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How has Covid-19 influenced the composition of bank incomes?

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Abstract

Banks have two sources of income. They earn interest income from traditional bank services such as credits. They also make non-interest income by charging their customers fees in exchange for various financial services such as checking and cash management, safe-keeping services, investment services, and insurance services. The Covid-19 crisis influenced not only the level of bank revenues, but also their composition. The share of interest income to non-interest income has shown a substantial decrease. This article analyzes the origins of this change and its implications for the banking system for the post-Covid environment. While the literature analyzing income shares only looks at the supply factors, this paper introduces the demand-side factors and finds that the demand-side factors were more important. The deterioration in consumer sentiment has been found to be among the significant determinants of this change. Finally, we find that the income structure of banks of different sizes are determined by different sets of factors.

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1. Introduction

Banks have two sources of income: Interest and non-interest income. Interest income comes from investments that pay interest, such as loans, mortgages, and securities. Non-interest income is generated from sources unrelated to the collection of interest payments, such as service charges (Haubrich and Young (2019). These services include checking and cash management, safe-keeping, investment services, insurance services, ATM fees and loan origination fees (DeYoung and Rice (2004a)).

While interest incomes are generated by issuing loans and collecting interest payments, a significant portion of bank revenues comes from non-interest revenues. DeYoung and Rice, in their 2004 paper, chart a steady increase in the share of non-interest income, going from around 20% of total income in the 1970s to over 40% in the 2000s.

As a major factor in bank profitability, the phenomenon of non-interest revenue has received attention from the literature. Hahm (2008) looked at the structure of bank incomes in 29 OECD countries from 1992 to 2006. He found that banks with relatively large asset sizes, low net interest margins, high impaired loan ratios, and high cost-income ratios tend to exhibit higher non-interest income shares. Smith et al. (2003) examined the variability of interest and non-interest income for the banking systems of EU countries for the years 1994-98. They found that the share of non-interest income increased, which was accompanied by more stable bank profits in the European banking industry in those years. DeYoung and Rice (2004b) tied the increase in non-interest revenues to a shift in the way banks earn money from their traditional banking activities. DeYoung, R., and G. Torna (2013) saw this shift as a permanent movement and discussed the role of the Gramm-Leach-Bliley Act in this change. More recently, Haubrich and Young (2019) related the increase in non-interest incomes to the low-interest environment that followed the sub-prime mortgage crisis.

In addition to analyzing the trends related to income shares, the literature has also looked at how this income structure influences bank risk. The findings are worrisome and conclude that higher non-interest income shares are accompanied by higher risks. Hahm (2008) investigated the consequences of non-interest income expansion on bank profitability and risks in OECD countries. He found that bank profits increase, but profits become more unstable for banks with high non-interest rate incomes. Kohler (2013) analyzed the impact of banks' non-interest income share on risk in the German banking sector. He found that as the share of non-interest income increases, investment-oriented banks become significantly less stable. Brunnermeier et al. (2020) examined the contribution of non-interest income to systemic bank risk and showed that systemic risk is higher for banks with a higher ratio of non-interest income to assets. Antao and Karnik (2022) looked at the relationship between bank incomes and performances and showed that an increase in non-interest income worsens bank risk.

Overall, the literature shows a significant and sustained long term trend in the rise

of non-interest income revenue shares and provides evidence that this is accompanied by higher risk and lower stability in profits. These findings show a need to analyze this phenomenon further. It is likely that the mechanisms at play with respect to income composition and the accompanying risk increase is different for different types of banks. We need to better understand these mechanisms so we can make appropriate recommendations to manage it based on the situation.

This need has long been recognized by various authors who have examined the characteristics of banks that exhibit high non-interest income. Sherene and Bailey (2010) analyzed the determinants of non-interest income for Jamaican banks. They found that banks that have improved their technologies generate higher levels of non-interest income. Craigwell and Maxwell (2006) found similar results for Barbados commercial banks. Hahm (2008) analyzed banks that exhibit high non-interest income in 29 OECD countries from 1992 to 2006. He found that banks with relatively large asset sizes, low net interest margins, high impaired loan ratios, and high cost-income ratios tend to exhibit higher non-interest income shares. Rogers and Sinkey (1999), De Young and Hunter (2003) and De Young et al. (2004a) looked at the role of the bank size in determining the share of non-interest incomes and found that larger banks are more likely to experience non-interest income expansion. These are all interesting findings and prompt further investigation.

There are also some other elements that current literature has not yet analyzed. First, the articles that have looked at the trends relating to non-interest income all employ a long-term view, analyzing decades of data. While this view is certainly valuable, the lagged nature of these studies prevents policymakers from adjusting their policy based on the results. Understanding the sources of short-term movements is crucial in deciphering the impact of shocks on the banking sector. This is also important in guiding policymakers in the short term during these shocks, because decisions need to be made to address the immediate concerns of the public. A long-term strategy that ignores the short term is not ideal in economic policy making. The recent Covid-19 crisis is an example of one of those shock environments. The pandemic has caused havoc in financial markets and the real economy. As the economic fallout spread, traditional banking activities took another hit due to social distancing and near-zero interest rates. Moreover, with so many people out of work, banking sector consumers became more cost-conscious. They demanded more services for less cost, which put banks relying on non-interest incomes in a difficult position. In this paper, we will analyze the immediate impact of the shock brought on by the COVID crisis on the composition of bank revenues. In doing so, we will incorporate elements that previously were not included in analyses.

Second, the literature so far has focused on the supply side of factors in analyzing the determinants of bank revenues. In their analysis, they typically concentrated on bank indicators, leaving out the demander's response to changes in the economy. This is especially important in analyzing the impact of Covid-19 crisis on bank revenues since the demand for bank services has been deeply influenced by this crisis. We will address this issue by creating a comprehensive dataset that incorporates data downloaded from the Census survey to characterize the demand

side.
Third, building on DeYoung's work on the different characteristics of banks of different sizes, we will analyze if the demand-side factors impact small and large banks differently.

2. Data and Methodology

This section introduces the data and the methodology that will be used in the empirical analysis. The data come from two sources. The first is the Call Reports supplied by the FDIC, which provides individual-level bank data at a quarterly frequency. Previous studies were limited to using data from these Call Reports. However, this data does not provide any information that can be used to analyze demand side behavior. For this purpose, we incorporate data from the Census, which come from the bi-weekly online Household Pulse Survey studying the social and economic impacts of the coronavirus on U.S. households. The data cover the 2018: Q1 -2021: Q1 period. As a result, we create a more detailed dataset, which allows us to investigate the impact of the Covid 19 crisis.

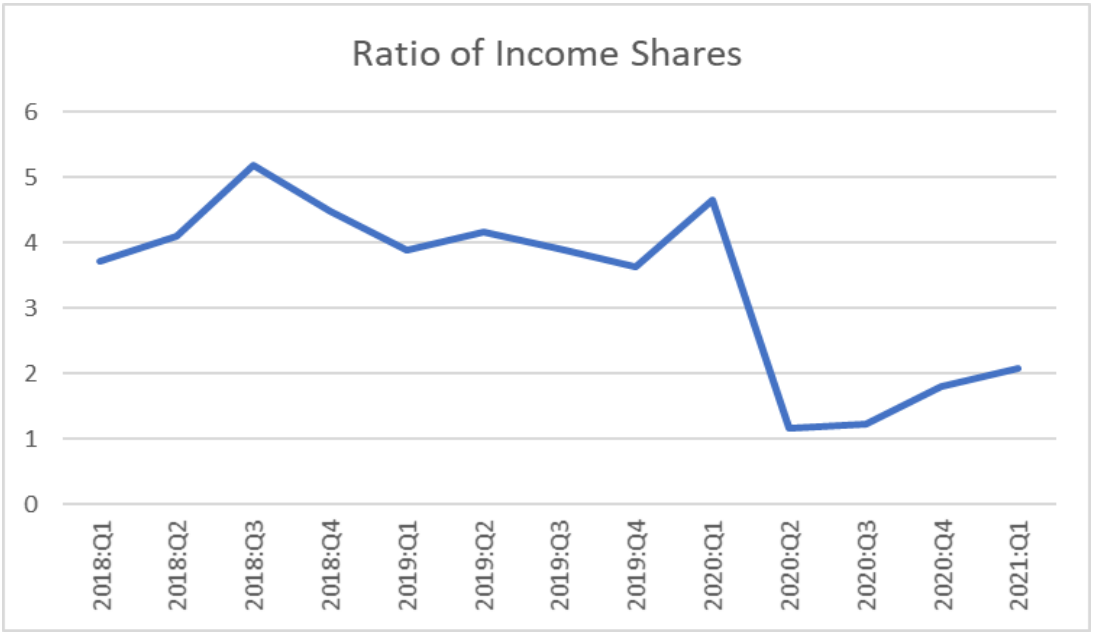

Figure 1: The ratio of interest income to noninterest income

Figure 1 shows the evolution of the interest and non-interest incomes in the Covid-19 crisis environment. Initially, the share of interest income was up to five times than the non-interest income. Both interest and noninterest incomes fell during the Covid crisis, but the drop in interest income was much sharper than the non-interest income. In the second quarter of 2020, the share of non-interest income equalled interest income and the ratio stayed close in subsequent quarters. The paper aims to

explain this structural change in the composition of bank revenues and examine the role of Covid-related factors. For this purpose, we introduce Equation (1).

$$Income_{it} = Bank\ indicators_{it} + Consumer\ Sentiment\ indicators_t + Macro\ indicators_t + e_{it} \quad (1)$$

Equation (1) builds on Hahm (2008) by introducing consumer sentiment indicators and macroeconomic indicators in addition to the bank indicators that he used. $Income_{it}$ in this equation represents one of the two independent variables: the share of interest income to net income and the share of non-interest income to net income. Bank $indicators_{it}$ in this equation controls for banks' characteristics such as funding structure, asset structure, profitability and risk. They include variables such as:

- total loans to total assets (Loans),
- deposits to total assets (Deposits),
- nonperforming assets to total assets (No payment assets).

Next, Consumer Sentiment $Indicators_{it}$ control for the demand-side and examine how the changes in consumer sentiment during the Covid crisis impacted the bank incomes based on Census data. The variables related to the covid crisis in the data include:

- Share of confirmed cases (Confirmed covid cases),
- Aggregated deaths attributed to Covid-19 cases to population (Deaths),
- Share of population 18+ who experienced a loss of employment income at some point since March 13, 2020 (Lost income),
- Share of population 18+ who are "not at all confident" that the household will be able to afford the kinds of food desired in the next 4 weeks (NC to afford food),
- Share of renters who are not current as of the due date for last month's rent (Not current rent),
- Share of population 18+ who are living in a property where they pay rent (Share rent).

Finally, the equation controls for macroeconomic indicators such as annual GDP growth (GDP) and CPI inflation (inflation).

3. Results

Equation (1) is estimated using the fixed-effect panel data method for the share of interest income and the share of non-interest income. Table 1 and Table 2 present these regression results respectively. The standard errors used in calculating the t-ratios are robust standard errors. All of the independent variables coming from Call Reports are expressed as a share of total assets. The data for confirmed Covid cases and share rent are expressed as a share of the total population.

Table 1 and Table 2 include four columns. The first three columns present the results for each indicator separately and the last column includes all three indicators. The results in the first column replicate the previous literature as they are based on the indicators previously used by the literature. Columns II and III provide estimates of the shares using just the new indicators we introduce. Finally, Column IV estimates Equation (1). The AIC indicators at the bottom of the tables allow us to select the best specification for estimating our independent variables. The model with smaller AIC should be selected as it fits the data better than one with the larger AIC.

The results in Table 1 are from the regression for the share of interest income. Column I presents the result that includes only the Bank Indicatorsit. This column shows that the share of interest income increases as the size of the loan portfolio grows. The interest income share is negatively associated with the share of deposits, non-performing assets and ROA. This suggests that as bank activities are concentrated on making loans, the share of interest income increases as expected. However, the increase in the level of risk in the loan portfolio dampens the share of interest incomes. Moreover, bank profits measured by ROA is found to be negatively associated with the share of interest incomes. This might be because banks incurred large losses due to their loan portfolios during the Covid environment.

Column II includes only Consumer Sentiment Indicatorsit as explanatory variables. The interest income share increases as consumer sentiment indicators such as Lost income and Not confident to afford food increase. The share of renters is also positively associated with the share of interest income. This suggests that banks opened more consumer credits as consumers became pessimistic about their future. Column III includes just the macroeconomic indicators. It shows that as the GDP growth increases, the share of interest income increases. That might mean that banks extend more loans during economic expansions. Finally, Column IV provides the results with all three indicators. The results in Column IV are in line with Columns I to III. They show that improvement in macroeconomic conditions and deterioration in consumer sentiment are followed by an increase in the share of interest income. As the degree of bank risk measured by nonperforming loans decreases and the share of loans increases, the share of interest income increases. Column IV is shown to perform best based on the AIC criteria.

Table 1: Regressions Results for the Share of Interest Income to Net Income

	I		II		III		IV	
	Coef	**t-test**	**Coef**	**t-test**	**Coef**	**t-test**	**Coef**	**t-test**
Loans	42.39***	18.32					32.57***	11.72
Deposits	-11.05***	-2.77					-14.54***	-3.62
No payment assets	-103.76***	-4.54					-95.02***	-4.16
ROA	-0.30***	-2.79					-0.07	-0.65
Equity	-2.38	-0.23					12.85	1.21
Confirmed covid cases			9.33**	-1.38			-3.21	-0.63
Deaths			142.60	1.17			149.19	1.20
Lost income			27.83***	5.13			27.92***	5.13
NC to afford food			22.20**	2.31			29.95***	3.11
Not current rent			-21.21	-1.54			-20.33	-1.45
Share rent			21.31***	5.18			16.46**	2.40
GDP					1.38***	12.11	0.32*	1.93
Inflation					-9.92	-0.34	-2.69	-1.04
_cons	-21.85***	-13.70	-16.23***	-6.86	-13.08***	-9.50	-31.19***	-7.86
N	76,113		76,113		76,113		76,113	
F- test	78.30		61.76		160.64		41.11	
R2	0.01		0.01		0.01		0.02	
AIC	566,720		566,753		566,819		564,819	

Table 2: Regressions Results for the Share of Non-interest Income to Net Income

	I		II		III		IV	
	Coef	**t-test**	**Coef**	**t-test**	**Coef**	**t-test**	**Coef**	**t-test**
Loans	8.94	1.53					-9.11	-1.30
Deposits	-12.35	-1.23					-19.42*	-1.92
No payment assets	-17.47	-0.30					-3.04	-0.05
ROA	-2.24***	-8.22					-1.84***	-6.59
Equity	76.76**	2.92					105.84**	3.96
Confirmed covid cases			0.02	0.00			-6.68	-0.52
Deaths			115.67	0.38			148.17	0.47
Lost income			15.11	1.11			17.42	1.27
NC to afford food			15.00	0.62			16.52	0.68
Not current rent			-68.70**	-1.99			-50.26*	-1.91
Share rent			41.18***	3.97			18.97*	1.93
GDP					-0.86***	-2.99	-0.00***	-4.01
Inflation					4.90**	2.03	-1.01	-0.16
_cons	-8.74**	-2.18	-13.56**	-2.28	-6.85**	-1.98	-10.53	-1.05
N	76113		76113		76113		76113	
F- test	16.09		10.71		31.99		9.73	
R2	0.01		0.01		0.01		0.02	
AIC	707,304		706,330		707,322		705,250	

Table 2 presents the results for the share of non-interest income. Column I shows that loans, deposits and non-performing loans are not significant determinants of the share of non-interest income, while ROA and the equity ratio are negatively associated with this variable. Column II shows that the two variables are the significant consumer sentiment indicators: “share of renters” and “share of renters who are not current”. The positive sign of the share of renters might indicate that renters demanded more services such as cash management and insurance services during the Covid environment. On the other hand, the negative association with the share of population not current in their rent suggests that the deterioration in

consumer sentiment resulted in lower demand for such services. Column III presents the results with macroeconomic indicators. The share of non-interest income has been found to be negatively associated with the GDP growth, which might mean that banks focus on service activities less as growth picks up. Column IV combines all the indicators and shows that the share of non-interest incomes is negatively associated with Deposits, ROA and Not Current Rent. It increases as the Equity and the share of renters increase. The AIC results confirm that the specification in Column IV fits the model better.

Overall, the results in Table 1 and Table 2 suggest that including the consumer sentiment indicators and the macroeconomic indicators previously unaccounted for by the literature actually result in better fits. By including these variables into the model, we are able to see how the deterioration in the consumer sentiment can change the structure of bank incomes.

After presenting the results for the entire sample, we next analyze the income shares for different bank sizes by following Rogers and Sinkey (1999), De Young and Hunter (2003) and De Young et al. (2004a). In Tables 3 and 4, we provide the regression results for different sizes of banks. Since the model that includes all three indicators is selected as the best specification, we use this moving forward. We divide our sample into three size groups and present the results for these sizes. In both tables, Column I provides the results for banks at the bottom 25th percentile. Column II includes banks that are between 25th and 75th percentile and finally Column III presents those that are in the top 25th percentile.

Table 3: Regressions Results for the Share of Interest Income to Net Income for Different Bank Sizes

	I		II		III	
	Coef	**t-test**	**Coef**	**t-test**	**Coef**	**t-test**
Loans	0.59	0.17	17.95***	3.96	388.15***	38.72
Deposits	5.14	1.25	-5.43	-0.60	13.62	0.41
No payment assets	25.39	0.74	-50.75	-1.62	-812.04***	-6.71
ROA	0.08	0.51	0.89***	5.29	-4.32***	-12.50
Equity	-28.99**	-2.52	43.28**	1.98	11.09	0.20
Confirmed covid cases	-1.81	-0.22	5.87	0.72	-70.38***	-7.61
Deaths	141.60	0.72	179.49	0.91	564.31***	2.59
Lost income	-4.44	-0.49	10.72	1.24	87.16***	9.51
NC to afford food	-4.62	-0.29	5.63	0.38	29.14*	1.68
Not current rent	28.84	1.21	-25.73	-1.18	-18.62	-0.78
Share rent	19.16	1.48	3.07	0.28	22.20**	2.16
GDP	0.49	0.77	-0.63	-1.13	9.80***	17.13
Inflation	-4.78	-1.01	4.12	1.00	-70.65***	-16.64
_cons	6.10	0.89	-27.61***	-4.28	-147.83***	-19.07
N	17,372		38,856		19,885	
F- test	7.49		7.24		211.85	
R2	0.01		0.00		0.17	
AIC	160,207		298,520		140,076	

The results in Tables 3 and 4 indicate that the share of incomes has different determinants for different sizes. In Table 3, for the very small banks in Column I, equity is the only significant variable. On the other hand, for medium size banks in Column II, the indicators reflecting the health of the banking sector such as loans, ROA and Equity are found to be significant, while the demand side indicators are still not significant. All three indicators are found to be significant for large banks. The signs of the regression coefficients in Table 3 are in line with Table 1. The share of loans, the number of Covid cases and Covid-related deaths are positively associated with the share of interest income. The size of non-performing loans and inflation have a negative association with the share of interest incomes for these banks.

Table 4: Regressions Results for the Share of Non-interest Income to Net Income for Different Bank Sizes

	I		II		III	
	Coef	**t-test**	**Coef**	**t-test**	**Coef**	**t-test**
Loans	-35.51	-1.53	5.10***	3.50	188.58***	35.35
Deposits	-55.64**	-2.00	-1.37	-0.47	-8.53	-0.48
No payment assets	-117.71	-0.51	-26.55***	-2.63	-415.94***	-6.46
ROA	-6.37***	-6.19	0.30***	5.59	-2.28***	-12.37
Equity	190.08**	2.44	-7.94	-1.13	4.99	0.16
Confirmed covid cases	44.00	0.81	4.68*	1.78	-36.75***	-7.46
Deaths	-110.10	-0.08	-9.31	-0.15	310.76***	2.68
Lost income	38.40	0.63	0.41	0.15	39.43***	8.08
NC to afford food	-0.96	-0.01	7.60	1.60	13.26	1.44
Not current rent	-213.74	-1.33	-11.27	-1.61	-14.05	-1.11
Share rent	97.94	1.12	-5.68	-1.60	17.15***	3.14
GDP	-2.34	-0.54	-0.58***	-3.22	4.61***	15.15
Inflation	11.59	0.36	4.29***	3.24	-32.47***	-14.36
_cons	-18.21	-0.39	-7.78***	-3.75	-73.51***	-17.82
N	17,372		38,856		19,885	
F- test	7.11		5.19		191.64	
R2	0.01		0.00		0.16	
AIC	186,655		210,349		115,998.1	

Table 4 provides the results for the share of non-interest incomes for different sizes. For small banks, consumer-sentiment and macro indicators do not significantly impact the share of non-interest incomes. The bank indicators and macroeconomic indicators are significant for medium size banks, while all three are found to be significant for large banks. The share of non-performing loans, confirmed covid cases and inflation are negatively associated with the share of non-interest income. The results in Tables 3 and 4 demonstrate that banks of different sizes determine their incomes differently. Banks' own indicators are found to be the only factor that matters for the smallest banks in the sample. Bank indicators as well as macroeconomic factors are found to be significant for medium size banks. The model with all three indicators works best for the largest banks in the sample. This suggests that ignoring consumer sentiment and macroeconomic indicators is especially limiting for medium and large size banks' regressions.

The results also show that high GDP figures boast interest and non-interest income shares for large banks. On the other hand, higher inflation hurts both shares. That

might mean that the expenses incurred by large banks are larger than the revenues in less stable macroeconomic environments.
Higher numbers of Covid cases cause a drop in both income shares while Covid-related deaths result in higher shares for both variables. As the share of renters increases, banks direct their attention to on-balance sheet activities and both income shares increase as a result.

4. Conclusions and Policy Suggestions

This paper analyzes banks' income structure and looks at the determinants of the share of interest and non-interest incomes. The paper extends the literature in three dimensions:
First, the literature previously has focused on the supply side of factors in analyzing the determinants of bank income shares. In their analysis, they concentrated on bank indicators, leaving out the demander's response to changes in the economy. The paper introduces the demand side indicators into the analysis and shows that the demand side factors measuring consumer sentiment and the economy's overall health also affect banks' income structure. Deterioration in consumer sentiment resulted in lower non-interest income share. While demand side factors cannot be directly managed by banks, understanding their impact on income structures provides insight to banks so they can make better decisions on the factors that they can control. Recognizing the pressures created by the demand side factors will provide an opportunity to account for and manage their impact.
Second, this paper looks at the immediate impact of the Covid-19 crisis on banks' income structure. Previous studies in the literature analyzed the long-term changes in bank incomes and were not able to provide instant feedback to policymakers due to their delayed nature. Understanding the sources of short-term movements is important in guiding policymakers during these shocks, because decisions need to be made to address the immediate concerns of the public. Our results indicate share of interest incomes went down sharply during the Covid crisis, leading to a significant change in the income structures of banks.
The results also suggest that there is room for policymakers to help banks stabilize incomes. Banks can pick the most impactful variables on the supply side to manage their income structure. Our results show that by decreasing the riskiness of loan portfolios and increasing the share of loans in total bank assets, the share of interest incomes can stay stable even in the face of a shock like Covid.
Finally, we suggest it would be a mistake to treat all banks the same when we analyze how the income structure changes. Our findings demonstrate that income decisions are made differently for different size banks. While banks' own characteristics are the only determinant of income shares for small banks, large bank income shares are found to be determined by all three indicators. This means that decision makers need to recognize that the impact of bank size on their income shares. Especially for large institutions, regulators should encourage banks to consider the demand side factors when diversifying their loan portfolios. That may

mean diversifying loan portfolios based on a geographical basis. This is feasible for especially large banks who have large networks. Banks making loans to different locations will be subject to varying degrees of such shocks, which is especially important in pandemics.

While it is hard to predict when the new outbreak will be, our results also provide input for regulators for future pandemics. The paper's findings suggest that income shares would be less stable for banks located in areas where consumer sentiment changes more. While it is outside this paper's scope, future research should conduct regional analysis to detect these areas. Banks located in the more susceptible areas should be given a priority in receiving government assistance during these crisis since pandemics' impact would be longer-lasting for these banks.

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