

---

CHAMP - ESCB RESEARCH NETWORK  
TRANSMISSION THROUGH THE REAL ECONOMY  
5<sup>th</sup> Workshop

The pass-through of cost shocks to firms' prices

Fabio Parlapiano  
Bank of Italy, Financial stability directorate

Brussels, 31 January 2025



BANCA D'ITALIA

# 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**. 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 ( $\Delta$ ) of value added (VA) is decomposed as follows:

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

$$\Delta VA_{t,t-1} = \Delta p_{t,t-1}^{VA} + \Delta q_{t,t-1}^{VA} + \Delta pq_{t,t-1}^{VA} \quad 1)$$

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

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

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

$$\Delta pq_{t,t-1}^{VA} = \frac{1}{VA_{t-1}} [Rev_{t-1} \cdot \Delta p_{t,t-1}^o \cdot \Delta q_{t,t-1}^o - Cost_{t-1} \cdot \Delta p_{t,t-1}^i \cdot \Delta q_{t,t-1}^i]$$

# Modelling framework (1/2)

## Decomposing Value Added (VA)

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

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

$$\Delta VA_{t,t-1} = \Delta p_{t,t-1}^{VA} + \Delta q_{t,t-1}^{VA} + \Delta pq_{t,t-1}^{VA} \quad 1)$$

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

$$\Delta p_{t,t-1}^{VA} = \frac{1}{VA_{t-1}} [Rev_{t-1} \cdot \boxed{\Delta p_{t,t-1}^o} - Cost_{t-1} \cdot \boxed{\Delta p_{t,t-1}^i}] \quad \text{PP, pass-through}$$

$$\Delta q_{t,t-1}^{VA} = \frac{1}{VA_{t-1}} [Rev_{t-1} \cdot \boxed{\Delta q_{t,t-1}^o} - Cost_{t-1} \cdot \boxed{\Delta q_{t,t-1}^i}] \quad \text{IP, input prod.}$$

$$\Delta pq_{t,t-1}^{VA} = \frac{1}{VA_{t-1}} [Rev_{t-1} \cdot \Delta p_{t,t-1}^o \cdot \Delta q_{t,t-1}^o - Cost_{t-1} \cdot \Delta p_{t,t-1}^i \cdot \Delta q_{t,t-1}^i]$$

# Modelling framework (1/2)

## Decomposing Value Added (VA)

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

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

$$\Delta VA_{t,t-1} = \Delta p_{t,t-1}^{VA} + \Delta q_{t,t-1}^{VA} + \Delta pq_{t,t-1}^{VA} \quad 1)$$

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

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

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

} **III,**  
Intensity input

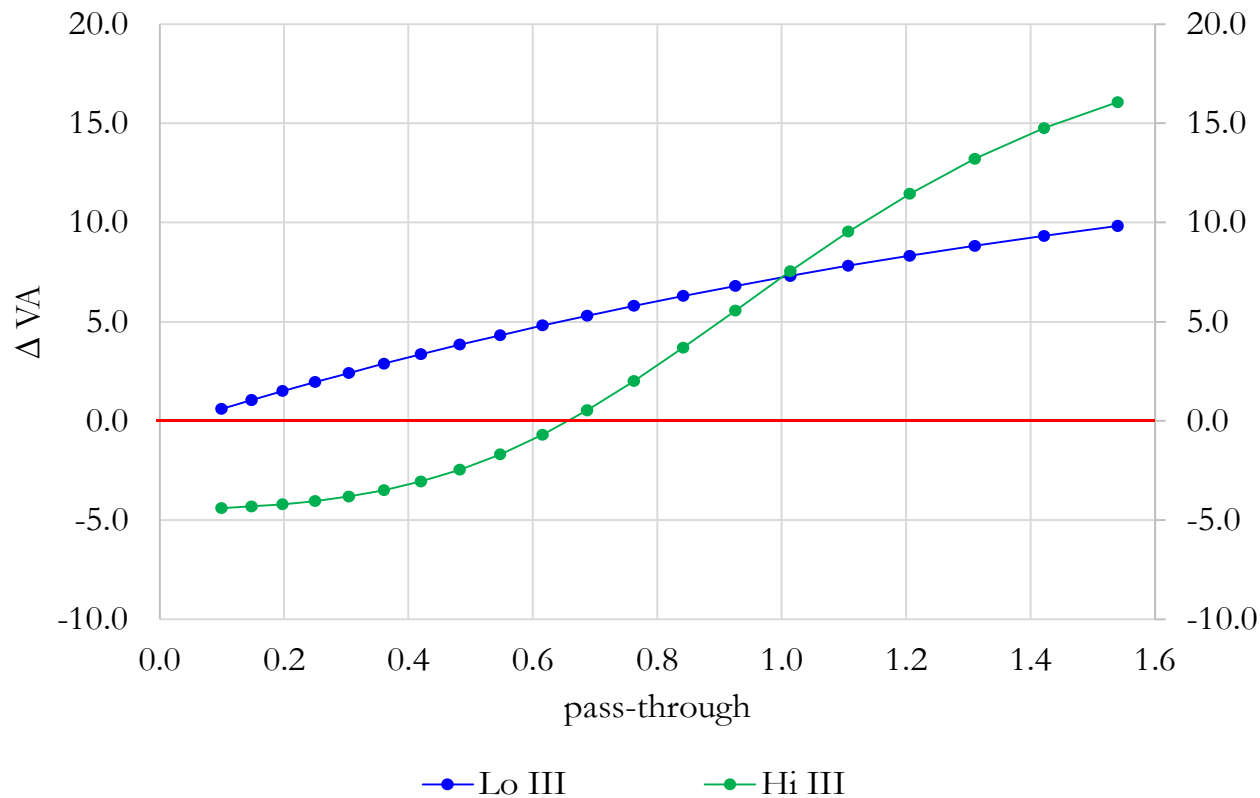
$$\Delta pq_{t,t-1}^{VA} = \frac{1}{VA_{t-1}} \left[ Rev_{t-1} \cdot \Delta p_{t,t-1}^o \cdot \Delta q_{t,t-1}^o - Cost_{t-1} \cdot \Delta p_{t,t-1}^i \cdot \Delta q_{t,t-1}^i \right]$$

# Modelling framework (2/2)

## Comparative statics: pricing policies and growth rate of value added

Firms' pricing policies (in ratio) and  $\Delta VA$  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);  $\Delta$  output quantities are held constant.

### 1 - CHANGE IN PASS-THROUGH AND VALUE ADDED

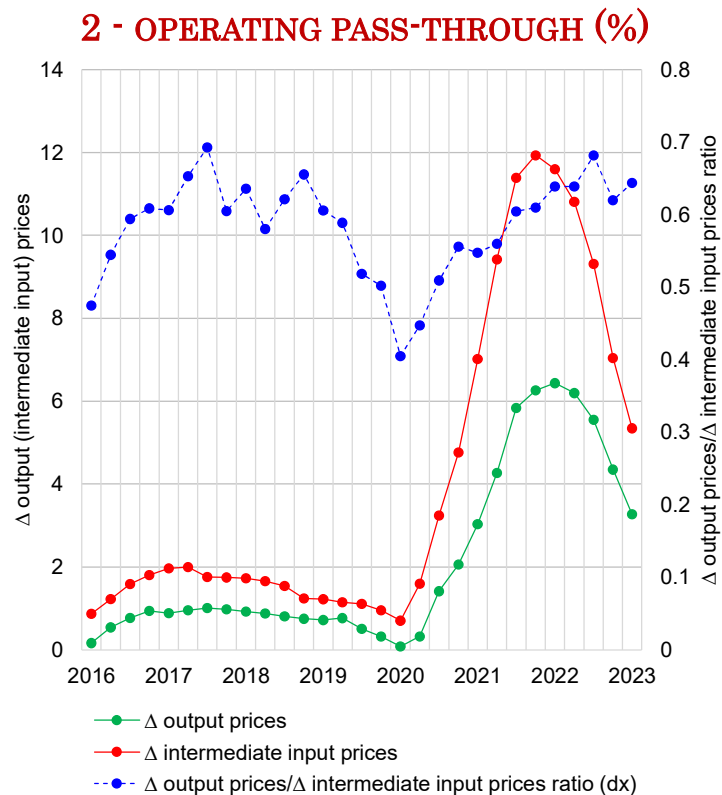


# Data

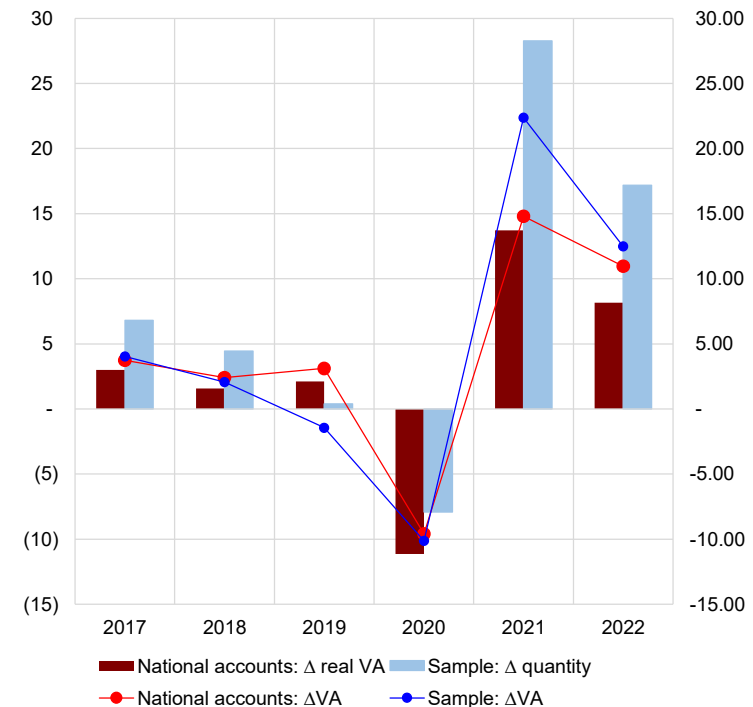
## Prices ( $\Delta p^{i,0}$ )

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?



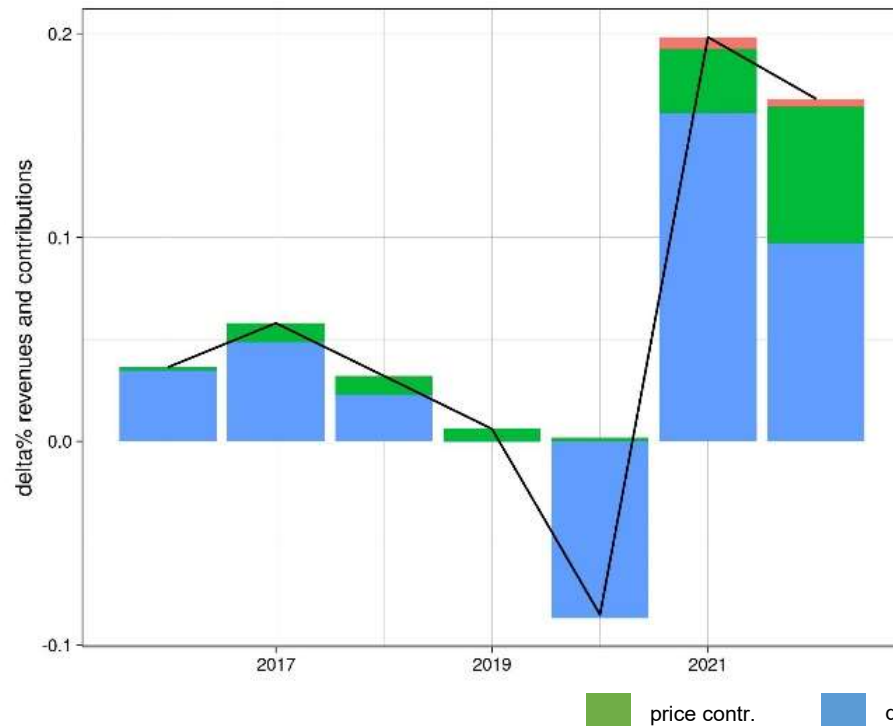
## 3 - SIGE AND NATIONAL ACCOUNTS DATA (%)



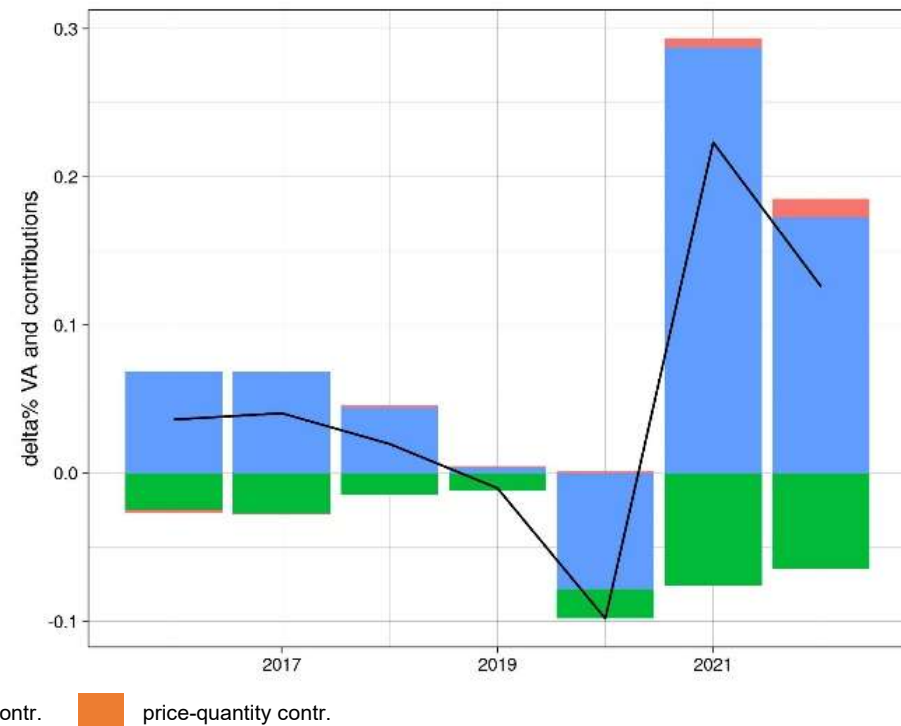


# 1. Results: pricing policies over time

4 -  $\Delta$ REVENUES (%)



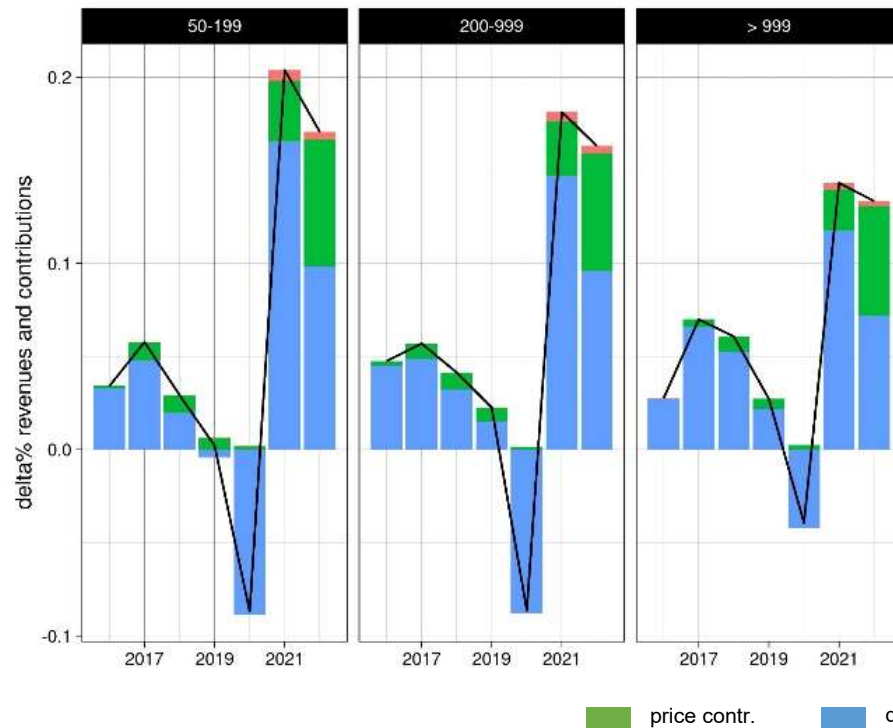
5 -  $\Delta$ VALUE ADDED (%)



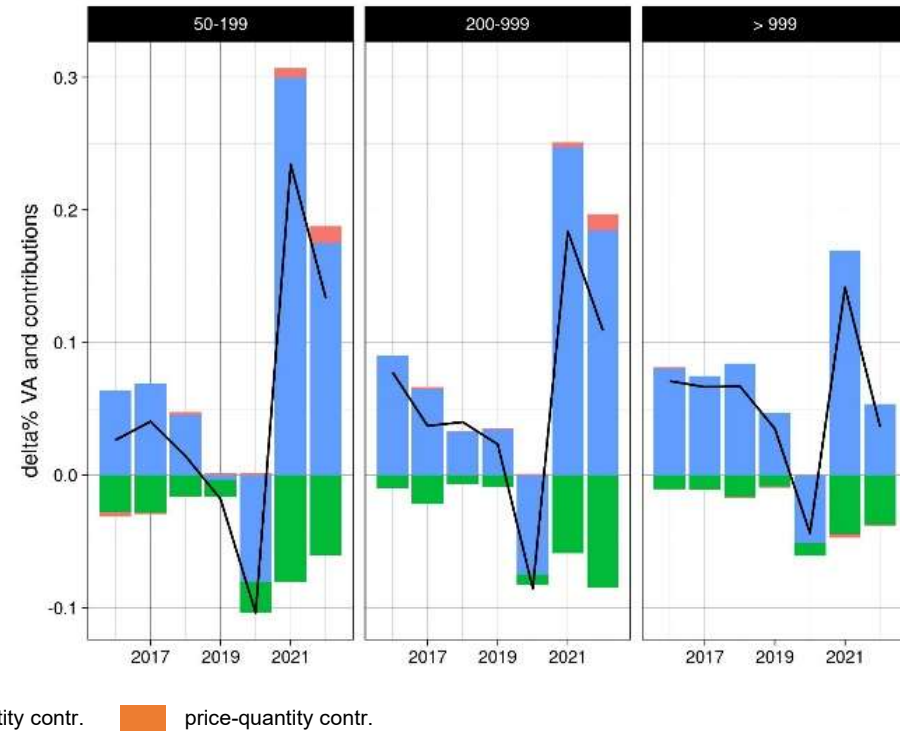
- Firms' revenues (solid line) fluctuations over the 2016-22 period are correlated with output **prices** (green histogram); accounting for 1/3 of revenues growth. **After the pandemic**, the notable surge in inflation also manifested itself in a **substantial increase in the incidence of output price**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

## 2. Results: differences across sizes

6 -  $\Delta$ REVENUES (%)



7 -  $\Delta$ VALUE ADDED (%)



- Larger firms display a negative, but more muted, contribution of prices to  $\Delta$ VA; 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 pandemic.

### 3. Cost-shock driven pricing changes and 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 ( $dPP$ ):

$$Z_{i,t-1} = \Delta p_{i,t-1}^i - E(\Delta p_{i,t-1}^i | t-2) \quad \text{INSTRUMENT}$$

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

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

- **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.  $Z$ ,  $\Delta VA \cong 0$ );
- **Exclusion:** effects on  $\Delta VA$  occur 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 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.

	$\Delta VA_t$ ( <i>second stage</i> ) (1)	$dPP_t$ ( <i>first stage</i> ) (2)	$\Delta VA_t$ ( <i>second stage</i> ) (3)	$dPP_t$ ( <i>first stage</i> ) (4)	$\Delta VA_t$ <i>reduced form</i> (5)
$dPP_t$	0.0825 (1.054)	0.6267 *** (0.1315)	0.0527 (1.016)		
Input cost shock $t-1$					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:	-----	-----	-----	-----	-----
<i>year</i>	Yes	Yes	Yes	Yes	Yes
<i>firm</i>	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**.