# Bank stability, bank business model and the financial resource curse

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# I- Introduction

- The literature on resource curse has caught the attention of several economists, since the seminal article of Sachs and Warner (1996).
- During the last 20 years, strong fluctuations of natural resources price have focused the attention on the transmission of this instability to the banking system.
- Beck (2011) was the first one to highlight that countries rich in natural resources have less developed financial system.
- He was followed by authors like Kinda et al. (2016) and Mlachila and Ouedraogo (2017), who pinpointed the impact of natural resource price volatility on bank fragility.
- By relying on bank aggregate variables, they explained how low macroeconomic performance due to resource curse, translate to the banking system through credit defaults, deposits shrinking, and then bank instability.

# Research question and hypotheses

- **RQ: How does bank risk management help in explaining the financial resource curse?**
- To the best of our knowledge, this is the first time, the question is asked through this angle.
- Other studies used bank agregates variables and were only able to explain how banks reacted to external factors due to the resource curse.
- To the best of our knowledge, only Beck and Poelhekke (2023) use bank level data to address the issue, but they just confirm previous findings on aggregate data.
- **H: The novelty of our study , is to help understanding how banks behaviour (business model and credit policy) is at the heart of the financial resource curse.**

# II- Literature review:

- 2.1 On financial resource curse:
  - Financial resource curse evidenced as **financial instability**:
    - resource price volatility easily translate into financial instability.
    - Crises occurrence: Van der Ploeg and Polhekke (2009) and Eberhardt & Presbitero (2021)
    - Financial fragility: Mlachila and Ouedraogo (2017) and Kinda et al. (2016)
  - Financial resource curse evidenced as **low level of financial development**:
    - Strengh of institutions to shape financial development
    - Contracts enforcement and fostering incentives: Kassouri et al. (2020), Bhattacharyya and Hodler (2014), Acemoglu and Johnson (2005).
  - Financial resource curse evidenced as **low level of intermediation**:
    - No demand in external finance ⟹ low level of intermediation through banks: Do and Levchenko (2007), Batthacharya and Holder (2014).
    - Investing most in the resource sector ⟹ low risk management: Beck and Polhekhe (2017).

# II- Literature review:

- 2.2 On bank risk:
  - Market structure, opacity and banking stability:
    - The market structure : competition, concentration and market power: Calice et al. (2021), Boyd and De Nicolo (2005), Morgan, 2002; Flannery et al. 2013)
  - Bank business model and banking stability:
    - The way banks generate their profit, the targeted customers and the distribution channels of their financial services, Köhler (2015).
    - Risk management: funding and income structures will be part of their diversification strategy, Demirgüç-Kunt and Huizinga (2010), Altunbas et al. (2011), DeYoung and Torna (2013).

# III-Methodology:

## 3.1 The model:

- Following Köhler (2015) and Fosu et al. (2017) we relate bank risk to bank business model, the credit policy and total natural resource rents.

  - Model 1:

$$\ln(Risk_{i,j,t}) = \alpha + \beta_1 TOTAL\_RENTS_{j,t-1} + \beta_2 TOTAL\_RENTS^2{}_{j,t-1} + \beta_3 LOANS\_ASSETS_{i,j,t} + \beta_4 BUSINESS\_MOD_{i,j,t} + \gamma_1 X_{i,j,t} + \delta_1 Z_{j,t} + \mu_j + \nu_t + \varepsilon_{i,j,t} \quad (1)$$

  - Model 2: which is model 1 encompassing crossed terms between total resources rents and bank business model and credit policy.

$$\ln(Risk_{i,j,t}) = \alpha + \lambda_1 TOTAL\_RENTS_{j,t-1} + \lambda_2 TOTAL\_RENTS^2{}_{j,t-1} + \lambda_3 LOANS\_ASSETS_{i,j,t} + \lambda_4 BUSINESS\_MOD_{i,j,t} + \lambda_5 \left(BUSINESS\_MOD_{i,j,t} * TOTAL\_RENTS_{j,t-1}\right) + \lambda_6 (LOANS\_ASSETS_{i,j,t} * TOTAL\_RENTS_{j,t-1}) + \gamma_2 X_{i,j,t} + \delta_2 Z_{j,t} + \mu_j + \nu_t + \varepsilon_{i,j,t} \quad (2)$$

# III-Methodology:

- Model 3: which is model 2 encompassing tripled crossed terms between total resource rents bank business model and credit policy.

- $$\ln(Risk_{i,j,t}) = \alpha + \theta_1 TOTAL\_RENTS_{j,t-1} + \theta_2 TOTAL\_RENTS^2{}_{j,t-1} + \theta_3 LOANS\_ASSETS_{i,j,t} + \theta_4 BUSINESS\_MOD_{i,j,t} + \theta_5 \left(BUSINESS\_MOD_{i,j,t} * TOTAL\_RENTS_{j,t-1}\right) + \theta_6 (LOANS\_ASSETS_{i,j,t} * TOTAL\_RENTS_{j,t-1}) + \theta_7 \left(BUSINESS\_MOD_{i,j,t} * LOANS\_ASSETS_{i,j,t} * TOTAL\_RENTS_{j,t-1}\right) + \gamma_3 X_{i,j,t} + \delta_3 Z_{j,t} + \mu_j + \nu_t + \varepsilon_{i,j,t} \quad (3)$$

  - Where :

    -$TOTAL\_RENTS_{j,t-1}$: is the level of total natural rents as a percentage of GDP in country j at year t-1.
    -$LOANS\_ASSETS_{i,j,t}$ is the ratio of loans to total assets for bank i in country j at year t.
    -$BUSINESS\_MOD_{i,j,t}$ is a vector of two variables namely non interest income share and the ratio of non-deposit funding to total assets of bank i in country j at year t.
    - $X_{i,j,t}$: is a set of bank specific control variables.
    - $Z_{j,t}$ : is a set of country specific control variables.
    - $\mu_j$: is a country fixed effect.
    - $\nu_t$ : is a year fixed effect.
    - $\varepsilon_{i,j,t}$: is the error term.

# III-Methodology:

## 3.2 Data and summary statistics

Table A1: Descriptive statistics for profitability, capitalisation and risk measures

***Panel A:*** **resource based countries**

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| ROE | 15842 | 9.1*** | 12.507 | -55.09 | 53.18 |
| ROA | 15863 | 1.337*** | 2.077 | -8.69 | 11.05 |
| Equity/Assets | 17054 | 19.047*** | 15.899 | 1.09 | 94.68 |
| Total capital adequacy ratio (as reported) | 8977 | 23.81*** | 17.297 | 6.73 | 134.6 |
| Loan loss reserves/ Gross cust. loans and advances | 13221 | 5.625*** | 7.931 | 0 | 55.62 |
| Loan loss reserves/ Impaired loans | 11974 | 199.491*** | 232.209 | 10.36 | 1500 |
| NPLs ratio (as reported) | 14297 | 6.105*** | 6.083 | 0 | 29.79 |
| ln zscore v1 | 15848 | 2.657*** | .95 | -.19 | 4.996 |
| ln zscore v2 | 13997 | 3.126*** | 1.153 | -1.044 | 6.069 |

**Panel B: Non resource based countries**

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| ROE | 46765 | 6.513 | 10.764 | -55.36 | 53.14 |
| ROA | 47012 | .75 | 1.613 | -8.68 | 11.05 |
| Equity/Assets | 49245 | 13.569 | 13.936 | 1.04 | 94.7 |
| Total capital adequacy ratio (as reported) | 32312 | 20.099 | 13.207 | 6.73 | 134.5 |
| Loan loss reserves/ Gross cust. loans and adv. | 37834 | 6.493 | 7.895 | 0 | 55.71 |
| Loan loss reserves/ Impaired loans | 35686 | 96.001 | 123.737 | 10.36 | 1500 |
| NPLs ratio (as reported) | 42017 | 3.896 | 4.382 | 0 | 29.79 |
| ln zscore v1 | 46267 | 3.003 | .969 | -.189 | 5.017 |
| ln zscore v2 | 42630 | 3.335 | 1.174 | -1.057 | 6.069 |

Notes: Data are yearly from 2011 to 2021. ** denotes significance at 5% level for the mean comparison test. Data source is BankFocus. Variables are winsorised at 1% and 99%.

# 3.3-Results: model 1

| VARIABLES | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| Total rents (t-1) | 0.363*** | 0.739*** | 0.570*** | 0.493*** | 0.438*** | 0.799*** | 0.637*** | 0.659*** | 0.447** |
| | (0.0910) | (0.102) | (0.105) | (0.106) | (0.106) | (0.147) | (0.178) | (0.192) | (0.224) |
| Square _Total rents (t-1) | -0.582*** | -1.041*** | -0.666*** | -0.644*** | -0.648*** | -1.006*** | -0.871** | -0.562 | -0.429 |
| | (0.217) | (0.225) | (0.231) | (0.231) | (0.231) | (0.300) | (0.358) | (0.398) | (0.445) |
| gdp_c (t-1) | | | -0.121*** | -0.146*** | -0.139*** | -0.126*** | -0.170*** | -0.256*** | -0.309*** |
| | | | (0.0164) | (0.0168) | (0.0168) | (0.0220) | (0.0373) | (0.0368) | (0.0564) |
| gdp_growth (t-1) | | | | 0.00272*** | 0.00290*** | 0.00154*** | -0.000126 | 0.000203 | -0.000255 |
| | | | | (0.000387) | (0.000389) | (0.000500) | (0.000689) | (0.000840) | (0.000974) |
| inflation (t-1) | | | | | 0.000717*** | 0.000581*** | 0.00242*** | 0.00319*** | 0.00161* |
| | | | | | (0.000140) | (0.000200) | (0.000705) | (0.000659) | (0.000880) |
| interest rate (t-1) | | | | | | 0.0478 | 0.129 | 0.202*** | 0.0704 |
| | | | | | | (0.0401) | (0.0790) | (0.0679) | (0.0950) |
| concentration | | | | | | | -0.00148*** | | -0.000684* |
| | | | | | | | (0.000232) | | (0.000300) |
| depth of credit information | | | | | | | | -0.0127 | 0.0239 |
| | | | | | | | | (0.178) | (0.217) |
| legal rights | | | | | | | | -0.472*** | -0.468** |
| | | | | | | | | (0.153) | (0.217) |
| Constant | 1.448*** | 1.455*** | 2.121*** | 2.248*** | 2.190*** | 1.979*** | 2.058*** | 2.175*** | 2.412*** |
| | (0.291) | (0.292) | (0.306) | (0.306) | (0.306) | (0.333) | (0.389) | (0.380) | (0.471) |
| Observations | 53,240 | 53,240 | 53,023 | 53,013 | 53,013 | 37,285 | 26,726 | 25,052 | 19,288 |
| Number of BankID | 6,848 | 6,848 | 6,812 | 6,805 | 6,805 | 5,400 | 5,206 | 5,129 | 4,967 |
| Country FE | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Year FE | NO | YES | YES | YES | YES | YES | YES | YES | YES |
| R_square | 0.305 | 0.305 | 0.303 | 0.303 | 0.304 | 0.309 | 0.312 | 0.329 | 0.329 |

Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

# 3.3-Results: model 2

| VARIABLES | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| Total rents (t-1) | 1.819*** | 2.184*** | 1.823*** | 1.636*** | 1.412*** | 2.273*** | 2.043*** |
| | (0.176) | (0.181) | (0.186) | (0.240) | (0.290) | (0.322) | (0.384) |
| Square _Total rents (t-1) | -0.484** | -0.929*** | -0.546** | -0.916*** | -0.727** | -0.485 | -0.334 |
| | (0.219) | (0.227) | (0.233) | (0.301) | (0.362) | (0.398) | (0.446) |
| (Total rents(t-1))*(Gross Loans / Assets) | -1.582*** | -1.564*** | -1.586*** | -1.307*** | -0.879*** | -1.875*** | -1.427*** |
| | (0.152) | (0.152) | (0.153) | (0.194) | (0.235) | (0.266) | (0.319) |
| (Total rents(t-1))*(Non interest income/ Gross revenues) | -0.311** | -0.255* | -0.220 | 0.396** | 0.358* | 0.0374 | 0.156 |
| | (0.139) | (0.139) | (0.140) | (0.176) | (0.212) | (0.228) | (0.278) |
| (Total rents(t-1))*(Customer deposits / Total funding) | -0.637*** | -0.675*** | -0.574*** | -0.336** | -0.593*** | -0.775*** | -1.138*** |
| | (0.124) | (0.125) | (0.126) | (0.159) | (0.194) | (0.210) | (0.253) |
| Constant | 1.382*** | 1.390*** | 2.153*** | 1.969*** | 2.019*** | 2.050*** | 2.195*** |
| | (0.290) | (0.291) | (0.305) | (0.332) | (0.390) | (0.380) | (0.473) |
| Observations | 53,240 | 53,240 | 53,013 | 37,285 | 26,726 | 25,052 | 19,288 |
| Number of BankID | 6,848 | 6,848 | 6,805 | 5,400 | 5,206 | 5,129 | 4,967 |
| Country FE | YES | YES | YES | YES | YES | YES | YES |
| Year FE | NO | YES | YES | YES | YES | YES | YES |
| R-square | 0.306 | 0.306 | 0.304 | 0.310 | 0.313 | 0.330 | 0.331 |

Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

# 3.3-Results: model 3

| VARIABLES | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| Total rents (t-1) | 2.077*** | 2.464*** | 2.141*** | 1.900*** | 1.666*** | 2.360*** | 1.992*** |
| | (0.235) | (0.240) | (0.243) | (0.305) | (0.364) | (0.404) | (0.479) |
| Square _Total rents (t-1) | -0.486** | -0.932*** | -0.550** | -0.907*** | -0.713** | -0.468 | -0.326 |
| | (0.219) | (0.227) | (0.233) | (0.301) | (0.362) | (0.398) | (0.447) |
| (Total rents(t-1))*(Gross Loans / Assets) | -2.080*** | -2.104*** | -2.201*** | -1.800*** | -1.367*** | -2.012*** | -1.283** |
| | (0.340) | (0.340) | (0.341) | (0.407) | (0.479) | (0.520) | (0.614) |
| (Total rents(t-1))*(Non interest income/ Gross revenues) | -0.634*** | -0.579** | -0.525** | 0.0223 | 0.0893 | -0.479 | -0.0342 |
| | (0.235) | (0.234) | (0.236) | (0.297) | (0.356) | (0.385) | (0.468) |
| (Total rents(t-1))*(Customer deposits / Total funding) | -0.784*** | -0.856*** | -0.836*** | -0.445* | -0.807*** | -0.400 | -0.773** |
| | (0.204) | (0.204) | (0.206) | (0.249) | (0.289) | (0.323) | (0.374) |
| (Total rents(t-1))*(Gross Loans / Assets)*(Customer deposits / Total funding) | 0.298 | 0.363 | 0.515 | 0.222 | 0.415 | -0.665 | -0.678 |
| | (0.312) | (0.311) | (0.314) | (0.364) | (0.410) | (0.457) | (0.521) |
| (Total rents(t-1))*(Gross Loans / Assets)*(Customer deposits / Total funding)*(Non interest income/ Gross revenues) | 0.668* | 0.676* | 0.649* | 0.727 | 0.531 | 0.891 | 0.254 |
| | (0.385) | (0.385) | (0.386) | (0.465) | (0.537) | (0.582) | (0.679) |
| Constant | 1.381*** | 1.389*** | 2.151*** | 1.959*** | 2.016*** | 2.021*** | 2.182*** |
| | (0.290) | (0.290) | (0.305) | (0.332) | (0.390) | (0.380) | (0.473) |
| Observations | 53,240 | 53,240 | 53,013 | 37,285 | 26,726 | 25,052 | 19,288 |
| Number of BankID | 6,848 | 6,848 | 6,805 | 5,400 | 5,206 | 5,129 | 4,967 |
| Country FE | YES | YES | YES | YES | YES | YES | YES |
| Year FE | NO | YES | YES | YES | YES | YES | YES |
| R_square | 0.306 | 0.306 | 0.304 | 0.310 | 0.313 | 0.331 | 0.331 |

Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

# 3.4 Robustness checks: Placebo test.

| VARIABLES | (1) | (2) | (3) |
|---|---|---|---|
| Total rents (t-1) | 27.48 | 50.13** | 53.95** |
| | (24.02) | (25.17) | (26.89) |
| Square _Total rents (t-1) | -3,842 | -4,315 | -4,475 |
| | (3,527) | (3,527) | (3,528) |
| Gross Loans / Assets | 0.238*** | 0.243*** | 0.242*** |
| | (0.0371) | (0.0373) | (0.0373) |
| Non interest income/ Gross revenues | 0.0490 | 0.0653** | 0.0645** |
| | (0.0298) | (0.0300) | (0.0300) |
| Customer deposits / Total funding | 0.234*** | 0.238*** | 0.239*** |
| | (0.0308) | (0.0309) | (0.0310) |
| | | | |
| (Total rents(t-1))*(Gross Loans / Assets) | | -8.383 | -6.608 |
| | | (10.22) | (23.07) |
| (Total rents(t-1))*(Non interest income/ Gross revenues) | | -43.27*** | -66.76*** |
| | | (10.26) | (22.83) |
| (Total rents(t-1))*(Customer deposits / Total funding) | | -5.329 | 5.990 |
| | | (5.143) | (9.916) |
| (Total rents(t-1))*(Gross Loans / Assets)*(Customer deposits / Total funding) | | | -31.23 |
| | | | (23.36) |
| (Total rents(t-1))*(Gross Loans / Assets)*(Customer deposits / Total funding)*(Non interest income/ Gross revenues) | | | 51.66 |
| | | | (43.81) |
| Constant | 1.142** | 1.177** | 8.338 |
| | (0.547) | (0.546) | (6.499) |
| Observations | 10,065 | 10,065 | 10,065 |
| Number of BankID | 1,954 | 1,954 | 1,954 |
| Country FE | YES | YES | YES |
| Year FE | YES | YES | YES |
| R-square | 0.227 | 0.228 | 0.228 |

# 3.4 - Robustness checks:

- Robustness tests related to natural resources
  - Outliers
  - Heterogeneity: oil, energy, minerals
  - Different definitions of total rents

- Robustness related to bank stability/risk
  - Another definition of Z-score (Lepetit and Strobel, 2013)
  - Dependent variables component of Z-score (next slide):
    - Risk adjusted profit
    - Risk-adjusted capital
  - Considering bank types in the regressions
  - Introducing islamic banks in the sample
  - Different samples : range of the banking system, without OECD countries, without developed countries.

# Robustness: Alternative measure of z-score and its components

| | Z_score 2 | | | RAROA | | | RACAR | | |
|---|---|---|---|---|---|---|---|---|---|
| VARIABLES | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| Total rents (t-1) | 2.437*** | 5.503*** | 5.520*** | 1.723*** | 3.765*** | 3.965*** | 0.402*** | 0.949*** | 1.020*** |
| | (0.276) | (0.436) | (0.615) | (0.307) | (0.541) | (0.714) | (0.0836) | (0.134) | (0.189) |
| Square _Total rents (t-1) | -2.987*** | -2.580*** | -2.580*** | -2.060*** | -1.861*** | -1.864*** | -0.248 | -0.196 | -0.196 |
| | (0.607) | (0.612) | (0.612) | (0.663) | (0.668) | (0.668) | (0.184) | (0.186) | (0.186) |
| (Total rents(t-1))*(Gross Loans / Assets) | | -2.602*** | -2.674*** | | -2.163*** | -2.558** | | -0.562*** | -0.667** |
| | | (0.298) | (0.858) | | (0.449) | (1.003) | | (0.0930) | (0.267) |
| (Total rents(t-1))*(Non interest income/ Gross revenues) | | -0.811** | -0.754 | | 0.223 | 0.176 | | -0.0774 | -0.199 |
| | | (0.358) | (0.597) | | (0.421) | (0.705) | | (0.110) | (0.183) |
| (Total rents(t-1))*(Customer deposits / Total funding) | | -1.922*** | -2.070*** | | -1.286*** | -1.586*** | | -0.295*** | -0.253 |
| | | (0.322) | (0.504) | | (0.367) | (0.604) | | (0.101) | (0.156) |
| (Total rents(t-1))*(Gross Loans / Assets)*(Customer deposits / Total funding) | | | 0.294 | | | 0.577 | | | -0.0873 |
| | | | (0.758) | | | (0.924) | | | (0.234) |
| (Total rents(t-1))*(Gross Loans / Assets)*(Customer deposits / Total funding)*(Non interest income/ Gross revenues) | | | -0.0489 | | | 0.138 | | | 0.202 |
| | | | (0.919) | | | (1.157) | | | (0.285) |
| Constant | 1.125*** | 0.971*** | 0.973*** | -3.132*** | -3.263*** | -3.263*** | 1.859*** | 1.839*** | 1.836*** |
| | (0.345) | (0.344) | (0.344) | (0.351) | (0.351) | (0.350) | (0.280) | (0.279) | (0.279) |
| Observations | 52,114 | 52,114 | 52,114 | 47,802 | 47,802 | 47,802 | 53,604 | 53,604 | 53,604 |
| Number of BankID | 6,823 | 6,823 | 6,823 | 6,624 | 6,624 | 6,624 | 6,858 | 6,858 | 6,858 |
| Country FE | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Year FE | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| R-square | 0.312 | 0.312 | 0.312 | 0.180 | 0.182 | 0.182 | 0.325 | 0.325 | 0.325 |

# Conclusion and discussion:

- Past studies have highlighted lower financial development in RBC: more fragility and less intermediation.
- The novelty in our article is to consider bank business model and credit policy with micro level data, to better understand this issue.
- Doing so, we are able to explain :
  - Financial resource curse appears after a certain threshold of total rents.
  - Why banks in RBC have larger exposure to financial instability.
  - Why there is more credit rationing in RBC.
- Volatility of deposits and less stabilizing business model (income generation and financing structure).
- Firms in non-resource sector receive less credit, because they are seen as riskier.
- Therefore banks don’t exercise their expertise in credit risk management and distribution.

# Discussion and conclusion

- Enforce:
  - information access to banks, as for firms'reliability.
  - Trustworthiness through the protection of borrowers and lenders'rights.

**Thanks for your attention!**