

Bank Branching Strategies in the 1997 Thai Financial Crisis and Local Access to Credit

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Introduction

- Financial crises can lead banks to slow the opening of branches and lead to closures.
- Even after the economy recovers on aggregate, some areas may go unbanked for many years.
- Distance to the nearest branch is an important determinant of access to credit (Burgess and Pande, 2005; Degryse and Ongena, 2005; Agarwal and Hauswald, 2010; Nguyen, 2019).
 - Even in developed countries despite digitalization (Herpfer et al., 2023).
 - But especially in rural areas of developing countries.
- Thus the effect of crises can have long-term effects on financial access through this branching channel.

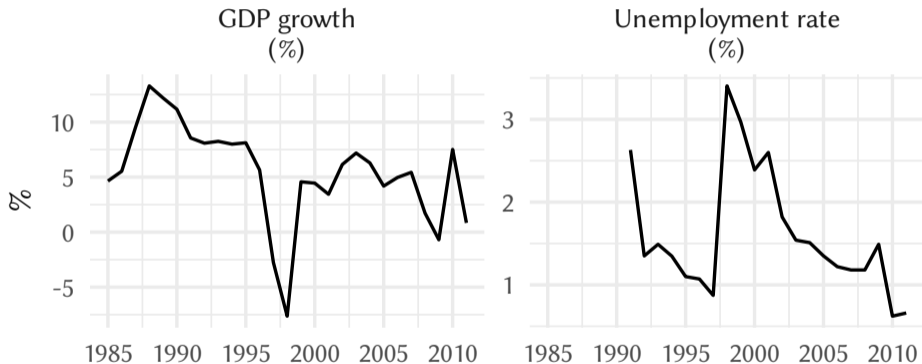
This Paper

- We estimate a dynamic oligopoly model of bank branching around the Thai financial crisis of 1997.
- We use the model to compute the impact of the crisis on financial access.
- We do this by simulating branching decisions under a no-crisis scenario:
 - In the absence of the crisis, 10 years later on our model predicts there would have been:
 - 7.2% more branches overall;
 - 4.8% more markets served by at least one branch; and
 - an 7.4 p.p. increase in financial access, driven by a 29.1% reduction in the average distance to the nearest branch.
- We also explore the effects of targeted branch supports in vulnerable markets.

Related Literature and Contributions

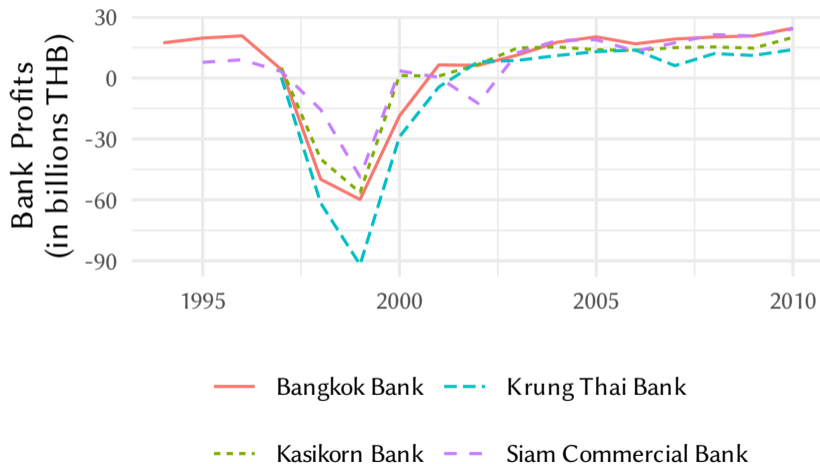
1. Impacts of financial crises and competition on financial access (Bernanke, 1983; Beck et al., 2004; Degryse and Ongena, 2005; Marín and Schwabe, 2019; Allen et al., 2021).
2. The scarring effects of crises (Dell’Ariccia et al., 2008; Huckfeldt, 2022; Attanasio et al., 2022).
3. Estimation of dynamic entry models (Igami, 2017; Collard-Wexler, 2013; Lin, 2015; Zheng, 2016).
 - Bounded rationality on banks’ expectations of the crisis (Aguirregabiria and Jeon, 2020) with a drastic change in environment (Ryan, 2012).
 - Banks also account for the effect of their presence on local demand transitions (Jayaratne and Strahan, 1996; Fulford, 2015; Nguyen, 2019; Young, 2021).
4. Using Empirical IO tools to study market frictions in developing economies (Ryan, 2021; Hidalgo and Sovinsky, 2022; Vitali, 2022)

GDP Growth and Unemployment During the Crisis



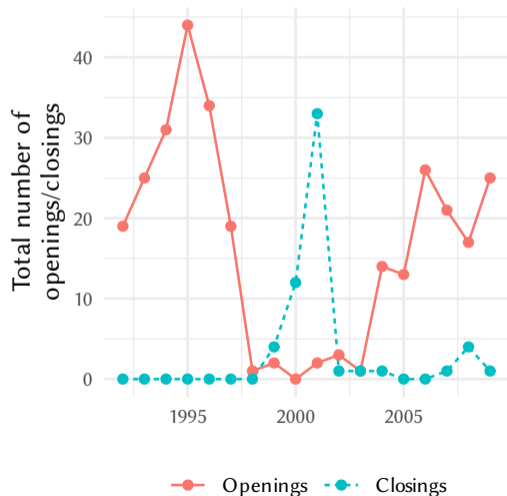
Thailand's economy recovered relatively quickly after the crisis on aggregate.

Total Profits By Bank (in billions THB)



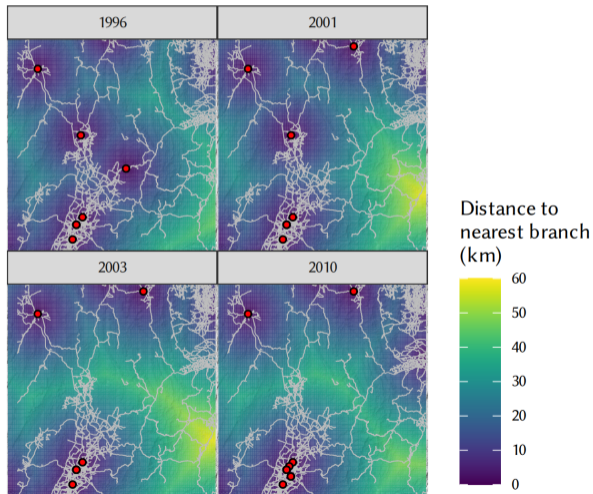
Source: Banks' Annual Reports. Note: 1 USD \approx 35 THB during our sample period.

Branch Openings and Closings by Year



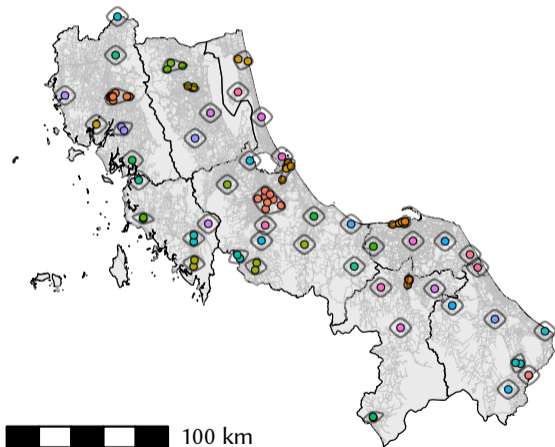
- The crisis slowed branch openings and led to the first closures.
- No branch closures in our data between 1927-1998.

Branch Closures and Distance to Nearest Branch



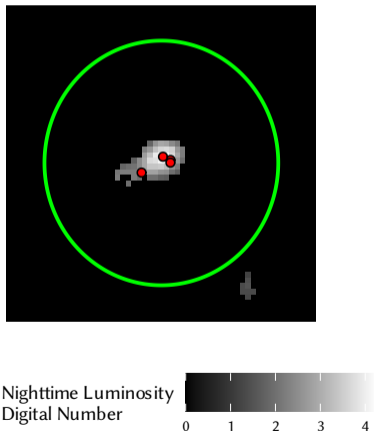
- Entry post-crisis was not always in the places that saw exit.
- The figure shows an example area in northern Thailand.
- Several locations that lose branches do not become banked by the end of our sample period.

Market Definition: Clustering Branch Locations by Proximity



- In our model, banks make branching decisions market by market.
- If 2 locations are within 10km of each other (by road), they are in the same market.
- Thus branches in different markets are at least 10km apart.

Local Demand Measure: GDP-Intercalibrated Nighttime Luminosity



- We use nighttime luminosity to measure local demand near branches.
- To measure local demand, we sum the digital numbers within a 20km radius around the centroid of each market.
- We intercalibrate satellite readings across province-years such that aggregate changes in luminosity match aggregate changes in GDP at the province level.

Bank Profits in a Market

If bank f has n_{fmt} branches in market m at time t , it earns profits equal to:

$$\pi_{fmt}(\mathbf{s}_{mt}, \boldsymbol{\theta}) = n_{fmt} \left(\theta_{k(m)} + \theta_f^b + \theta^z z_{mt} + \theta^{\text{own}} (n_{fmt} - 1) + \theta^{\text{comp}} \sum_{g \neq f} n_{gmt} + \theta^{\text{gov}} g_{mt} + \theta^{\text{crisis}} \zeta_t \right)$$

- The per-branch profit can differ by the market group $k(m) \in \{1, \dots, K\}$ and by bank, f .
- z_{mt} is our measure of local demand.
- g_{mt} is an indicator for government branch presence.
- ζ_t is an indicator for the financial crisis (= 1 for 1998-2004).
- The market state is $\mathbf{s}_{mt} = \left(\{n_{fmt}\}_{f=1}^F, z_{mt}, g_{mt}, m, t \right)$.

Strategies

- $F = 5$ banks simultaneously choose whether to open or close a branch in each market in each period.
- The 5 banks are the 4 largest commercial banks, and a fringe bank which combines all 14 smaller banks.
- Let $a_{fmt} \in \{-1, 0, 1\}$ be the bank's action (close, do nothing, open), where:

$$n_{fmt+1} = n_{fmt} + a_{fmt}$$

- Banks can have a maximum of $N = 2$ branches per market.
- Opening a branch entails a cost θ_{ec} .
- We normalize the scrap value to zero.
- Banks also receive action-specific private information shocks:

$$\epsilon_{fmt} = \left(\epsilon_{fmt}^{-1}, \epsilon_{fmt}^0, \epsilon_{fmt}^1 \right)$$

State Transitions and Beliefs

True State Transition Processes:

- Crisis indicator: $\zeta_t = \begin{cases} 1 & \text{if } t \in \{1998, \dots, 2004\} \\ 0 & \text{otherwise} \end{cases}$
- Local demand Markov process: $z_{mt+1} \sim h_t(\mathbf{s}_{mt})$.
 - We allow the sum of local branches, $\sum_f n_{fmt}$, to impact $h_t(\cdot)$.
 - Process $h_t(\cdot)$ changes permanently after 1997.
- Government branches: $g_{mt+1} \sim \tilde{g}_t(\mathbf{s}_{mt})$, which depends on $\sum_{f=1}^F n_{fmt}$ and z_{mt} .

Banks' Beliefs Before the Crisis:

In years $t \leq 1997$, banks do not anticipate the crisis. They believe:

- $\zeta_{t+\tau} = 0 \forall \tau \geq 0$, and
- $z_{mt+\tau+1} \sim h_t(\mathbf{s}_{mt+\tau}), \forall \tau \geq 0$.

Banks' Beliefs After the Crisis:

- Banks learn the true process for ζ_t and z_{mt} .

Value Function and Equilibrium

- Banks discount future profits with $\beta = 0.95$.
- In the terminal period T , the value function is:

$$\tilde{V}_{fmt}(\mathbf{s}_{mT}, \boldsymbol{\theta}) = \frac{\pi_{fmt}(\mathbf{s}_{mT}, \boldsymbol{\theta})}{1 - \beta}$$

- In periods $t < T$, the value function is:

$$\begin{aligned} \tilde{V}_{fmt}(\mathbf{s}_{mt}, \boldsymbol{\theta}, \boldsymbol{\varepsilon}_{fmt}) &= \pi_{fmt}(\mathbf{s}_{mt}, \boldsymbol{\theta}) + \max_{a \in \{-1, 0, 1\}} \left\{ \varepsilon_{fmt}^a - \theta^{ec} \mathbb{1}\{a = 1\} \right. \\ &\quad \left. + \beta \mathbb{E} \left[\tilde{V}_{fmt+1}(\mathbf{s}_{mt+1}, \boldsymbol{\theta}, \boldsymbol{\varepsilon}_{fmt+1}) \mid \mathbf{s}_{mt}, a_{fmt} = a \right] \right\} \end{aligned}$$

- Solution concept is Bayesian Markov Perfect Equilibrium.

Market Group Fixed Effects

- To control for unobserved market heterogeneity, we allow for $K = 10$ market groups.
- We fix market groups using the market fixed effects from an ordered probit model.

<i>Dependent variable:</i>	Enter (1) Nothing (0) Exit (-1)
Own branches	-1.439 (0.076)
Rival branches	-0.559 (0.039)
Government Bank Presence	-0.182 (0.310)
Local demand	0.971 (0.162)
Observations	42210
Market fixed effects	Yes

Transition Process for Local Demand

- We model local demand transitions according to:

$$z_{mt+1} - z_{mt} = \eta_{k(m)} + \eta_{k(m)}^{post} \mathbb{1}\{t > 1997\} + \alpha^B \sum_{f=1}^F n_{fmt} + \alpha^G g_{mt} + \delta_{96} \mathbb{1}\{t = 1996\} + \delta_{97} \mathbb{1}\{t = 1997\} + \nu_{mt+1}$$

where $\nu_{mt+1} \sim \mathcal{N}(0, \sigma_\nu^2)$.

- Before the crisis, banks believe that local demand transitions according to:

$$z_{mt+1} - z_{mt} = \eta_{k(m)} + \alpha^B \sum_{f=1}^F n_{fmt} + \alpha^G g_{mt} + \nu_{mt+1}$$

- After the crisis, banks learn the true process.

Maximum Likelihood

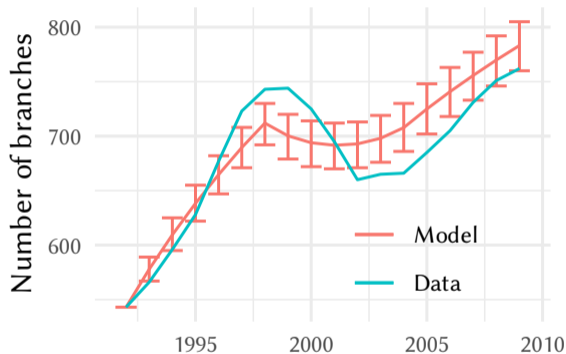
- Given each guess of θ , we solve the model via backward induction.
- Our estimator for θ is:

$$\hat{\theta} = \arg \max_{\theta} \sum_{t=1992}^{2009} \sum_{m=1}^M \sum_{f=1}^F \log (p_{fk(m)t} (a_{fmt} | \mathbf{s}_{mt}, \theta))$$

where $p_{k(m)} (a_{fmt} | \mathbf{s}_{mt}, \theta)$ is the equilibrium conditional choice probability.

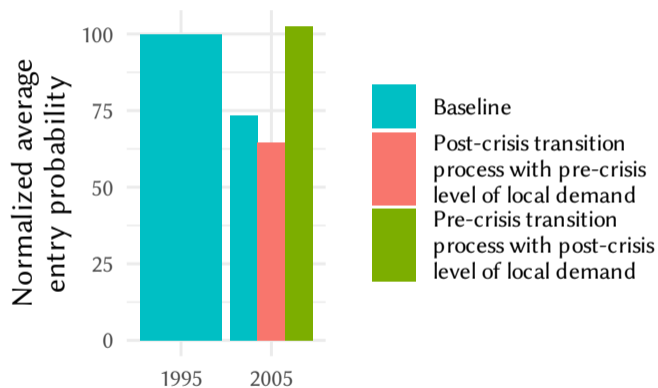
Structural Parameter Estimates and Model Fit

	Estimate	Standard Error
Entry cost	11.749	(0.314)
Market group 1	0.156	(0.089)
Market group 2	0.253	(0.089)
Market group 3	0.289	(0.097)
Market group 4	0.326	(0.107)
Market group 5	0.341	(0.091)
Market group 6	0.387	(0.090)
Market group 7	0.440	(0.087)
Market group 8	0.502	(0.088)
Market group 9	0.614	(0.093)
Market group 10	0.878	(0.101)
Bank 2	-0.001	(0.011)
Bank 3	0.000	(0.011)
Bank 4	-0.065	(0.012)
Bank 5	-0.053	(0.011)
Local demand	0.475	(0.054)
Own branches	-0.126	(0.009)
Rival branches	-0.104	(0.009)
Government branches	0.000	(0.087)
Crisis	-0.549	(0.080)



Error bands contain 95% of simulated paths from 1,000 simulations.

The Effect of Lower Local Demand Growth Post Crisis



- Figures shows model entry probabilities in markets in groups 1-3 without any branches.
- Despite the *level* of demand recovering by 2005, slower demand *growth* reduced entry.

The Effect of the Financial Crisis

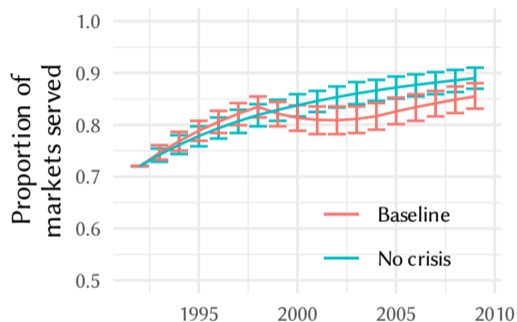
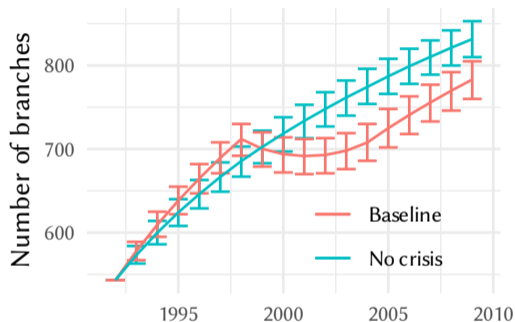
- We simulate branching strategies under the scenario where GDP had a less volatile growth path throughout our sample period (1992-2009).
- We assume local demand transitions according to:

$$z_{mt+1} - z_m = \eta_{k(m)}^* + \alpha^B \sum_{f=1}^F n_{fmt} + \alpha^G g_{mt} + \nu_{mt}$$

where we solve for the $\eta_{k(m)}^*$ which produces average market-group-level local demand in 2009 across simulations that matches the baseline crisis scenario.

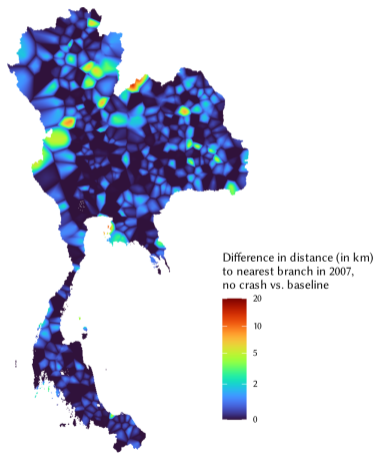
- Because entry and exit affect z_{mt+1} , we solve our model for each trial value of $\eta_{k(m)}^*$.
- Using $\eta_{k(m)}^*$ with $\zeta_t = 0 \forall t$, we solve for the equilibrium strategies of the banks.

The Effect of the Financial Crisis



- Because the growth process is constant over time there is less entry pre-crisis but more post-crisis.
- 10 years after the crisis, there would have been 7.2% more branches & 4.8% more markets served by a branch.

Change in Distance to Nearest Branch and Financial Acces



- We calculate the distance to the nearest branch in both the crisis and no crisis cases 10 years after the crisis.
- The figure shows the average change in distance from our simulations.
- Absent the crisis, there is a 29.1% reduction in distance.
- Using estimates from Ji, Teng and Townsend (JPE, 2023), this translates to an 7.4 p.p. increase in financial access.

Targeted Branch Supports

- We consider a targeted subsidy for branches in *vulnerable* markets.
- We define a vulnerable market as:
 - A market with only one bank branch, and
 - The market is either in the lowest quintile of local demand or market group.
- We consider a subsidy equal to $-\theta^{crisis}\zeta_t$.
- After 10 years, overall there are:
 - 1.8% more branches
 - 3.3% more markets served by a branch.

Robustness Checks

- We repeat our entire main analysis (structural estimation and no-crisis counterfactual) in each of the following settings:
 - Larger market size threshold (15km instead of 10km).
 - Banks not internalizing the effects of their branching decisions on local demand transitions.
 - Setting the coefficient on the number of active branches in the local demand transition equation to half its estimated size in case of potential upward bias.
 - All 5 banks behave as a cartel instead of competing.
- In each case, we find only very small changes in our headline results.

Conclusion

- The 1997 Thai Financial Crisis had long-term impacts on financial access in rural areas.
- Lower growth rates after the crisis lowered the incentive to enter even after GDP recovered.
- Branch supports could have prevented vulnerable markets from going unbanked.