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The pass-through of cost shocks to firms' prices and the impact on value added

Fabio Parlapiano
Bank of Italy, Financial stability directorate

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Background and objectives

Background:

The resurgence of inflation in the years 2021-22, prompted renewed interest in **firms' pricing policies** for their role a) in the **propagation** of the inflationary dynamic b) setting the extent that firms' bear (or share) the **burden of soaring production costs** with their counterparties (hedging).

What the paper does:

Uses detailed firm-level **survey data** on output and intermediate input price changes matched with **balance-sheet** information to:

a. Analyses the **relationship between firms' pricing policies** and their **value added dynamic**;

b. Decomposes the annual variation of value added into three additive components: i) **price** (pricing policy), ii) **quantity** (intermediate input productivity) and iii) the **interaction** between the two;

c. Analyses the **response** of firms' pricing policies and value added dynamics to **idiosyncratic intermediate input price shocks**. Enabling us to characterise the **resilience** of firms, in terms of their cost-transfer capacity to output prices and, eventually, hedge their economic margins.

Related works

How does an inflationary environment affect firms' profits?

- When inflation is high profits tend to expand. However, **if inflation is particularly high, profits decelerate and eventually fall**. Intuitively, profit expand when output prices grow faster than input prices (Andler and Kovner, 2022; Moore, 1983).

To what extent firms' pricing policies, measured via mark-ups, contribute to inflation?

- Surging inflation in the 2021-22 period cannot be attributed to pricing policies, as **mark-ups mostly remained stable** or returned to pre-pandemic levels (Colonna *et al.*, 2023; Leduc *et al.*, 2024);

- **The transmission of cost-shocks to output prices is incomplete** (0.7 percent increase in output prices for every 1 percent rise in costs), and b) contrary to the expectations of competitive markets, the pass-through effect is **lower in industries with higher levels of concentration** (Ganapati *et al.*, 2020; Champion et *al.*, 2023);

- Firms with greater **market power** (high mark-up) **are less likely to pass on cost-shocks** to end prices (Kouvavas *et al.*, 2021; Kharroubi *et al.* 2023).

Modelling framework (1/2)

Decomposing Value Added (VA)

Nominal growth rate (Δ) of value added (VA) is **decomposed** as follows:

$$\Delta VA_{t,t-1} = \frac{VA_t - VA_{t-1}}{VA_{t-1}} = \frac{1}{VA_{t-1}} \left[\Delta Rev \cdot Rev_{t-1} - \Delta Cost \cdot Cost_{t-1}\right]$$

$$\Delta VA_{t,t-1} = \Delta p^{VA}_{t,t-1} + \Delta q^{VA}_{t,t-1} + \Delta pq^{VA}_{t,t-1} \quad \text{1)}$$

The **contribution** made by firms' pricing policies (both output and intermediate input prices), productivity and the interaction term between prices and quantities are defined:

$$\Delta p^{VA}_{t,t-1} = \frac{1}{VA_{t-1}} \left[Rev_{t-1} \cdot \Delta p^{o}_{t,t-1} - Cost_{t-1} \cdot \Delta p^{i}_{t,t-1}\right]$$

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$$\Delta q^{VA}_{t,t-1} = \frac{1}{VA_{t-1}} \left[Rev_{t-1} \cdot \boxed{\Delta q^{o}_{t,t-1}} - Cost_{t-1} \cdot \boxed{\Delta q^{i}_{t,t-1}}\right] \qquad \textbf{IIP,} \text{ input prod.}$$

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III,
Intensity input

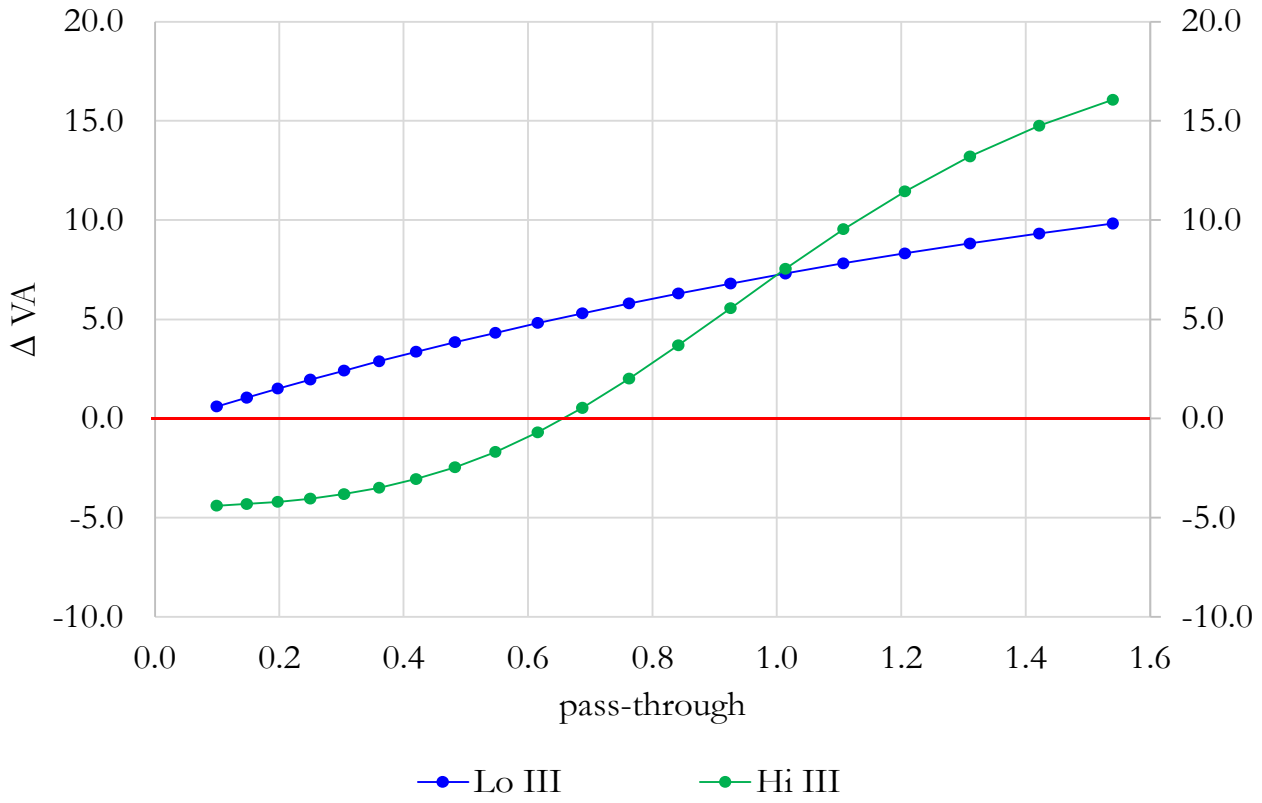
$$\Delta pq^{VA}_{t,t-1} = \frac{1}{VA_{t-1}} \left[Rev_{t-1} \cdot \Delta p^{o}_{t,t-1} \cdot \Delta q^{o}_{t,t-1} - Cost_{t-1} \cdot \Delta p^{i}_{t,t-1} \cdot \Delta q^{i}_{t,t-1}\right]$$

Modelling framework (2/2)

Comparative statics: pricing policies and growth rate of value added

Firms' pricing policies (in ratio) and ΔVA in **two polar cases**: the share of intermediate input used to produce 1 unit of output is 0.1 (Low III) and 0.9 (High III); Δ output quantities are held constant.

1 - CHANGE IN PASS-THROUGH AND VALUE ADDED



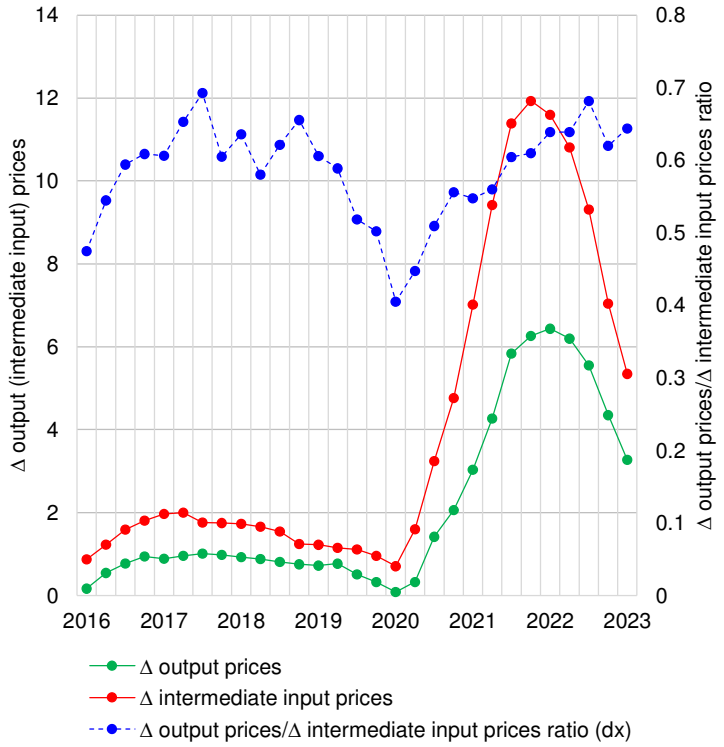
Data

Prices ($\Delta p^{i,o}$)

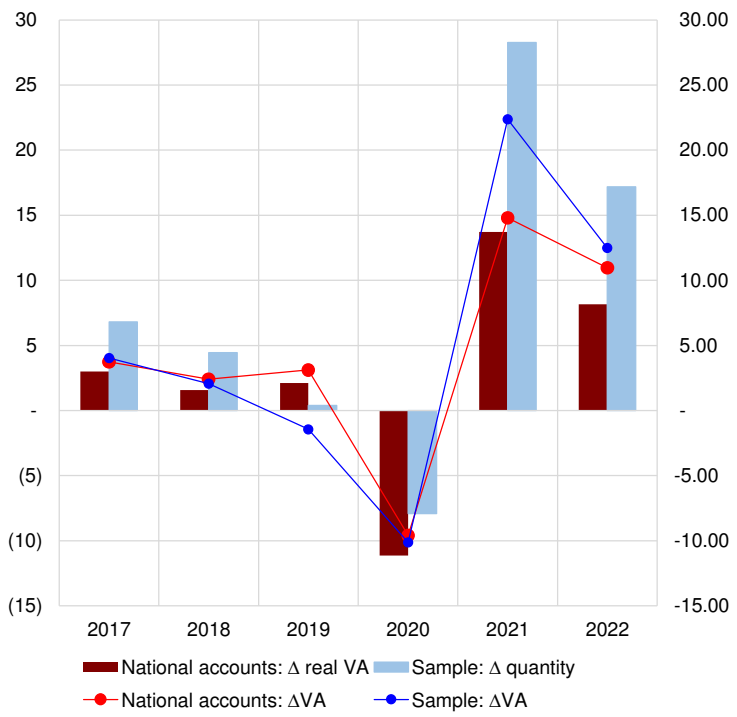
Firm-level price change information for the 2016-22 period sourced from the Survey on Inflation and Growth Expectations (SIGE); information collected at quarterly frequency from a sample of medium-sized and large Italian firms.

- What was the average variation of output (intermediate input) price for the products or services sold (purchased) by your company over the last 12 months?

2 - OPERATING PASS-THROUGH (%)

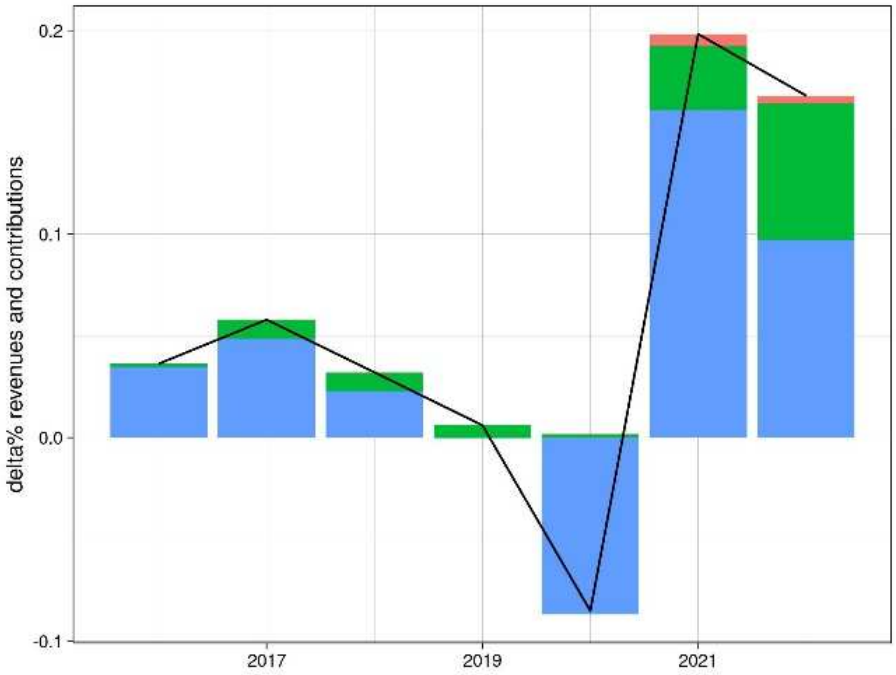


3 - SIGE AND NATIONAL ACCOUNTS DATA (%)

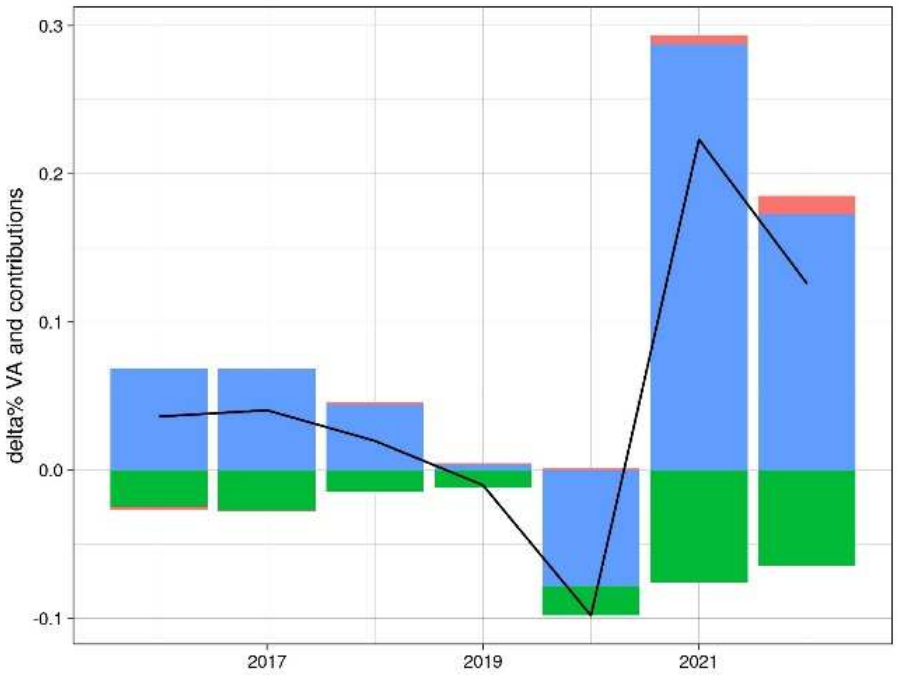


1. Results: pricing policies over time

4 - ΔREVENUES (%)



5 - ΔVALUE ADDED (%)

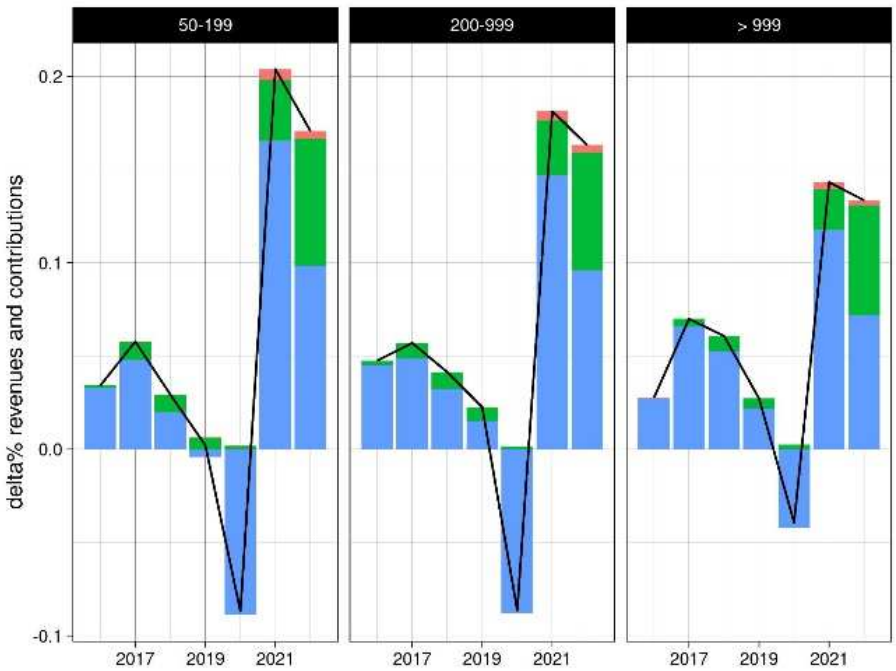


price contr. quantity contr. price-quantity contr.

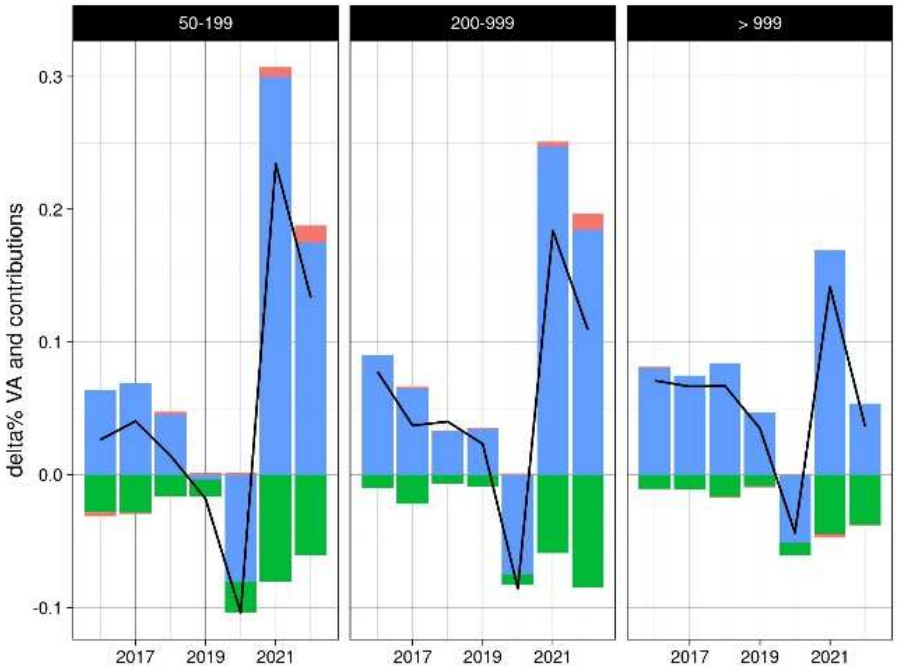
- **Firms' revenues** (**solid line**) fluctuations over the 2016-22 period are correlated with output **prices** (**green histogram**); accounting for 1/3 of revenues growth. **After the pandemic**, the notable surge in inflation also manifested itself in a **substantial increase in the incidence of output price** on revenue growth rates.
- Negative effect of **prices (Δp^{VA})** on ΔVA due to a) incomplete PT and b) the high extent of intermediate input intensity. The VA dynamic is predominantly driven by **quantities (Δq^{VA})**.

2. Results: differences accross sizes

6 - ΔREVENUES (%)



7 - ΔVALUE ADDED (%)



price contr. quantity contr. price-quantity contr.

- **Larger firms display a negative, but more muted, contribution of prices to ΔVA**; they are potentially less susceptible to fluctuations in intermediate input prices, since the impact of such price increases is approximately half that of smaller firms. Furthermore, the divergence in these outcomes became more pronounced following the impact of the pandemic.

3. Cost-shock driven pricing changes and the impact on value added

2SLS - IV setting

How changes in a firm's pricing policy affects its economic performance? **Simultaneity and omitted variables bias** addressed in IV setting:

- **Idiosyncratic shocks** (surprises) to **intermediate input costs** occurred in the $t-1$ period ($Z_{i,t-1}$) are used in the first stage to isolate exogenous variations in a firm's pricing policy (dPP):

$$Z_{i,t-1} = \Delta p^i_{i,t-1} - E\left(\Delta p^i_{i,t-1} | t-2\right) \qquad \text{INSTRUMENT}$$

$$dPP_{i,t,t-1} = \alpha + \gamma Z_{i,t-1} \cdot X_i + \gamma_i + \tau + \mu_{i,t,t-1} \qquad \text{FIRST STAGE}$$

$$\Delta VA_{i,t,t-1} = \alpha + \delta \widehat{dPP_{i,t,t-1}} + \gamma_i + \tau + \epsilon_{i,t,t-1} \qquad \text{SECOND STAGE}$$

- **Relevance:** if firms adjust their current **pricing policy** following **input price forecasting errors** made in the previous period (cor. Z, dPP = 0.3);
- **Exogeneity**: independence between the **instrument** and the **outcome variable** (cor. Z, ΔVA$\cong$0);
- **Exclusion**: effects on ΔVA occurr only via dPP; input prices forecasting error made by a firm impacts its value added changes only via firm-specific changes to its pricing policy.

3. Cost-shock driven pricing changes and the impact on value added

2SLS - IV setting

- **Firms adjust their pricing policies following an idiosyncratic input cost shock**: 1-SD cost shock (5 p.p.) results in a 3 pp increase in operating pass-through (c.2). Impact on value added is however not statistically significant (c.1);
- **Larger** firms endure cost fluctuations and **enhance their operational pass-through by more**. This alone **does not lead to positive changes in value added**.

	ΔVA_t	dPP_t	ΔVA_t	dPP_t	ΔVA_t
	(second stage)	*(first stage)*	*(second stage)*	*(first stage)*	*reduced form*
	(1)	(2)	(3)	(4)	(5)
dPP_t	0.0825 (1.054)		0.0527 (1.016)		
Input cost shock $_{t-1}$		0.6267 *** (0.1315)			0.0517 (0.6511)
$dIIP_t$			0.0019 (0.0020)	-3.31e-5 (0.0006)	
Input cost shock t-1 * Size =1				0.6611 *** (0.1385)	
Input cost shock t-1 * Size =2				0.4100 ** (0.1183)	
Input cost shock t-1 * Size =3				1.066 *** (0.1297)	
Fixed-Effects:	---	---	---	---	---
year	Yes	Yes	Yes	Yes	Yes
firm	Yes	Yes	Yes	Yes	Yes
S.E.: Clustered	by: firm & year	by: firm & year	by: firm & year	by: firm & year	by: firm & year
Observations	2019	2019	2019	2019	2019
R2	0.45	0.53	0.45	0.54	0.45
F-test (1st stage)		595.29		209.85	
Wald (1st stage)		22.718		108.96	

Conclusion

- The narrative for which firms have charged higher prices with respect to the cost increase (*i.e.* greedy pricing) **does not find empirical support** in our study.
  - Firms' **pass-through** of intermediate input to output prices is, on average, **incomplete**.

- The robust growth in **output quantities** has driven the **positive developments** in value added observed during the **post pandemic recovery**.

- Shifts in firms' pass-through driven by idiosyncratic cost shocks **do not translate into improvements** in their value added dynamics.

- This finding aligns with firms' **limited operational hedging capacity** through sale price increases; firms strive to uphold their existing profitability levels and **opt to share** a portion of the economic losses with either end consumers or businesses in order to **retain their market shares**.