The effects of cost-push inflation on Austrian banks

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To better understand what the current inflationary surge means for financial stability, this study analyzes how cost-push inflation resulting from import price shocks affected key Austrian macroeconomic variables during the current high inflation period (Q2 21 to Q1 23). Broadly in line with the expectable effects of a negative supply shock, the import price shocks are estimated to have caused an 8% rise in Austrian consumer prices, a 1% drop in Austrian GDP and a 180 basis point increase in interest rates following central bank reactions to higher inflation. The effects on Austrian banks' income statements are more nuanced. On the one hand, the inflationary shocks drove up costs (staff costs and administrative expenses) and banks' risk provisions; on the other hand, they also caused banks' income to rise (net interest income and income from fees and commissions). Net interest margins, for instance, are estimated to be 25 basis points (14 basis points) higher for small (large) banks in the period from 2021 to 2023 due to cost-push inflation. The net effects on bank profitability turn out to be heterogenous. For small banks, cost push-inflation drove up costs and risk provisions more than income, causing the return on assets (ROA) to be 35 basis points lower in the period from 2021 to 2023. For large banks, the shocks led to smaller increases in costs and risk provisioning, resulting in a ROA that was 13 basis points higher in the same period.

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Since mid-2021, inflation has spiked in Europe but also globally, reaching double-digit levels not seen since the 1970s. What does this inflationary surge mean for financial stability? This study approaches this question by analyzing how supply-side, cost-push inflation from the import side (e.g. through higher prices for energy imports or supply bottlenecks) affected the Austrian economy and key components of Austrian banks' income statements during the current high inflation period (Q2 21 to Q1 23). Banks are the most significant actors in the Austrian financial sector, and imported cost-push inflation was one of the main sources of the current inflationary spike.[2]

This paper follows similar studies on the effects of terms-of-trade, import or oil price shocks on macroeconomic aggregates.[3] It is structured as follows: Section 1 identifies inflationary cost-push shocks from the import side. Section 2 estimates the effects of such shocks on Austrian macroeconomic variables (GDP, CPI inflation and short-term interest rates) to clarify the macroeconomic scenario. Finally, section 3 estimates the effects of these shocks on key components of Austrian

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[2] *This ignores demand-driven inflationary factors like government spending programs during the COVID-19 pandemic.*

[3] *On terms-of-trade shocks and import price shocks, see Schmitt-Grohe and Uribe (2018) and Juvenal and Petrella (2019); on oil price shocks, see Kilian (2008), Bjornland et al. (2018) and Kaenzig (2021).*

banks' income statements. All models employed in this study are estimated using data up until Q4 19 only, given the extreme effects of the COVID-19 pandemic,[4] and are then applied to the current high inflation period in Austria. Since the transmission of import price shocks to macroeconomic and bank variables takes time, all models are estimated with lags of up to two years.

1 Shock identification

To identify the import price cost-push shocks, I follow Bjornland et al. (2018) and estimate the following bivariate vector autoregression (VAR) model with quarterly world GDP growth, *GDP*, as measured by the seasonally adjusted GDP of all OECD countries, and import price growth, *comm*, as measured by the Hamburg Institute of International Economics (HWWI) commodity price index for Europe, for Q4 78 to Q4 19.[5]

$$GDP_t = c_1 + a_{y,1}^{y}\, GDP_{t-1} + a_{y,1}^{\pi}\, comm_{t-1} + \varepsilon_{y,t}$$
$$comm_t = c_2 + a_{\pi,0}^{y}\, GDP_t + a_{\pi,1}^{y}\, GDP_{t-1} + a_{\pi,1}^{\pi} comm_{t-1} + \varepsilon_{\pi,t}$$

The idea behind this VAR is to disentangle the demand and supply factors behind commodity prices since they impact macroeconomic variables very differently. For instance, a positive shock to global demand ε_y should drive up GDP, while a positive supply shock ε_π, e.g. due to supply restrictions following a conflict or war, should cause GDP to decrease. To identify the supply-side commodity price shocks ε_π, the VAR assumes that import prices can react directly to changes in world demand but that world demand reacts to changes in prices with a one-quarter lag.

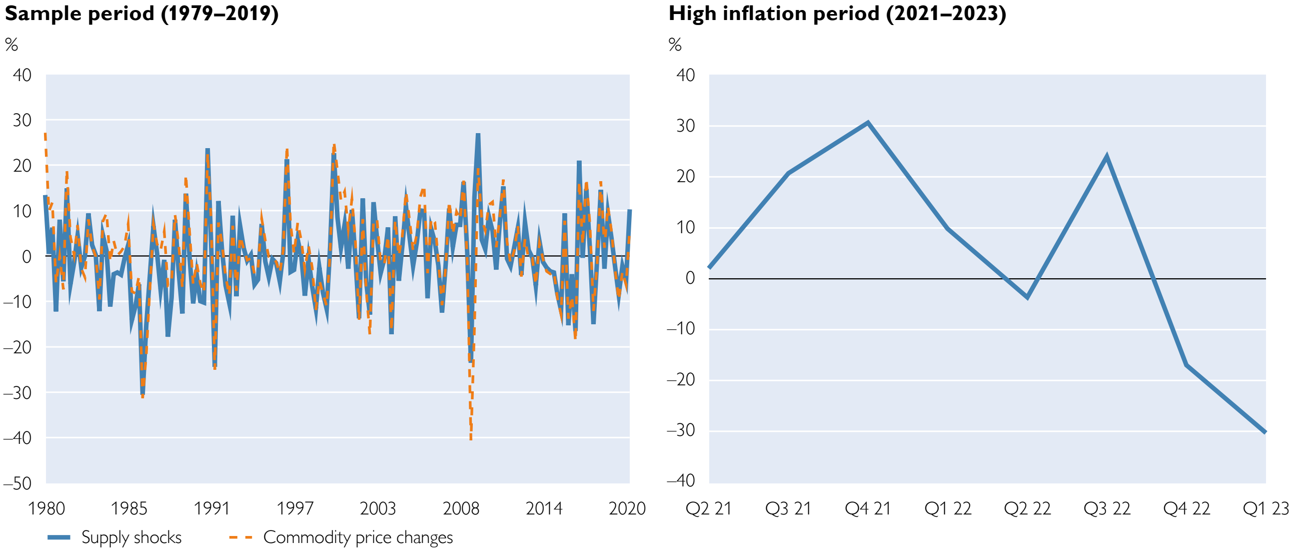
Chart 1 shows the VAR model estimates of the supply shocks $\varepsilon_{\pi,t}$ and the actual commodity price changes. As the left-hand panel indicates, cost-push shocks explain most of the changes in actual commodity prices. The right-hand panel also shows the model-implied shocks for the high inflation period from Q2 21 to Q1 23. The cost-push shocks were particularly strong in the second half of 2021 and in the first quarter of 2022.

[4] *For example, Austrian GDP in Q2 20 contracted by 11.4% before bouncing back by the same extent in Q3 20. These extreme values lead to macroeconomic effects that are at odds with findings from other studies and thus bias the results for bank variables.*

[5] *Using other import price measures, such as industry import prices, leads to very similar results. The same holds for using real commodity prices deflated by the OECD consumer price index (CPI).*

Chart 1

Commodity price changes and supply shocks



Source: HWWI, OECD, author's calculations.

2 Macroeconomic effects

To better understand the macroeconomic scenario in which the banking sector operates with imported cost-push inflation, I first regress the import price shocks ε_π identified in section 1 on key Austrian macroeconomic variables with lags of eight quarters or two years:

$$y_t = \beta_0 + \sum_{h=0}^{8} \beta_{h+1}\varepsilon_{\pi,t-h} + u_t \qquad (1)$$

The following table summarizes the macroeconomic variables y used in the regression:

Macroeconomic variables used in this study

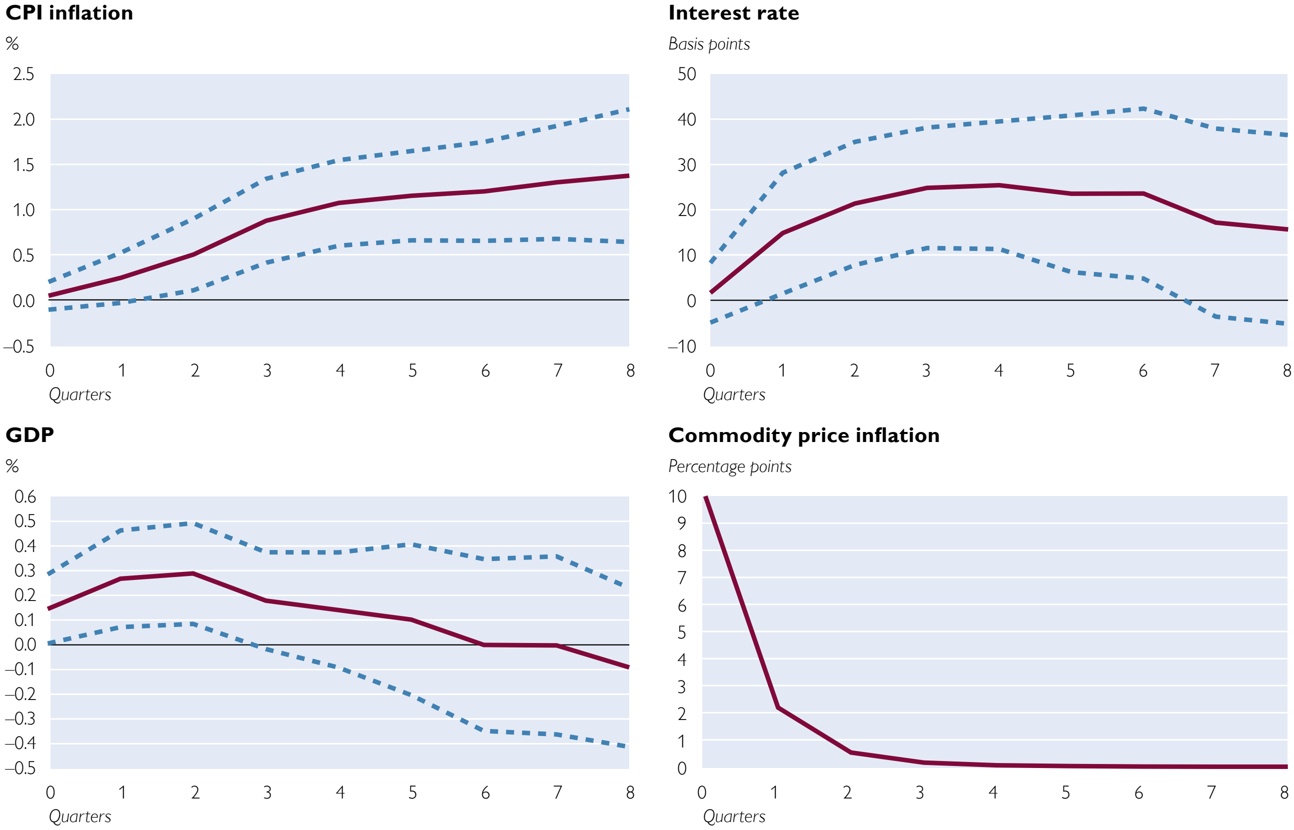
	Description of variable	Period	Source
CPI inflation	Yearly change in Austrian consumer price index in %	Q1 93 to Q4 19	Statistics Austria
Interest rate	Quarterly change in euro area three-month interbank rate in basis points	Q1 94 to Q4 19	OECD; FRED[1]
GDP	Quarterly Austrian GDP growth in %, seasonally adjusted	Q2 95 to Q4 19	Statistics Austria

Source: Author's compilation.

[1] *FRED = Federal Reserve Economic Data database (series ID:IR3TIB01EZM156N).*

Chart 2

Impulse response functions of Austrian macroeconomic variables after a cost-push inflation shock



Source: Author's calculations.

Note: The red line shows the impulse response of the macroeconomic variables. The dashed blue lines mark the 90% confidence bands that result when we use the Newey-West correction for serial correlation with a truncation parameter of 4.

Chart 2 shows the reactions of these variables after a supply shock initially increased commodity prices by 10 percentage points, as shown in the bottom right-hand panel, over the following two years (eight quarters).[6]

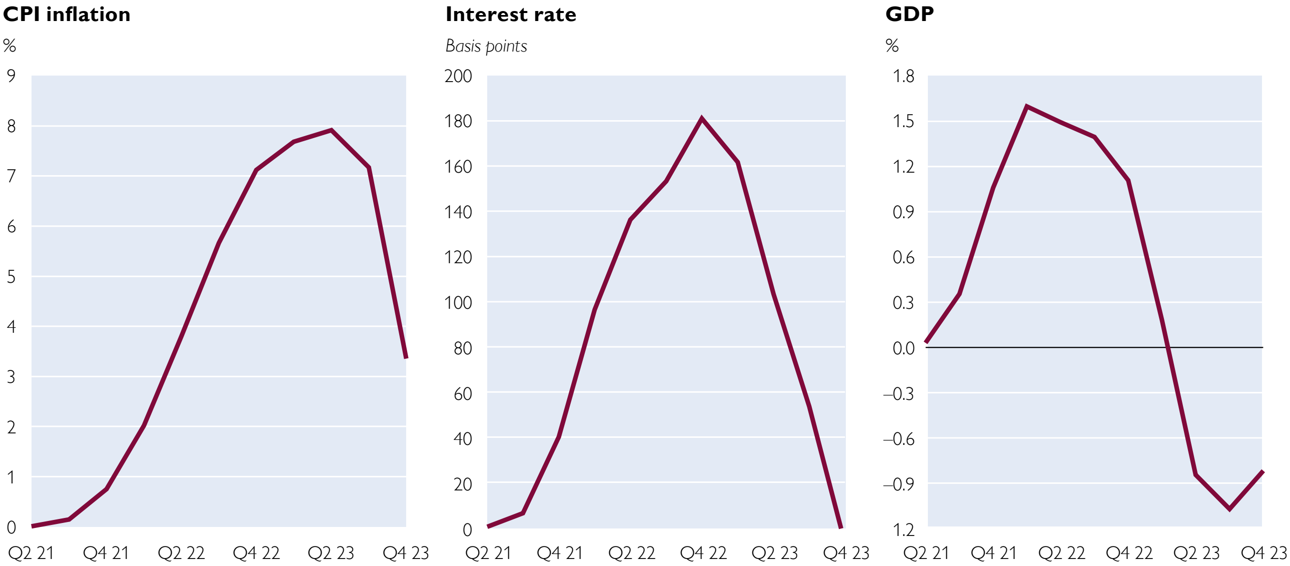
The other panels show that such a shock increases consumer prices by 1.3% and short-term interest rates – through central bank reactions – by about 20 basis points in the course of two years. After an initial rise, GDP finally decreases by 0.1% after a period of two years.

Chart 3 applies the model to the current high inflation period. It shows the marginal effects of the cost-push inflation shocks of the period from Q2 21 to Q1 23 on the three macroeconomic variables until Q4 23, i.e. it shows how the variables would have developed if they had only been affected by the cost-push shocks of the high inflation period.

[6] *To be precise, the charts show the cumulative effects, i.e. the sum of the dynamic coefficients in regression (1). Shocks of this magnitude are commonly analyzed in the literature and are close to the shocks' standard deviation of 9.4%. The effects on commodity prices are shown as deviations from their steady-state values.*

Chart 3

Macroeconomic effects of cost-push inflation shocks in Austria in the high inflation period



Source: Author's calculations.

The model suggests that the shocks caused Austrian consumer prices to rise by about 8%, interest rates to increase by 180 basis points and GDP to decline by about 1%. Given the long lags in the effects on GDP, however, this decline is not expected to materialize until mid-2023. These results are broadly in line with the expected effects of an imported negative supply shock: Higher energy and commodity prices should lead to a rise in production costs and inflation, reduce output and increase interest rates as central banks react to rising inflation.[7] The results are also broadly in line with actual data. Actual inflation increased by 8.0 percentage points between Q2 21 and Q1 23 while the model predicts a rise in inflation by 7.7 percentage points. However, the model underestimates the actual interest rate increase. Actual interest rates rose by 317 basis points between Q2 21 and Q1 23, while the model only predicts an increase by 161 basis points. This is no surprise as the current interest rate hikes were exceptionally strong by historical standards.[8]

[7] *Other papers tend to find similar effects on interest rates, while the effects on inflation (output) tend to be smaller (bigger). Kaenzig (2021) and Bjornland et al. (2018) estimate that a similar shock to oil prices drives up US inflation by 20 basis points to 40 basis points and interest rates by 10 basis points to 20 basis points. In a recent review on the macroeconomic effects of oil and energy price shocks, Bjornland (2022) estimates that a 10% oil supply shock (e.g. due to conflicts and/or war) on average reduces real GDP in the euro area by 0.5% over the same horizon. Kaenzig (2021) and Bjornland et al. (2018) arrive at similar figures for the United States.*

[8] *The effects on GDP are difficult to compare to actual data since GDP is affected by many other factors and follows a trend.*

3 Effects on banks

Like in regression (1), we now regress the import price shocks ε_π on key Austrian bank variables in an unbalanced panel regression, where $\Delta x_{i,t}$ are the bank variables of interest for bank i in first differences.[9]

$$\Delta x_{i,t} = \beta_0 + \sum_{h=0}^{8} \beta_{h+1}\varepsilon_{\pi,t-h} + u_{i,t} \tag{2}$$

The bank variables stem from the quarterly income statements of Austrian banks at the unconsolidated level, i.e. excluding foreign subsidiaries. The data cover 98 quarters, from Q4 98 until Q4 19. I focus on six key bank variables, all expressed as margins in relation to total assets: net interest margin (NIM), fees and commissions income, staff costs, administrative expenses, risk provisions (mainly for credit risk) and net profits after tax, i.e. return on assets (ROA). To mitigate the effect of large outliers, I exclude all values below the first and above the 99th percentile and omit banks with only one observation.[10] To account for the heterogeneity between banks, the results below will be presented for two groups of banks, namely small and large banks. Small banks are defined as banks holding 0.1% or less of aggregate total assets in a given period, while large banks hold 1% or more. With aggregate total assets of around EUR 1,000 billion (in 2022, average total assets were EUR 1,030 billion), this means large banks have a balance sheet of EUR 10 billion or more, and small banks have a balance sheet of EUR 1 billion or less.[11]

Chart 4 and chart 5 show the reactions of the bank variables to the same supply shock that initially increased commodity prices by 10 percentage points over the following two years (eight quarters). They provide five main takeaways: First, except for large banks where administrative expenses hardly react, the inflationary shock tends to increase banks' staff costs and administrative expenses. This is consistent with the idea that cost-push inflation increases input prices and wages. Second, the fees and commissions income of both groups of banks also goes up, suggesting that banks can pass part of the cost increases on to customers. Third, cost-push inflation shocks tend to improve Austrian banks' NIM. This is consistent with the view that banks can pass on most of the interest rate increases to their borrowers due to the high share of variable rate loans. In contrast, customer deposits, especially those of households, are rather insensitive to interest rate changes, which means deposit repricing is slow.[12] Fourth, the inflation shock drives

[9] *The regressions also include quarterly dummies to control for seasonal patterns not shown here. First differencing mitigates stationarity issues and controls for bank-specific time-invariant factors. Including bank fixed effects has practically no influence on the coefficient estimates and only slightly improves the standard errors.*

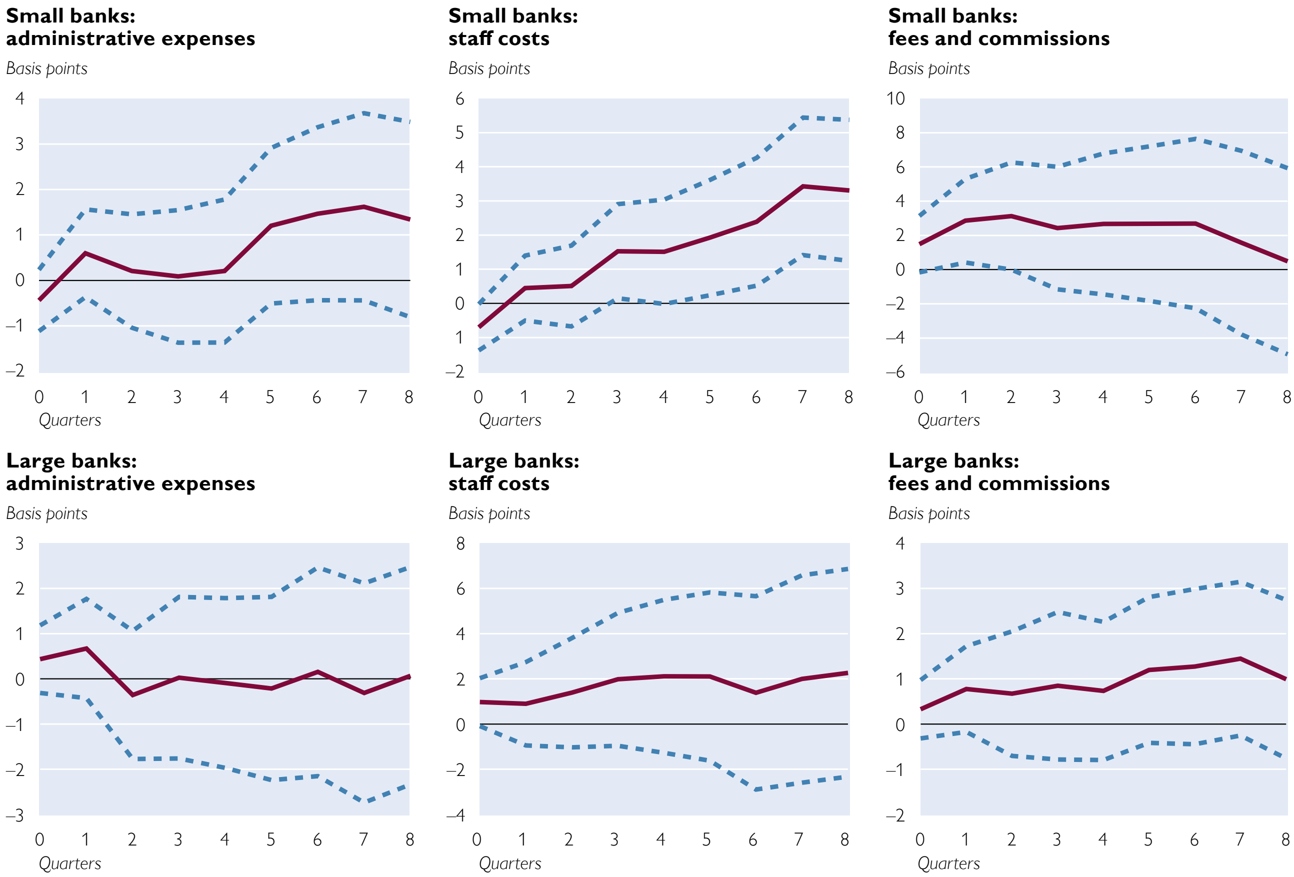
[10] *To give a concrete example: For the NIM, excluding values below the first and above the 99th percentile means excluding values below –0.37% and above 4.34%. Nine banks have only one observation.*

[11] *Note that this definition differs from the size criterion of EUR 30 billion defined for significant banks by the Single Supervisory Mechanism. Small banks account for 88.9% of observations and for 13.9% of total assets, while large banks account for 65.2% of total assets but only for 2.3% of observations. The number of large banks varies between 13 and 21 per period, without exhibiting any clear time trend, while the number of small banks decreases in parallel with the total number of banks over the sample period, from 844 (914) to 438 (538). More detailed statistics on the two groups of banks can be found in the annex.*

[12] *Hoffmann et al. (2018) investigate these arguments in more detail for the euro area.*

Chart 4

Impulse response functions of Austrian bank variables after a cost-push inflation shock



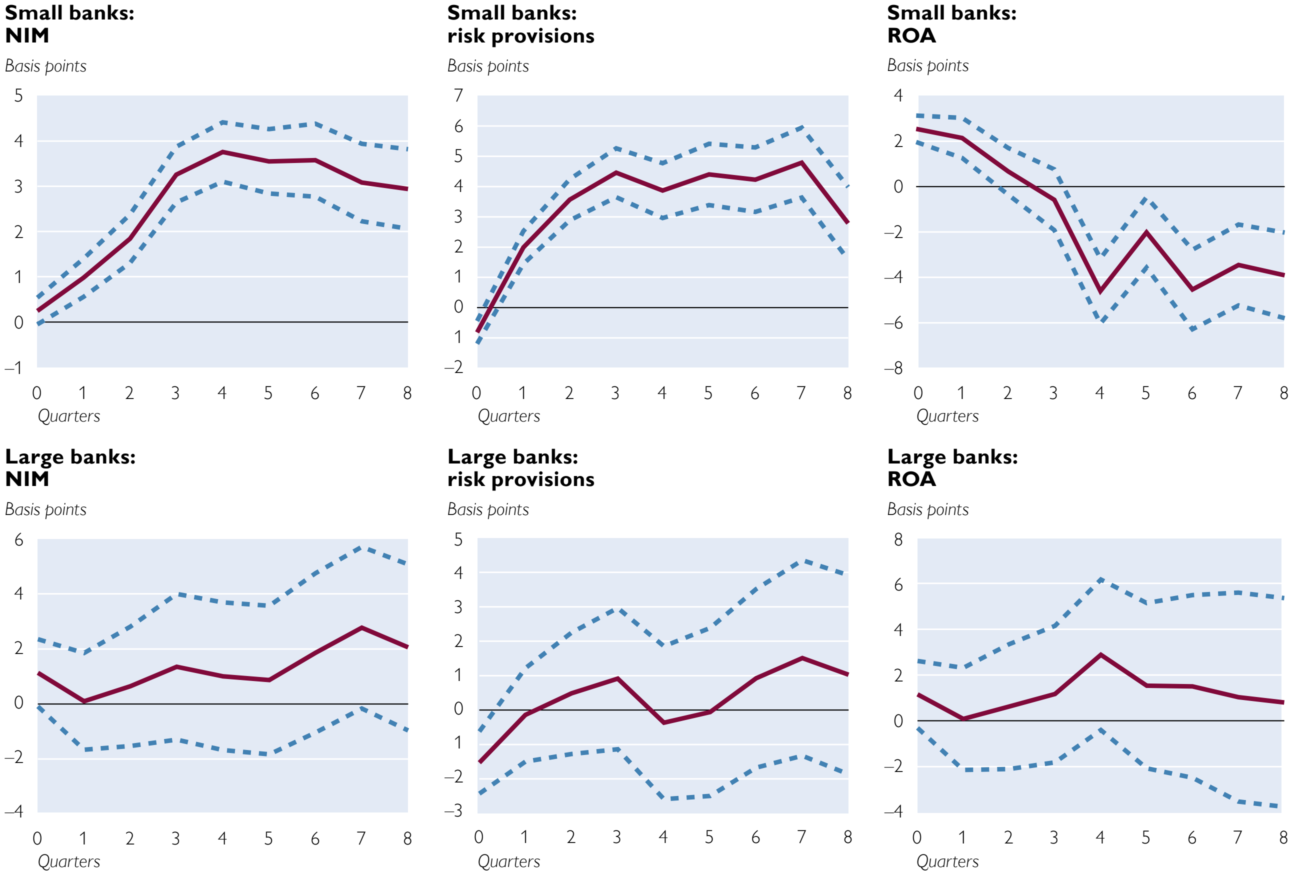
Source: Author's calculations.

Note: The red line shows the impulse response of the bank variables. The dashed blue lines mark the 90% confidence bands that result when we use the Newey-West correction for serial correlation with a truncation parameter of 4.

up bank risk provisions, which is consistent with the idea that higher inflation, higher interest rates and lower growth tend to increase credit and market risk. Fifth, the overall effect on banks is heterogenous: While the overall profitability of an average small bank tends to go down after the inflationary shock, the effect on the overall profitability of an average large bank is slightly positive. For small banks, rising costs and higher risk provisions outweigh increasing net interest margins and fees and commissions income. For large banks, smaller cost increases and smaller risk provisioning turn the balance the other way.

Chart 5

Impulse response functions of Austrian bank variables after a cost-push inflation shock



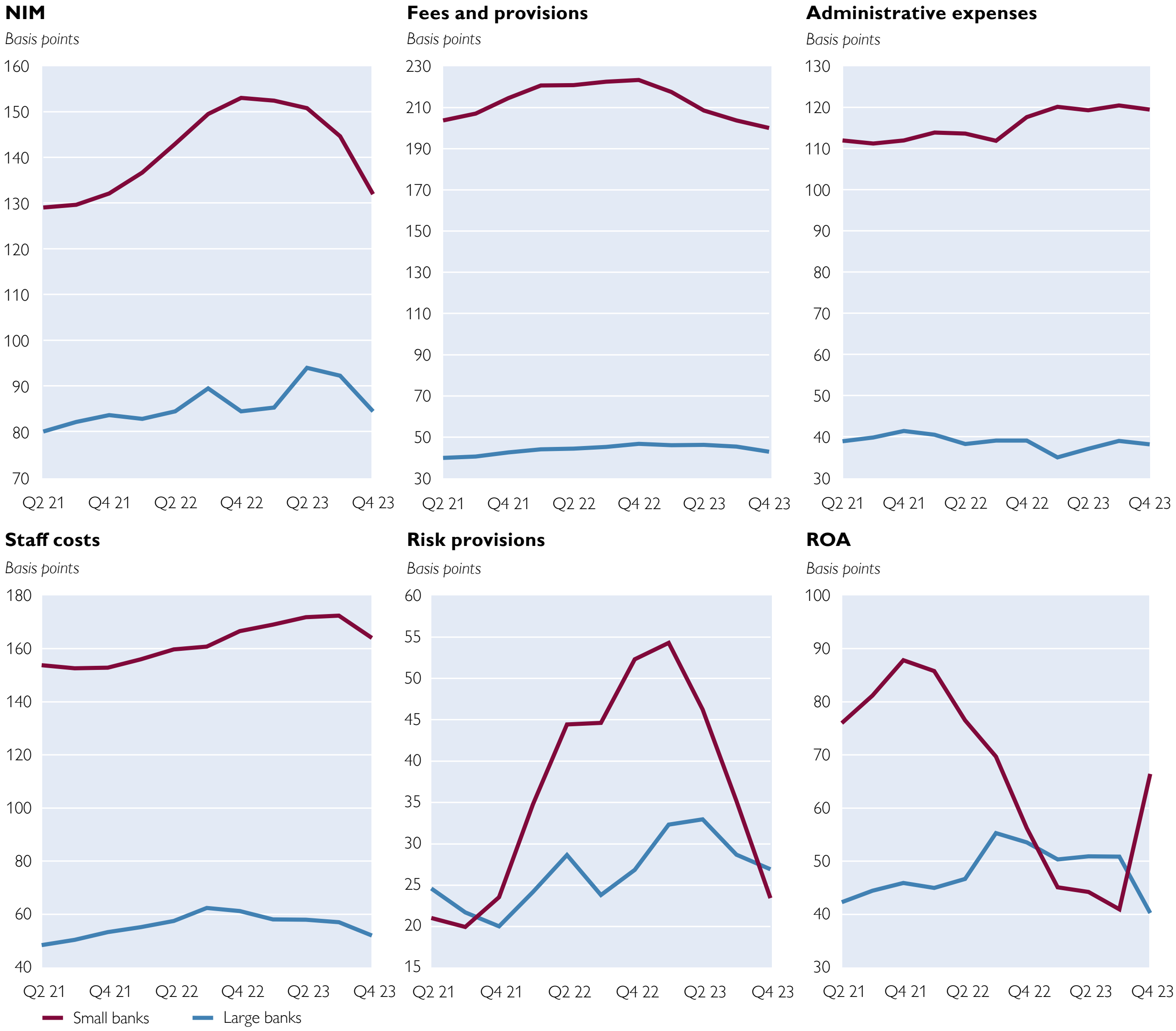
Source: Author's calculations.

Note: The red line shows the impulse response of the bank variables. The dashed blue lines mark the 90% confidence bands that result when we use the Newey-West correction for serial correlation with a truncation parameter of 4.

To put this into a quantitative perspective, chart 6 shows how the inflationary shocks of the current high inflation period (Q2 21 to Q1 23) affected bank variables, starting from their 2021 means. For an average small bank, it is estimated that the cost-push shocks increased the NIM by 25 basis points (19%) and fees and commissions income by 20 basis points (10%) until end-2022. They also caused administrative expenses and staff costs to rise by 9 basis points (8%) and 19 basis points (12%), respectively. Their most significant effect is the increase in small banks' risk provisions by 35 basis points (150%) though. This is the main reason why the shocks reduced the ROA of small banks by 45% from around 75 basis points in 2021 to 40 basis points in 2023. For large banks, the model predicts that the current inflationary shocks increased the NIM and fees and commissions income by 14 basis points (18%) and by 7 basis points (17%), respectively, while the effect on costs was concentrated on staff costs increasing by 14 basis points (30%). Risk provisions went up only by 8 basis points (33%) due to the inflationary shocks, contributing to a modest increase in large banks' ROA by 13 basis points (31%). Comparing the predicted values with actual data, we find that the model's underestimation of NIM increases is particularly striking. Between Q1 21 and Q1 23, the actual average NIM for small (large) banks increased by 111 (38) basis points, while the model predicts increases of 24 (6) basis points. This probably has two reasons: First, as explained above, the model underestimates interest rate increases as such. Second, the pass-through of interest rate increases to deposit rates has been exceptionally low in the current hiking cycle, as documented e.g. by Ferrer et al. (2023).

Chart 6

Effects of cost-push inflation shocks on bank variables in Austria in the high inflation period



Source: Author's calculations.

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Annex

Table A1

Descriptive statistics for small and large banks (Q4 98 to Q4 01)

	Number of observations			Means, basis points		
	All banks	Small banks	Large banks	All banks	Small banks	Large banks
Net interest margin (NIM)	62,646	56,295	1,468	193	201	89
Fees and commissions income	62,693	56,232	1,451	166	178	37
Administrative costs	62,655	56,291	1,408	107	113	38
Staff costs	62,649	56,290	1,442	158	167	55
Risk provisions	21,908	16,672	1,501	23	21	25
Return on assets (ROA)	62,653	57,028	1,484	73	76	34

Source: OeNB.