Evaluating Interest Rate Adjustment Costs

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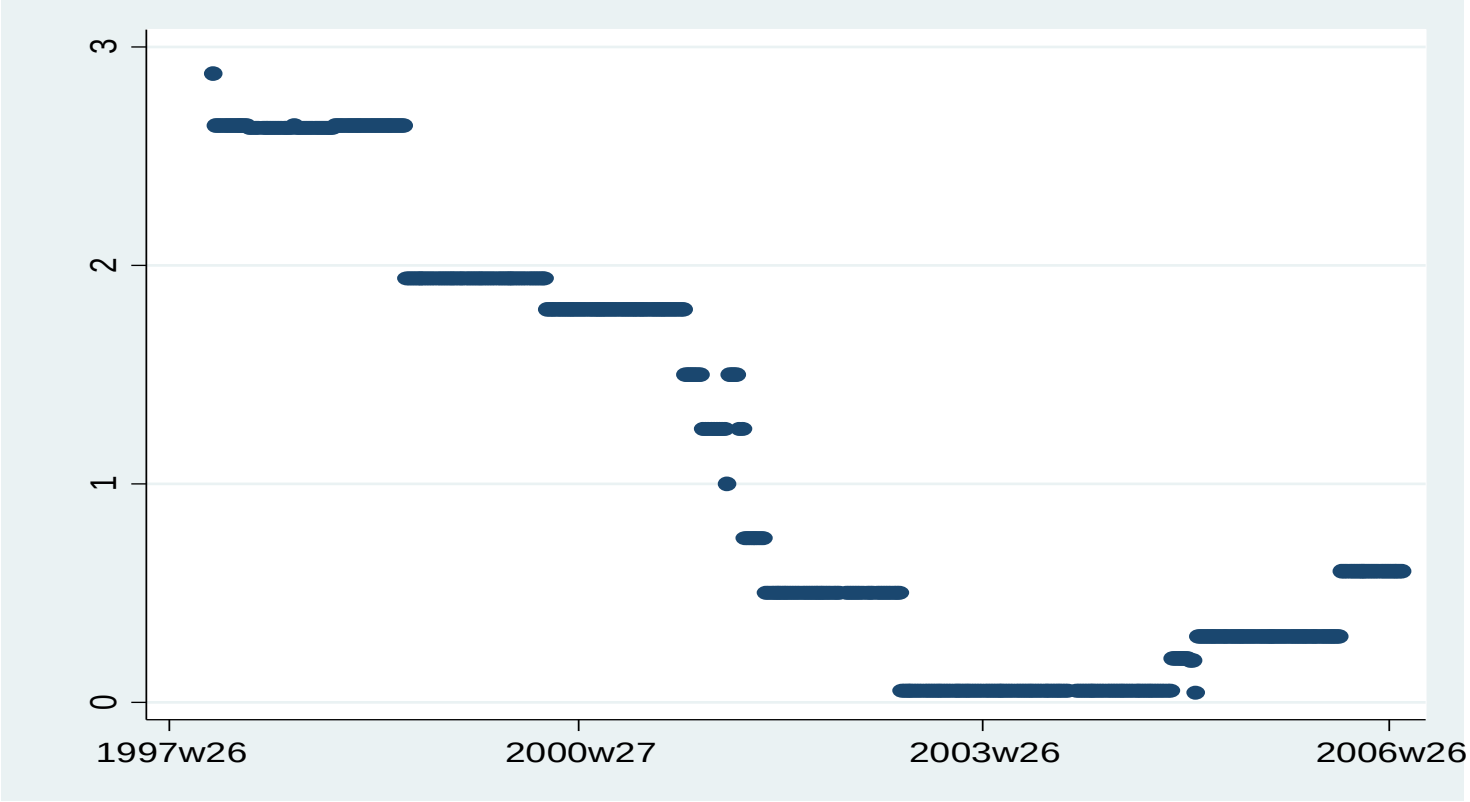
The observation

- Deposit rate changes are infrequent



Deposit rates offered by a major bank in a selected local market

Questions

- Why do banks change their deposit rates infrequently?

- Are the costs associated with interest rate adjustments substantial?

This paper

- Presents a structural model for the evaluation of retail (deposit) interest rate adjustment costs.

Why this topic?

- Research on interest rate dynamics assumes the existence of adjustment costs but does not try to evaluate them
- Challenges to:
  - Understanding interest rate dynamics
  - Predicting monetary policy transmission (especially close to the zero bound)
  - Understanding deposit volume dynamics
  - Understanding the effect of exogenous changes of adjustment costs

Why this topic…?

- But more generally: understanding dynamic choices with costly adjustments
- Other applications in banking:
  - When to enter a new market?
  - When to close branches?
  - When to issue new capital?

Why a structural approach?

- The structural approach:
  - describes agents' preferences and beliefs about exogenous constraints
  - limits endogeneity concerns
  - enables counterfactual experiments

The model

- …is built in the tradition of dynamic discrete choice models:
  - Intertemporal profit function maximization: $max\ U = \sum_{t=0}^{\infty} \beta^t u_t$
  - Profit=markup(MU_t)*volume (S_t)=(T-Bill rate-deposit rate)*volume
  - Adjustment costs (C_t): profit foregone due to the deposit rate change

$$u_t = S_t * MU_t - C_t$$

The model

- Assumptions:
  - Infinitely inelastic demand for deposits
  - Deposit supply modeled in a monopolistic competition framework
  - The decision of the bank is discrete:

$$Y_t = \begin{cases} = 2 \; if \; r_t > r_{t-1} \; (increase \; rates) \\ = 1 \; if \; r_t = r_{t-1} \; (keep \; rates \; unchanged) \\ = 3 \; if \; r_t < r_{t-1} (decrease \; rates) \end{cases}$$

The model

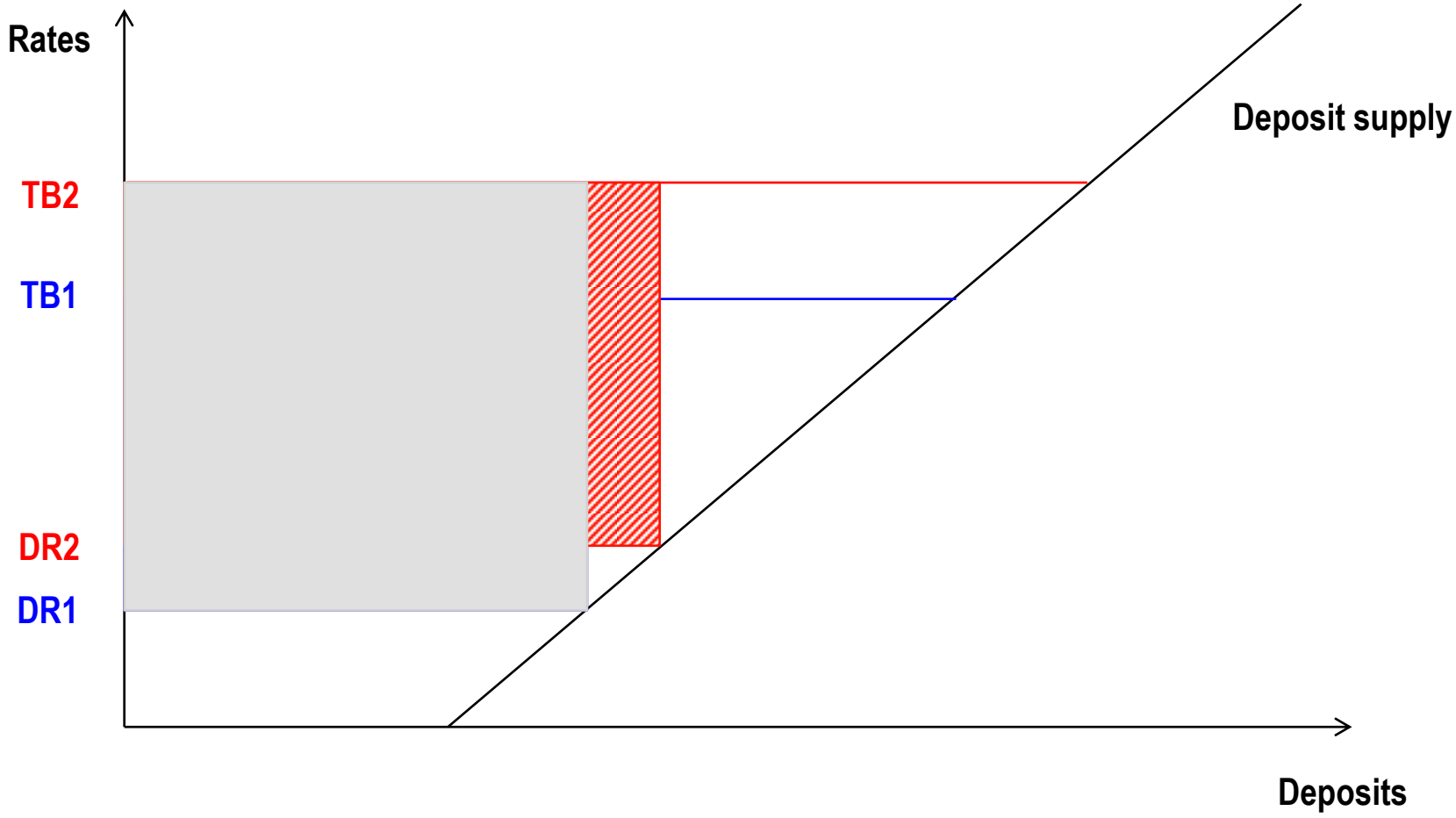
- The adjustment costs, C_t, of changing the deposit rate depend on Y_t, and are given by:

$$C_t = \begin{cases} C_u, if\ r_t > r_{t-1} \Leftrightarrow Y_t = 2 \\ 0\ if\ r_t = r_{t-1} \Leftrightarrow Y_t = 1 \\ C_d, if\ r_t < r_{t-1} \Leftrightarrow Y_t = 3 \end{cases}$$

- The costs of deposit rate adjustment does not depend on the magnitude of the adjustment (but can depend on bank and market characteristics)

The static problem

As in Hannan and Berger (1991)



The static problem

Profit after adjustment - **Profit without adjustment** **> or < C_t**

The bank will only change the rate if the induced change of the profit is larger than the deposit rate adjustment costs.

The dynamic problem

Incorporates:

- the interaction of accumulated profit changes and adjustment costs
- the transition probabilities
- the discount factor

The dynamic problem

Before taking a decision, Y_t, the bank observes the state variable X_t which depends on:

- Markup
- Bank size
- Market share
- Market concentration

The bank also observes the transition probabilities $X_{i,t} \longrightarrow X_{j,t+1}$

The dynamic problem

- Is solved using the nested-pseudo likelihood algorithm (Aguirregabiria and Mira 2002)
- This algorithm combines the **efficiency** of the nested-fixed point algorithm (Rust 1987) with the **computational gain** of the conditional choice probabilities model (Hotz and Miller 1993)

Data

- Weekly deposit rate series for 624 banks in 164 local markets (MSAs) from 1997 to 2006 (*BankRate Monitor*)
- Bank financial statements data
- Local market characteristics

Results

Variable	Coefficient	
PROFIT	1.77E-08	***
	1.53E-09	
CONSTANT Up	-4.739	***
	14.390	
BANK SIZE Up	7.894	***
	0.839	
MARKET SHARE Up	-162.265	***
	3.045	
CONCENTRATION Up	157.541	***
CONSTANT Down	-70.661	***
	14.341	
BANK SIZE Down	11.498	***
	0.836	
MARKET SHARE Down	-157.658	***
	3.037	
CONCENTRATION Down	162.820	***
	4.932	
Observations	154990	
Log-likelihood function	119471.7	

*** mean values of bank and market characteristics**

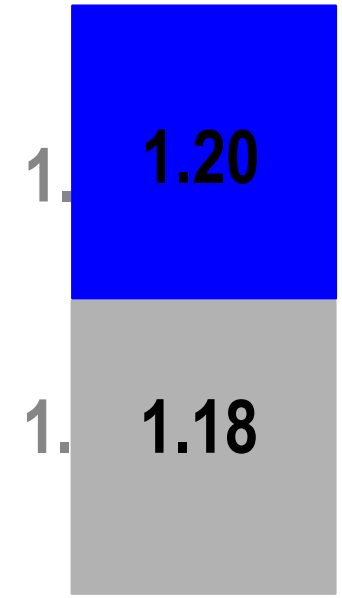
scaled by weekly deposit market profit

Results

Variable	fixed costs evaluated at the mean
CONSTANT Up	-0.042
BANK SIZE Up	1.225
MARKET SHARE Up	0.296
CONCENTRATION Up	0.224
CONSTANT Down	-0.629
BANK SIZE Down	1.784
MARKET SHARE Down	-0.200
CONCENTRATION Down	0.232

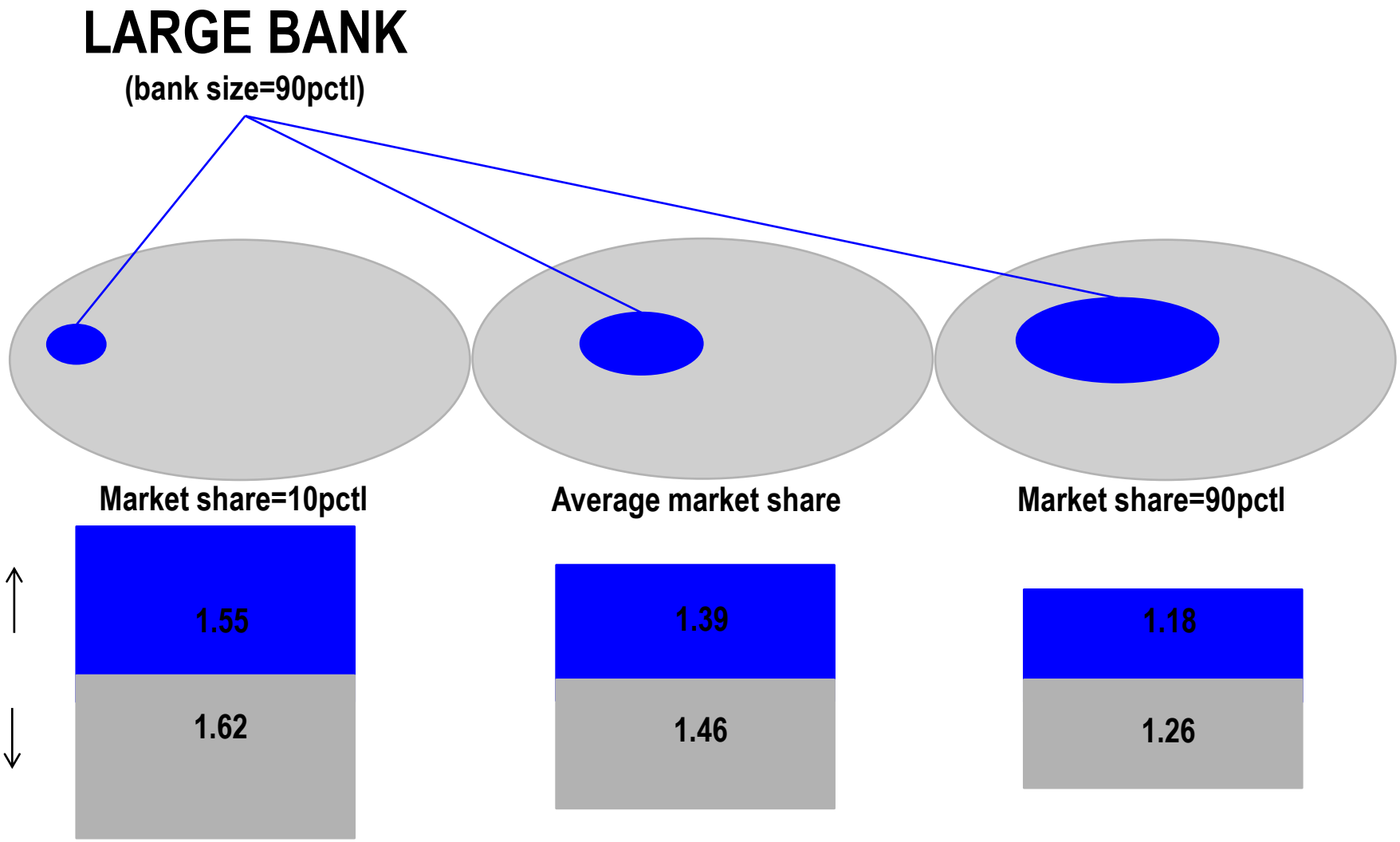
Costs of positive deposit rate changes

Costs of negative deposit rate changes



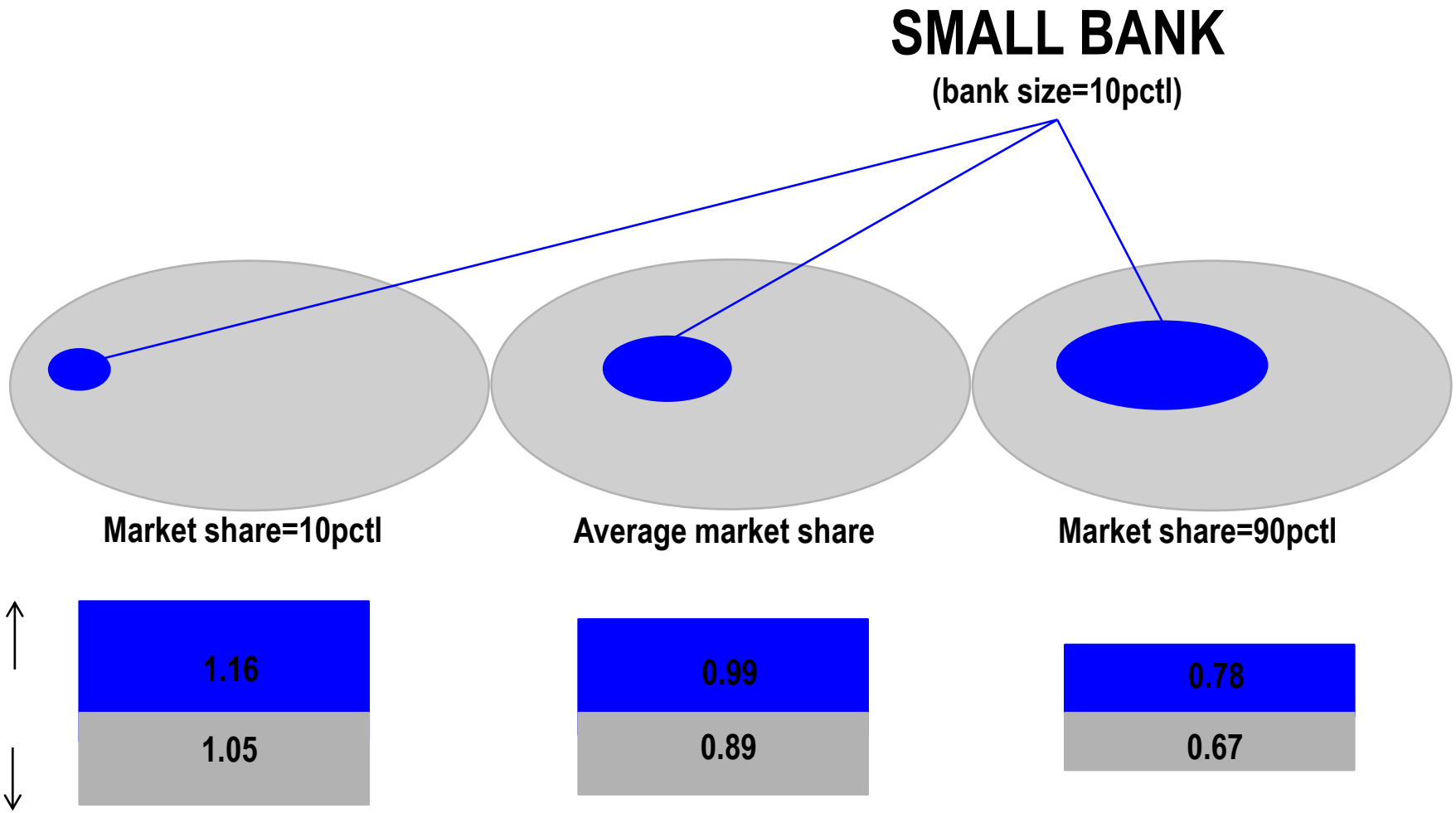
Results

Adjustment costs normalized weekly deposit market profit



Results

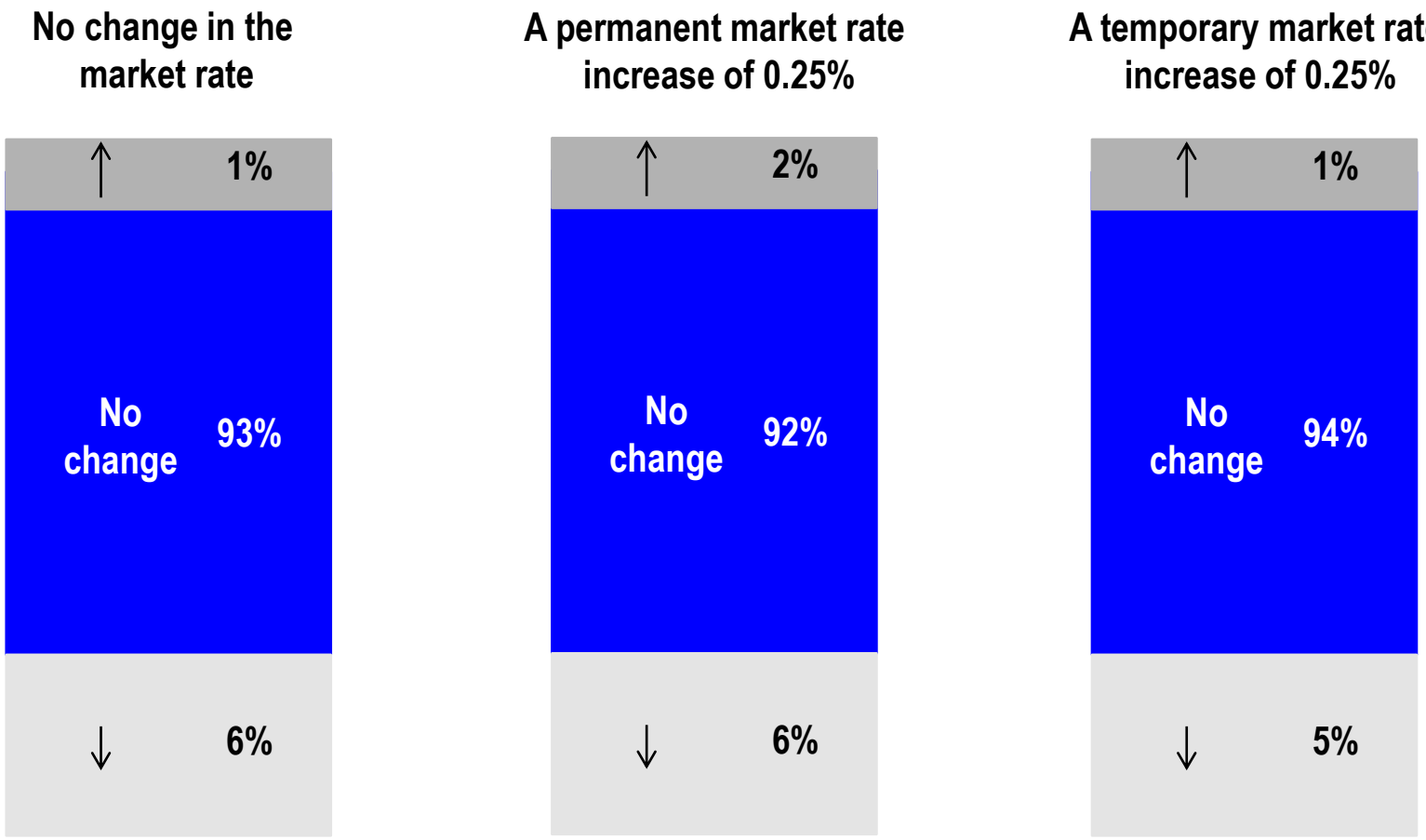
Adjustment costs normalized weekly deposit market profit



Results

Probability of deposit rate changes

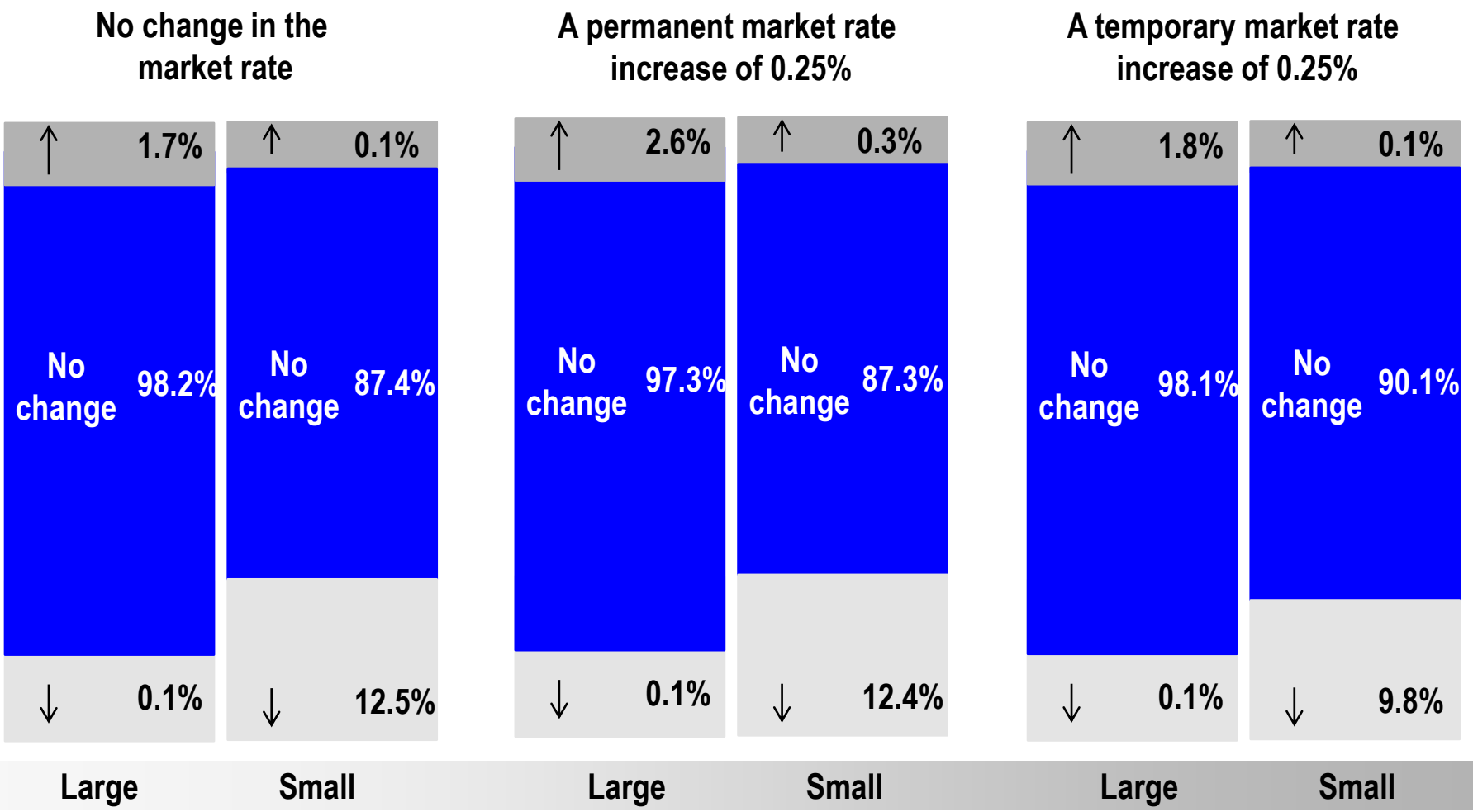
Compare three counter-factual scenarios



Results

Probability of deposit rate changes

LARGE vs SMALL BANKS



Conclusion

- Deposit rate dynamics is affected by substantial adjustment costs
- These vary with bank and market characteristics
- Their estimated magnitude suggests that a reaction to small monetary policy rate changes is unlikely

Further steps

- Explore potential changes in adjustment costs across time
- Examine the reaction of the probability of deposit rate changes to exogenous (e.g. regulatory) changes in adjustment costs

The algorithm

- Estimate the deposit supply function
- Evaluate the instantaneous profit as a function of the parameters
- Estimate the transition probabilities
- Start with an initial value of $P(Y_{Y=1,2,3})$
- Calculate the value function
- Use logistic assumption to give an implied probability for each of the actions => estimate the parameters from a conditional logit
- Generate a new value of $P(Y_{Y=1,2,3})$