# The (dis)equalizing Effect of Production Networks Income dependent inflation exposure

# in EU countries

### Leonhard Ipsen<sup>1,2</sup> Jan Schulz<sup>1</sup>



- <sup>1</sup> Department of Economics, Otto-Friedrich-University of Bamberg
- <sup>2</sup> Bamberg Research Training Group on Bounded Rationality, Heterogeneity and Network Effects
  - funded by

### Hans **Böckler** Stiftung



### Do production networks matter for inflation?

(Weber et al., 2022; Ipsen, Aminian and Schulz, 2023; Ipsen and Schulz, 2024)

# Do production networks matter for inflation inequality?

(Ipsen and Schulz, 2024)

### **Does the Average Propensity to Consume matter for** <u>realized</u> inflation inequality?

(Ipsen and Schulz, 2024; ???)

Income effect of production networks L. Ipsen J. Schulz Otto-Friedrich Universität Bamberg





### Data

### World Input Output Database (WIOD)

 Sector level data for 43 countries with 56 sectors each (2000 - 2014; > 85% GDP)

**Classification of individual consumption by purpose** (COICOP)

- Eurostat: 21 EU countries, 5 quantiles each (2020)
- matched to WIOD data (Cai and Vandyck, 2020)

**Average income for each quintile** 

• Eurostat: 21 EU countries (2020)

**Average Propensity to Consume** 

• Eurostat: 19 EU countries (2020)

Income effect of production networks L. Ipsen

### Otto-Friedrich-Universität Bamberg J. Schulz





Sector level consumption shares are used to measure the impact of sectoral price shocks on final consumers.

Consumption shares are heterogenous for countries and income quintiles. Thus exposure to individual sectors is asymmetric!

Income effect of production networks L. Ipsen



## Limitations

- no substitution effects
  - in the network (1:1 supported by Duprez and Magerman, 2018)
  - in products
  - in consumption shares
- Sector level data
- no wealth and debt effect

### Income effect of production networks L. Ipsen



# Do production networks matter for inflation?



### Input price shock



Production costs for intermediate goods

Production costs for final goods



### Income effect of production networks L. Ipsen



# **Systemically Significant Prices**







9

# **Systemically Significant Prices**



- Accommodation & food service (..) -
  - Warehousing (..) -
  - Financial service activities (..) -
  - Legal & accounting activities (..) -
- Retail trade, exc. of motor vehicles (..) -
  - Manuf. of basic metals -
    - Construction -
  - Administrative (..) activities -
    - Manuf. of chemicals (..) -
- Land transport & transport via pipelines -
- Wholesale trade, exc. of motor vehicles (..) -
  - Crop & animal production (..) -
    - Mining & quarrying -
    - Manuf. of food products (..) -
  - Manuf. of coke & ref. petroleum (..)
    - Electricity, gas (..)

Real estate activities -





# Do production networks enhance or reduce inflation inequality?

# Inflation Inequality Puzzle

- (Ipsen, Aminian and Schulz, 2023)
- No consensus about whether inflation has a dis- or equalizing effect. 2002; Palotti et al., 2023)

### Why?

• It depends on the sector.

Income effect of production networks L. Ipsen



Suggestive evidence that inflation exposure is higher for poorer countries.

(Adam and Zhu, 2023; Bobasu et al., 2023; Dullien and Tober, 2022; Hobjin and Lagakos, 2005; Jaravel, 2019, 2021; Kaplan and Schulhofer-Wohl, 2017; Oldfield and Crawford,



# Inequality reducing effect



Income effect of production networks L. Ipsen

**Consumption Shares** 

Effect

 $= 0.1 \times 0.2 = 0.02$ direct<sup>LI</sup>

indirect<sup>LI</sup> =  $0.1 \times 0 \times 0.8 = 0$ 

= 0.02 + 0 = 0.02total<sup>LI</sup>

 $direct^{HI} = 0.1 \times 0.2 = 0.02$ 

 $= 0.1 \times 0.5 \times 0.8 = 0.04$ *indirect<sup>HI</sup>* 

 $total^{HI} = 0.02 + 0.04 = 0.06$ 

total<sup>LI</sup> < total<sup>HI</sup>



# Inequality enhancing effect



Income effect of production networks L. Ipsen

**Consumption Shares** 

Effect

 $= 0.1 \times 0.2 = 0.02$ direct<sup>LI</sup>

 $= 0.1 \times 0.5 \times 0.8 = 0.04$ *indirect<sup>LI</sup>* 

= 0.02 + 0.04 = 0.06total<sup>LI</sup>

 $direct^{HI} = 0.1 \times 0.2 = 0.02$ 

*indirect<sup>HI</sup>*  $= 0.1 \times 0 \times 0.8 = 0$ 

 $total^{HI} = 0.02 + 0 = 0.02$ 

total<sup>LI</sup> > total<sup>HI</sup>

![](_page_13_Picture_14.jpeg)

![](_page_14_Picture_0.jpeg)

### Input price shock

![](_page_14_Figure_2.jpeg)

### Income effect of production networks L. Ipsen

![](_page_14_Picture_6.jpeg)

## Regression

- elasticity estimates for sector *i*
- country c and income quintile q are varied
- $\delta_c$  is a country dummy variable for Fixed Effects
- $\epsilon_{i,c,q}$  is an error term

### Income effect of production networks L. Ipsen

 $log(TE)_{i.c.a} = \beta_0 + \beta_1 log(Y_{a.c}) + \delta_c + \epsilon_{i.c.a}$ 

![](_page_15_Picture_11.jpeg)

### **Total Effect**

### **Coefficients Total Effect - Systemically Significant Prices**

![](_page_16_Figure_2.jpeg)

Sectors

# **Direct Effect**

![](_page_17_Figure_1.jpeg)

![](_page_17_Figure_2.jpeg)

### **Coefficients Direct Effect - Systemically Significant Prices**

### Indirect Effect

### Coefficients Indirect Effect - Systemically Significant Prices

![](_page_18_Figure_2.jpeg)

Sectors

# **Does the Average Propensity to Consume matter for realized inflation inequality?**

# Introducing Average Propensity to Consume

Expenditure Weights  $\times$  APC =  $\left(\frac{\text{Expenditure}}{\text{Total Expendit}}\right)$ 

![](_page_20_Picture_2.jpeg)

GEO	Q1 (%)	Q2 (%)	Q3 (%)	Q4 (%)	<b>Q5 (%)</b>
BEL	118.9	92.1	73.8	63.3	50
BGR	113.9	89.6	75	62.2	44.1
DNK	117.5	85.6	74.8	62.3	46.5
DEU	143.4	91.6	84.4	77.5	63.4
EST	108.3	81.9	69.9	54	45.3
GRC	168	110.4	101.5	88.6	72
ESP	129.3	90.6	76	65.8	50.6
HRV	121	107.7	88.4	80	63
LVA	114	88.7	78	72.4	56.9
LTU	110.7	82.1	69.5	51.8	39.4
LUX	112.9	86.8	80.4	63.8	52.8
HUN	113.4	94.8	83.3	74.8	66.2
NLD	148.2	104.3	83.6	68.3	52.9
AUT	129.8	97.9	85	75.9	59.4
POL	104.1	60.6	53.5	47.2	38.8
ROU	195.4	126.6	104.1	86	65.6
SVN	116.5	95.7	87	78.2	64.3
SVK	103	89.2	79.6	71.3	55

### Income effect of production networks L. Ipsen

re <sub>i</sub>		Total Expenditures	$\_$ Expenditure <sub><i>i</i></sub>
itures /	^	Income	Income

![](_page_20_Picture_7.jpeg)

![](_page_20_Picture_14.jpeg)

# **Direct Effect: controlling for APC**

![](_page_21_Figure_2.jpeg)

**Coefficients Direct Effect considering APC - Systemically Significant Prices** 

![](_page_21_Picture_5.jpeg)

# Indirect Effect: controlling for APC

### Coefficients Indirect Effect considering APC - Systemically Significant Prices

![](_page_22_Figure_2.jpeg)

Sectors

# **Total Effect: controlling for APC**

### Coefficients Total Effect considering APC - Systemically Significant Prices

![](_page_23_Figure_2.jpeg)

# **Take Aways**

- Production networks matter for inflation: Systemically Significant Prices
- Production networks matter for inflation inequality
  - Inequality Enhancing Prices: identify all relevant sectors by focusing only on consumption share differences.
  - Significant overlap of SSP and IEP
  - **Mostly homogenizing effect** however important exception!
- APC dominant factor for realized inflation inequality: Every price shock becomes an IEP when considering APC

Income effect of production networks L. Ipsen

We find one relevant channel for inflation inequality. We can identify the sectors to which a price shock is inequality enhancing. One would fail to

![](_page_24_Picture_15.jpeg)

### References

- Adam, K., & Zhu, J. (2016). Price-level changes and the redistribution of nominal wealth across the Euro Area. Journal of the *European Economic Association*, 14(4), 871–906.
- Bobasu, P.A., di Nino, V., & Osbat, C. (n.d.). The impact of the recent inflation surge across households.
- Cai, M., & Vandyck, T. (2020). Bridging between economy-wide activity and household-level consumption data: Matrices for European countries. Data in Brief, 30, 105395. https://doi.org/10.1016/j.dib.2020.105395
- Dullien, S., & Tober, S. (n.d.). IMK Policy Brief Nr. 123, Mai 2022.
- Hobijn, B., & Lagakos, D. (2005). Inflation Inequality in the United States. *Review of Income and Wealth*, 51(4), 581–606. <u>https://</u> doi.org/10.1111/j.1475-4991.2005.00170.x
- Ipsen, L., Aminian, A., & Schulz, J. (2023). Stress-testing Inflation Exposure: Systemically Significant Prices and Asymmetric Shock Propagation in the EU28. BERG Working Paper Series, 188.
- Jaravel, X. (2019). The Unequal Gains from Product Innovations: Evidence from the U.S. Retail Sector\*. The Quarterly Journal of Economics, 134(2), 715–783. https://doi.org/10.1093/qje/qjy031
- Jaravel, X. (2021). Inflation Inequality: Measurement, Causes, and Policy Implications. Annual Review of Economics, 13(1), 599– 629. <u>https://doi.org/10.1146/annurev-economics-091520-082042</u>
- Kaplan, G., & Schulhofer-Wohl, S. (2017). Inflation at the household level. Journal of Monetary Economics, 91, 19–38. https:// doi.org/10.1016/j.jmoneco.2017.08.002
- Oldfield, Z., & Crawford, I. (2002). Distributional aspects of inflation. https://doi.org/10.1920/co.ifs.2002.0090
- Pallotti, F., Paz-Pardo, G., Slacalek, J., Tristani, O., & Violante, G. (2023). Who Bears the Costs of Inflation? Euro Area Households and the 2021–2022 Shock (w31896; p. w31896). National Bureau of Economic Research. https://doi.org/10.3386/w31896

### Income effect of production networks J. Schulz Otto-Friedrich-Universität Bamberg L. Ipsen

![](_page_25_Picture_22.jpeg)