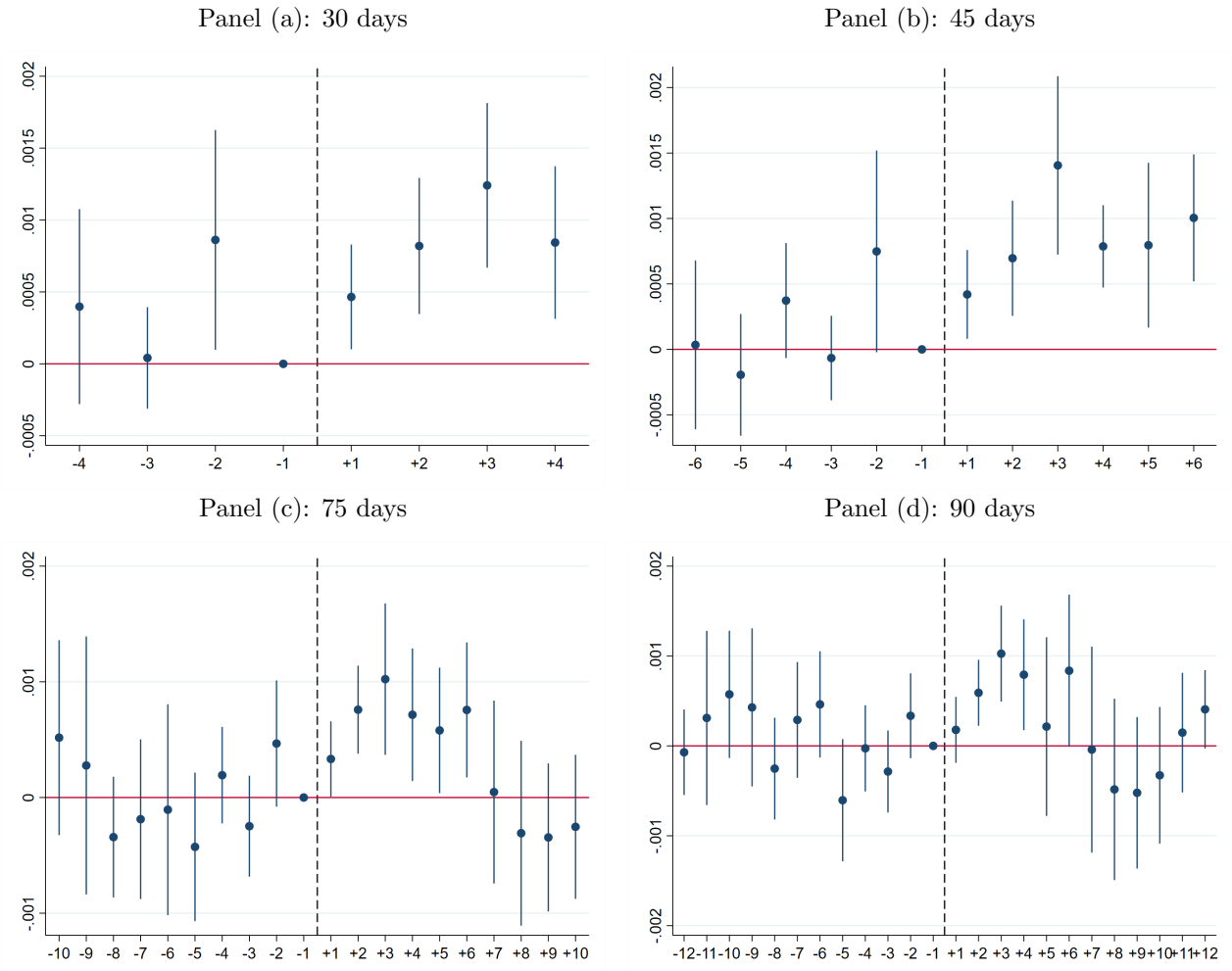
	30	45	60	75	90
Post	0.028	-0.000	0.00135	0.00577	0.0182
	(1.01)	(-0.01)	(0.04)	(0.14)	(0.43)
Post x Δ(IR)	0.00054***	0.00065***	0.00069***	0.00063***	0.00051***
	(2.62)	(6.44)	(6.43)	(5.02)	(3.11)
Obs.	19123	22021	23751	23930	23982
# countries	63	63	63	63	60
# events	217	174	149	138	114

The table reports the baseline estimates (column 2 of Table A2) for different windows to create the sample. In column (1), firms interviewed 30 days before and 30 days after the event are selected. In the following columns, we consider the following window in number of days: 45, 60 (which is the baseline model), 75, and 90. Only coefficients associated with *Post* and the interaction between $Post \times \Delta(IR)$ are displayed. *, ** and *** refer to statistical significance at 10%, 5% and 1% respectively.

Second, we change the specification used by relying on different dependent and interest variables and a different empirical approach. First, we consider alternative measures of the dependent variable in the three columns of Table 2.5. First, we compute a dummy variable equal to one if the firm reports that access to credit is a severe or major constraint. The

[10]Note that the sample changes for each window as some firms are included and others excluded (mainly due to the non-overlapping restriction).

Figure 2.3: Alternative windows: Event study by week



The figure display the coefficients associated with the interaction between week dummies and key policy rate change $\Delta(IR_e)$ for four alternative windows (30, 45, 75, and 90 days, respectively). Models also include event fixed effects, *Post* dummy and firm-level control variables (Size, Age, Experience, Female, Foreign, State, Manufacturing, Multi-plant, Export, Listed, Partnership, Sole Proprietorship, Mean_Constraints). Standard errors are clustered at the event level.

results in columns (1) [OLS] and (2) [probit] confirm our main findings. We then follow the approach of Cazals and Léon (2023), who use a relative measure of constraints in column (3). The idea is to measure the relative importance of the constraint under consideration compared to other constraints. We confirm our main result. In the following two columns we change our main variable of interest ΔIR_e. So far, we measure the change in basis points only, without taking into account the initial level of the policy rate. We therefore measure the relative change by reporting the percentage change between the new and the old policy rate. We present results from the parsimonious model (without control variables) in column (4) and for the full model in column (5). The econometric results are unchanged. Differences in the amplitude of the coefficient are due to the difference in measurement between our baseline measure and the relative change used here.

Third, we examine the sensitivity to the econometric model in the last three columns of table 2.5. In column (6) we re-estimate our baseline model but consider an ordered probit model. The baseline analysis uses a linear approach even though the dependent variable is an ordered variable ranging from 0 to 4. The decision to rely on a linear model is twofold. First, the inclusion of many fixed effects induces a parameter risk in a non-linear model. Second, the interpretation of interactions in a non-linear model is complex. Results using an ordered probit model are consistent with the baseline linear model. We investigate the robustness of our empirical model by adding additional sets of fixed effects. The results are unchanged when we include year dummies (column 7) or country year dummies (column 8). Finally, in an unreported analysis, we change the level of clustering by considering several alternative levels: country, country-year, survey, region, year. Results remain statistical significant irrespective of the correction of standard errors.

Table 2.5: Robustness checks (1): Variables and model

	Dummy		Rel.	Scale				
	OLS	Probit	OLS	OLS	OLS	Ord. Probit	OLS	OLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post	-0.0050	0.0071	-0.0045	0.0366	0.0099	0.0032	-0.0171	-0.0157
	(-0.47)	(0.16)	(-0.12)	(0.78)	(0.25)	(0.09)	(-0.50)	(-0.44)
Post x Δ(IR)	0.00010*	0.00069***	0.00065***	0.0034***	0.0029***	0.00080***	0.00076***	0.00072***
	(1.68)	(3.53)	(4.82)	(5.37)	(5.13)	(7.55)	(7.11)	(7.15)
Obs.	23,751	23,751	23,751	29,021	23,751	23,751	23,751	23,751

The table reports the impact of *Post* and *Post* $\times \Delta(IR)$ variables on perception of credit constraints. The dependent variable is a dummy variable taken value one if credit constraints is a major or severe obstacle in columns (1) and (2). In column (3), the dependent variable is a relative measure of credit constraint measured as the value of credit constraint minus the average of other constraints. In the rest of columns, the dependent variable is the perception of access to finance as an obstacle by the manager. In all models, $\Delta(IR)$ is the absolute variation of policy rate in basis points, except in columns (4) and (5). In both columns, $\Delta(IR)$ is the percentage of key rate change (based on initial key rate). Column (6) reports baseline results using ordered probit model (coefficients are reported). Columns (7) and (8) add year dummies and country-year dummies, respectively. All models are estimated using control variables (except in the fourth column) and event fixed effects. Standard errors are clustered at the event level. *, ** and *** refer to statistical significance at 10%, 5% and 1% respectively.

Fourth, we examine whether the econometric results are affected by the number of observations. In an unreported analysis (results available on request), we drop countries one by one. The results remain similar in terms of statistical significance and economic meaning. The empirical results remain unchanged when we weight the observations by the inverse of the number of firms per country (i.e. we get the same weight for each country). Both tables are available on request. We then focus on the number of observations per event. In table 2.6 we drop events when the number of observations is below a threshold ranging from 50 to 250 observations. The results are not affected by excluding events with a low number of observations.

Table 2.6: Robustness checks (2): Sample dependence

	Threshold					Weighted
	50	100	150	200	250	obs.
	(1)	(2)	(3)	(4)	(5)	(6)
Post	0.00165	0.00544	-0.00218	-0.0111	-0.00640	-0.0108
	(0.04)	(0.14)	(-0.05)	(-0.26)	(-0.14)	(-0.26)
Post xΔ(IR)	0.00070***	0.00071***	0.00072***	0.00075***	0.00073***	0.00053**
	(6.26)	(5.98)	(5.96)	(6.14)	(6.07)	(2.46)
Obs.	22,823	20,837	19,061	17,157	14,964	23,751

The table reports the impact of *Post* and $Post \times \Delta(IR)$ variables on the perception of access to finance as an obstacle by the manager. We limit the analysis to event with more than 50 obs in column (1), 100 in column (2), 150 in column (3), 200 in column (4) and 250 in column (5). The last column displays results from a model where each observation is weighted by the number of observations per country. All models are estimated using control variables and event fixed effects. Standard errors are clustered at the event level. *, ** and *** refer to statistical significance at 10%, 5% and 1% respectively.

Finally, we conclude the sensitivity analysis with a falsification test. To do this, we rerun equation 2.1, but we consider alternative barriers faced by firms. A change in monetary policy should primarily, if not exclusively, affect the perception of access to credit as an obstacle. We do not expect monetary policy to affect the level of perceived corruption or access to electricity. We present results for spurious tests for 14 other obstacles and the mean of these obstacles.[11] We present the results in table 2.7 . As expected, a change in monetary policy

[11] We drop the mean of other obstacles as a control variable.

does not affect other obstacles, either collectively or individually. However, there are two exceptions: access to land and the ability to attract skilled labor. There are two possible explanations. On the one hand, both access to land and access to skilled labor may require external finance. Access to land is a form of investment that requires large sums of money. For skilled labor, it could be argued that it is a variable input that also requires a sufficient amount of cash. On the other hand, these results could be due to a statistical artefact. We prefer this explanation. Indeed, we perform additional analyses based on an event study model for both barriers. The results do not show a clear trend, as shown for the perception of access to credit (results available on request), and are rather chaotic. We therefore doubt that the results are driven by a real effect.

Table 2.7: Falsification tests

	$Post$		$Post \times \Delta(IR)$				
Obstacle	Coef.	t	Coef.	t	Obs.	R2	Aver
All (average)	0.0312	(0.66)	0.00018	(0.69)	23,781	0.210	1.181
Tax (rate)	0.1170	(1.34)	-0.00008	(-0.20)	23,482	0.159	1.722
Corruption	0.0412	(0.49)	0.00006	(0.15)	22,974	0.180	1.625
Pol instability	0.0403	(0.67)	0.00025	(0.58)	23,332	0.238	1.584
Electricity	0.0215	(0.35)	0.00036	(1.21)	23,651	0.168	1.510
Workforce	0.0527	(0.94)	0.00059***	(4.15)	23,250	0.133	1.228
Tax (adm)	0.0978*	(1.87)	-0.00015	(-0.35)	23,385	0.122	1.227
Transport	0.0167	(0.26)	-0.00005	(-0.13)	23,410	0.100	1.112
Crime	-0.0011	(-0.02)	0.00008	(0.27)	23,484	0.144	0.997
Business Lic	0.0446	(0.91)	0.00000	(0.01)	23,042	0.122	0.965
Land	0.0525	(0.87)	0.00059**	(2.35)	22,796	0.106	0.934
Labor Reg.	0.0097	(0.17)	0.00040	(1.83)	23,518	0.164	0.924
Custom	0.0093	(0.22)	0.00007	(0.22)	21,453	0.137	0.901
Telecom	-0.0275	(-0.57)	0.00022	(0.85)	14,339	0.161	0.842
Courts	-0.0392	(-1.40)	0.00010	(0.78)	22,163	0.156	0.809

The table reports the impact of $Post$ and $Post \times \Delta(IR)$ variables on the perception of different obstacles by the manager. We consider the following constraints in the following rows: all constraints (except access to finance), tax rate, corruption, political instability, electricity, workforce, tax administration, transport, crime, business license, land access, labor regulation, customs, telecommunication, and courts. All models are estimated using control variables and event-fixed effects. Standard errors are clustered at the event level. *, ** and *** refer to statistical significance at 10%, 5% and 1% respectively.

2.5 Heterogeneity analyses

In this section, we analyze whether the relationship between monetary policy and the perception of finance as an obstacle depends on individual and country characteristics. According to our framework, changes in monetary policy will affect managers' perceptions if (i) firms rely on formal credit for their activities and (ii) the transmission of monetary policy is effective. The two sequential channels may be moderated by bank-level characteristics for the first channel and by country-level characteristics for the second channel. We therefore examine how firm- and country-level characteristics shape the basic relationship.

2.5.1 Firm characteristics and monetary policy

We begin our exploration of heterogeneity by examining whether firms' sensitivity to policy rate fluctuations varies according to their structural characteristics. To this end, we examine the following firm-level characteristics: size, age, foreign ownership, multiple plants and gender of the owner.

To examine the impact of different firm-level characteristics on the relationship between monetary policy changes and managers' perceptions of finance as an obstacle, we estimate a triple interaction term model using equation 2.2. Table A5 reports the estimates. We only report the coefficients associated with $Post \times \Delta(IR)$ and $Post \times \Delta(IR) \times Z$ (where Z represents the firm-level characteristics).[12] The first interaction gives us the effect of the monetary policy change when the moderating variable (Z) is zero. The third interaction allows us to examine how firm characteristics shape the relationship. The interpretation is slightly different for continuous variables (size and age) and dummy variables (the rest of the firm-level moderators). For dummy variables, the triple interaction indicates the additional impact of the post-treatment effect of being in the category under consideration (foreign, multi-plant, female-owned). For continuous variables, the triple interaction gives

[12]We control for the *Post* dummy as well as for the interaction $\Delta(IR) \times Z$.

the additional effect of a unit increase in size (number of employees) or age (in years).

The results shown in the first column of Table A5 document that older firms are more likely to be sensitive to a change in monetary policy. However, size has a modest economic impact: the marginal impact of monetary policy increases by only 3% between a firm with no employees and a firm with 20 employees (the median).[13] Moreover, the effect of size is potentially non-linear. To test this intuition, we classify firms into three size categories: small firms (less than 10 employees), medium firms (11-50 employees) and large firms (more than 51 employees). Table A6 (Panel A) shows the point estimates and 95% confidence interval for each category (results of the regressions are available on request). We find that the effect of monetary policy is strongest for the largest firms. Firms with more than 50 employees are more likely to have access to credit. It should be noted that our results also suggest that small firms are more affected than medium-sized firms. However, this result should be treated with caution as the confidence intervals are relatively wide. To sum up, larger firms are more sensitive to monetary policy, but the difference between the groups of firms is rather modest.

We then turn to the role of firm age, which is often used as a second proxy to measure firm opacity (Hyytinen and Pajarinen, 2008). Column (2) of the Table A5 documents that older firms are more likely to be affected by a change in monetary policy. The effect of age seems to be more pronounced than that of size. For example, if we compare a new firm with a firm that is 14 years old (the median), the marginal effect of monetary policy increases by 41%. We also examine whether the effect is linear by using the categories: young (less than 10 years old), youth (between 11 and 20 years old) and old firms (more than 21 years old). The results, reported in Table A6 (panel B), indicate that the moderating effect of age is rather linear. The effect of the monetary policy change is smallest for young firms and largest for old firms.

[13]The calculation is as follows. With no employees, the impact is given by the coefficient associated with $Post \times \Delta(IR)$ (β_1 in equation 2.2). For a company with 20 employees, we did the following calculation: $\beta_1 + 20 \times \beta_3$. We get 0.000607 for firms with no employees and 0.000627 for firms with 20 employees.

In columns (3) to (5) of table A5 we consider alternative firm-level characteristics: foreign ownership (column 3), multi-plant firms (column 4) and firms owned by a woman (column 5). There is no difference between domestic and foreign firms, nor between single-plant and multi-plant firms. An interesting result, however, is that female-owned firms are less sensitive to a change in monetary policy. The coefficient associated with the triple interaction term ($Post\times\ \Delta(IR) \times Z$) is statistically significant and negative (column 5 of table A5). While the effect of the monetary policy change is statistically significant for male-owned firms, it is significantly reduced and no longer statistically significant for female-owned firms.

The previous results suggest that larger, older and male-owned firms are more likely to be sensitive to changes in monetary policy. One possible explanation is that these firms have better access to credit in developing countries. It is well known that access to credit is correlated with size and age (Beck et al., 2006). In addition, a burgeoning literature has documented the possible gender bias in access to credit (Asiedu et al., 2013). To confirm this intuition, we add a final specification in the Table A5. We consider a dummy equal to one if a firm already has a loan from a formal credit institution. The econometric result, reported in column (6), shows that firms with a loan from a financial institution are more sensitive to changes in monetary policy rates than firms without a banking relationship. It is interesting to note that both groups of firms suffer from a tighter monetary policy, but the effect is doubled for firms with a credit line.

In summary, empirical results suggest that changes in monetary policy affect the intensive margin (loan terms) more than the extensive margin (likelihood of obtaining a loan). After a monetary contraction, firms with a previous loan relationship are more likely to report higher levels of financial constraint. Firms without a previous relationship also suffer from a tightening of monetary policy. However, the change in their perception is less pronounced than for the first group (large and old firms, firms with a credit line).

2.5.2 Country characteristics and monetary policy

2.5.2.1 Financial system and monetary policy

We then turn to the debate on the factors affecting the effectiveness of monetary policy in developing countries. It has been emphasised that the limited level of financial system development, lack of competitiveness, large presence of foreign banks and excess liquidity in the banking system can be significant impediments to the transmission of monetary policy in developing countries (Mishra et al., 2012, 2014). To examine these relationships, we use a triple interaction model as shown in equation 2.2 ($Post \times \Delta(IR) \times Z$), where Z represents different characteristics of the national financial systems.

More specifically, we examine the impact of financial development (measured by private credit to GDP), concentration within the banking system (indicated by the asset share of the five largest banks), and the presence of foreign banks (measured by the share of foreign banks in total banks) on the effectiveness of monetary policy, particularly in response to policy rate changes (mitigating or exacerbating). We use remittance inflows as a proxy for excess liquidity in shaping the relationship between monetary policy and perceptions.

The results are presented in Table A7. The coefficients corresponding to $Post \times \Delta(IR)$ represent the effect of policy rate changes on perceptions when the moderating variable (Z) is zero. The triple interaction ($Post \times \Delta(IR) \times Z$) indicates whether these factors moderate the effect of monetary policy changes on managers' perceptions of credit constraints. Our results provide no evidence that financial development affects the effectiveness of monetary policy (as shown in column 1). However, it is worth noting that the effect of financial development may be non-linear. Ma and Lin (2016) find that the effectiveness of monetary policy declines as the financial system becomes more developed. To account for this potential threshold effect, we divide countries into three blocks of financial level (low, medium and high)[14].

[14]The low group comprises the bottom 1/3 of observations. The medium group consists of the middle 1/3 of observations. The high group consists of the top 1/3 of observations.

The estimates in Table A8 show a threshold effect, with the high group of countries serving as the base. Our results suggest that the perception of countries in the middle financial level becomes more important following a change in monetary policy. These findings are consistent with Ma and Lin (2016), suggesting that higher levels of financial development induce a more effective transmission of monetary signals and reduce the perceived obstacles to finance. However, this effect diminishes once a certain threshold of financial development is reached.

We examine the role of bank competition using an indicator of concentration (share of the five largest banks). The results indicate that concentration reduces the impact of monetary policy changes on perceptions, as observed in column 2 of Table A7. Specifically, we find that perception is significantly higher in a more competitive banking sector after a monetary policy policy rate change, which is consistent with the existing literature (Mishra et al., 2014). The effect of a less competitive banking sector on the perception is economically significant if we compare a fully competitive banking sector with the median (70.6), the marginal effect decreases by 69%.[15] We found no evidence of the presence of foreign banks. The lack of result may be due to the limited number of observations, as the data on foreign banks only cover the period 2008-2013 (Claessens and Van Horen, 2014).

Finally, an environment of excess liquidity hampers the transmission of monetary policy. Saxegaard (2006) provides evidence that excess liquidity hampers the effectiveness of monetary policy in a number of African developing countries. We proxy excess liquidity with the level of remittance inflows. The intuition is that countries with relatively high levels of remittances may render monetary policy ineffective by creating excess liquidity in the banking system, thereby reducing its responsiveness to changes in interest rates. Indeed, there is empirical evidence on the link between the inertia of monetary actions and the level of

[15] We assume that the concentration ratio tends to zero in a perfectly competitive market. The relative difference is given by the ratio $\frac{\beta_1+70.6\times\beta_3}{\beta_1}-1=-0.689$, where β_1 and β_3 are taken from column (2) of Table A7.

remittance inflows (Barajas et al., 2018). The estimate presented in column 4 of Table A7 shows that remittance inflows attenuate the impact of monetary policy. The marginal effect of monetary policy is reduced by half if we compare the reaction of a manager in a country with no remittances and another manager located in a country with a remittances-to-GDP ratio of 3% (which is the median). Conversely, an increase in remittance inflows reduces the effectiveness of monetary policy. This finding is consistent with the research conducted by Barajas et al. (2018).

2.5.2.2 Central bank independence and monetary policy

In addition to the structure of the financial sector, the transmission of monetary policy can be shaped by the credibility of central bank announcements (Cukierman and Meltzer, 1986). A credible announcement implies that the central bank's strategy is time-consistent and based on economic motivations. In a credible framework, agents' expectations will be consistent with the central bank's monetary policy stance. As a result, a change in interest rates is immediately internalized by economic agents. Measuring central bank credibility is a complex task (Blinder, 2000). One common approach to capturing credibility is to rely on central bank independence (hereafter CBI). Extensive empirical research has consistently shown that a higher degree of CBI improves the credibility of monetary authorities and leads to a reduction in the level and volatility of inflation (Grilli et al., 1991; Cukierman et al., 1992; Alesina and Summers, 1993; Garriga and Rodriguez, 2020).

In this paper, we use data on the measure of the CBI to examine whether the credibility of monetary policy announcements is reflected in firms' perceptions. We follow the same approach as in the analysis of the moderating effect of the structure of the financial sector. We consider several measures of the CBI. First, we use a *de jure* measure using data provided by Romelli (2022) (CBIE).[16] The CBIE from Romelli (2022) ranges from 0 to 1 and

[16]The CBI of Romelli (2022) combines the indicators of Grilli et al. (1991) and Cukierman (1992) and adds more information on central bank independence based on 42 criteria of central bank institutional design.

increases with the CBI. Cukierman et al. (1992) argue that legal independence proxies may not accurately reflect the practical independence of central banks in less developed countries, where actual practices may deviate from the legal framework. To address this concern, we introduce the turnover rate (TOR) as proposed by Cukierman et al. (1992). The TOR variable is a measure of the average number of sales per year (number of sales divided by the number of years). It ranges from 0 (no turnover) to infinity (theoretically). We calculate two measures of TOR. The first one considers the whole period and the second one (TOR decade) focuses on the 10 years before the date considered in our paper. Finally, we include a dummy variable to account for irregular turnover of central bank governors extracted from the Dreher et al. (2008, 2010) database. The variable takes the value one if a governor was replaced before the end of his or her mandate. Contrary to the CBIE, the three measures of turnover increase when the central bank loses its autonomy.

Table A9 presents the estimates from Eq.2.2. Column 1 presents results using the *de jure* measure of CBI from Romelli (2022) (CBIE). We find no significant effect. However, as explained above, *de facto* measures are more relevant in low-income countries. We therefore include different measures of governor turnover in columns 2 to 4 of table A9. The econometric result in column (2) indicates that countries with higher CBI, characterised by lower turnover rates (TOR), are more likely to be affected by a monetary policy change. This result holds when we restrict the measure of turnover to the decade preceding the survey (column 3). Finally, firms' perceptions are not sensitive to monetary policy changes when we observe an irregular turnover of central bank governors (column 4). In summary, the results suggest that central bank credibility, captured by *de facto* measures of CBI, affects the transmission of monetary policy changes to firms' perceptions of financial constraints. This conclusion is in line with the literature, which emphasises that the credibility of monetary authorities affects the transmission of monetary policy.

2.6 Conclusion

The return of inflation, combined with global tensions, has brought the importance of monetary policy back into the spotlight. The empirical literature on the effectiveness of monetary policy, particularly the bank lending channel, in developing countries remains to be explored. While many papers have failed to find an effect of monetary policy (Mishra and Montiel, 2013), some recent evidence based on natural experiments points to a notable effect (Abuka et al., 2019; Berg et al., 2019) Nevertheless, these works remain context-dependent and specific to the event under consideration. We propose a new perspective, focusing on the reaction of potential borrowers to a change in monetary policy. More specifically, we use survey data from firms to analyze whether a change in monetary policy affects their perception of the credit squeeze. Our identification strategy is to compare a group of managers surveyed just before (60 days) with another group surveyed just after (60 days), adapting the framework developed by Depetris-Chauvin et al. (2020).

The empirical analysis provides the following main results. First, a change in monetary policy affects managers' perceptions of access to credit as an obstacle to firm growth in developing countries. The effect is symmetric (as it occurs for both increases and decreases), but limited to substantial changes (the policy rate changes by more than 100-150 basis points). The marginal effect is far from anecdotal : a 150 basis point increase in the policy rate raises perceptions by about a quarter of a standard deviation of the measure of credit access perceptions. An event study approach documents that the effect occurs mainly in the first month after the policy decision. Moreover, there is no anticipation effect as treated and control firms do not differ in their perception before the event. The empirical results are robust to many empirical tests, including changes in the window retained (from 30 days to 90 days), in the measurement of the dependent and interest rate variables, in the econometric model employed, and in the sample considered. In addition, falsification tests show that monetary policy does not influence other firm's business obstacles such as corruption or

access to electricity.

In a final step of the analysis, we examine firm- and country-level factors that affect the sensitivity of managers' perceptions to monetary policy changes. We document that firms without banking relationship are less sensitive to monetary policy changes. We interpret this finding to mean that these firms are too far removed from banks to really benefit from a tightening (or easing) of monetary policy. We also document that firms are more sensitive to changes in monetary policy when the level of financial development is medium (neither low nor high), banks compete and are not over-liquid, and central banks are independent.

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Table A1: Balance test

	Before	After	Coefficient	p-value	Obs.
	(1)	(2)	(3)	(4)	(5)
Size	81.45	98.96	11.39	0.118	28,813
Age	18.53	18.22	-0.823	0.081	26,920
Female	0.295	0.288	-0.011	0.194	27,449
Manag Exp	17.58	17.22	-0.011	0.968	28,361
Foreign	0.081	0.083	0.005	0.398	29,021
State	0.014	0.008	-0.002	0.069	29,021
Manufacturing	0.045	0.049	-0.004	0.854	29,021
Listed	0.183	0.193	0.007	0.259	28,918
Partnership	0.308	0.285	0.004	0.577	28,918
Sole Prop.	0.161	0.159	-0.031	0.027	28,918
Multiplant	0.223	0.217	-0.008	0.384	28,279
Export	0.545	0.550	0.008	0.486	28,712
Other constraints	1.214	1.231	0.042	0.297	29,020

The table presents the balance tests comparing pre- and post-event respondents. The coefficients in column (3) are obtained from the regressions of each variable on the treatment dummy, *Post*, while controlling for event fixed effects and clustering the standard errors at the event level. The p-values associated with these coefficients are reported in column (4). The last column presents the number of observations.

Table A2: Effect of monetary policy changes on perception of financial obstacles

	(1) Perception	(2) Perception
Post	0.0324	0.00135
	(0.68)	(0.04)
Post×Δ(IR)	0.000621***	0.000688***
	(3.10)	(6.43)
Size		-0.0781***
		(-7.51)
Age		-0.0304*
		(-1.85)
Female		-0.0159
		(-0.71)
Experience of manager		0.00277
		(0.22)
Foreign owned		-0.186***
		(-4.95)
State owned		0.0489
		(0.43)
Listed		0.0444
		(0.94)
Partnership		0.00752
		(0.25)
Sole Proprietorship		0.0462
		(1.52)
Multiplant		-0.0532
		(-1.28)
Export		-0.0188
		(-0.61)
Manufacture		0.123***
		(4.26)
Mean others		0.810***
		(26.67)
Observations	29,021	23,751
Adjusted R^2	0.120	0.296

The table reports the estimates of our baseline model (Eq. 2.1). The dependent variable is the perception of access to finance as an obstacle by the manager. *Post* id a dummy equal to one if the firm was surveyed after the event and $\Delta(IR)$ is the change of key policy rate in basis points. Other variables are described in Table A4. All estimates are based on OLS regressions technique and include event fixed effects (defined as a monetary policy change). Robust t-value in parentheses are clustered at the event level. *, ** and *** refer to statistical significance at 10%, 5% and 1% respectively.

Table A3: Sample composition

Country	# obs.	# svy	# MP	Country	# obs.	# svy	# MP	Country	# obs.	# svy	# MP
Albania	106	1	1	Guatemala	256	2	2	North Macedonia	263	2	3
Argentina	390	1	3	Hungary	1	1	1	Pakistan	676	1	3
Armenia	292	2	3	Hungary	44	1	1	Peru	490	3	6
Azerbaijan	136	3	4	India	3,130	1	2	Philippines	282	2	2
Benin	108	1	1	Indonesia	405	1	2	Poland	135	2	2
Brazil	157	1	2	Jordan	151	1	1	Romania	121	2	3
Burkina Faso	314	1	1	Kazakstan	1,199	2	4	Russia	2,175	2	7
Cameroon	236	1	2	Kenya	1,432	3	3	Serbia	427	3	5
Chad	139	1	1	Latvia	216	1	1	Sierra Leone	114	1	2
Chile	477	2	4	Lituania	198	1	1	Slovak Rep.	10	1	1
Colombia	270	2	3	Madagascar	189	2	1	Slovenia	212	1	1
Costa Rica	169	1	2	Malawi	196	1	2	South Africa	222	2	4
Côte d'Ivoire	2	1	1	Malaysia	167	1	3	Tajiskistan	573	2	6
Croatia	287	1	1	Mauritius	111	1	4	Tanzania	31	1	1
Czech Rep.	259	2	5	Moldova	268	3	5	Tunisia	587	2	3
Dominican Rep.	200	2	3	Mongolia	530	1	5	Turkey	1,071	2	9
DR of Congo	305	2	2	Morocco	25	1	2	Uganda	536	1	3
Egypt	4,818	2	7	Mozambique	333	2	3	Ukraine	623	2	5
Estonia	231	1	1	Namibia	399	1	3	Uruguay	294	1	1
Georgia	485	2	5	Niger	102	1	1	Vietnam	459	1	3
Ghana	224	1	2	Nigeria	443	1	1	Zambia	320	2	5

Table A4: Description of variables

Variable	Definition	Source
Perception	Variable measuring the degree of perception of credit access as an obstacle to firm growth, ranging from 0 (no obstacle) to 4 (very severe obstacle)	World Bank Enterprise Surveys
$\Delta(IR)$	Monetary policy key rate change	Hand-collected data (CB reports)
Age	The number of employees in the firm in logarithm	World Bank Enterprise Surveys
Size	Age of the firm in logarithm	World Bank Enterprise Surveys
Female	Dummy equal to one if the firm is foreign-owned	World Bank Enterprise Surveys
Experience of manager	Logarithm of experience of the manager	World Bank Enterprise Surveys
Foreign owned	Dummy equal to one if the firm is foreign-owned	World Bank Enterprise Surveys
State owned	Dummy equal to one if the firm is State-owned	World Bank Enterprise Surveys
Listed	Dummy equal to one if the firm is Listed	World Bank Enterprise Surveys
Partnership	Dummy equal to one if organizational type of the firm is a partnership	World Bank Enterprise Surveys
Sole Proprietorship	Dummy equal to one if organizational type of the firm is a sole proprietorship	World Bank Enterprise Surveys
Subsidiary	Dummy equal to one if a firm is a subsidiary of a larger firm	World Bank Enterprise Surveys
Export	Dummy equal to one if a firm exports directly or indirectly	World Bank Enterprise Surveys
Manufacture	Dummy equal to one if firm operates in manufacture	World Bank Enterprise Surveys
Mean other	Mean of other obstacles	World Bank Enterprise Surveys

Table A5: Effect of monetary policy changes on perception: firm characteristics

	(1)	(2)	(3)	(4)	(5)	(6)
Z →	Size	Age	Foreign	Multi-plant	Female	Has a loan
Var. type	Cont.	Cont.	Dummy	Dummy	Dummy	Dummy
$Post \times \Delta(IR)$	0.000607***	0.000441***	0.000662***	0.000697***	0.000811***	0.000468***
	(5.62)	(2.79)	(6.25)	(6.38)	(7.32)	(2.75)
$Post \times \Delta(IR) \times Z$	0.000001*	0.000013*	0.000220	-0.000256	-0.000589***	0.000427*
	(1.94)	(1.69)	(0.44)	(-1.24)	(-2.75)	(1.80)
Observations	23514	23514	23514	23514	23514	23037
Adjusted R^2	0.296	0.296	0.296	0.296	0.296	0.299

The table reports the estimates of triple-difference model (Eq.2.2) with firm characteristics. Only coefficients associated with $Post \times \Delta(IR)$ and $Post \times \Delta(IR) \times Z$ are displayed. Z represents firm characteristics, including two continuous variables (age, size) and five dummy variables (foreign ownership, multi-plant, women-owned, audited firms, and an indicator for firms having a loan). All models are estimated using firm-level control variables, event-fixed effects and *Post* and $\Delta(IR)$ $timesZ$ variables. Standard errors are clustered at the event level. *, ** and *** refer to statistical significance at 10%, 5% and 1% respectively.

Table A6: Effect of monetary policy changes on perception: firm characteristics

	Point	Min	Max	# Firms
Panel A: Size				
Small (less than 10 employees)	0.00078	0.00033	0.00123	8,405
Medium (11-51 employees)	0.00045	0.00021	0.00068	11,122
Large (More than 51 employees)	0.00091	0.00056	0.00127	7,241
Panel B: Age				
Young (lower than 10-year old)	0.00051	0.00016	0.00852	9,179
Medium (11-20 year-old)	0.00065	0.00042	0.00089	9,275
Old (more than 21 year-old)	0.00086	0.00047	0.00125	8,171

The table reports the point estimates and 95% confidence interval (column min and max) for each sub-group of firms according to their size (Panel A) and age (Panel B). Model is based on Eq.2.2. The last column displays the number of firms per group.

Table A7: Effect of monetary policy changes on perception: financial and economic structures.

	(1) Financial development	(2) Banking sector structure	(3)	(4) Excess-liquidity
Z →	Private credit to GDP	5-largest banks	Foreign banks	Remittance
Var. type	Cont.	Cont.	Cont.	Cont.
Post x $\Delta(IR)$	0.00094***	0.00307***	0.00091	0.00102***
	(3.12)	(2.63)	(0.67)	(6.90)
post x $\Delta(IR)$*Z	-0.00001	-0.00003**	-0.00000	-0.00016*
	(-0.99)	(-2.00)	(-0.04)	(-1.93)
Observations	23502	21808	8072	23514
Adjusted R-squared	0.296	0.294	0.252	0.297

The table reports the estimates of triple-difference model (Eq.2.2) with financial development level, banking system structure and the excess-liquidity. Only coefficients associated with *Post*, $Post \times \Delta(IR)$, $Post \times Z$ and $Post \times \Delta(IR) \times Z$ are displayed. Z represents private credit to GDP, assets of the five largest banks, foreign banks among total banks (%), and remittance inflows to GDP. All models are estimated using control variables and event-fixed effects. Standard errors are clustered at the event level. *, ** and *** refer to statistical significance at 10%, 5% and 1% respectively.

Table A8: Effect of monetary policy changes on perception: financial development.

	(1)
Z →	Financial development
Var. type	Dummy
Post* $\Delta(IR)$	0.00064***
	(6.10)
Post* $\Delta(IR)$*Z=1	0.00054
	(1.14)
Post* $\Delta(IR)$*Z=2	0.00057**
	(2.35)
Observations	23502
Adjusted R-squared	0.296

The table reports the estimates of triple-difference model (Eq.2.2) with financial development. Only coefficients associated with $Post \times \Delta(IR)$ and $Post \times \Delta(IR) \times Z$ are displayed. Z represents the private credit to GDP. The model is estimated using control variables and event-fixed effects. Standard errors are clustered at the event level. *, ** and *** refer to statistical significance at 10%, 5% and 1% respectively.

Table A9: Effect of monetary policy changes on perception: institutional quality

	(1)	(2)	(3)	(4)
Z →	CBIE	TOR	TOR decade	Irregular turnover
Var. type	Cont.	Cont.	Cont.	Dummy
Post x $\Delta(IR)$	0.001	0.002***	0.001***	0.001***
	(1.31)	(3.75)	(3.56)	(4.77)
Post x $\Delta(IR)$*Z	-0.001	-0.005***	-0.004*	-0.001***
	(-0.76)	(-2.67)	(-1.66)	(-4.48)
Observations	14531	15507	15410	15410
Adjusted R-squared	0.269	0.258	0.260	0.260

The table reports the estimates of triple-difference model (Eq.2.2) with institutional characteristics. Only coefficients associated with *Post* and $Post \times Z$ and $Post \times \Delta(IR) \times Z$ are displayed. Z represents Central bank independence indicators: CBIE from Romelli (2022), TOR and Irregular turnover dummy from Dreher et al., 2008, 2010. All models are estimated using control variables and event-fixed effects. Standard errors are clustered at the event level. *, ** and *** refer to statistical significance at 10%, 5% and 1% respectively.

Chapter 3

Monetary policy and risk-taking in Africa

3.1 Introduction

The importance of a sound financial system for economic development is hardly debatable. The global financial crisis of 2007-2009 underscored the relevance of financial stability for macroeconomic stability. Banks have played an essential role in the propagation of this crisis (Cetorelli and Goldberg, 2011). Some stressed that the risk-taking by banks was the main driver of the precedent financial crisis owing to the loose monetary policy. Indeed, the investigations into the origins of the 2007-2009 *subprime* crisis have led academicians to consider a new channel for monetary policy's decisions transmission through banks' appetite or tolerance for risk throughout a loose monetary policy period. Some studies suggest that persistently low-interest rates incentivize excessive risk-taking by banks, especially in the United States and the Euro area. This new channel, known as the bank risk-taking channel, impairs bank portfolio quality and was among the main drivers of the 2007-09 global financial crisis (GFC) (Abbate and Thaler, 2019).

As defined by Borio and Zhu (2012), the risk-taking channel refers to the impact of changes in policy rates on either risk perceptions or risk tolerance, and hence on the degree of risk in portfolios, on the pricing of assets, and on the price and non-price terms of the extension of funding. This channel focuses on the effect of monetary policy on the quality of loans rather than on their volume. The literature highlights several mechanisms through which a low-interest rate policy can affect bank risk on both the asset and liability sides through risk perception. This transmission of monetary actions may pass through the valuation of assets and collateral (Borio and Zhu, 2012), the search for yield (Rajan, 2006) and the predictability of monetary policy (Diamond and Rajan, 2012).[1]

The empirical literature on the effects of monetary policy on bank risk-taking has largely focused on advanced economies in Europe and the United States (Altunbas et al., 2010; Delis and Kouretas, 2011; Jiménez et al., 2014; Dell'Ariccia et al., 2017) and some emerging

[1] A fourth possible mechanism is through financial or debt leverage (Adrian and Shin, 2010).

economies (Chen et al., 2017). The literature has been silent in the investigation of this channel of monetary policy in developing countries, where banks play a crucial role in the financial system. Banks are the primary (exclusively in some countries) formal source of finance due to underdeveloped capital markets, which are still in the early stages of development or nonexistent in some countries. This analysis is particularly important in developing countries because they experience more frequent banking crises than high-income countries (Laeven and Valencia, 2020), which come with significant costs. Additionally, a stable financial system is crucial for economic development, and any turbulence in the banking sector can jeopardize private sector financing (Brei et al., 2020). Therefore, we aim to fill this research gap by analyzing the effects of an expansionary monetary policy on bank risk-taking behavior in African countries.

To analyze the effect of monetary policy on the risk-taking behavior of African banks, we consider a panel of 537 banks across the continent and employ the fixed-effect estimator to account for heterogeneity across banks, countries, and time effects. Our analysis reveals several results. Firstly, we find that changes in monetary policy positively affect the Z-score. Put it differently, a loose monetary policy significantly increases bank risk-taking. This finding is further confirmed when using alternative proxies for risk-taking, such as non-performing loans (NPLs) and loan loss provisions (LLPs), reflecting bank asset quality. The results remain robust across different model specifications and alternative estimation techniques. Secondly, sub-regional analysis indicates a difference between the two African regions, e.i., Sub-Saharan Africa (SSA) and North Africa. The results demonstrate a significant link only for the sample of banks in the ASS.

Regarding heterogeneity, we find that bank size, leverage, efficiency, and foreign ownership structure matter in shaping the relationship between monetary policy and risk-taking behaviors. These results suggest the importance of considering bank-specific characteristics in understanding the impact of monetary policy on bank risk-taking.

Our paper makes at least two main contributions to the existing literature. Firstly, we contribute to the literature on the nexus between monetary policy and bank risk-taking by examining a block of developing countries (African economies). To the best of our knowledge, this paper is the first to investigate the effects of monetary policy on bank risk-taking across a comprehensive set of developing countries. There are works on emerging countries such as those by Chen et al. (2017), which analyze risk-taking in 29 emerging countries and by Sarkar and Sensarma (2019) for the specific Indian case. Thus, this paper aims to fill this gap in the literature by shedding light on the effect of policy on risk-taking in the context of developing countries. Secondly, our study relates to African countries where the issue of development financing is a central concern. A sound financial system is necessary to support this process. Therefore, we contribute to the literature on financial stability by highlighting the effect of monetary policy on the behavior of banks in Africa. This is particularly important as it helps to understand whether there is synergy or a trade-off between the mandates of central bankers, namely monetary stability and financial stability.

The remainder of the paper is organized as follows. Section 3.2 provides an overview of the related literature (both theoretically and empirically). Section 3.3 describes our data and presents descriptive statistics of the variables. Section 3.4 introduces the empirical model and the estimation strategy. Section 3.5 presents the main results of the baseline model. Section 3.6 and Section 3.7 present the robustness checks and heterogeneity analysis, respectively. Finally, Section 3.8 summarizes our main findings and concludes.

3.2 Literature review

The risk-taking behavior of banks has been the subject of extensive research due to their crucial role in allocating financial resources. Studies have revealed that banks' appetite for risk is shaped by various factors, including competition within the banking sector, as well as bank-specific characteristics such as size, capitalization, and diversification, among others.

Moreover, the 2007-09 GCF has underscored the impact of an expansionary or prolonged period of accommodative monetary policy, characterized by a low-interest rate environment, on banks' propensity for risk-taking.

The GFC of *subprime* has sparked a debate about the role of monetary policy in incentivizing banks' risk-taking behavior. Some scholars argue that persistently low-interest rates may have prompted banks to engage in risky activities, such as lending to less creditworthy customers, that they would not have pursued under normal circumstances (Borio and Zhu, 2012). This new channel of monetary policy is known as the risk-taking channel of monetary policy. The theoretical literature identifies at least three ways in which the risk-taking channel can operate.

Firstly, low-interest rates can impact banks' sensitivity to risk-taking through the "search for yield" (Rajan, 2006). This mechanism operates through the relationship between market rates and target rates of financial intermediaries. As argued by Gambacorta (2009), when a low-interest rate environment reduces the return on investments, such as government (risk-free) securities, banks and other financial intermediaries may be incentivized to switch to riskier activities to meet a nominal target return for psychological, contractual, or institutional reasons. The impact of this channel may be stronger when the gap between market rates and target rates is large (Borio and Zhu, 2012). For example, bank managers with nominal targets during prolonged periods of low rates on safe assets may be incentivized to take on more risky assets with high returns to meet their nominal targets. Consequently, banks may relax their lending standards and extend loans to borrowers who would not have been approved in previous periods.

A second mechanism through which a low-interest rate environment may impact banks' sensitivity to risk-taking is its effect on valuations, incomes, and cash flows (Borio and Zhu, 2012). Firstly, a loose monetary policy boosts the prices and collateral values of the assets in banks' balance sheets. This modification of risk-management input, in turn, reduces

banks' estimates of probabilities of default, loss given default, and volatilities. Secondly, the decrease in the default of agents changes the risk perceptions of banks and increases their risk tolerance. Consequently, banks become more tolerant and less cautious, leading to an expansion of their lending lines (Borio and Zhu, 2012) and increased risk-taking.

The central bank communication policies that affect expectations are the third mechanism through which a low-interest rate environment may impact banks' sensitivity to risk-taking. Given the procyclicality of monetary policies, economic agents may take riskier positions because the central bank would ease monetary policy during periods of recession and vice versa. In other words, the predictability of monetary actions encourages agents to take more risks (Diamond and Rajan, 2012).[2]

3.2.1 Empirical literature

There are growing, still limited, empirical investigations on this new monetary policy channel. The first empirical work is Jiménez et al. (2014) that uses micro-data from Spanish Credit Register from 1984-2006. The authors find evidence of the monetary policy risk-taking channel. This study reveals several interesting findings. In the short term, low-interest rates reduce the risk of default of borrowers enhance. In the medium term, the increase in collateral value drives banks to relax their lending standards. Furthermore, contrary to highly capitalized banks, the lowly-capitalized banks grant more loan applications to a firm with ex-ante risk, characterized by more credit and less collateral requirement during a prolonged period of low-interest rates (Jiménez et al., 2014). Similar results are found by Ioannidou et al. (2015) for Bolivia, albeit with different financial and economic levels of the two countries. Controlling for bank, firm, bank-firm relationship, loan, banking market characteristics, and macroeconomic conditions, Ioannidou et al. (2015) find that a lower federal funds rate

[2] A possible fourth mechanism is "leverage". According to Diamond and Rajan (2012), banks may increase their indebtedness and leverage due to lower interest rates on their assets. The development of banks' liabilities encourages them to take more significant risks due to the limited liability that most banks enjoy. In such context, according to Adrian and Shin (2010), banks may be blinded by the concern of getting rid of excess liquidity lent to agents who cannot reimburse their loans (not creditworthy).

spurs banks to grant loans to ex-ante less creditworthy borrowers and a high probability of default. Moreover, the results show that banks with high non-performing loans and lower capital ratio take on more risk.

Using data from the Survey of Terms of Business Lending (STBL) for the USA banks over the period 1997 to 2008, Buch et al. (2014) find no evidence supporting the new monetary policy channel of risk-taking for the large domestic and foreign banks in the USA. However, they find that small banks change their risk structure during low-interest rate periods by increasing their lending to risky borrowers, and an increase does not follow this behavior in risk premiums. In contrast to Jiménez et al. (2014), small U.S. banks adjust their loan contracts by nonetheless decreasing the maturity of these loans during periods of low rates. Other studies show evidence of the risk-taking channel for the USA banks (see among others Delis and Kouretas (2011); Dell'Ariccia et al. (2017)). Studies on European banks (not by country) are increasingly numerous and most often show the existence of risk-taking by banks during periods of low-interest rates (Brana et al., 2019).

There is a scant study concerning emerging countries and none on developing countries in our knowledge. Using a panel of 1000 banks from 29 emerging countries, Chen et al. (2017) point out that banks increase their risk-taking during periods of monetary easing. These results remain robust using different monetary policy measures and employing different econometric methodologies. Given the differences in monetary practices between developed and emerging economies, the authors consider the other monetary instruments, both direct and indirect. In particular, some emerging countries still use reserve requirements and discount rates. In addition, Sarkar and Sensarma (2019) have undertaken the same exercise with regard to the Indian banking system. Their sample consisted of 89 banks over the period 1999-2000 and 2001-2016. They pointed out that expansionary monetary policy increases the default risk of mainly foreign banks and private sector banks.

Our work aims to fill this gap in the literature on monetary policy and bank risk-taking in

the context of African countries.

3.3 Data and summary statistics

3.3.1 Data

We use an unbalanced panel data of individual banks from all African countries over the period 2000-2020 to examine how monetary policy matters for bank risk taking. The bank-level data come from Fitch Connect, covering all African countries prior to filtering. We applied several filters to the data, which reduced the number of banks and countries in the final sample. Firstly, we included only monetary institutions that receive deposits and extend credit. Secondly, to avoid double counting, we considered the balance sheets of non-consolidated banks, and if unavailable, the consolidated balance sheet is considered. We then restricted our sample to banks with a minimum of 5 observations to see the effect of monetary policy changes on risk indicators. Finally, we cleaned the sample by removing outliers. Each accounting variable was winsorized at the top and bottom 1% to mitigate the impact of extreme values. Considering the baseline model with all control variables, we end up with an unbalanced panel of 537 banks from 43 African countries, making 4931 observations over the period 2003-2020.[3] Monetary policy key rates came from IMF's international financial statistics (IFS) database. Country-level variables are from different sources.[4] .

3.3.1.1 Identification of bank risk-taking

The analysis of bank risk-taking is an arduous empirical investigation. Given the availability or accessibility of data, different identifications of risk-taking are used to highlight the link between monetary policy stance and banks' risk appetite. Starting with granular data as the Survey of Terms of Business Lending (STBL) (Buch et al., 2014), credit register (Jiménez

[3]Note that the study period for the baseline model was adjusted from 2000-2020 to 2003-2020 due to the calculation window requirements for the Z-score, specifically for the volatility of bank asset profitability. However, for other indicators that do not require rolling windows, the period remains from 2000-2020.

[4]See Table A2 in Appendix for more details.

et al., 2014; Ioannidou et al., 2015) or bank balance sheets, especially ex-post data such as NPLs, risky assets (Altunbas et al., 2010) or the Z-score (Chen et al., 2017) are used to assess the relationship between monetary policy and risk-taking. The latter is the most common indicator to identify bank stability (Laeven and Levine, 2009). The Z-score indicator measures a bank's probability of not failing, so if the Z-score value is high, the hit shows the bank's strength and its inverse is the probability of failure (Roy, 1952). The attractiveness of this index lies in its close link with the likelihood of a bank's insolvency, i.e., the probability that the value of its assets is insufficient to cover the repayment of its liabilities. In contrast to other indicators used in the banking literature to account for risk-taking, such as the ratio of non-performing loans or the ratio of assets, which measure asset quality, the Z-score provides more information on a bank's risk of default (Brana et al., 2019). Referring to this vast literature, we use the Z-score indicator as our primary measure of banking stability. The Z-score indicator is computed as follows :

$$Z_{i,t} = \frac{ROA_{i,t} + EA_{i,t}}{\sigma(ROA)_{i,t}} \tag{3.1}$$

Where $ROA_{i,t}$ is the return on assets of bank i in year t, $EA_{i,t}$ is the ratio of equity to total assets, and $\sigma(ROA)_{i,t}$ is the standard deviation of return on assets. In this framework, a bank defaults when its current losses exceed its capital, i.e., $Pr[\Pi_{i,t} \leq C_{i,t}]$, with Π the profit and C the bank's capital. Normalizing by the bank's assets and its size, the probability of default of the bank becomes: $Pr[ROA_{i,t} \leq EA_{i,t}]$. Thus, assuming that the return on assets follows a normal distribution as suggested by Hannan and Hanweck (1988) and Boyd et al. (1993), and centering and reducing by $ROA_{i,t}$, we obtain:

$$\begin{aligned} Pr[ROA_{i,t} \leq EA_{i,t}] &= Pr\left[\frac{ROA_{i,t} - ROA_{i,t}}{\sigma(ROA)_{i,t}} \leq \frac{EA_{i,t} + ROA_{i,t}}{\sigma(ROA)_{i,t}}\right] \\ &= N(-Z_{i,t}) \\ &= 1 - N(Z_{i,t}) \end{aligned} \tag{3.2}$$

Where $N(.)$ is the normal cumulative distribution function. If the hypothesis of a normal distribution of $ROA_{i,t}$ allows us to have the Z-score formula, it remains that $ROA_{i,t}$ is very asymmetric. To overcome this problem, many authors use the natural logarithm of Z-score (see among others, Laeven and Levine (2009); Uhde (2016)), which is normally distributed. We apply this same technique. In the remainder of the paper, we refer to the logarithm of the Z-score simply as the "Z-score".[5] We consider three other measures of bank risk-taking for the robustness checks. Specifically, we include the ratio of NPLs, LLPs, and risk assets to total assets as in Delis and Kouretas (2011) and Chauvet and Jacolin (2017) and the Z-score components.

3.3.1.2 Monetary policy identification strategy

In most economies, market-based instruments are commonly used as monetary policy tools. To identify changes in monetary policy, researchers often rely on short-term interest rates, such as the central bank's policy rate, interbank market rates, money market rates, Treasury bond rates, and longer-term rates like government bond yields. These instruments are prevalent in advanced economies and some emerging economies, but they may lees accurate in capturing monetary policy stance in developing countries. In fact, the interbank market may not exist in some developing countries, and if it does, its functionality may be limited. Therefore, monetary impulse in these countries relies on the central bank's policy rate and

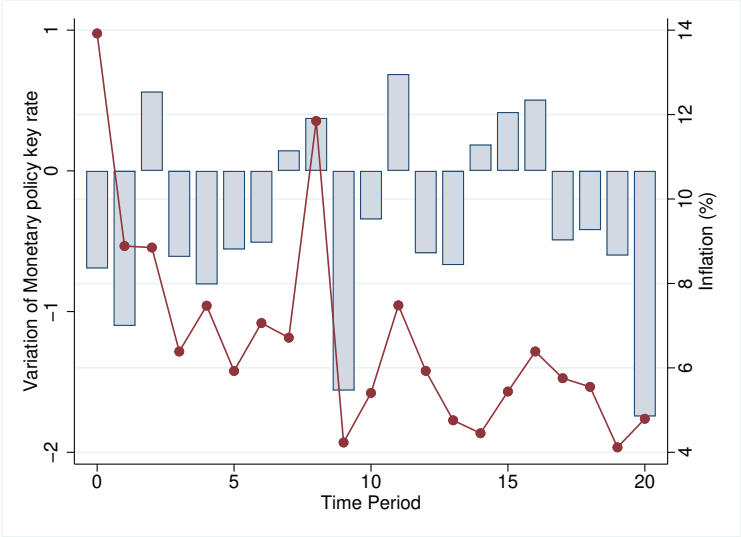
[5]This indicator may have some limitations despite its ease of use by many institutions with unsophisticated data. According to Čihák et al. (2013), the fact that the Z-score can be calculated on accounting data means that it can be subject to voluntary manipulation by institutions to appear more stable than they are. Another limitation is the risky nature of the indicator, which does not consider the impact of one institution's failure on others in the system

the discount rate applied at the discount window. However, for this instrument to be effective, the banking system must not be excessively liquid, and the monetary, financial and real spheres need to be interconnected.

In order to have a homogeneous instrument between countries, the identification is based on the policy key rate of central bank and the discount rate. First of all, we use the policy key rate where this instrument is available. There are some countries for which this indicator is not available or does not exist in the all study period. The second step consists for us to use discount rate if the key interest is not observable or if the number of observation of discount rate is higher than the key rate number of observation. These two variables can be use interchangeably because if the key rate change, the discount rate is likely to change to make the monetary policy change coherent. The most of time, the discount rate is set at 25 or 50 basis points beyond the key rate.

We analyze the changes in the key policy rate by taking the first difference, allowing us to identify shifts in monetary policy stance. Positive values indicate episodes of tight monetary policy, while negative values represent an expansionary monetary policy. Throughout the study period, there have been 242 cuts and 102 hikes in the key policy rate. This suggests that, on average, African central bankers have adopted a more accommodative monetary policy stance over the past two decades. Figure 3.1 illustrates this expansionary monetary policy. Over the 21 periods, the average of the policy rate variations is only positive in 7 periods (meaning tight monetary policy in average). Also, we observe a positive relationship between inflation and the policy rate, except for two exceptional periods (2000 and 2020) where a negative relationship is observed. This suggests that central banks are primarily focused on maintaining price stability. However, during periods of severe economic crises such as the COVID-19 pandemic, the average policy rate experienced the highest reduction over the two decades, coupled with an increase in inflation. This highlights the importance of economic stability alongside monetary stability in such challenging times.

Figure 3.1: Monetary policy key rate and inflation dynamics in Africa.



Source: Author's calculations based on data from IMF's IFS database and the World Bank's WDI database. The bars represent the average of the policy rate variations over years. Solid line presents the average of inflation rates over the years.

3.3.1.3 Control variables

To ensure a robust specification of our baseline model, we introduce a set of bank characteristics and country level variables that may determine bank risk-taking behaviors. Specifically, bank risk-taking behaviors can be influence by its size, capitalization level (leverage), loan growth, diversification, and efficiency. At country level, competition in banking sector, existence of a deposit insurance, level of financial development, GDP growth, inflation, price of commodities (exportation) and the quality of institutions as regulatory quality.

Bank-level characteristics

- *Size* (bank total assets in logarithm) : the literature on the nexus between bank size and bank risk appetite remains controversial. Two views have been defended. While some believe that large banks take more risk because of the existence of implicit insurance that they are too big to fail (Afonso et al., 2014). Mishkin (2006) and Demirgüç-Kunt and Huizinga (2010) have shown that large banks have a greater incentive to undertake risky activities by making moral hazard a part of their business, given their weight

in the economy.[6] On the other hand, some authors consider large companies to be less risky. They often have a very diversified portfolio, which helps mitigate their risk-taking, as these risks would have little impact on their balance sheet if they materialize. Berger (1995) considers that the economies of scale they enjoy, and their market share make the large banks less risky. We can expect a positive impact of this variable if the "too big to fail" hypothesis does not dominate.

- *Capitalization* (ratio of equity to total assets): Due to the moral hazard, under-capitalized banks may increase the riskiness of their loan portfolios, which results in higher non-performing loans on average (Berger and Humphrey, 1997). Calem and Rob (1999) document, however, that banks would increase their risk positions when their capital exceeds a threshold. Some evidence has been found between bank capitalization and risk-taking (e.g., Duan et al. (1992); Calem and Rob (1999); Delis and Kouretas (2011)).

- *Diversification* (ratio of non-interest income to total operating income): in banking, the portfolio theory suggests that diversification can potentially reduce the probability of failure. Some studies document that large banks have used their diversification advantage to operate with greater leverage and to pursue riskier, potentially more profitable lending (Demsetz and Strahan, 1997). Stiroh (2004) reports that banks with higher non-interest income shares have lower profitability per unit of risk.

- *Efficiency* (ratio of expense to total revenue): following the 'bad management' hypothesis developed by Berger and Humphrey (1997), in the poor senior management banks, the 'bad managers' have poor skills in credit rating combined with the difficulty in monitoring and controlling the borrowers after loans are issued to assure the respect of the contract and also these managers can be less competent to evaluate the value of col-

[6]Because they are aware that their failure will harm macroeconomic stability through the instability of the financial system of which they are a significant component

lateral pledged against the loans. Under this hypothesis, the efficiency cost may explain the quality of a bank balance sheet. This variable can be endogenous, as explained by Delis and Kouretas (2011). Banks with higher risks may explain the technical efficiency levels if they are responsible for the level of bank income. We expect that the efficiency will decrease the bank riskiness as in Berger and Humphrey (1997) and Fiordelisi et al. (2011).

- Profitability (ratio of profits before tax to total assets): profitability or the franchise value of a bank can reduce the risk-taking incentives (Keeley, 1990; Demsetz and Strahan, 1997). The reason is that the more profitable banks have much to lose if the risk of failure materializes due to risky business positions.

Potential macroeconomic, institutional and regulatory determinants of Banks' risk-taking

We account for these effects by including a vector of country-level controls. At the financial level, competition in the banking sector and financial development level. Macroeconomic conditions such as GDP growth (GDP), inflation (Inflation), international commodity prices, and remittance inflows (Remittance). Banks' risk-taking may also depend upon the regulatory and institutional environment in which they operate, so they need to be controlled. We include the regulatory framework as the existence of implicit deposit insurance and the regulator's quality (RQE).

- *Market concentration* (five largest bank assets to total assets): although studies have shown a positive link between the probability of bank failure and concentration (De Nicolo et al., 2006), the theory that establishes a link between bank competitiveness and risk-taking is that of "competition-fragility". According to this view, when banks face declining revenues while trying to offer higher rates in the deposit market in a competitive environment, they risk neglecting the asset market. Therefore, the last refuge is

to undertake riskier investments to compensate for lost (Matutes and Vives, 2000).

- *FDI* (Financial Development index): a high level of financial development through the expansion of credit can affect bank solvency as the ratio of private lending to GDP increases over the period ahead of distress (Männasoo and Mayes, 2009).

- *GDP growth rate*: during economic booms, banks may increase their volume of credit due to a favorable environment and thus reduce the quality of their assets (Delis and Kouretas, 2011).

- *Inflation* (consumer price index growth rate): higher Inflation implies an increase in uncertainty and may reduce the risk-taking incentives of banks (Drakos et al., 2016).

- *Commodity price index*: given the characteristics of African countries, the evolution of commodity prices - international commodity prices - and migrant remittances can affect banking system stability. African countries are highly dependent on commodity exports and are poorly diversified. Most African households live from agriculture and, therefore, from MPs, and a shock in MP prices could reduce the probability of repayment of bank loans.

- *Remittance* (remittance inflows to GDP): the relationship between migrant remittances and risk-taking can be analyzed as an idiosyncratic shock of the former on the latter by increasing, for example, the probability of defaulting on loans.[7]

- *Deposit insurance* (Dummy variable if the country as an explicit deposit insurance): the existence of deposit insurance could introduce moral hazard among banks by incentivizing them to take risky positions. The empirical literature leads to mixed results. Some studies find that deposit insurance has a positive impact on bank risk-taking appetite by reducing the market discipline of banks' creditors (Demirgüç-Kunt and Detragiache,

[7]The hypothesis behind this is that migrant remittances are an important source of income in some countries, they can be used for loan repayments.

2002; Demirgüç-Kunt and Huizinga, 2004; Ioannidou and Penas, 2010).[8] In contrast, some others find that deposit insurance does not induce risk-taking by banks (Karels and McClatchey, 1999; Gropp and Vesala, 2004).

- *RQE* (Regulatory quality index): the institutional quality is represented by the quality of the regulator seen in terms of creditor protection, so when this power is weak, the assets of creditors - here, the banks - tend to deteriorate (Levine, 1997).

3.3.2 Descriptive Statistics

Table 3.1 provides descriptive statistics of the variables included in the baseline analysis. These statistics offer insights into the characteristics of banks and macroeconomic and institutional conditions that may contribute to banks' risk-taking behavior. The dependent variable, Z-score, has an average value of 3.385 in logarithmic form. The range between the minimum and maximum values is substantial, indicating a disparity among African banks [0.154 to 6.548].

Over the 2000-2020 period, the average variation of the key policy rate in the continent was -39.6 basis points (SD=355). The maximum decrease observed was around 1750 basis points, while the maximum increase reached 1200 basis points.

Correlation matrix reported in Table A4 indicates a positive correlation between monetary policy rate changes and Z-score despite a weak link (0.026). Moreover, the problem of multicollinearity between our control variables is weak since the correlation coefficients between them are low.

[8] The effect of deposit insurance on banks' risk-taking incentives also depends on the institutional framework, Demirgüç-Kunt and Detragiache (2002) find that the negative impact on banking stability is more acute in countries with poor institutional quality, and interest rates are deregulated.

Table 3.1: Summary statistics.

	Obs.	Mean	SD.	Min.	Max
Zscore	4931	3.385	1.188	0.154	6.548
$\Delta(IR)$	4931	-0.396	3.555	-17.500	12.000
Size	4931	20.157	1.898	15.547	25.057
Capitalization	4931	14.239	11.453	-0.480	88.640
Diversification	4931	0.394	0.205	-0.057	1.097
Efficiency	4931	65.159	35.607	9.020	357.480
Profitability	4931	2.307	3.476	-12.750	16.030
Market concentration	4931	0.062	0.093	0.000	0.780
FDI	4931	0.217	0.149	0.037	0.634
Inflation	4931	6.941	5.638	-2.540	41.130
GDP growth rate	4931	4.221	3.305	-7.980	14.600
Commodity prices index	4931	87.068	19.898	35.035	134.631
Remittance	4931	3.012	4.188	0.000	50.102
Deposit insurance	4931	0.350	0.477	0.000	1.000
RQE	4931	-0.322	0.498	-1.365	1.127

This table reports summary statistics of the variables used in this study. The variables are as follows: Zscore, which is the natural logarithm of z-score: Log($zscore = \frac{ROA_{it}+EA_{it}}{\sigma(ROA_{it})}$)). $\Delta(IR)$ is the variation of the policy rate. Size is the natural logarithm of total assets. Capitalization is the ratio of equity capital to total assets. Efficiency is the ratio of expenses to total revenue. Diversification is the ratio of non-interest income to total operating income (%). Profitability is the ratio of profits before tax to total assets. Market Concentration is the assets of the three largest commercial banks as a share of total commercial banking assets. Financial depth is the financial development index (FDI). Market concentration is the assets of the five largest banks as a share of total commercial banking assets. GDP growth rate is the annual growth rate of real gross domestic product. Commodity price index is the commodity export price index. Remittance is the remittance inflows (% of GDP). Deposit insurance is a dummy variable equal to 1 if the country j has a deposit insurance, 0 otherwise. RQE is the regulator quality from WGI (Kaufmann et al., 2011).

3.4 Empirical model and Estimation strategy

3.4.1 Empirical model

The baseline empirical model specifying the relationship between bank risk-taking and monetary policy is as follows:

$$\begin{aligned} Zscore_{ijt} = c + \beta\Delta(IR)_{jt} + \alpha Bankcharact_{ijt} + \gamma Macro_{jt} \\ + \delta Institut_{jt} + \nu_i + \mu_j + \pi_t + \varepsilon_{ijt} \end{aligned} \tag{3.3}$$

where $Zscore$ stands for the Z-score of bank i in year t. $\Delta(IR)_{jt}$ is the variation of monetary policy key rate. The characteristics of bank i during year t that may explain its risk-taking

behavior are represented by the vector $Bankcharact_{ijt}$. Macroeconomic and other control variables in our study are represented by $Macro_{jt}$. $Institut$ is a vector that represents the institutional quality of country j at period t. We also include bank, country and time fixed-effects (ν_i , μ_j and π_t) and ϵ_{ijt} is the idiosyncratic error.

We are interested in the sign of parameter β. When $\beta < 0$, that suggests the monetary policy key rate changes harm the bank risk-taking indicator. Specifically, a tight monetary policy (a positive $\Delta(IR)$) increases bank wealth by reducing default risk. On the other hand, whether $\beta > 0$ will validate banks' risk-taking behavior throughout a loose monetary policy stance.

3.4.2 Estimation Strategy

The baseline model is a three-way fixed-effects model that integrates bank-specific, country-specific and time-specific fixed-effects. Taking into account the fixed-effects cannot be achieved with a model estimated using ordinary least squares (OLS) as it may produce biased results. The Hausman test has supported the choice of fixed-effects model, which favors it over a random-effects model.

Since bank characteristics can be endogenous, we include all bank-level variables with one lag in the model to reduce the endogeneity bias. In addition, given that each bank has its own characteristics, we consider robust standard errors by clustering at the bank level.

3.5 Baseline results

We analyze the effect of monetary policy key rate variations on financial stability, i.e., the Z-score. We estimate our baseline model by employing the fixed-effects method that takes into account bank, country and time fixed-effects. Table 3.2 presents the estimation of Equation (3.3), with the first two columns representing the estimates of the full sample. The results suggest a positive relationship between monetary policy and bank risk-taking. These findings

hold when introducing bank characteristics macroeconomic and institutional control variables (column 2). Considering the baseline model results (column 2 of Table 3.2), we find that a decrease in monetary policy rate significantly reduces the bank Z-score at 10%. Specifically, cutting the policy rate by 100 basis points reduces the Z-score by 0.995%($\approx$ 1%). These results are in line with the findings on developed economies (Jiménez et al., 2014; Altunbas et al., 2010; Brana et al., 2019) and emerging economies (Chen et al., 2017). Our result shows that banks in African countries do not deviate from risk-taking behavior during an expansionary monetary policy period.

However, this effect varies across African regions. Interestingly, we observe that the effect is only significant for SSA countries where a cut in policy key rate increases bank default probability (column 4) but not statistically significant for North Africa countries (column 6). These findings raise the question of what could explain this difference between the two regions, particularly about their financial systems. Table A3 presents the comparison tests between the mean of the variables by sub-sample: SSA versus North Africa. There are significant differences between SSA and North Africa regarding banking and economic features. The banking system in North Africa has less probability of default, is more efficient, and is less concentrated with a higher financial development level than SSA's banks. On the contrary, the banks are more capitalized, more dynamic in loan growth, and more diversified. Their relatively larger sizes can explain the non-significant impact of monetary policy on the Z-score in North African banks. Indeed, large banks may have access to other funding sources and be less affected by policy changes.

Most of the control variables have a significant effect on the bank default indicator. The size, capitalization, and profitability of the bank have a positive impact on Z-score. The positive relationship between bank size and the Z-score does not confirm the "too big to fail" hypothesis, which postulates that large banks take on more risk because they know they will be bailed out in case of default. In other words, large banks take on more risk because they

are aware that they will be rescued in times of distress. However, the results here suggest the opposite effect: larger the bank is, the more solvent it is. In developing countries where the safety net system for creditors or the bailout of large financial institutions is precarious or sometimes non-existent, large banks may be more cautious in evaluating and taking risks.

The positive effect of capitalization on the Z-score suggests that the more capitalized the bank (with shareholders more exposed), the lower its default risk. In other words, under-capitalized banks tend to take on more risk due to moral hazard. The sign of the coefficient of the diversification variable aligns with our expectations. Diversification of the bank helps reduce its probability of default - not putting all its eggs in one basket. The structure of the market has a significant effect on the risk of bank default.

The efficiency variable, as measured by the ratio of expenses to total revenue, is statistically significant and negative in all regressions. The estimates suggest that when the efficiency increases (a decrease in the ratio), bank solvency increases. This finding is in line with the conclusions of Berger and Humphrey (1997) and Fiordelisi et al. (2011). Finally, profitability has a positive influence on bank risk-taking. This suggests that the more profitable a bank becomes, the lower its default risk. In the next section, we check the robustness of our findings.

Turning now to macroeconomic variables, only the level of financial development, inflation, economic growth, and the quality of regulation have significant effects on bank solvency. Financial development and economic growth reduce the probability of bank failure by improving the Z-score. On the other hand, inflation and the existence of explicit deposit insurance deteriorate the Z-score.

3.6 Robustness checks

We run three sets of robustness checks to validate previous findings. We first use alternative risk-taking measures. Secondly, we transform our basic specification into a dynamic model. Thirdly, we run our basic specification with alternative estimators.

3.6.1 Monetary policy and bank portfolio quality

The first set of metrics is the components of the Z-score: profit (ROA), leverage risk (EA) and assets risks ($\sigma(ROA)$). The second set is inherent to bank assets' quality: NPLs and LLPs. Finally, we use risk assets proxy to reflect bank portfolio riskiness and correspond directly to the term "bank risk-taking" (Delis and Kouretas, 2011). The different indicators allow us to evaluate the effect of monetary policy changes on bank wealth more exhaustively.

Table 3.3 presents the results of the aforementioned risk metrics. The findings indicate that changes in monetary policy positively affect bank profitability (ROA and ROE). Put it differently, a loose monetary policy reduces bank profits, which is a plausible outcome as a decrease in interest rates may lower banks' net interest margins and, hence, their overall profits. For the quality of the bank portfolio, our results suggest an inverse relationship between $\Delta(IR)$ and NPLs, LLPs and risk-assets ratio. These findings highlight the effect of a loose monetary policy on the quality of bank assets and are statistically significant (see columns 4, 5 and 6in Table 3.3). Our results are consistent with those reported by Delis and Kouretas (2011). These different results with various indicators suggest that banks' risk indicators tend to deteriorate significantly when the policy rate decreases. To support these results, the following tests consider the proper specification of the model, the endogeneity problem, and the relevance of the estimation technique used.

Table 3.2: Monetary policy rate changes and risk-taking.

	Full Sample		SSA		North Africa	
	(1) Zscore	(2) Zscore	(3) Zscore	(4) Zscore	(5) Zscore	(6) Zscore
$\Delta(IR)$	0.00381	0.00995**	0.00521	0.00910**	-0.0474*	0.00699
	(1.10)	(2.54)	(1.44)	(2.23)	(-1.76)	(0.23)
Size	0.171***	0.184***	0.103	0.138**	0.522**	0.465**
	(2.67)	(2.79)	(1.59)	(1.99)	(2.40)	(2.02)
Capitalization	0.0179***	0.0174***	0.0150***	0.0149***	0.0496**	0.0375*
	(5.11)	(4.84)	(4.28)	(4.14)	(2.31)	(1.84)
Diversification	-0.192	-0.364**	-0.407**	-0.505***	0.355	0.0282
	(-1.25)	(-2.47)	(-2.57)	(-3.02)	(1.02)	(0.09)
Efficiency	-0.00274***	-0.00197**	-0.00211**	-0.00138	-0.00589***	-0.00487***
	(-3.39)	(-2.43)	(-2.47)	(-1.60)	(-3.81)	(-2.83)
Profitability	0.0434***	0.0501***	0.0472***	0.0505***	0.0828*	0.131***
	(5.09)	(5.68)	(5.47)	(5.55)	(1.79)	(2.76)
Market concentration		-0.122		0.157		-1.841
		(-0.26)		(0.37)		(-1.06)
FDI		3.650***		3.526***		2.499
		(3.56)		(3.24)		(0.92)
Inflation		-0.00896**		-0.00374		-0.0298*
		(-2.10)		(-0.79)		(-1.89)
GDP growth rate		0.0138**		0.0137**		0.0444
		(2.31)		(2.25)		(1.51)
Commodity prices index		-0.000767		-0.000236		0.00145
		(-0.45)		(-0.13)		(0.24)
Remittance		-0.0182		-0.00924		-0.0401
		(-1.16)		(-0.60)		(-0.69)
Deposit insurance		-0.224*		-0.203		-
		(-1.77)		(-1.57)		-
RQE		-0.207		-0.172		0.735
		(-1.48)		(-1.07)		(1.65)
Observations	5127	4931	4293	4097	834	834
# banks FE	556	537	482	463	74	74
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.096	0.107	0.101	0.110	0.125	0.149

This table reports the estimations of the baseline model Equation (3.3). The dependent variable is the bank Z-score in logarithm. The variable of interest is monetary policy key rate changes ($\Delta(IR)$). The empirical strategy is the FE estimator. Country, bank and time fixed-effects are included in all models. Standards errors are robust and clustered at the bank level.

*** Statistical significance at the 1% level

**Statistical significance at the 5% level

* Statistical significance at the 10% level.

Table 3.3: Interest rates and Risk-taking in Africa: Alternative risk measures.

	Full Sample						SSA						North Africa					
	(1) ROA	(2) ROE	(3) $\sigma(ROAA)$	(4) NPLs	(5) LLPs	(6) Risk-assets	(7) ROA	(8) ROE	(9) $\sigma(ROAA)$	(10) NPLs	(11) LLPs	(12) Risk-assets	(13) ROA	(14) ROE	(15) $\sigma(ROAA)$	(16) NPLs	(17) LLPs	(18) Risk-assets
$\Delta(IR)$	0.0234**	0.250***	-0.00678	-0.0930**	-0.0311**	-0.00157*	0.0228*	0.223**	-0.00705	-0.104**	-0.0317**	-0.00148	0.0801	1.118**	0.0330	0.0715	0.0486	0.00729**
	(2.10)	(2.80)	(-1.18)	(-2.19)	(-2.13)	(-1.84)	(1.94)	(2.36)	(-1.18)	(-2.43)	(-2.06)	(-1.67)	(1.36)	(2.06)	(1.10)	(0.45)	(0.82)	(5.45)
Size	-0.266**	-0.381	-0.297***	1.247	0.361*	0.0101	-0.257	0.583	-0.294***	0.556	0.467*	0.0238	-0.407*	-3.800	-0.326*	6.208*	-0.0752	-0.131***
	(-2.00)	(-0.35)	(-3.14)	(1.19)	(1.82)	(0.53)	(-1.60)	(0.47)	(-2.61)	(0.53)	(1.90)	(1.70)	(-1.99)	(-1.51)	(-1.94)	(1.88)	(-0.32)	(-11.92)
Capitalization	-0.00448	-0.304***	-0.000691	0.0272	0.00367	0.00268**	-0.00653	-0.275***	-0.000374	-0.0288	0.00376	0.00247**	0.0215	-0.663**	-0.00166	0.328	0.0476**	0.0139***
	(-0.30)	(-3.80)	(-0.10)	(0.42)	(0.26)	(2.40)	(-0.41)	(-3.29)	(-0.05)	(-0.45)	(0.25)	(2.20)	(1.09)	(-2.34)	(-0.17)	(0.73)	(2.05)	(253.87)
Diversification	-0.863**	-8.377***	0.162	4.494**	0.662	-0.0429	-0.930**	-6.213*	0.154	2.797	0.740	-0.0302	-0.0822	-2.161	0.220	-1.531	0.245	-0.0197
	(-2.50)	(-3.23)	(0.79)	(2.43)	(1.48)	(-1.33)	(-2.01)	(-1.87)	(0.57)	(1.26)	(1.29)	(-0.84)	(-0.29)	(-0.61)	(1.05)	(-1.20)	(0.33)	(-0.62)
Efficiency	-0.00423	-0.0533**	0.00244	-0.0174	-0.00981**	0.0000482	-0.00435	-0.0407*	0.00304	-0.0250	-0.0104**	0.0000618	-0.00434	-0.125**	-0.00141	0.00759	-0.00442	-0.000382***
	(-1.38)	(-2.52)	(1.25)	(-1.07)	(-2.42)	(0.38)	(-1.22)	(-1.74)	(1.38)	(-1.62)	(-2.37)	(0.53)	(-1.64)	(-2.62)	(-0.83)	(0.14)	(-0.54)	(-17.75)
Profitability	0.291***	1.743***	-0.0587***	-0.687***	-0.156***	0.0000790	0.285***	1.620***	-0.0539**	-0.709***	-0.146***	-0.000529	0.292***	3.594***	-0.138**	-0.357	-0.364***	-0.00363*
	(7.04)	(6.72)	(-2.77)	(-4.76)	(-3.50)	(0.05)	(6.33)	(6.02)	(-2.41)	(-5.01)	(-3.08)	(-0.33)	(4.61)	(2.94)	(-2.27)	(-0.87)	(-3.74)	(-3.46)
Market concentration	0.892*	12.89**	-0.195	-7.150	1.498	-0.695***	1.404**	15.12**	-0.183	-6.505	1.206	-0.708***	1.715	43.57***	0.705	-5.287	2.674	-0.314*
	(1.80)	(2.29)	(-0.51)	(-0.80)	(1.30)	(-6.06)	(2.48)	(2.38)	(-0.43)	(-0.83)	(0.94)	(-5.88)	(1.28)	(2.65)	(0.74)	(-0.14)	(0.89)	(-3.57)
FDI	0.00425	-1.417	-2.577**	-13.87	3.577*	-0.476***	2.556	66.19***	-2.966*	-38.54***	1.851	-0.486**	-1.876	-32.64	-1.219	39.95**	2.370	0.273
	(0.00)	(-0.11)	(-2.42)	(-1.24)	(1.67)	(-3.04)	(1.13)	(4.35)	(-1.87)	(-3.08)	(0.53)	(-2.16)	(-0.67)	(-0.98)	(-0.62)	(2.22)	(0.56)	(1.87)
Inflation	0.0186	0.202**	0.0219***	-0.00419	0.0175	0.00153**	0.0222	0.141	0.0201***	0.106	0.0215	0.00175**	-0.0325	-0.462*	0.0129	-0.0598	0.0356	-0.00301**
	(1.47)	(2.36)	(3.49)	(-0.06)	(1.15)	(2.18)	(1.43)	(1.45)	(2.74)	(1.51)	(1.21)	(2.53)	(-1.30)	(-1.70)	(1.40)	(-0.57)	(0.97)	(-4.86)
GDP growth rate	0.0243	0.385***	-0.00202	-0.263***	-0.0277	0.00231**	0.0168	0.286**	-0.00317	-0.165**	-0.0144	0.00233*	0.0566	0.563	0.00837	-0.736***	-0.0160	-0.00166
	(1.65)	(3.25)	(-0.22)	(-3.09)	(-1.14)	(2.23)	(1.01)	(2.28)	(-0.31)	(-2.01)	(-0.54)	(1.81)	(1.59)	(1.55)	(0.68)	(-3.44)	(-0.31)	(-1.26)
Commodity prices index (Importations)	-0.000368	0.0250	-0.000527	0.0117	0.00238	0.000210	0.00175	0.0365	-0.00136	0.0127	0.00160	0.000219	-0.00190	-0.00144	0.000458	-0.0581	-0.0300**	-0.0000197
	(-0.11)	(1.05)	(-0.23)	(0.88)	(0.58)	(0.38)	(0.47)	(1.39)	(-0.54)	(0.86)	(0.34)	(0.36)	(-0.33)	(-0.03)	(0.16)	(-1.07)	(-2.00)	(-0.07)
Remittance	0.00242	0.138	0.0167	0.0177	0.00873	0.000434	0.00421	-0.0409	0.0118	0.514**	0.000976	-0.00166	0.0235	0.475	0.0437*	-0.376	0.0147	0.00598**
	(0.15)	(1.03)	(1.14)	(0.08)	(0.33)	(0.09)	(0.24)	(-0.31)	(0.78)	(2.41)	(0.03)	(-0.34)	(0.39)	(0.61)	(1.76)	(-0.85)	(0.16)	(5.64)
Deposit insurance	-0.0597	1.385	0.0941	0.955	0.435	0.0739***	0.0103	2.659	0.0902	-0.0564	0.359	0.0688***	-	-	-	-	-	-
	(-0.33)	(0.74)	(0.61)	(0.83)	(1.55)	(5.14)	(0.05)	(1.42)	(0.57)	(-0.05)	(1.25)	(3.85)	-	-	-	-	-	-
RQE	0.232	-4.231	0.229	3.384	0.321	0.0540	0.839**	4.009	0.343	0.484	-0.230	0.0323	-1.089***	-11.82***	-0.913***	5.525	1.874**	-0.168***
	(0.85)	(-1.48)	(1.26)	(1.47)	(0.74)	(1.05)	(2.53)	(1.38)	(1.45)	(0.20)	(-0.44)	(0.47)	(-3.84)	(-3.07)	(-2.86)	(1.33)	(2.34)	(-17.82)
Observations	5009	4972	5151	3211	4643	2246	4154	4122	4278	3064	3836	1971	855	850	873	395	807	275
# banks FE	542	540	542	420	518	326	468	466	468	390	446	295	74	74	74	51	72	31
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.159	0.143	0.069	0.107	0.036	0.083	0.157	0.146	0.070	0.139	0.031	0.085	0.271	0.269	0.126	0.221	0.134	0.323

This This table reports the results of estimations of the baseline model Equation (3.3). We use alternative risk-taking proxies as return on assets ($ROAA$), return on equity (($ROEA$), standard deviation of $ROAA$ around three years windows, ratio of performing loans to total gross loans ($NPLs$), ratio of provision for loss loans to gross loans ($LLPs$) and ratio of risk-weighted assets to total assets (Risk-assets). The variable of interest is monetary policy key rate changes ($\Delta(IR)$). The empirical strategy is the FE estimator. Country, bank and time fixed-effects are included in all models. Standards errors are robust and clustered at the bank level.

*** Statistical significance at the 1% level

**Statistical significance at the 5% level

* Statistical significance at the 10% level.

For clarity, we will focus on the following indicators in the remainder of the analysis: Z-score, NPLs, LLPs, and Risk-assets. These indicators provide valuable insights into the solvency and risk-taking behavior of banks.

3.6.2 Endogeneity of monetary policy and risk-taking

In our baseline model, we assumed that monetary policy changes are not sensitive to developments in banking stability indicators. This assumption is plausible because central banks generally prioritize monetary stability in most of countries, and the focus on financial stability gained significant attention after the 2008-2009 financial crisis. Central banks primarily achieve financial stability through implementing banking regulations rather than through adjustments in interest rates, as far as our understanding goes.

However, we address this potential reverse causality by instrumenting for the changes in policy rates using the two-stage least squares technique (2SLS). The challenge with the instrumental variable approach lies in selecting relevant instruments. In other words, we need to find a variable related to the variations in monetary policy (instrument relevance) but not directly linked to the Z-score (exclusion restriction). Given the difficulty in finding such variables, we use lagged changes in the policy rates as instruments. Specifically, we utilize internal instruments such as second and third-order lags of monetary policy key rate as Altunbas et al. (2010).[9]

Several tests are conducted to verify the validity of our instrumental variable technique. First, we check whether the instrument satisfies the first criterion of a good instrument, which is whether it is related to the variable being instrumented. For this, we refer to the first-stage F-statistics of excluded instruments. Secondly, the second criterion of exclusion restriction

[9]Some authors have used external instruments as the monetary policy rate or other interest rates of a related country. For example, Iannotta et al. (2013) use as IV the federal fund rate for the Bolivian interbank rate. For the ECB policy rate IV, Delis and Kouretas (2011) uses the German short-term nominal interest rate. We doubt that African countries' monetary policy rates follow the monetary policy stance of the ECB or Fed.

is verified through an over-identification test. This test checks whether the instruments are orthogonal to the error term in the second stage. A final test is the analysis of exogeneity using the Durbin-Wu-Hausman test to compare the model with instruments and the model estimated by the instrumental variable approach. The null hypothesis is that the two models provide the same results.

Table 3.4 displays the results using IV approach. For the Kleibergen-Paap Wald rank F-statistic for weak instruments, we consider the "rule of thumb" of Staiger and Stock (1994), which says that the F-statistic should be at least 10 for the week identification should not be considered as an issue.[10] For all models, F-statistic is above ten. We reject the null hypothesis for weak correlation between the endogenous regressor and our IV. Also, we failed to reject the null hypothesis of Hansen's test of over-identification. All instruments are valid. They satisfy the exclusion restriction condition. The null hypothesis of exogeneity of the model is rejected for some models while we failed to reject this hypothesis in some others. IV approach results in Table 3.4 are consistent of the fixed-effect estimator technique as the effect of $\Delta(IR)$ on the Z-score remains significant (column 1) and the effects are statistically significant for Z-score and NPLs in SSA and for NPLs and LLPs in North Africa.

[10]It cannot be compared to Stock and Yogo (2005) statistics due to the use of robust standard errors and clustering.

Table 3.4: Monetary policy and risk-taking: Endogenous monetary policy.

	Full Sample				SSA				North Africa			
	(1) Zscore	(2) NPLs	(3) LLPs	(4) Risk-assets	(5) Zscore	(6) NPLs	(7) LLPs	(8) Risk-assets	(9) Zscore	(10) NPLs	(11) LLPs	(12) Risk-assets
$\Delta(IR)$	0.0680***	-0.552**	-0.0857	-0.00299	0.0690***	-1.105***	-0.125	-0.00105	0.0195	0.972**	0.218**	0.00184
	(3.28)	(-2.33)	(-1.30)	(-1.21)	(2.97)	(-4.30)	(-1.57)	(-0.35)	(0.32)	(2.25)	(2.46)	(0.19)
Observations	4009	2871	2676	1875	3300	2500	2345	1603	709	371	690	272
# banks	441	352	342	262	384	309	300	233	57	43	56	29
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.068	0.108	0.038	0.111	0.060	-0.009	0.025	0.120	0.192	0.217	0.187	0.390
F-1st stage	48.994	40.032	48.509	56.776	39.902	31.248	36.145	32.828	1681.068	214.669	1333.789	16.182
Over-identification test (p-value)	0.830	0.692	0.256	0.968	0.812	0.576	0.390	0.857	0.175	0.125	0.624	0.371
Exogeneity test (p-value)	0.002	0.035	0.020	0.431	0.005	0.000	0.008	0.945	0.942	0.052	0.034	0.467

This table reports the estimates of the baseline model Equation (3.3). The dependent variable is the bank Z-score in logarithm. The variable of interest is monetary policy key rate changes ($\Delta(IR)$). The monetary policy key rate is considered as endogenous. The empirical identification strategy employed is the 2SLS using internal instruments (lag 1 and 2 of $\Delta(IR)$). All models include control variables. F-1st stage refers to Kleibergeen-Paap Wald rank F-statistic. Over-identification test refers to the J-value of the Hansen over-identification test. Under the null hypothesis, instruments are valid, i.e., respect the exclusion restriction. The exogeneity test refers to the Durbin-Wu-Hausman test of exogeneity. Under the null hypothesis, the model is exogenous. Standard errors are robust and clustered at the bank level for all models.

*** Statistical significance at the 1% level

**Statistical significance at the 5% level

* Statistical significance at the 10% level.

3.6.3 Dynamic model

Several arguments are put forward in the literature to highlight the dynamic nature of banking risk. Therefore, using a static model while ignoring this dynamic aspect could bias the analysis results. We employ a new specification of our baseline model by treating the risk indicators as dynamic, incorporating the lag of the Z-score as one of the regressors. Thus, the new model is formulated as follows:

$$\begin{aligned} Zscore_{ijt} = \lambda Zscore_{ij,t-1} + \beta\Delta(IR)_{jt} + \alpha Bankcharact_{ijt} + \gamma Macro_{jt} \\ + \delta Institut_{jt} + \nu_i + \mu_j + \pi_t + \varepsilon_{ijt} \end{aligned} \tag{3.4}$$

The usual estimators, such as Least Square Dummy Variables (LSDV) and the fixed-effects (FE), are not appropriate for estimating the above model (Equation (3.4)). Because of lagged dependent variable, $Zscore_{i,t-1}$, the LSDV estimator produces biased and inconsistent estimates as the $Zscore_{i,t-1}$ is correlated with the individual fixed-effect, i.e., $E[Zscore_{i,t-1}\mu_i] \neq 0$. This bias can be tackled by using the FE estimator, which eliminates the fixed-effects through the within-group transformation. Applying FE does not solve the bias due to the correlation between the lagged dependent variable and the error term in the transformation model. The bias is known as Nickell-bias (Nickell, 1981). Other estimators have been proposed to overcome the finite-sample bias of the FE estimator as the instrumental variable approach of Anderson and Hsiao (1982), which removes the fixed-effects via the first difference transformation of the Equation (3.4).

$$\begin{aligned} \Delta Zscore_{ij,t} = \lambda\Delta Zscore_{ij,t-1} + \beta\Delta(\Delta(IR)_{jt}) + \alpha\Delta Bankcharact_{ijt} + \gamma\Delta Macro_{jt} \\ + \delta\Delta Institut_{jt} + \Delta\nu_{it}, \quad i = 1, ..., N;\ t = 3, ..., T. \end{aligned} \tag{3.5}$$

The main limitation of this method is a lack of efficiency due to ignoring additional valid instruments. Indeed, this approach employs $Zscore_{ij,t-2}$ (or $\Delta Zscore_{ij,t-2}$) as the instrument

for $Zscore_{ij,t-1}$. Some researchers, to address this lack of efficiency of the AH-IV estimator, have proposed using longer-lagged dependent variables as additional instruments. Applying the generalized method of moments, Arellano and Bond (1991) suggest the first-Difference GMM (Diff-GMM), which considers the moment conditions, $E[Zscore_{ij,t-s\Delta\nu_{ijt}}] = 0$, with $t = 3, ..., T$ and $s = 2, ..., t-1$, and uses a vector $(Zscore_{ij1}, ..., Zscore_{ij,t-2})$ as the instruments for $\Delta Zscore_{ijt}$ in the first-differenced Equation (3.5). To improve the efficiency of the former estimator, Blundell and Bond (1998) proposed the system GMM estimator (Sys-GMM) by utilizing additional moment conditions in the level Equation (3.4). This estimator considers $(\Delta Zscore_{ij1}, ..., \Delta Zscore_{ij,t-2})$ as instruments for $Zscore_{ij,t-1}$ under the following moment conditions : $E[\Delta Zscore_{ij,t-s}\nu_{it}] = 0$ for $t = 3, ..., T$ and $s = 1, ..., t-2$ (Arellano and Bover, 1995; Blundell and Bond, 1998).

However, as noted by Bruno (2005), for IV and GMM estimators to hold, their properties required a large N relative to T, so with a small number of cross-section units in panel data, this approach can be severely biased and imprecise. Another strand of research techniques to correct the bias of fixed-effects is the bias-corrected least-squares dummy variable estimator (LSDVC) proposed by Kiviet (1995). Bruno (2005) extends Kiviet (1995) formulas to unbalanced panels with a strictly exogenous selection rule. We use the system GMM and the LSDVC techniques as alternative methods for the robustness checks.

Table 3.5 displays the estimates of two estimator techniques (GMM and LSDVC). The estimates using GMM-system and LSDVC are consistent with previous findings using the FE approach. Thus, our baseline model does not suffer from misspecification. The results of the sub-samples are also consistent with the baseline model. A cut (hike) in key policy rate significantly affects the Z-score, NPLs and LLPs in SSA.

Table 3.5: Monetary policy and risk-taking: Dynamic model.

	Z-zcore		NPLs		LLPs		Risk-assets	
	GMM-S (1)	LSDVC (2)	GMM-S (3)	LSDVC (4)	GMM-S (5)	LSDVC (6)	GMM-S (7)	LSDVC (8)
$\Delta(IR)$	0.00897***	0.00758*	-0.112***	-0.0832***	-0.00717	-0.0239	-0.000167	-0.000155
	(2.67)	(1.72)	(-3.24)	(-12.53)	(-0.40)	(-1.59)	(-0.21)	(-0.20)
Observations	4640	4617	3195	3195	3168	4569	2013	2013
# banks	528	528	428	428	427	513	317	317
Bank FE		Yes		Yes		Yes		Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of instruments	189		115		115		96	
AR1 (p-value)	0.000		0.000		0.000		0.000	
AR2 (p-value)	0.622		0.883		0.265		0.191	
Hansen-J (p-value)	0.196		0.168		0.403		0.665	

This table reports the coefficients of the dynamic model estimation using the system GMM and LSDVC techniques. The dependent variable in columns and 2 is the Z-score in logarithm; in columns 3 and 4, the dependent variable is the ratio of non-performing loans (NPLs); in columns 5 and 6, the dependent variable is the ratio of loss loan provisions (LLPs) and in columns 7 and 8 the dependent variable is the ratio of risk assets to assets (Risk-assets). All models include control variables. Standard errors are robust and clustered at the bank level.

*** Statistical significance at the 1% level

**Statistical significance at the 5% level

* Statistical significance at the 10% level.

Table 3.6: Monetary policy and risk-taking by subsamples: Dynamic model.

	SSA								North Africa							
	Z-zcore		NPLs		LLPs		Risk-assets		Z-zcore		NPLs		LLPs		Risk-assets	
	GMM-S	LSDVC	GMM-S	LSDVC	GMM-S	LSDVC	GMM-S	LSDVC	GMM-S	LSDVC	GMM-S	LSDVC	GMM-S	LSDVC	GMM-S	LSDVC
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	Zscore	Zscore	NPLs	NPLs	LLPs	LLPs	Risk-assets	Risk-assets	Zscore	Zscore	NPLs	NPLs	LLPs	LLPs	Risk-assets	Risk-assets
$\Delta(IR)$	0.00827**	0.00716***	-0.123***	-0.0930***	-0.0514	-0.0260**	-0.0000159	-0.000188	-0.0164	-0.0113	-0.0260	-0.192	0.0207	0.0505	-0.000988	0.00244
	(2.36)	(2.84)	(-3.47)	(-15.89)	(-0.81)	(-1.97)	(-0.02)	(-0.25)	(-0.53)	(-0.25)	(-0.14)	(-0.89)	(0.32)	(0.42)	(-0.17)	(0.14)
Observations	3836	3818	2842	2842	3776	3776	1769	1769	804	799	353	353	793	793	244	244
# banks	454	454	378	378	443	443	287	287	74	74	50	50	70	70	30	30
Bank FE		Yes				Yes		Yes		Yes				Yes		Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of instruments	185		111		109		93		76		75		76		60	
AR1 (p-value)	0.000		0.000		0.000		0.000		0.000		0.013		0.003		0.000	
AR2 (p-value)	0.906		0.810		0.819		0.245		0.667		0.361		0.154		0.662	
Hansen-J (p-value)	0.066		0.231		0.336		0.536		0.713		1.000		0.763		1.000	

This table reports the coefficients of the dynamic model estimation using the system GMM and LSDVC techniques. All models include control variables. Standard errors are robust and clustered at the bank level.

*** Statistical significance at the 1% level

**Statistical significance at the 5% level

* Statistical significance at the 10% level.

3.7 Heterogeneous analyses

The relationship between monetary policy changes and risk-taking can be shaped by some characteristics. In our analysis of heterogeneity, we seek to determine how banks and financial systems characteristics influence the extent to which monetary policy affects the risk-taking behaviors of banks. To do so, we extend our baseline model by including interaction terms. We have the following model :

$$\begin{aligned} Zscore_{ijt} = c + \beta\Delta(IR)_{jt} + \theta\Delta(IR)_{jt} * Z + \alpha Bankcharact_{ijt} + \gamma Macro_{jt} \\ + \delta Institut_{jt} + \nu_i + \mu_j + \pi_t + \varepsilon_{ijt} \end{aligned} \tag{3.6}$$

where Z represents the characteristic of interest. $\Delta(IR)$ indicates the isolated effect of the variation in the Central bank policy rate on bank risk-taking, while $\Delta(IR) \times Z$ signifies the combined effect of the variation in the policy rate along with the characteristic of interest. When $\Delta(IR) \times Z$ is greater than zero, it indicates that the Z variable amplifies the effect of monetary policy on risk-taking. On the other hand, when $\Delta(IR) \times Z$ is less than zero, it indicates that the variable Z mitigates the effect of a policy rate cut on bank risk-taking.[11]

3.7.1 Bank characteristics

Empirical evidence shows that banks' characteristics influence their risk-taking. Thus, it is important to understand to what extent these characteristics affect the impact of a change in the monetary policy rate on their risk-taking. We examine the following bank characteristics: size, capitalization, efficiency and ownership structure.

Regarding bank size, the prevailing wisdom in the literature suggests that large banks may be more prone to taking risks due to moral hazard concerns (Mishkin, 2006). Therefore,

[11]This only applies to the Z-score indicator. For other dependent variables such as NLPs, LLPs, and risk-assets ratios, if $\Delta(IR) \times Z < 0$, it indicates an amplification of the effect of an accommodative monetary policy on bank risk-taking. Conversely, if $\Delta(IR) \times Z > 0$, it indicates a reduction in risk-taking during an expansionary monetary policy period.

a decrease in monetary policy rates could incentivize larger banks to take on more risk to achieve their desired level of profitability. We include in all models banks and macroeconomic variables and Z. For clarity, we only display the following coefficients: $\Delta(IR)$ and $\Delta(IR) \times Z$. In Equation (3.6), the interaction term is presented as $\Delta(IR) \times Size$. Tableau 3.7 presents the estimations of Equation (3.6). The coefficient of the interaction term ($\Delta(IR) \times Size$) is positive and significant. This finding suggests that the bank size enhances the effect of a loose monetary policy on bank Z-score. Specifically, when there is a positive change in monetary policy (indicating a tightening of monetary policy), it improves the solvency of large banks. On the other hand, a reduction in the key policy rate harms the Z-score of large banks, suggesting that they tend to take on more risk when interest rates decrease, reducing their solvency. This finding confirmed the conclusions of Mishkin (2006) and Demirgüç-Kunt and Huizinga (2010) on the positive nexus between bank size and risk-taking.

The second banking characteristic that we are interested in our heterogeneity analysis is capitalization. There is a vast literature on the link between bank leverage and risk-taking. Undercapitalized banks tend to take more risks than their well-capitalized counterparts due to the lower loss they would incur. The interaction term with capitalization ($\Delta(IR) \times Capitalization$) allows us to demonstrate the effect of the level of capitalization on bank risk-taking during a period of expansionary monetary policy. Results presented in Table 3.7 display the positive relationship between the risk-assets variable and the interaction term ($\Delta(IR) \times Capitalization$). These results suggest that capitalization reduces bank risk-taking during a loose monetary policy stance. These findings are in line with those of Delis and Kouretas (2011), who find that the bank capitalization is inversely related to the ratio of risk assets to total assets and NLPs.

The third banking characteristic that we examine is its efficiency ($\Delta(IR) \times Efficiency$). Banking efficiency is measured by the ratio of expenses to total revenue. A low ratio denotes greater efficiency of the bank, meaning that it generates more revenue with minimum cost.

Thus, the most efficient banks are able to reduce the adverse effect of an expansionary monetary policy on bank risk-taking. The coefficient associated with the interaction term $(\Delta(IR) \times Efficiency)$ in Table 3.7 is positive and statistically significant at the 10% level. This result supports the thesis that inefficiency harms the probability of bank default (Berger and Humphrey, 1997) and amplifies bank risk-taking during a loose monetary policy stance.

The fourth banking characteristic we examine is the ownership structure, specifically domestic versus foreign ownership. The literature on ownership structure and risk-taking is mixed. On the one hand, foreign banks, particularly "greenfield" banks, face an informational disadvantage at the start of their operations, unlike their older counterparts, who have acquired expertise in distinguishing between good and bad credits over time. Consequently, some borrowers in these new foreign banks may be creditworthiness compared to those in older banks. It may take several years for these new foreign banks to catch up regarding information acquisition (Dell'Ariccia et al., 1999). Some argue that foreign banks take more risks than domestic banks due to the principal-agent problem arising from moral hazard. This is manifested by managers of foreign bank subsidiaries seeking huge profits, thus pursuing their interests. On the other hand, foreign banks could contribute to improving the health of the financial system in host countries, especially those in developing countries, through the transfer of techniques and technologies to the local market. According to some authors such as Levine (1996), foreign banks, particularly multinationals, can introduce new financial services, modern banking techniques, and more sophisticated technologies. This could encourage domestic banks to adopt them and thus improve the efficiency of the banking industry in the host country, for example, by improving risk assessment. Due to their multinational character, foreign banks may be less sensitive to interest rate fluctuations. They may access internal capital from their parent company and international markets. Therefore, the effect of a monetary policy tightening could be more significant for domestic banks than for foreign banks.

We focus our ownership analysis on two specific characteristics: domestic versus foreign. The African banking system is mainly composed of foreign banks. Foreign banks are mainly two types: Pan-African and foreign banks from other regions worldwide. The Pan-African banks (PABs) are owned by an African entity, i.e., that holds at least 50% of bank capital. Foreign banks other than PABs are mostly from developed countries such as France, the United Kingdom and the USA. To capture the type of ownership, we proceed in two steps. In the first step, we create a dummy which takes one whether 50% of capital is foreign held, 0 otherwise. In the second step, we generate another dummy to indicate the African ownership of the bank (foreign ownership from another region). To avoid multicollinearity, we introduce each ownership dummy in a separate equation (specification). The purpose of the analysis is to examine how the bank's ownership structure shapes the relationship between monetary policy and risk-taking by analyzing the interaction term $\Delta(IR) \times$ Foreign bank. Table 3.8 displays the estimates. We uncover that foreign ownership reduces risk-taking during a loose monetary policy. The domestic banks react to monetary policy key rate changes by taking on more risk during an expansionist monetary policy stance. However, we did not find any effect that being a Pan-African bank, where at least 50% of the bank's capital is held by an African entity, impedes the risk-taking behaviors of banks.

Table 3.7: Monetary policy key rate changes and risk-taking: bank characteristics.

	Full Sample				SSA				North Africa			
	(1) Zscore	(2) NPLs	(3) LLPs	(4) Risk-assets	(5) Zscore	(6) NPLs	(7) LLPs	(8) Risk-assets	(9) Zscore	(10) NPLs	(11) LLPs	(12) Risk-assets
$\Delta(IR)$	-0.0911**	0.130	0.0372	0.00669	-0.108**	0.266	0.0779	0.00760	-1.252**	5.429	0.536	-0.150***
	(-2.17)	(0.24)	(0.20)	(0.77)	(-2.51)	(0.47)	(0.42)	(0.87)	(-2.39)	(1.40)	(0.42)	(-3.43)
$\Delta(IR)$*Size	0.00473**	-0.0121	-0.00280	-0.000260	0.00563***	-0.0220	-0.00510	-0.000258	0.0511**	-0.234	0.00180	0.00602***
	(2.38)	(-0.52)	(-0.36)	(-0.70)	(2.76)	(-0.87)	(-0.62)	(-0.69)	(2.38)	(-1.43)	(0.04)	(3.66)
$\Delta(IR)$*Capitalization	-0.0000941	0.00781	0.00208	-0.000181*	-0.000130	0.00882*	0.00213	-0.000211*	0.00332	-0.0208	-0.0113	0.00115***
	(-0.26)	(1.50)	(1.41)	(-1.69)	(-0.37)	(1.72)	(1.43)	(-1.93)	(0.56)	(-0.41)	(-1.03)	(2.80)
L.Efficiency $\times$ $\Delta(IR)$	0.000146**	-0.00104	-0.000661	-0.00000352	0.000134**	-0.000892	-0.000616	-0.00000828	0.00206*	0.00149	-0.00999*	0.000268
	(2.47)	(-0.60)	(-1.27)	(-0.22)	(2.19)	(-0.53)	(-1.26)	(-0.51)	(1.82)	(0.14)	(-1.85)	(1.22)
Observations	4931	3459	4643	2246	4097	3064	3836	1971	834	395	807	275
# banks	537	441	518	326	463	390	446	295	74	51	72	31
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.114	0.118	0.045	0.097	0.119	0.150	0.042	0.103	0.189	0.293	0.190	0.415

This table reports the estimations of the baseline model Equation (3.6). Dependent variables are the Z-score (in logarithm), ratio of non-performing loans (NPLs), ratio of loss loan provisions (LLPs) and the ratio of risk-weighted assets (Risk-assets). The variable of interest is monetary policy key rate changes ($\Delta(IR)$). The empirical strategy is the FE estimator. Country, bank and time fixed-effects are included in all models. Control variables are included in all models. Standards errors are robust and clustered at the bank level.

*** Statistical significance at the 1% level

**Statistical significance at the 5% level

* Statistical significance at the 10% level.

Table 3.8: Monetary policy key rate changes and risk-taking: bank ownership structure.

	Foreign banks				Pan-African banks				Foreign banks from developed countries			
	(1) Zscore	(2) NPLs	(3) LLPs	(4) Risk-assets	(5) Zscore	(6) NPLs	(7) LLPs	(8) Risk-assets	(9) Zscore	(10) NPLs	(11) LLPs	(12) Risk-assets
$\Delta(IR)$	0.0179**	-0.0923	-0.0628***	-0.00156	0.0161***	-0.0683	-0.0387**	-0.00142*	0.0119**	-0.103**	-0.0512***	-0.00132*
	(2.40)	(-1.59)	(-2.84)	(-1.62)	(3.32)	(-1.42)	(-2.10)	(-1.84)	(2.37)	(-2.22)	(-3.13)	(-1.73)
$\Delta(IR)$*Foreign bank	-0.0148*	0.000422	0.0366	0.000580								
	(-1.73)	(0.01)	(1.47)	(0.53)								
$\Delta(IR)$*PAB					-0.0150*	-0.0636	-0.00773	0.000505				
					(-1.92)	(-0.95)	(-0.32)	(0.46)				
$\Delta(IR)$*Foreign bank (developed country)									-0.000700	0.0635	0.0418	0.000834
									(-0.09)	(0.77)	(1.34)	(0.64)
Observations	3468	3053	3870	2021	4071	3053	3870	2021	4071	3053	3870	2021
# banks	392	385	438	284	453	385	438	284	453	385	438	284
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.121	0.120	0.044	0.128	0.133	0.117	0.044	0.128	0.133	0.117	0.045	0.126

This table reports the estimations of the baseline model Equation (3.6). Dependent variables are the Z-score (in logarithm), the ratio of non-performing loans (NPLs), the ratio of loss loan provisions (LLPs) and the ratio of risk-weighted assets (Risk-assets). The variable of interest is monetary policy key rate changes ($\Delta(IR)$). The empirical strategy is the FE estimator. Country, bank and time fixed-effects are included in all models. Control variables are included in all models. Standards errors are robust and clustered at the bank level.

*** Statistical significance at the 1% level

**Statistical significance at the 5% level

* Statistical significance at the 10% level.

3.7.2 Country characteristics

We seek to determine whether the nexus between monetary policy and risk-taking is influenced by the following financial system characteristics: banking market concentration, financial development level and regulatory quality. Z represents in Equation (3.6) these characteristics.

The first financial characteristic that we look at is the competition within the banking sector. There is evidence of the nexus between monetary policy and competition in Africa. Akande et al. (2018); Borauzima and Muller (2023) uncover that an increase in competition, proxied by Lerner and Herfindahl-Hirschman indices, reduces bank solvency (Z-score) and increases the NPLs and LLPs. We seek to determine whether the level of competition within the banking sector shapes the effect of monetary policy stance on risk-taking behaviors. Competition is measured by its opposite, which is the concentration within the banking system. We use our proxy of concentration measured by the share of the five largest banks. Table 3.9 reports the estimation results of the model of Equation (3.6). $\Delta(IR)$ is the isolated effect of monetary policy, and $\Delta(IR) \times$ Market concentration is the combined effect of policy key rate and concentration. The result in column 1 of table 3.9 indicates that less concentrated (more competition) reduces bank solvency. Put it differently, banks take on more risks through a loose monetary policy stance when the market is more concentrated. These results contrast with those of Akande et al. (2018); Borauzima and Muller (2023). However, they are in line with those of De Nicolo et al. (2006). These authors find a negative relationship between competition (HHI) and bank probability of failure (Z-score). However, we find that the market concentration improves the quality of bank assets (LLPs) for the full-sample, NPLs and LLPs in SSA, LLPs and risk-assets in North Africa.

The financial system development can influence the relationship between monetary policy and risk-taking. In a developed financial system, the behavior of banks may differ from those operating in a low-developed financial country. Specifically, banks in a well-functioning

financial system tend to be more responsive to changes in monetary policy. However, the effectiveness decreases when the financial level increases (Ma and Lin, 2016). We assume that a decrease (increase) in the policy rate will have a positive (negative) impact on risk indicators. This effect could be even more pronounced in an environment where the financial sector is well-developed, as it tends to reduce overall interest rates. The estimates of $\Delta(IR) \times$ FDI in Table 3.9 indicate a positive effect. The overall effect is positive. That means that the bank risk-taking is amplified by the level of financial level. In other terms, the impact of a loose monetary policy on bank risk-taking behavior or the effectiveness of monetary policy on bank risk-taking is more important when the financial level increases. Regarding the LLPs and Risk-assets, the overall effect is more important with the financial development. These results are consistent with the SSA region.

The last country-level variable that we analyzed is the quality of the regulatory. The intuition is that bank risk-taking is less in countries with good regulatory quality. The results are consistent with the literature. The estimate in column 3 indicates that the regulatory quality reduces the bank risk-taking incentives by reducing the bank LLPs.

Table 3.9: Monetary policy key rate changes and risk-taking: country characteristics.

	Full Sample				SSA				North Africa			
	(1) Zscore	(2) NPLs	(3) LLPs	(4) Risk-assets	(5) Zscore	(6) NPLs	(7) LLPs	(8) Risk-assets	(9) Zscore	(10) NPLs	(11) LLPs	(12) Risk-assets
$\Delta(IR)$	-0.00239	-0.150**	-0.0176	0.000590	-0.0127	-0.131	0.00405	0.000826	0.228	-4.409	-2.041*	-0.103
	(-0.27)	(-1.97)	(-0.63)	(0.49)	(-1.46)	(-1.61)	(0.13)	(0.65)	(0.38)	(-1.19)	(-1.83)	(-1.26)
Market concentration $\times$ $\Delta(IR)$	0.0896*	0.723	0.362**	0.0245	0.0666	1.298**	0.344**	0.0227	0.430	-0.957	1.056***	0.0513***
	(1.80)	(1.16)	(2.46)	(1.36)	(1.31)	(2.11)	(2.31)	(1.11)	(1.44)	(-0.53)	(5.57)	(3.56)
FDI $\times$ $\Delta(IR)$	0.0851**	0.251	0.0330	-0.0109*	0.124***	-0.238	-0.0992	-0.0127*	-0.325	9.146	4.746*	0.275
	(2.06)	(0.85)	(0.32)	(-1.72)	(2.91)	(-0.83)	(-0.79)	(-1.82)	(-0.24)	(1.01)	(1.83)	(1.31)
RQE $\times$ $\Delta(IR)$	0.0102	0.0103	0.101***	0.00219	-0.00365	0.0441	0.115***	0.00270	0.147	-2.202	-0.735*	-0.0305
	(1.01)	(0.11)	(2.64)	(1.15)	(-0.37)	(0.42)	(2.60)	(1.46)	(0.60)	(-1.61)	(-1.71)	(-1.15)
Observations	4294	3213	4087	2130	3521	2850	3336	1869	773	363	751	261
# banks	495	421	478	313	424	372	409	283	71	49	69	30
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.123	0.112	0.043	0.113	0.129	0.151	0.040	0.117	0.196	0.333	0.175	0.403

This table reports the results of estimations of the baseline model Equation (3.6). Dependent variables are the Z-score (in logarithm), the ratio of non-performing loans (NPLs), the ratio of loss loan provisions (LLPs) and the ratio of risk-weighted assets (Risk-assets). The variable of interest is monetary policy key rate changes ($\Delta(IR)$). The empirical strategy is the FE estimator. Country, bank and time fixed-effects are included in all models. Control variables are included in all models. Standards errors are robust and clustered at the bank level.

*** Statistical significance at the 1% level

**Statistical significance at the 5% level

* Statistical significance at the 10% level.

3.8 Conclusion

Banks play a crucial role in the financial system, and their importance is even more pronounced in developing countries where the banking sector represents the prominent component of the financial system, given the limited breadth of financial markets. In these countries, ensuring financial stability is economic development. Therefore, it is essential to identify the factors that influence banks' risk-taking behavior. Such knowledge is crucial for designing and implementing effective policies to prevent and mitigate risks, ensuring a sustainable supply of financial services to support economic growth and development. In this paper, we analyze the effect of monetary policy on bank risk-taking in African countries. To do so, we use an unbalanced panel of 537 banks for 43 African countries over the 2000-2020 period.

Our findings reveal a positive relationship between the key policy rate and bank risk measures in Africa, indicating that loose monetary policy is associated with a decline in solvency. This finding adds to the existing literature on the impact of monetary policy and bank risk-taking. However, it is essential to note that our sub-sample analysis indicates heterogeneity in the response of African banks to changes in the central bank's key rate. These findings remain robust across alternative risk measures, including non-performing loans (NPLs) and loss loan provisions (LLPs). To ensure the robustness of our results, we conducted sensitivity tests using alternative estimation techniques and models. The consistent findings across these approaches strengthen the validity and reliability of our conclusions. Furthermore, we find that the adverse effect of an accommodative monetary policy on bank solvency is limited to banks in Sub-Saharan Africa. Interestingly, negative variation of monetary policy key rate improves the quality of bank assets in North Africa by reducing of risk-assets ratio.

Heterogeneity analyses yield several noteworthy findings. Bank size and inefficiency amplify the risk appetite during periods of loose monetary policy through an increase in bank Z-score. Conversely, bank capitalization level and foreign ownership structure reduce risk-

taking during a loose monetary policy period. Country characteristic analyses reveal also some interesting findings. We uncover that the market concentration harms bank solvency. This finding suggests the "concentration-fragility" view. Furthermore, risk-taking behaviors are amplified by the development of the financial system and are reduced by the regulatory quality.

We have demonstrated that there exists a trade-off between the objective of accommodating monetary policy to support economic growth and the risk-taking behavior of banks in African economies, particularly in Sub-Saharan Africa. These findings suggest that central bankers should carefully consider how to use monetary policy instruments to balance the needs of promoting growth while also managing the potential increase in banks' appetite for risk.

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Table A1: Number of banks and observation by country.

Country	# banks	# observations by country	Country	# banks	# observations by country
ALGERIA	11	165	LIBERIA	4	8
ANGOLA	22	191	MADAGASCAR	4	59
BENIN	8	49	MALAWI	5	10
BOTSWANA	13	147	MALI	5	51
BURKINA FASO	8	59	MAURITANIA	10	75
BURUNDI	5	38	MAURITIUS	20	176
CAMEROON	7	95	MOROCCO	22	220
CAPE VERDE	7	64	MOZAMBIQUE	15	176
CENTRAL AFRICAN REPUBLIC	2	14	NAMIBIA	5	10
CHAD	4	20	NIGER	4	46
CONGO, REPUBLIC OF THE	2	10	NIGERIA	33	233
COTE D'IVOIRE	13	127	RWANDA	9	84
EGYPT	25	419	SENEGAL	11	111
ESWATINI	5	58	SEYCHELLES	4	7
ETHIOPIA	13	21	SIERRA LEONE	5	17
GABON	6	44	SOUTH AFRICA	37	467
GAMBIA	4	46	TANZANIA, UNITED REPUBLIC OF	37	299
GHANA	29	303	TOGO	6	43
GUINEA	2	4	TUNISIA	16	30
GUINEA-BISSAU	1	4	UGANDA	23	227
KENYA	52	452	ZAMBIA	18	191
LESOTHO	5	61			

Table A2: Definition and source of variables

Variables	*Measure*	*Source*
	Bank-level data	
Z-score	Natural logarithm of z-score : Log($zscore = \frac{ROA_{it}+EA_{it}}{\sigma(ROA_{it})}$))	Fitch Connect
Size	Natural logarithm of real total assets	Fitch Connect
Capitalization	Ratio of equity capital to total assets	Fitch Connect
Diversification	Ratio of non-interest income to total operating income (%)	Fitch Connect
Efficiency	Ratio of expenses to total revenue	Fitch Connect
Profitability	Ratio of profits before tax to total assets	Fitch Connect
	Interest rate	
Monetary policy rate	Central Bank policy key rate	International financial statistics (IFS)
	Macroeconomic variables	
Market concentration	Assets of three largest commercial banks as a share of total commercial banking assets	Fitch Connect
Financial depth	Financial development index	Financial Development Index Database
Inflation	Consumer Price Index growth rate	International financial statistics (IFS)
GDP	Growth rate of Gross Domestic Product	International financial statistics (IFS)
Commodity price index	Commodity Export Price Index	Terms of Trade (PCTOT) IMF
Remittance	Remittance inflows to GDP	Global Financial Development Database (GFDD)
Deposit insurance	Dummy variable equal to 1 if the country has an explicit deposit insurance, 0 otherwise.	Deposit Insurance Dataset of World bank.
Regulatory quality	Regulatory quality index	Kaufmann et al. (2011) WGI

Table A3: Comparison between Sub-Saharan and North Africa.

	Sub-Sahara Africa		North Africa		T-test between regions	
	Obs.	Mean.	Obs.	Mean.	Diff.	P-value
Zscore	4097	3.303	834	3.789	0.486***	0.000
Size	4097	19.818	834	21.822	2.005***	0.000
Capitalization	4097	14.969	834	10.652	-4.317***	0.000
Diversification	4097	0.405	834	0.338	-0.067***	0.000
Efficiency	4097	68.651	834	48.003	-20.648***	0.000
Profitability	4097	2.404	834	1.833	-0.571***	0.000
Market concentration	4097	0.066	834	0.044	-0.022***	0.000
FDI	4097	0.204	834	0.280	0.076***	0.000
Inflation	4097	7.052	834	6.394	-0.658***	0.003
GDP growth rate	4097	4.358	834	3.548	-0.811***	0.000
Commodity prices index	4097	88.396	834	80.547	-7.849***	0.000
Remittance	4097	2.591	834	5.082	2.491***	0.000
Deposit insurance	4097	0.328	834	0.462	0.134***	0.000
RQE	4097	-0.276	834	-0.548	-0.272***	0.000

Table A4: Matrix correlation

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Zscore	1.000														
$\Delta(IR)$	0.026^{a}	1.000													
Size	0.263^{c}	0.043^{c}	1.000												
Capitalization	0.065^{c}	-0.008	-0.315^{c}	1.000											
Diversification	-0.114^{c}	0.021	-0.021	0.010	1.000										
Efficiency	-0.324^{c}	-0.006	-0.336^{c}	0.118^{c}	0.153^{c}	1.000									
Profitability	0.226^{c}	0.009	0.051^{c}	0.138^{c}	0.000	-0.614^{c}	1.000								
Market concentration	0.059^{c}	0.013	0.160^{c}	-0.199^{c}	0.114^{c}	-0.130^{c}	0.074^{c}	1.000							
FDI	0.166^{c}	0.008	0.428^{c}	0.044^{c}	0.016	-0.081^{c}	-0.035^{b}	-0.198^{c}	1.000						
Inflation	-0.118^{c}	0.177^{c}	-0.019	0.053^{c}	-0.033^{b}	-0.017	0.144^{c}	-0.175^{c}	-0.082^{c}	1.000					
GDP growth rate	-0.094^{c}	-0.041^{c}	-0.188^{c}	-0.059^{c}	-0.021	0.099^{c}	-0.049^{c}	-0.028^{b}	-0.326^{c}	0.045^{c}	1.000				
Commodity prices index	0.015	0.057^{c}	-0.083^{c}	0.019	-0.020	0.081^{c}	-0.086^{c}	0.034^{b}	-0.025^{a}	-0.157^{c}	0.220^{c}	1.000			
Remittance	0.041^{c}	0.037^{b}	0.025^{a}	-0.095^{c}	-0.066^{c}	-0.059^{c}	0.038^{c}	0.089^{c}	-0.089^{c}	-0.013	-0.044^{c}	-0.037^{c}	1.000		
Deposit insurance	0.166^{c}	0.044^{c}	0.168^{c}	0.033^{b}	-0.052^{c}	-0.037^{c}	0.000	-0.108^{c}	0.285^{c}	-0.277^{c}	-0.107^{c}	-0.002	-0.122^{c}	1.000	
RQE	0.047^{c}	0.010	0.050^{c}	0.056^{c}	-0.041^{c}	0.022	-0.018	-0.150^{c}	0.615^{c}	-0.204^{c}	-0.066^{c}	0.226^{c}	-0.098^{c}	0.150^{c}	1.000

(1)=$Z-score$ (2)=$\Delta(IR)$ (3)=Size (4)=Capitalization (5)=Diversification (6)=Efficiency (7)=Profitability (8)=Market Concentration (9)=(FDI) (10)=Inflation (11)= GDP growth rate (12)=Commodity prices index (13)=Remittance (14)=Deposit insurance (15)=RQE.
a $p < 0.1$
b $p < .05$
c $p < 0.01$

CONCLUSION GÉNÉRALE

Cette thèse présente trois chapitres empiriques concernant l'impact de la dette souveraine et de la politique monétaire sur la dynamique du crédit privé et la stabilité bancaire dans les pays en développement. Elle apporte de multiples contributions à la littérature économique, en offrant une meilleure compréhension des effets des instruments de politique économique dans les pays en développement.

Le premier chapitre de cette thèse a consisté à analyser l'effet de l'exposition des banques à la dette souveraine sur leur activité de prêt au secteur privé dans les pays en développement. Cette étude est motivée par le récent développement de la réorientation de la dette publique vers le marché domestique dans de nombreux pays en développement. Dans un contexte de ressources limitées, d'un marché financier étroit et où les banques jouent un rôle important en tant que principale source du financement formel dans les pays en développement, il est essentiel de comprendre comment l'intervention du gouvernement sur le marché des fonds prêtables affecte le financement du secteur privé. Ce premier chapitre contribue de deux manières à la littérature. Tout d'abord, il enrichit la littérature sur la dette publique domestique et le financement du secteur privé dans les pays en développement à faible et moyen revenu. Il améliore notre compréhension de l'effet du financement du déficit public sur le marché domestique dans les pays où le système financier est moins développé. Ensuite, il propose une approche novatrice en utilisant des données détaillées sur le système bancaire de ces pays. Ces données nous permettent d'analyser l'impact de l'exposition des banques sur le crédit privé en tenant compte de leur diversité en termes de taille, de capitalisation et de structure de propriété. À notre connaissance, notre étude est la première à examiner ces spécificités de manière approfondie.

En utilisant des données provenant de 136 banques issues de 8 pays de l'Union Économique et Monétaire Ouest Africaine (UEMOA) sur la période de 2001 à 2017, notre étude a révélé que l'exposition des banques à la dette souveraine sur les marchés de capitaux régionaux a un impact négatif sur leur prêt au secteur privé en le réduisant. Toutefois, cet effet d'éviction

varie en fonction des caractéristiques des banques, qu'elles soient domestiques ou étrangères, bien-capitalisées ou sous-capitalisées, et qu'elles soient de grande ou de petite taille.

Le deuxième chapitre poursuit l'analyse du financement du secteur privé dans les pays en développement. Il se penche sur l'analyse de l'instrument monétaire à travers une variation du taux directeur de la Banque Centrale sur la perception de contrainte financière des firmes dans les pays en développement. La motivation de ce chapitre réside dans le souci de mieux comprendre l'effet de l'instrument monétaire sur le financement du secteur privé dans les pays en développement. Les apports de ce chapitre à la littérature sont multiples. Tout d'abord, il contribue à la littérature sur les effets de la politique monétaire dans les pays en développement, dont les premiers résultats ont été mitigés. Il apporte des éclairages ainsi sur les effets des décisions monétaires sur le secteur réel dans ces pays. Ensuite, notre travail analyse la réaction des entreprises (emprunteurs) plutôt que celle des intermédiaires financiers après un changement de politique monétaire. Cette analyse permet d'observer comment un changement de politique monétaire est perçu par le secteur privé à travers une modification de leur perception de la contrainte financière. Enfin, ce chapitre va plus loin en analysant les caractéristiques des entreprises et des pays qui sont susceptibles d'amplifier l'effet de la politique monétaire.

En combinant des données provenant d'enquêtes auprès des entreprises menées par la Banque mondiale et les taux directeurs des Banques Centrales collectés par nos soins, les résultats montrent que la perception de la contrainte financière change après une variation du taux directeur dans les pays en développement. Plus spécifiquement, la perception de la contrainte financière des entreprises enquêtées après une hausse (baisse) du taux directeur de la Banque Centrale augmente (diminue) comparativement à celles enquêtées juste avant le changement. Les caractéristiques des entreprises telles que la taille, l'âge, le genre du propriétaire et la familiarité avec les institutions financières affectent l'ampleur de cette perception. De plus, les caractéristiques des pays telles que le développement financier, la compétition au sein

du secteur bancaire et la liquidité du système financier ainsi que des institutions comme l'indépendance de la Banque Centrale contribuent à amplifier ou atténuer l'effet d'une variation du taux directeur sur la perception de la contrainte financière.

Enfin, dans le troisième et dernier chapitre de cette thèse, nous avons cherché à déterminer l'effet d'une variation du taux directeur de la Banque Centrale sur la prise de risque des banques dans les économies africaines. Le manque d'études sur la stabilité bancaire en lien avec la politique monétaire dans les pays en développement a incité cette recherche. Cette étude complète la littérature sur le canal de la prise de risque de la politique monétaire en analysant les pays en développement, qui connaissent en moyenne plus de crises bancaires que les pays à revenu élevé. L'analyse de l'hétérogénéité des banques et des pays permet de mieux comprendre les mécanismes qui amplifient l'effet d'une variation du taux directeur sur la stabilité bancaire.

Nous avons utilisé des données de 537 banques provenant de 43 pays africains sur la période 2000-2020. Le principal résultat qui ressort de ce chapitre est qu'une baisse du taux directeur de la Banque Centrale dégrade la solvabilité des banques en augmentant leur prise de risques en Afrique. Ce résultat corrobore les conclusions de la littérature sur les pays développés et émergents. Cependant, le canal de la prise de risque est seulement significatif pour le sous-échantillon de la région de l'Afrique Sub-saharienne. L'analyse de l'hétérogénéité au niveau des banques et des pays révèle que la probabilité de défaut bancaire pendant une période de politique monétaire expansionniste augmente avec la taille de la banque et la concentration au sein du secteur bancaire, et diminue avec le niveau de capitalisation, la présence d'actionnaires étrangers et la qualité de la régulation.

En somme, cette thèse a montré que l'utilisation des instruments de politique économique, notamment à travers le financement du déficit public sur le marché domestique et la variation du taux directeur de la politique monétaire, ne laisse pas indifférente la dynamique du crédit privé dans les pays en développement. Si le premier instrument permet aux gouvernements

d'accéder aux ressources financières nécessaires pour combler leur déficit sur le marché interne ou régional, il représente néanmoins un risque pour le financement du secteur privé en évinçant ce dernier sur le marché des fonds prêtables. L'utilisation de l'instrument monétaire représente à son tour un compromis. D'un côté, une baisse du taux directeur de la Banque Centrale peut stimuler la croissance économique en détendant la contrainte financière des entreprises. Et de l'autre côté, elle peut inciter les banques à prendre davantage de risques lors d'une période de politique monétaire expansionniste et menaçant ainsi la stabilité bancaire.

Les travaux empiriques abordés dans cette thèse pourraient être étendus. Dans le premier chapitre, nous avons analysé le canal quantitatif en supposant que le canal du taux était faible voire inexistant. Il serait intéressant de pousser l'analyse en examinant ce canal de transmission. En outre, en termes de stabilité, il serait aussi intéressant de voir comment un défaut souverain pourrait entraver la fourniture des services financiers dans les pays en développement. Cela pourrait se faire en examinant les banques avec une forte exposition à la dette souveraine et l'aménagement de leur bilan après la matérialisation d'un défaut souverain.

Le troisième chapitre offre des perspectives de recherche assez prometteuses. Cette étude pourrait être étendue à toutes les régions du monde pour affiner nos résultats. Par exemple, des travaux futurs pourront analyser dans un premier temps si la prise de risques des banques diffère d'une région à une autre ou si le cadre réglementaire joue un rôle essentiel dans les comportements des banques. Dans ce second temps, voir si l'adoption des exigences de Bâle par les pays en développement a eu les effets escomptés en rendant le système bancaire plus solvable.

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