Bank Profitability by Line of Business

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Motivation I

- Many banks are *universal*, managing multiple lines of business
  - provide retail, commercial and investment services
- Key interest: how profitability covaries across business lines
- Policy relevance
  - Glass-Steagall, Gramm–Leach–Bliley, Dodd-Frank
- Modeling relevance
  - enrich modeling framework
  - how to map data moments to model moments

Motivation II

- What literature, largely, does:
  1. split business lines by (a) interest and (b) non-interest activity
  2. consider only revenue items
  3. use bank-level observations
- This paper:
  1. split business lines by (a) commercial and (b) investment bank
  2. consider *net income* items
  3. use holding company data

Research Question(s)

For U.S. bank holding companies,

(1) How are expenses & net income distributed across business lines?

(2) How does net income co-vary across business lines?
   (a) aggregate, business cycle properties

   (b) bank-level properties

Summary Results

(1) expense and net income shares (aggregate)

- Total expenses split 55/45 across cbank/ibank lines
- Cbank more labor-intensive
- Ibank more *other*-intensive
  - legal, IT, consulting, marketing expense
- Cbank has 55% of net income share
  - declining over time

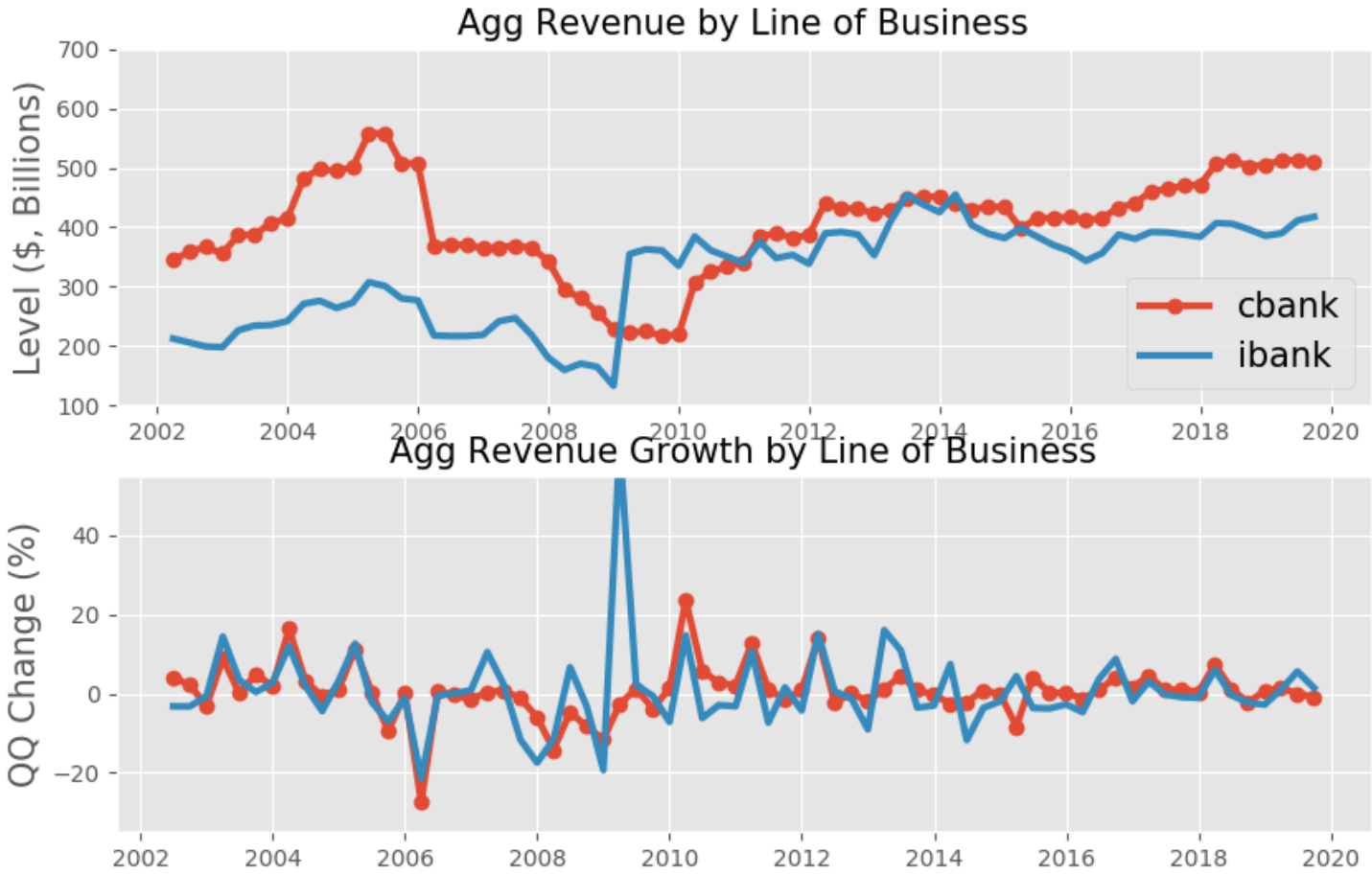
(2) net income correlation

- In the aggregate
  - cbank, ibank net income positively correlated (0.66)
  - pro-cyclical cbank net income (0.44)
  - counter-cyclical ibank net income (-0.09)
- Mixed results at the bank-level

Defining Business Lines

- Split lines by *commercial* and *investment* bank (revenue-generating) activities
- Commercial Bank
  - loan/lease + other long assets (securities, cash)
  - funded with short-term debt (deposits, fed funds/repo)
- Investment Bank
  - trade desk, insurance, brokerage, fiduciary, venture capital, securitization activities

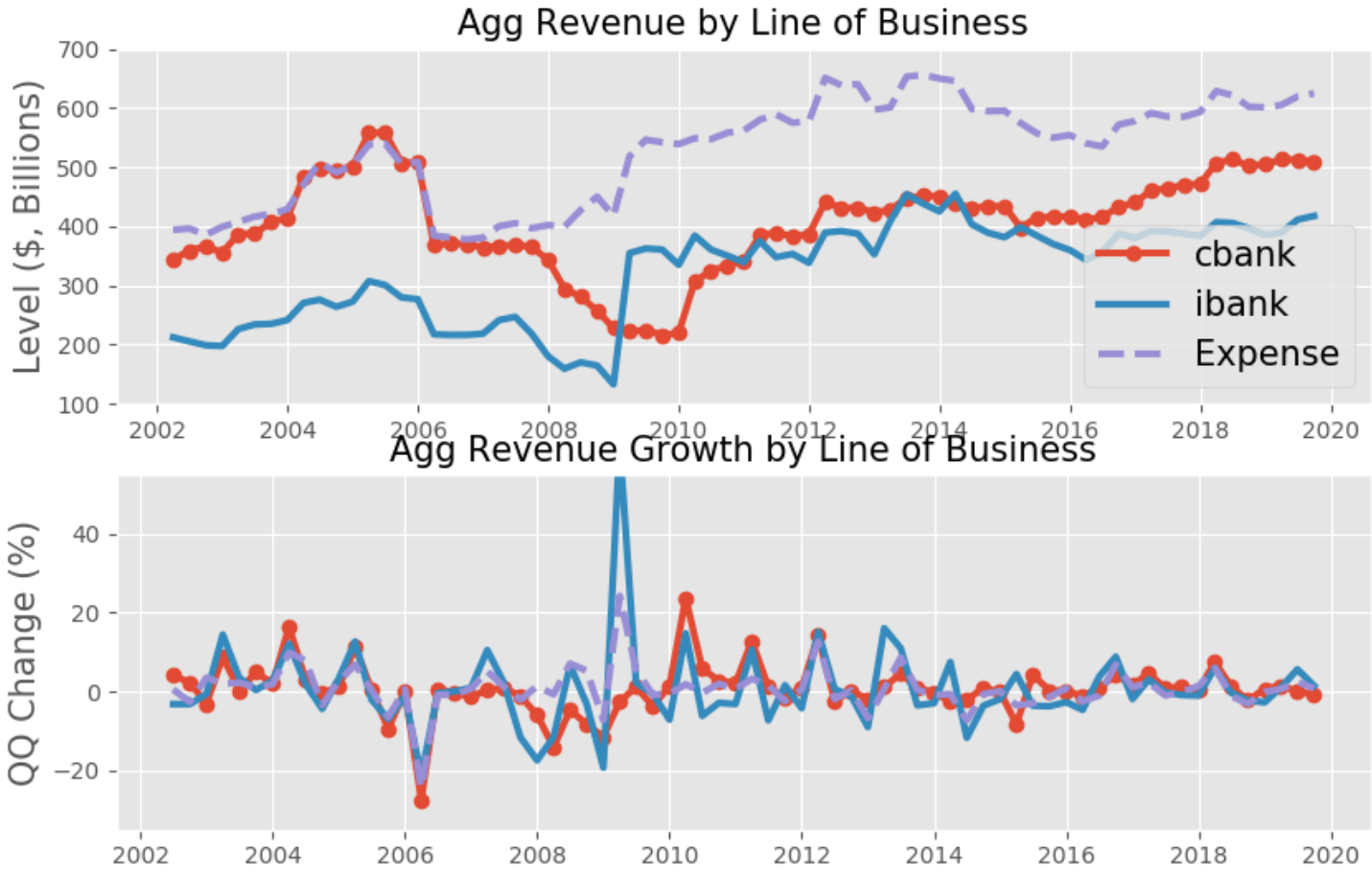
The Case for Net Income



Expense Decomposition

Quarterly FRY-9C BHC reports

The Case for Net Income: Expense Matters



Expense Decomposition

Quarterly FRY-9C BHC reports

Empirical Methodology

- Issue: expense items not specified by business line
- Method
  (1) Partition expense into sub-categories $(Y_{it}^1, Y_{it}^2, ..., Y_{it}^N)$
  (2) Define set of line-specific covariates $(\mathbf{X_{it}^C}, \mathbf{X_{it}^I})$ and other $\mathbf{X_{it}}$
  (3) For each sub-category j, regress

$$Y_{it}^j \sim \mathbf{X_{it}^C}\beta_j^C + \mathbf{X_{it}^I}\beta_j^I + \mathbf{X_{it}}\beta_j + \epsilon_{it}$$

  (4) Inferred business line expense for category j:

$$\hat{Y}_{it}^{j,C} = \mathbf{X_{it}^C}\hat{\beta}_j^C + \frac{\mathbf{X_{it}}\hat{\beta}_j + e_{it}}{2}$$

$$\hat{Y}_{it}^{j,I} = \mathbf{X_{it}^I}\hat{\beta}_j^I + \frac{\mathbf{X_{it}}\hat{\beta}_j + e_{it}}{2}$$

  (5) Net income:

$$\hat{NI}_{it}^C = R_{it}^C - \left[\hat{Y}_{it}^{1,C} + \hat{Y}_{it}^{2,C} + ... + \hat{Y}_{it}^{N,C}\right]$$

$$\hat{NI}_{it}^I = R_{it}^I - \left[\hat{Y}_{it}^{1,I} + \hat{Y}_{it}^{2,I} + ... + \hat{Y}_{it}^{N,I}\right]$$

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Expense Categories and Covariates

- 3 main expense categories:
  1. labor (Y^1)
  2. premises, fixed assets (Y^2)
  3. other (Y^3)
     - legal fees, data processing, consulting, advertising/marketing, insurance
- Regression covariates
  - $\mathbf{X}^C = \{$ cbank revenue, cbank liabilities $\}$ details
  - $\mathbf{X}^I = \{$ ibank revenue, ibank liabilities $\}$
  - $\mathbf{X} = \{$ time fixed effects $\}$
- Other
  - all objects deflated (2012 \$)
  - units: \$, thousands

Regression Results

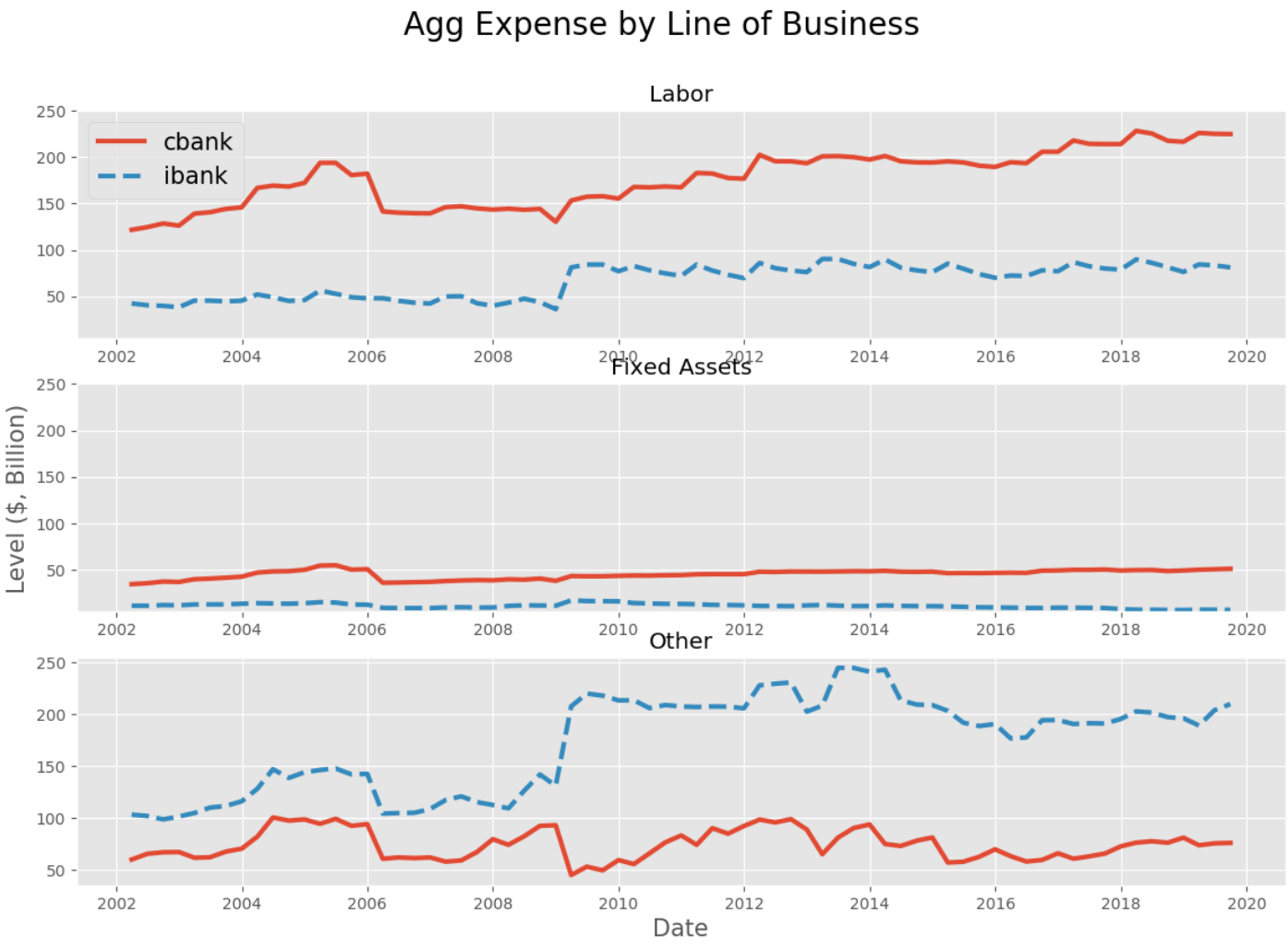
TABLE 4
EXPENSE REGRESSION OUTPUT

	(Y^1) Labor	(Y^2) Premises, fixed assets	(Y^3) Other
Intercept	3,048***	2,218***	10,690***
	(1,223)	(376)	(2,653)
cbank revenue	0.14***	0.03***	0.26***
	(0.002)	(0.001)	(0.003)
ibank revenue	0.12***	0.01**	0.54***
	(0.001)	(0.000)	(0.002)
cbank liabilities	0.01***	0.002**	-0.03***
	(0.000)	(0.000)	(0.000)
ibank liabilities	0.01***	0.0002**	-0.01***
	(0.000)	(0.000)	(0.000)
Time FE	✓	✓	✓
Time Periods	71	71	71
Entities	3000	3000	3000
R^2	0.96	0.90	0.80

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

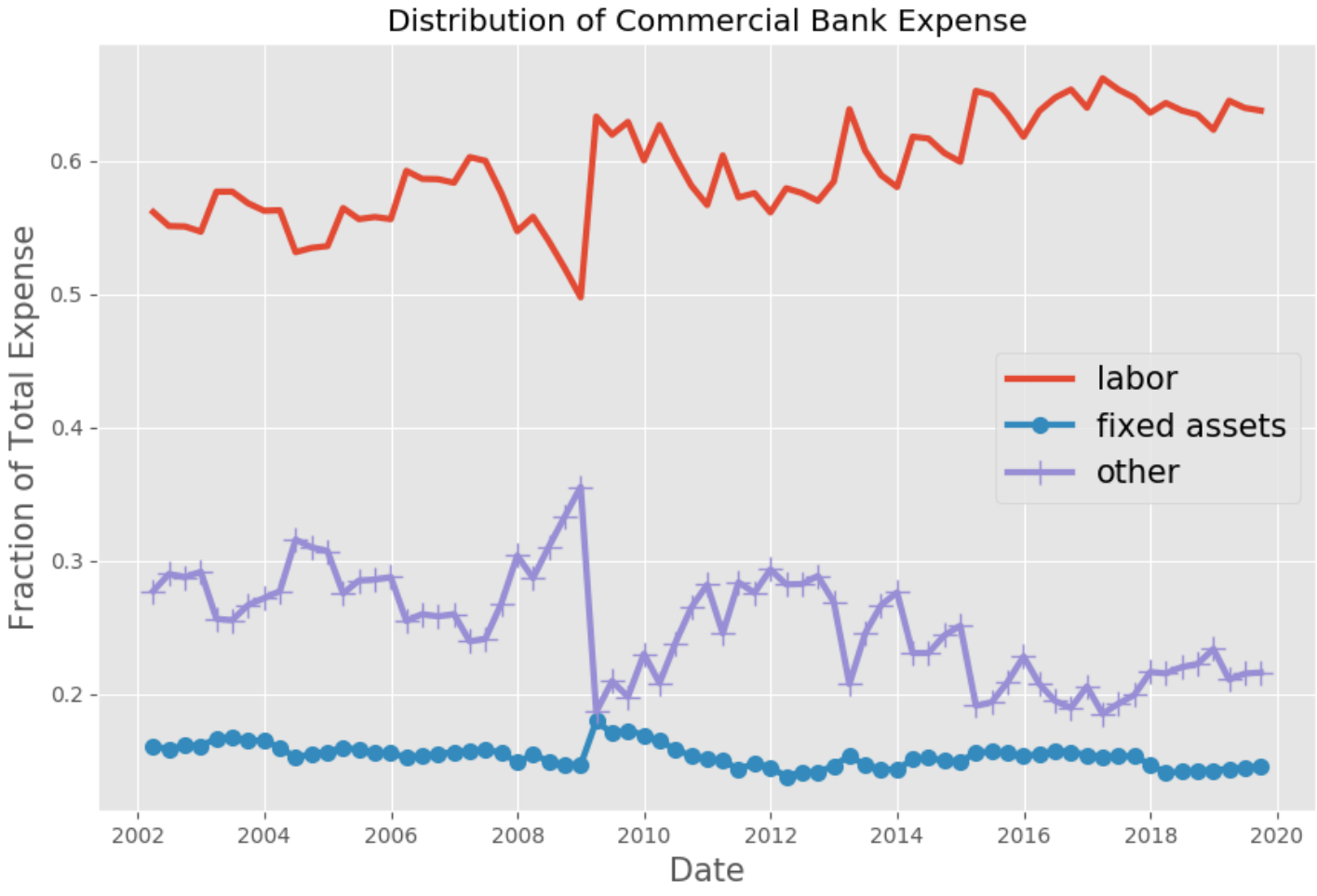
Aggregate Measures

Distribution of Expense Across Business Lines



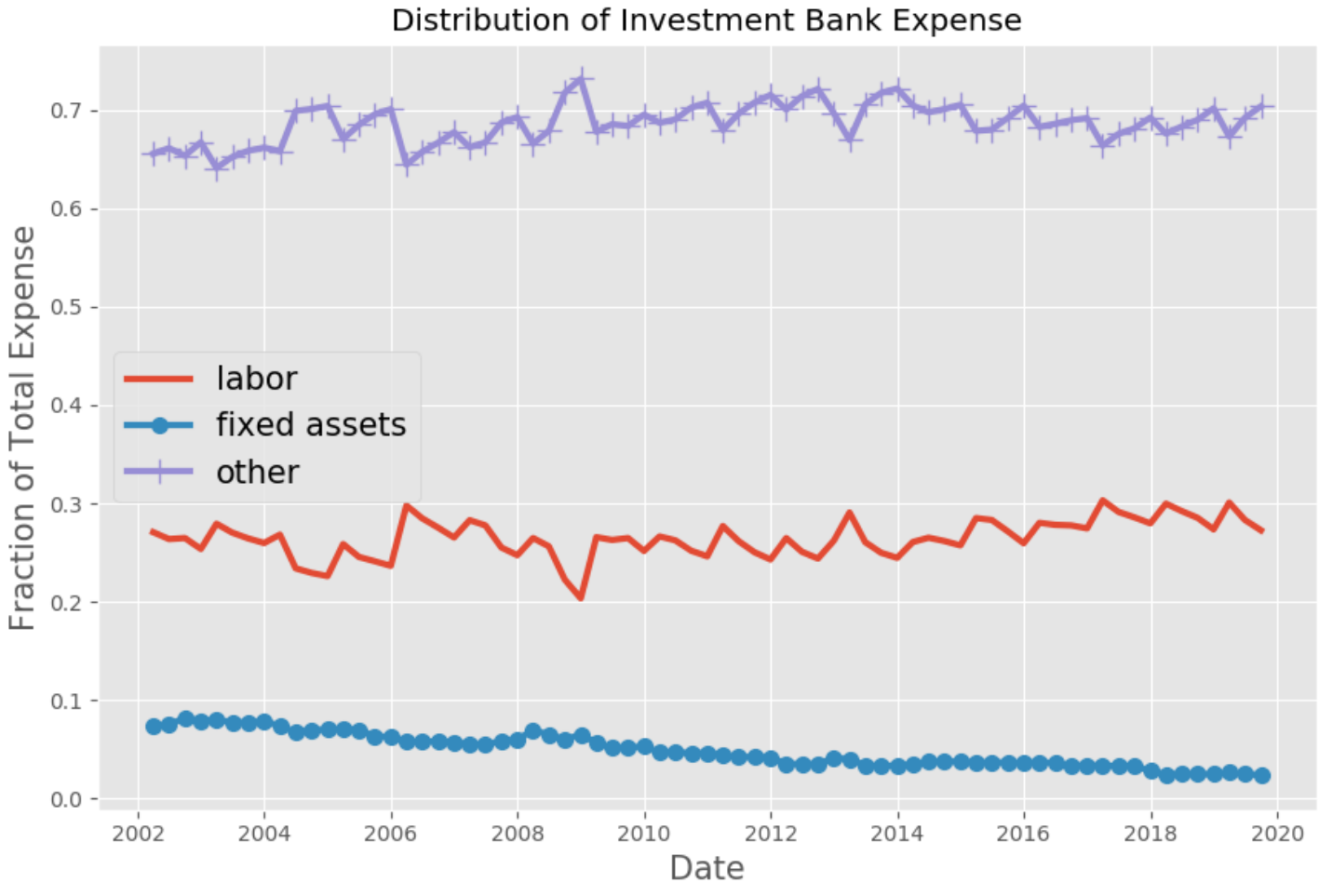
Distribution of Expense Within Business Lines

Commercial Bank



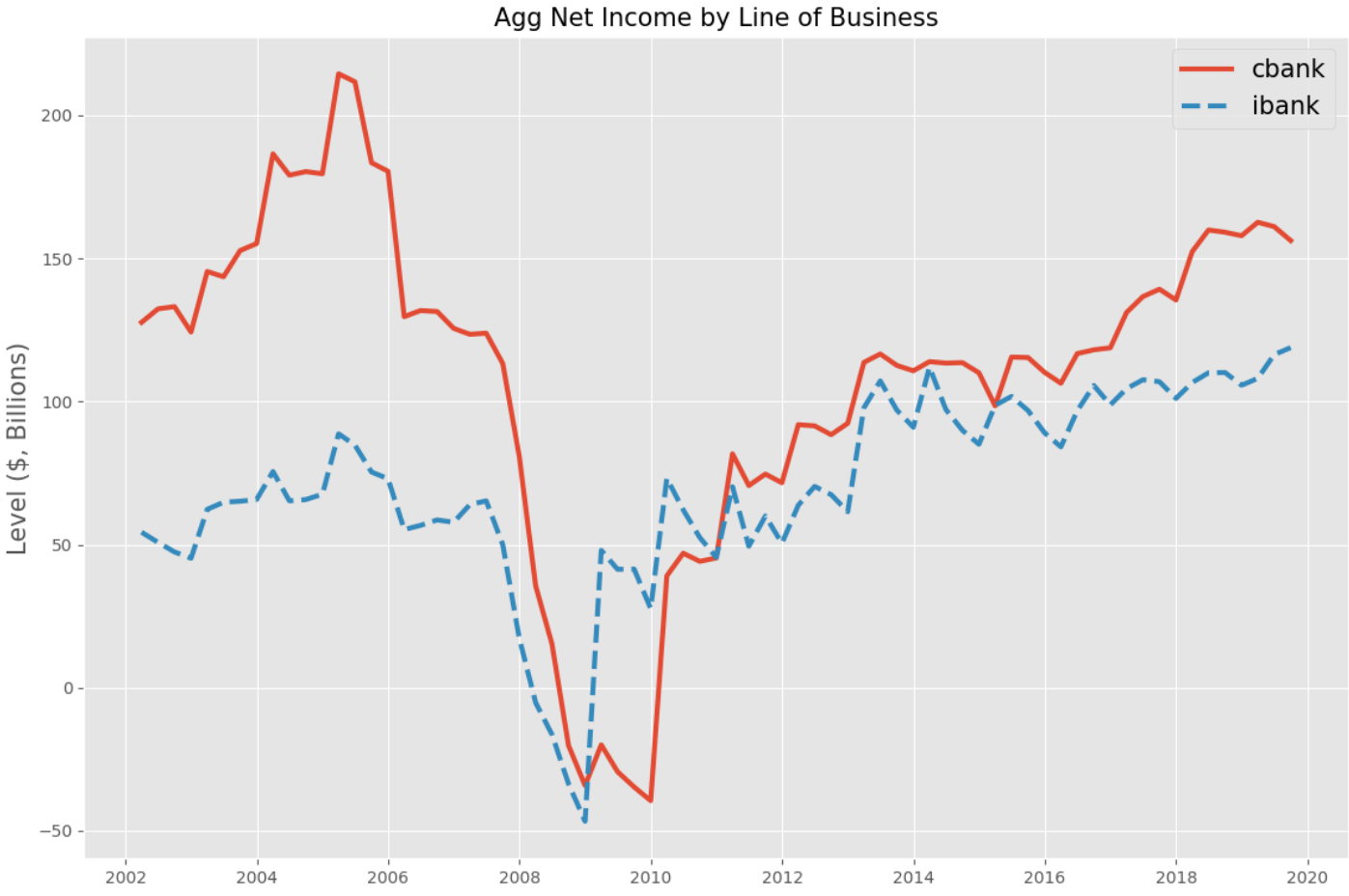
Distribution of Expense Within Business Lines

Investment Bank



Net Income by Business Line

cbank with 55% net income share



Net Income Correlations

- net income is positively correlated across business lines
- ibank net income is counter-cyclical
  - good hedge over the business cycle
  - how to think about 07-09?

TABLE 1
NET INCOME CORRELATION MATRIX

	GDP	NI	Ibank NI	Cbank NI
GDP	1	–	–	–
NI	0.26	1	–	–
Ibank NI	-0.09	0.86	1	–
Cbank NI	0.44	0.95	0.66	1

NOTE: All data items are of quarterly frequency and the cyclical component of the hp-filter with λ=1600. The sample period is from 2002:Q1 to 2019:Q4.

Revenue Correlations Expense Correlations

Bank-Level Measures

Cross-Section Correlation I

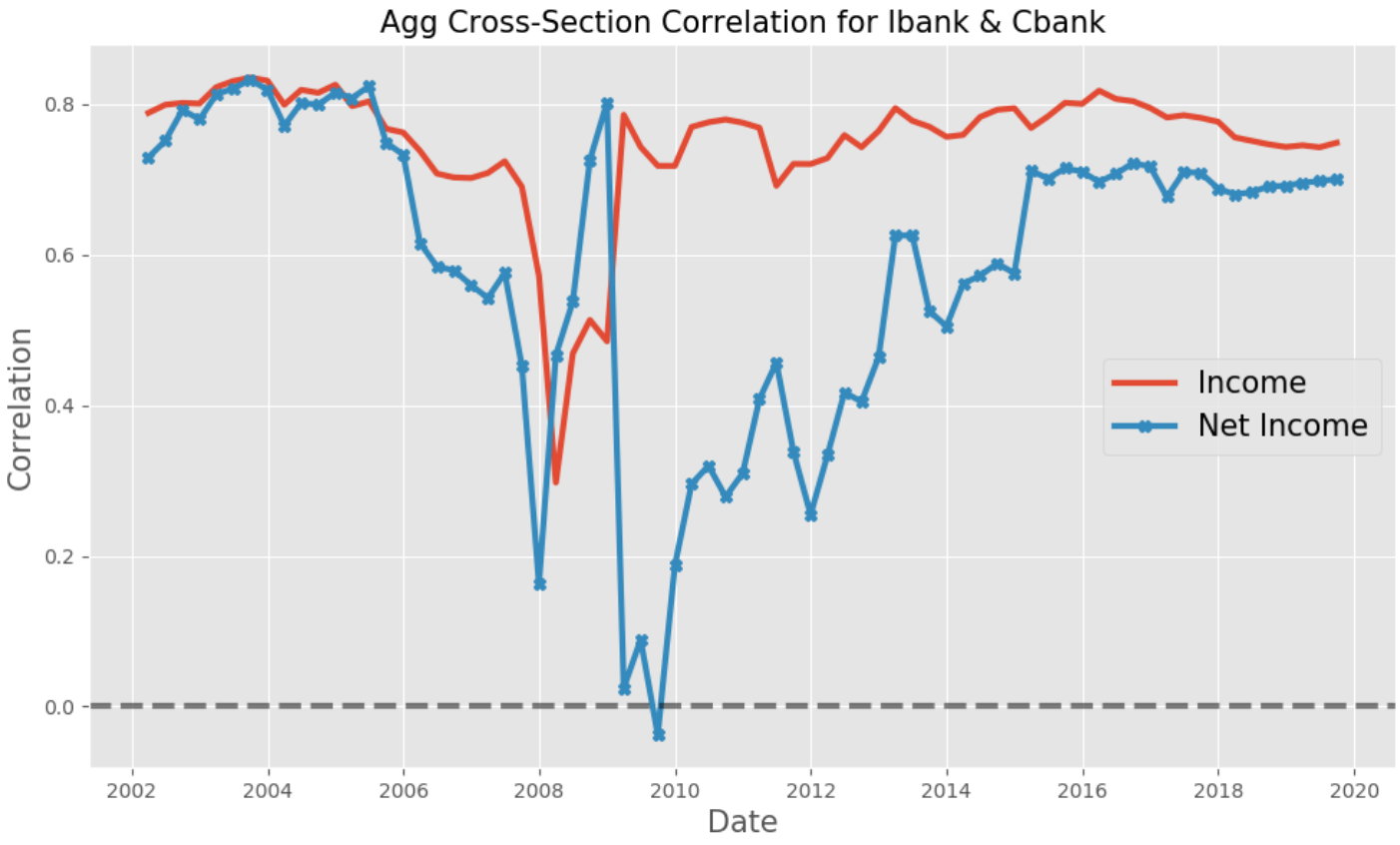
net income correlation lower

- Look at correlation of (ibank, cbank) net income in the cross-section
- For each point in time, define

$$\begin{aligned}\rho_t = & \quad Corr(NI^I_{i,t}, NI^C_{i,t}) \\ = & \quad \frac{\sum_{i=1}^{N}\left[(NI^I_{i,t} - \bar{NI}^I_t)(NI^C_{i,t} - \bar{NI}^C_t)\right]}{\left[\sum_{i=1}^{N}(NI^I_{i,t} - \bar{NI}^I_t)^2\right]^{1/2}\left[\sum_{i=1}^{N}(NI^C_{i,t} - \bar{NI}^C_t)^2\right]^{1/2}}\end{aligned}$$

Cross-Section Correlation II

net income correlation: lower during recessions, slowly rising



Intra-Bank Correlation I

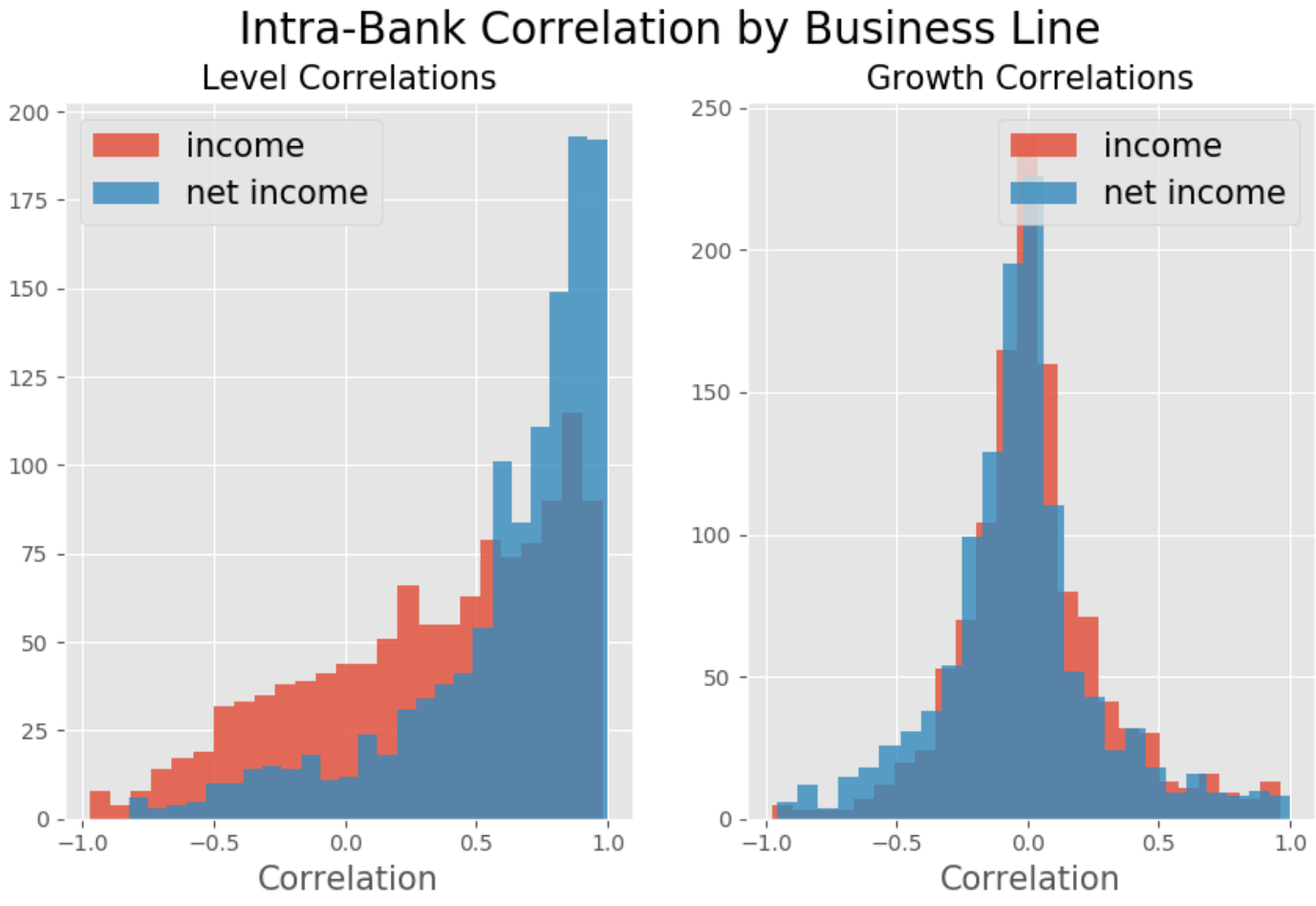
- Look at correlation of (ibank, cbank) net income intra-bank
- For each bank, define

$$\begin{aligned}\rho_i = & \quad Corr(NI^I_{i,t}, NI^C_{i,t}) \\ = & \quad \frac{\sum_{t=1}^{T}\left[(NI^I_{i,t} - \bar{NI}^I_i)(NI^C_{i,t} - \bar{NI}^C_i)\right]}{\left[\sum_{t=1}^{T}(NI^I_{i,t} - \bar{NI}^I_i)^2\right]^{1/2}\left[\sum_{t=1}^{T}(NI^C_{i,t} - \bar{NI}^C_i)^2\right]^{1/2}}\end{aligned}$$

- Require: at least 24 quarters of observation

Intra-Bank Correlation II

large variability, net income more correlated



Conclusion

- Summary
  - cbank and ibank have almost 50/50 net income share
  - commercial bank activity is more labor-intensive
  - cbank and ibank net income is positively correlated
    - ibank net income is counter-cyclical
- Future work
  - improve empirical methodology
  - consider other metrics (besides net income)

Data Overview

- Panel data: Federal Reserve Y-9C
- Frequency: quarterly
- Time period: 2002:Q1-2019:Q4
- Description
  - holding company data all companies with majority share in chartered bank subsidiary
  - detailed balance sheet, income statement line items

Return

Business Line Definitions

Commercial bank (cbank) Income

Commercial Bank Income = total int inc [BHCK 4107]
- trading int inc [BHCK 4069]
+ trading int exp [BHCK 4185]
+ deposit charge [BHCK 4483]
- loan provisions [BHCK 4230]
+ gains on securities [BHCK 3521,3196]
+ net servicing fees [BHCK B492]
+ checks [BHCK C013]
+ safe deposit [BHCK C015]
+ ATMs [BHCK C016]
- total int exp [BHCK 4073]

Business Line Definitions

Investment Bank (ibank) Income

Investment Bank Income = total nonint inc [BHCK 4079]
- deposit charge [BHCK 4483]
+ trading int inc [BHCK 4069]
- trading int exp [BHCK 4185]
- checks [BHCK C013]
- ATMs [BHCK C016]
- net servicing fees [BHCK B492]

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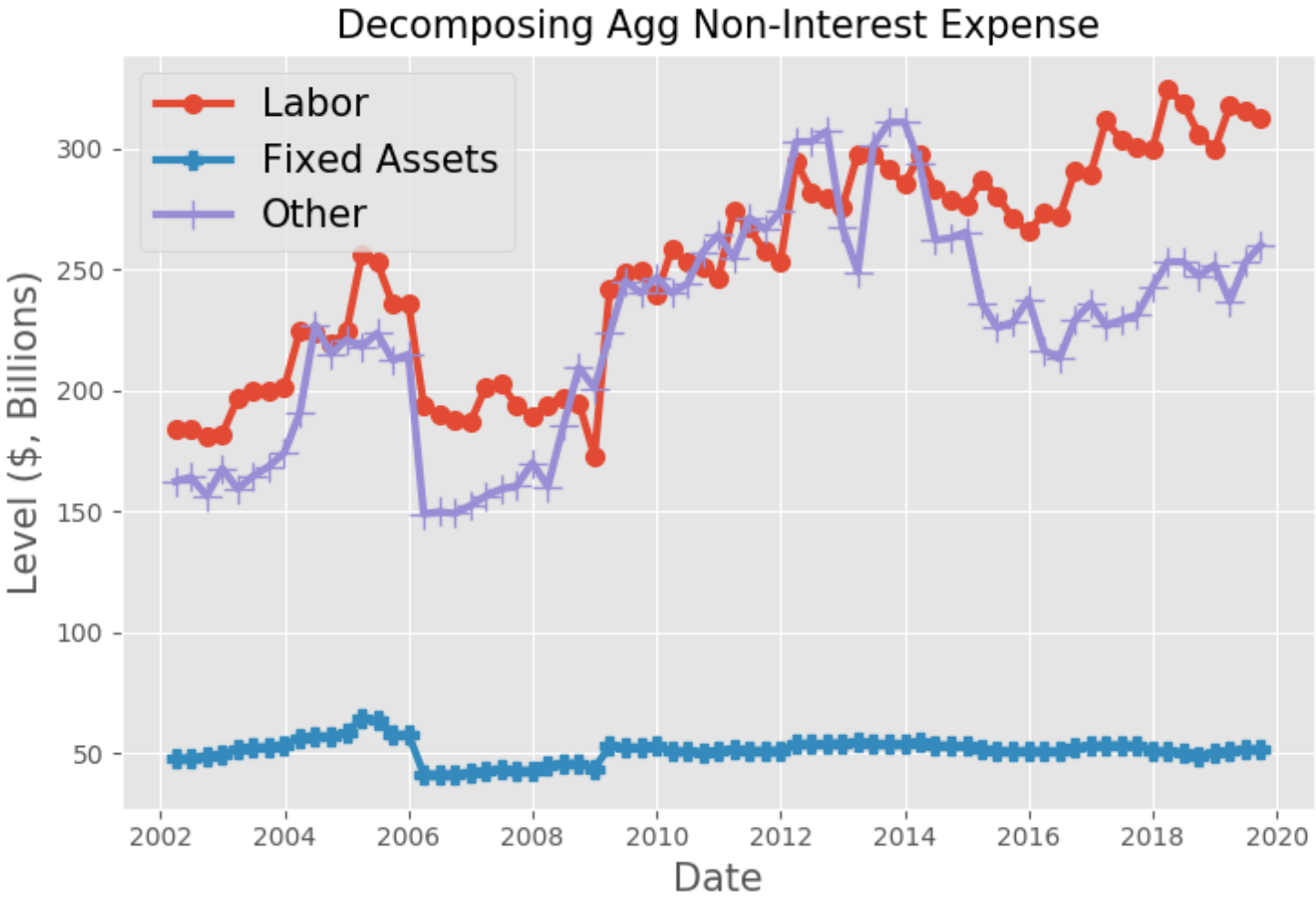
Expense Decomposition



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Literature Review

- Stiroh [2004,2006], Demirguc-Kunt and Huizinga [2010], Brunnermeier, Dong and Palia [2019], Haubrich and Young [2019], DeYoung and Roland [2001], DeYoung and Torna [2013]

- Contribution:
  (1) constructing ibank, cbank business lines

  (2) analysis of net income

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Expense Categories

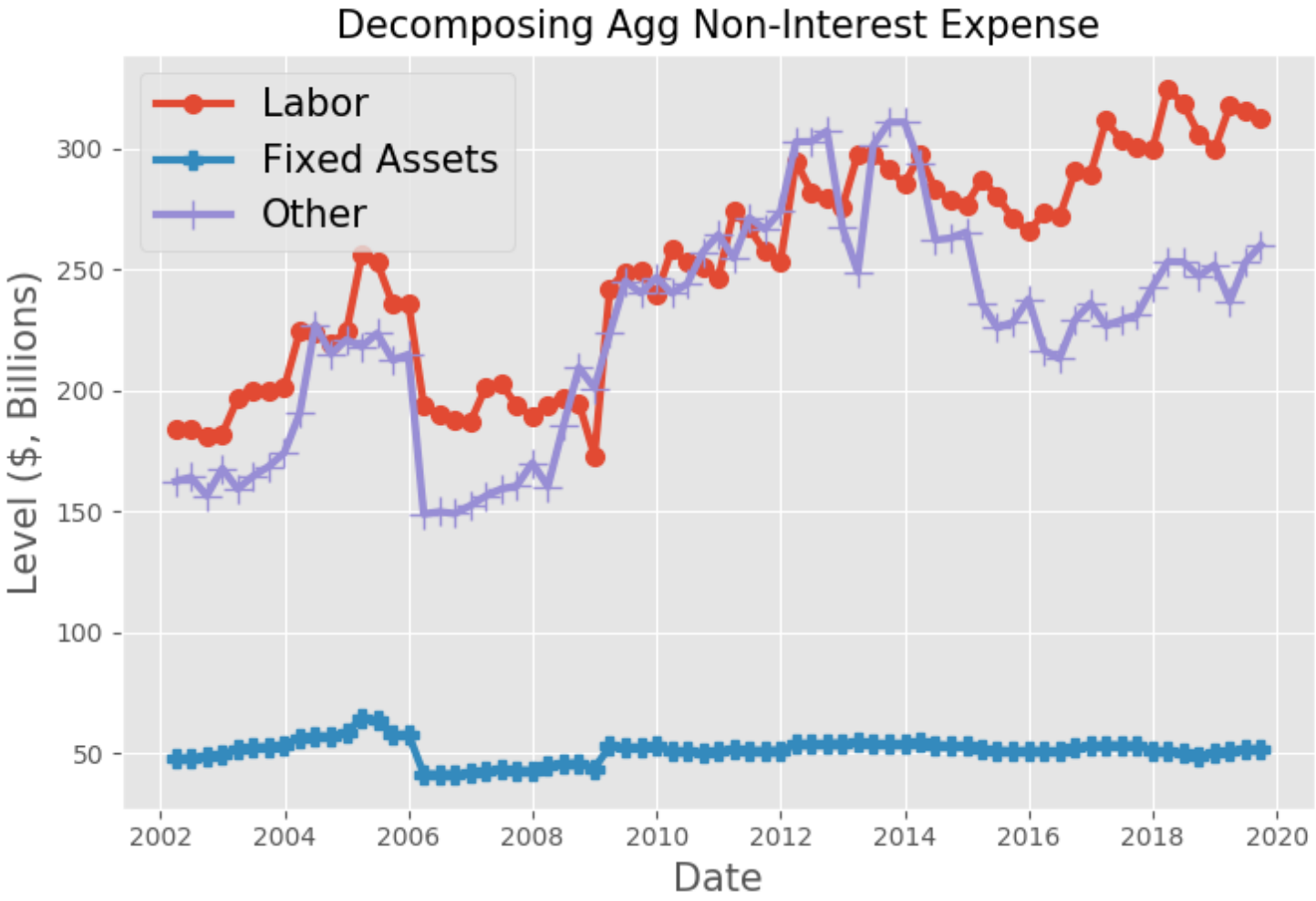
(1) Labor [BHCK 4135]

(2) Premises, fixed assets [BHCK 4217]

(3) Other
- goodwill/intangible impairment losses
- data expense
- advertising/marketing expense
- director fees
- legal and consulting fees
- ATM expense

Return

Expense Decomposition



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Bank Regression Covariates

- Cbank covariates
  - cbank income: previously defined
  - cbank liabilities: total liabilities [BHCK 2948] - trade liabilities [BHCK 3548]
- Ibank covariates
  - ibank income: previously defined
  - ibank liabilities: trade liabilities [BHCK 3548] + other borrowings [BHCK 3190]

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Revenue Correlations

TABLE 3
REVENUE CORRELATION MATRIX

	GDP	Rev	Ibank Rev	Cbank Rev
GDP	1	–	–	–
Rev	-0.05	1	–	–
Ibank Rev	-0.46	0.80	1	–
Cbank Rev	0.30	0.87	0.40	1

NOTE: All data items are of quarterly frequency and the cyclical component of the hp-filter with λ=1600. The sample period is from 2002:Q1 to 2019:Q4.

Return

Expense Correlations

TABLE 2
EXPENSE CORRELATION MATRIX

	GDP	Exp	Ibank Exp	Cbank Exp
GDP	1	–	–	–
Exp	-0.37	1	–	–
Ibank Exp	-0.64	0.86	1	–
Cbank Exp	0.05	0.82	0.41	1

NOTE: All data items are of quarterly frequency and the cyclical component of the hp-filter with λ=1600. The sample period is from 2002:Q1 to 2019:Q4.

Return