Price-cost margins, fixed costs and excess profits

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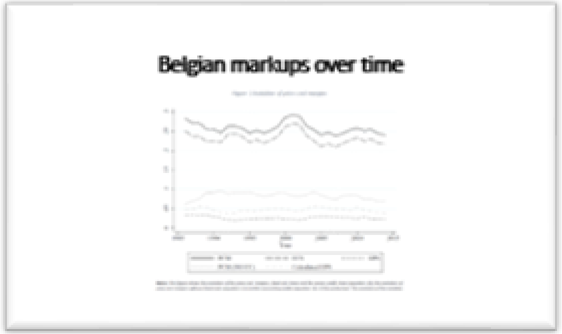
Introduction

- **Concerns** about **rise of US markups** (De Loecker, Eeckhout & Unger, 2020).
  - Interpreted as rising product market power, and linked to other macroeconomic trends.
- However, still **heavily debated** at the conceptual and empirical level
  - Diverse reasons for rising markups which are not necessarily linked to rising market power (Berry, Gaynor & Scott, 2019), among which fixed costs
  - De Loecker and Warzynski (2012) is the dominant approach, and typically uses COGS and SG&A as respectively variable and fixed inputs.
    - Accounting practices, among which reclassification, might have changed (Traina, 2018; Karabarbounis and Neiman, 2018)
    - Basu (2019) is skeptical that the variable input choice issue can be adressed by current data availability
- Introduce a **novel methodology** building on Hall (1988) and Roeger (1995)
  - Based on Solow residuals: primal (Q) and dual (P) revenue and cost-based
  - Jointly estimate price-cost margins and fixed costs



What do we (not) do?

- **Advantages**
  - Assumptions
    - Flexible treatment of all inputs → No arbitrary assumption on fixity of an input
    - Returns to scale parameter ϒ is *not* restricted to one
      - If ϒ =/= 1, then estimate:

        $$PCM_t^{AVC} = 1 - \gamma_t(1 - PCM_t^{MC}) = \frac{P-AVC}{P}$$
      - If ϒ = 1, then estimate:

        $$PCM_t^{AVC} = PCM_t^{MC} = \frac{P-MC}{P}$$
    - No need for deflator → Use nominal values (Roeger, 1995)
    - Deals with endogeneity problem caused by unobservable productivity shocks (Roeger, 1995).
  - Results
    - Estimate aggregate PCM and the share of fixity for each input
    - Decompose PCM into FCR and EPR (link to profit rate; Barkai, 2020)

- **Disadvantages**
  - Assumptions
    - Static optimization framework → No dynamic costs.
    - Perfect competition in the input market
  - Results
    - Estimate 'aggregate' coefficients
      - Not able to estimate firm-year level coefficients based on firm-year accounts
      - Firm size distribution matters (De Loecker, Eeckhout & Unger, 2020)
    - However, able to estimate coefficients by subsamples based on microeconomic data
      - small vs. large, sector results and so on

Methodology

Assumptions
- No markup
- No fixed costs (i.e. all costs are variable)
- Constant returns to scale

Start from a short-run production function for firm i in year t,

$$Q = F(K\ ,L\ ,M\ )\ \theta$$

Define the primal revenue based Solow residual

$$SRQ^R \equiv \Delta q - \frac{WL}{PQ}\Delta l - \frac{P^M M}{PQ}\Delta m - (1 - \frac{WL}{PQ} - \frac{P^M M}{PQ})\Delta k$$

Use profit maximization, first-order-conditions and Euler's law to get,

Derivation

$$\Delta q = \left(\frac{RK}{PQ}\Delta k + \frac{WL}{PQ}\Delta l + \frac{P^M M}{PQ}\Delta m\right) + \Delta\vartheta$$

In order to obtain,

$$SRQ^R =$$

$$\Delta\theta$$

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Use profit maximization, first-order-conditions and Euler's law to get,

Derivation

$$\Delta q = \frac{1}{(1-PCM)}\left(\frac{RK}{PQ}\Delta k\ + \frac{WL}{PQ}\Delta l\ + \frac{P^M M}{PQ}\Delta m\ \right) + \ \Delta\vartheta$$

In order to obtain,

$$SRQ^R = (\qquad - PCM\ )(\Delta q - \Delta k) +$$

$$(1 - PCM)\Delta\theta$$

Methodology

Start from a short-run production function for firm i in year t,

$$Q = F(K^v, L^v, M^v)\ \theta$$

Define the primal revenue based Solow residual

$$SRQ^R \equiv \Delta q - \frac{WL}{PQ}\Delta l - \frac{P^M M}{PQ}\Delta m - \left(1 - \frac{WL}{PQ} - \frac{P^M M}{PQ}\right)\Delta k$$

Use profit maximization, first-order-conditions and Euler's law to get,

Derivation

$$\Delta q = \frac{1}{(1-PCM)}\left(\frac{sv^K RK}{PQ}\Delta k^v + \frac{sv^l WL}{PQ}\Delta l^v + \frac{sv^M P^M M}{PQ}\Delta m^v\right) + \ \Delta\vartheta$$

In order to obtain,

$$SRQ^R = (\qquad - PCM\ )(\Delta q - \Delta k) + \left(\frac{sv^K RK}{PQ}(\Delta k^v - \Delta k) + \frac{sv^l WL}{PQ}(\Delta l^v - \Delta l) + \frac{sv^M P^M M}{PQ}(\Delta m^v - \Delta m)\right) + \frac{(1-sv^L)WL}{PQ}(\Delta k - \Delta l) + \frac{(1-sv^M)P^M M}{PQ}(\Delta k - \Delta m) + \quad (1 - PCM)\Delta\theta$$

Assumptions

- Allow markup
- Allow fixed and variable costs for each input
- Constant returns to scale

Methodology

Assumptions
- Allow markup
- Allow fixed and variable costs for each input
- Allow returns to scale different from one

Start from a short-run production function for firm i in year t,

$$Q = F(K^v, L^v, M^v)^\gamma \theta^\gamma$$

Define the primal revenue based Solow residual

$$SRQ^R \equiv \Delta q - \frac{WL}{PQ}\Delta l - \frac{P^M M}{PQ}\Delta m - \left(1 - \frac{WL}{PQ} - \frac{P^M M}{PQ}\right)\Delta k$$

Use profit maximization, first-order-conditions and Euler's law to get, Derivation

$$\Delta q = \frac{1}{\gamma(1-PCM)}\left(\frac{sv^K RK}{PQ}\Delta k^v + \frac{sv^l WL}{PQ}\Delta l^v + \frac{sv^M P^M M}{PQ}\Delta m^v\right) + \gamma \Delta\vartheta$$

In order to obtain,

$$SRQ^R = (1 - \gamma(1 - PCM))(\Delta q - \Delta k) + \left(\frac{sv^K RK}{PQ}(\Delta k^v - \Delta k) + \frac{sv^l WL}{PQ}(\Delta l^v - \Delta l) + \frac{sv^M P^M M}{PQ}(\Delta m^v - \Delta m)\right) + \frac{(1-sv^L)WL}{PQ}(\Delta k - \Delta l) + \frac{(1-sv^M)P^M M}{PQ}(\Delta k - \Delta m) + \gamma^2(1 - PCM)\Delta\theta$$

Repeat for SRP^R, SRQ^C and SRP^C

- SRQ^R and SRP^R are subject to scale parameter, shares of fixity and price-cost margin, though different wedges
- SRQ^C and SRP^C are subject to scale parameter and shares of fixity *but not to the price-cost margin,* though different wedges

Methodology

- **Combine Solow residuals to eliminate unobservables**
- **Resulting main specification**

$$\Delta y_{it} = -\widehat{PCM}_t * \Delta x_{1it} + \widehat{sf}_t^k * \Delta x_{2it} + \widehat{sf}_t^l * \Delta x_{3it} + \widehat{sf}_t^m * \Delta x_{4it} + \epsilon_{it}$$

- With $\Delta y_{it} = (SRQ_{it}^R - SRP_{it}^R)PQ_{it} - (SRQ_{it}^C - SRP_{it}^C)C_{it}$
  - With $\Delta x_{1it} = PQ_{it}[(\Delta p + \Delta q)_{it} - (\Delta k + \Delta r)_{it}]$
  - With $\Delta x_{2it} = RK_{isct}[(\Delta p + \Delta q)_{it} - (\Delta k + \Delta r)_{it}]$
  - With $\Delta x_{3it} = WL_{isct}[(\Delta p + \Delta q)_{it} - (\Delta k + \Delta r)_{it}]$
  - With $\Delta x_{4it} = P^M M_{it}[(\Delta p + \Delta q)_{it} - (\Delta k + \Delta r)_{it}]$
- With $PCM_t^{AVC} = 1 - \gamma_t(1 - PCM_t^{MC}) = \frac{P-AVC}{P}$
- If $\gamma_t = 1$, then $PCM_t^{AVC} = PCM_t^{MC} = \frac{P-MC}{P}$

- **Decompose**

$$\widehat{PCM}_t \equiv \widehat{FCR}_t + \widehat{EPR}_t$$

- with $\widehat{FCR}_t \equiv \frac{\left(\widehat{sf}_t^k * RK_t + \widehat{sf}_t^l * WL_t + \widehat{sf}_t^m * P^M M_t\right)}{PQ_t}$
- with $\widehat{EPR}_t = \widehat{PCM}_t - \frac{\left(\widehat{sf}_S^k * RK_t + \widehat{sf}_t^l * WL_t + \widehat{sf}_t^m * P^M M_t\right)}{PQ_t}$

- Can be estimated for any 'aggregate' group of firms

Aggregate 'pooled' results (1985-2014, BE)

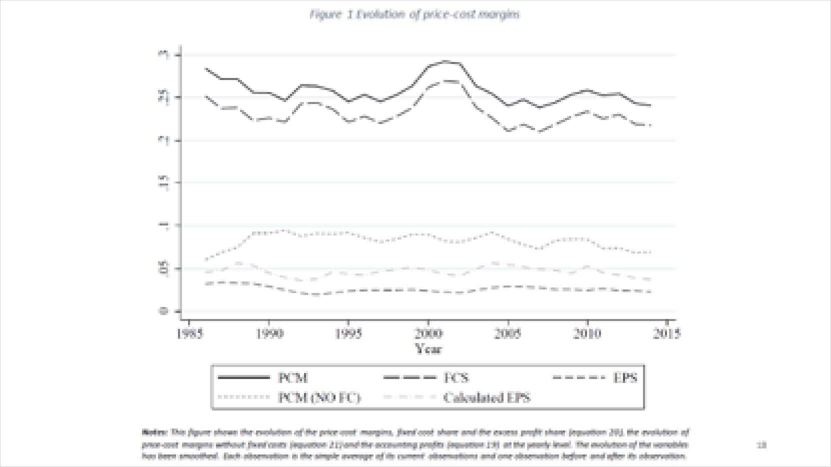
Table 2 Price-cost margins

	(1)	(2)	(3)	(4)	(5)
Price-cost Margins	0.080***	0.079***	0.080***	0.081***	0.254***
	(0.010)	(0.010)	(0.011)	(0.012)	(0.017)
Share of Fixed Capital					0.625***
					(0.041)
Share of Fixed Labor					0.173***
					(0.029)
Share of Fixed Intermediates					0.232***
					(0.017)
Fixed Costs Share					0.229***
					(0.017)
Excess Profits Share	0.080***	0.079***	0.080***	0.081***	0.025***
	(0.010)	(0.010)	(0.011)	(0.012)	(0.002)
Year FE	No	Yes	No	Yes	Yes
Firm FE	No	No	Yes	Yes	Yes
N	280,252	280,252	278,353	278,334	278,353
r2	0.27	0.28	0.31	0.39	0.54

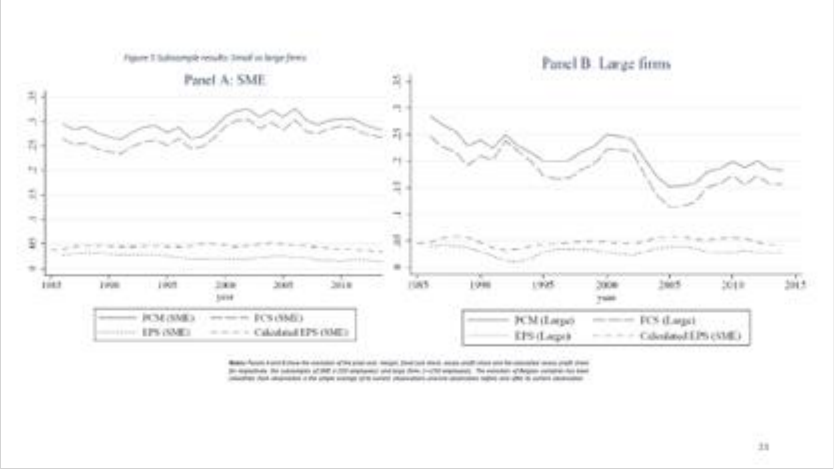
Notes: *Columns (1)-(4) show results from equation (21), assuming no fixed costs. Regressions are weighted by sales at the firm-year level. Column (5) show pooled results from equation (20), allowing for fixed costs. Standard errors in parentheses (+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$). Standard errors are clustered by NACE 2 digits.*

Aggregate yearly results (BE)

Baseline vs. no fixed costs

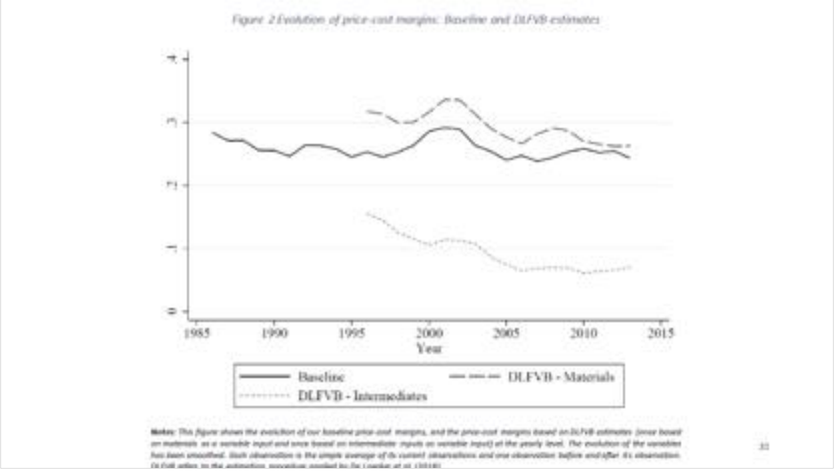


Subsample small vs. large firms



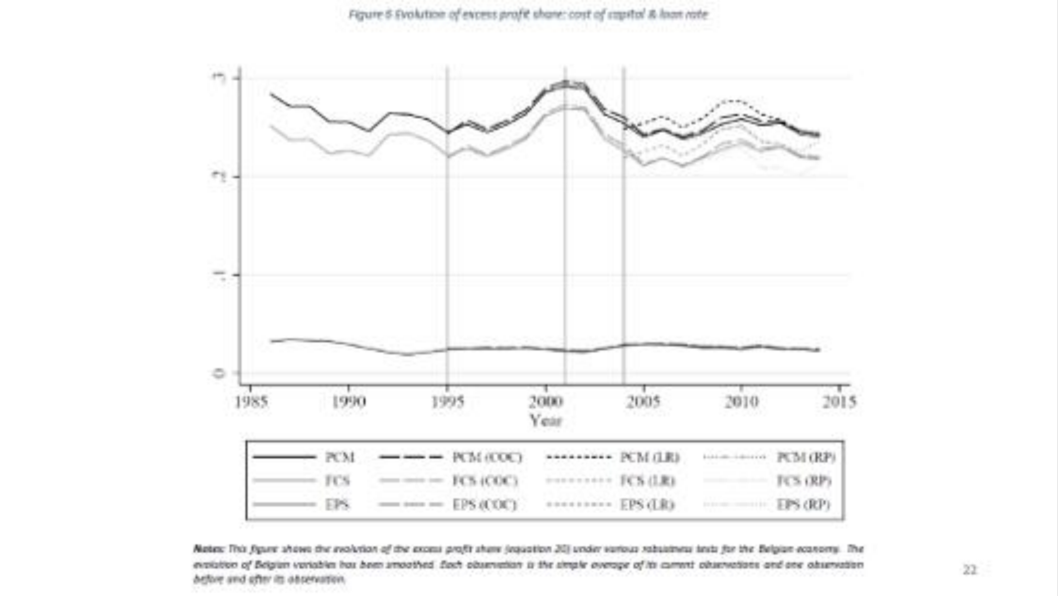
Baseline vs. ‘simple’ accounting markups

Baseline vs. DLFVB (2020) markups

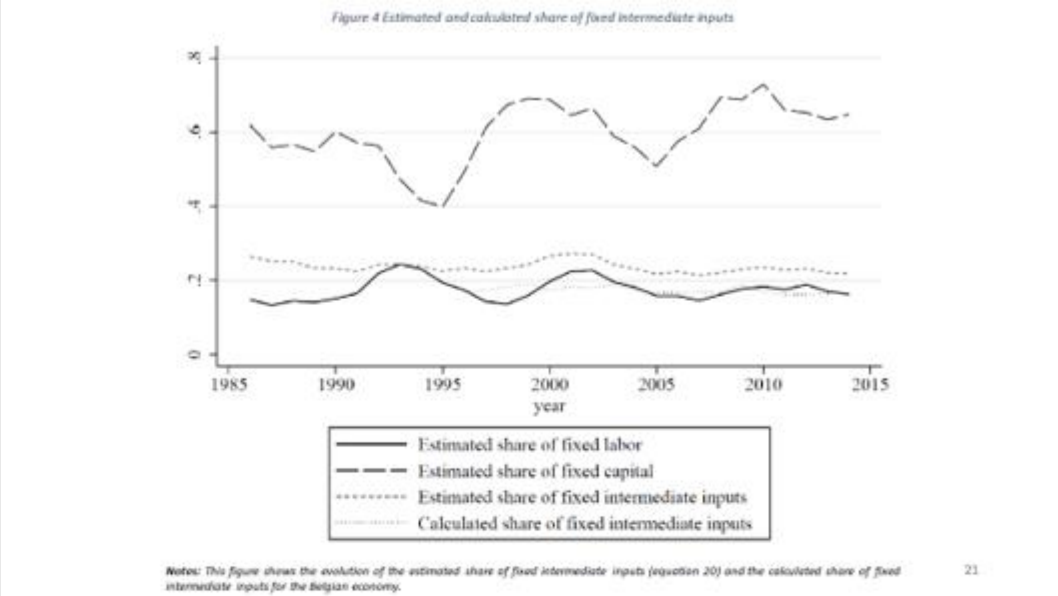


Robustness checks

Cost of capital



Share of fixed intermediate inputs



Conclusion

- **Novel methodology** to estimate price-cost margins
  - Allow flexible treatment of *all* input factors
    - Labor, capital and intermediate inputs
    - Each input can be variable, fixed or a combination of both

- Illustrate based on Belgian firm-level data
  - In **levels** → PCM (25.4%) = FCR (22.9%) + EPR (2.5%)
  - In **changes** → ΔPCM (-5.9%) = ΔFCR (-4.0%) + ΔEPR (-1.9%)
- PCM ≠ EPR due to FC
  - Additional layer of insight
  - Distinguish (evolution of) markups, market power, changing production processes (MC/FC/VC) and profitability

End

Contact

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