Discussion:
"The Debt-Inflation Channel of the German Hyperinflation"
by Brunnermeier-Correia-Luck-Verner-Zimmermann

Juliane Begenau

Stanford GSB & NBER & CEPR

NBER Spring CF 2023

The Debt-Inflation Channel of the German Hyperinflation

Inflation lowers debt burden $\Rightarrow$ expansionary

- ▶ Devaluation of nominal fixed rate debt
- ▶ Redistributes wealth from lenders to borrowers
- ▶ Reduces bankruptcy risk
- ▶ Relaxes firms' financial constraints
- ▶ Stimulates investment and employment
- ▶ Affects frequency of wages and prices setting

Inflation: (1) Lowers bankruptcies
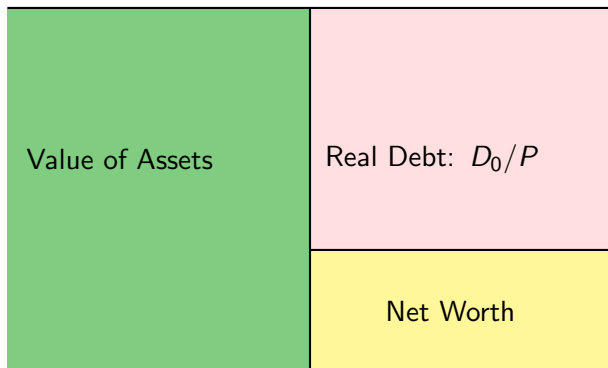
- ▶ Firm defaults if Value of Assets $\leq \frac{D_0}{P}$

- ▶ Increase in P lowers real debt burden and bankruptcies (c.p.)

Inflation: (2) Stimulates labor/capital demand

▶ Firms have projects, invest & demand labor accordingly

▶ Firms equate marginal benefit of investing to marginal cost

$$F_K(a_t, s_{i,t}, K_{i,t}) = MC_{i,t},$$

where marginal costs are a function of the cost of capital

▶ Cost of capital:

  ▶ Modigliani & Miller: cost of capital set by risk-return on project

  ▶ Fin frictions: cost of capital function of frictions, too

  ▶ Given project, optimize fin cost $\Rightarrow$ trade-off theory (or pecking order)

  ▶ Fin constrained in model: debt cannot exceed fraction of revenue

Inflation: (2) Stimulates labor/capital demand

$$F_K(a_t, s_{i,t}, K_{i,t}) = MC_{i,t},$$

▶ Suppose firms have nominal fixed rate debt outstanding & P_t rises

▶ Model: immediate relaxation of constraint $\rightarrow \Downarrow MC_{i,t}$

▶ Generally: $\Uparrow W_t$ net-worth and so $\downarrow$ debt overhang
$\Downarrow$ bankruptcy risk $\rightarrow \Downarrow MC_{i,t}$

▶ $\Downarrow F_K$ through a rise in K (more investment)

Evidence from 1918-1923 Germany

1. Aggregate time series

   ▶ A: Negative & convex correlation b/w inflation & firm bankruptcies

   ▶ B: As inflation rises: real debt burden declines & interest expense share declines, wage/price setting frequency increases

2. XS: Diff-Diff: treated high leverage firms

   ▶ High leverage firms in 18-19 have in 19-23
      ▶ more employment
      ▶ lower debt expense shares
      ▶ higher stock returns & book equity

   ▶ Effect driven by high leverage firms w/ highest long term debt share

▶ Note: Careful treatment of historical data and many additional facts/figures/tables in this paper incl. repricing freq., P.Curve, balance sheet characteristics of firms, central bank ..

Discussion

- ▶ Inflation can redistribute wealth from lenders to borrowers
  HH: Doepke & Schneider, 2006; Sovereigns: Aguiar & Amador 2014

- ▶ Firms: theoretically argued that inflation lowers cost of capital (e.g., Modigliani 1982)

Contribution

1. Firm level evidence of stimulative effects from debt devaluations

2. Digitization of historical data allows valuable insights from the past

Comment

- ▶ Interpretation of micro-evidence

Interpretation of micro-fact

▶ Paper: $L_{i,t} \uparrow$ driven by a $\downarrow MC_{i,t}$ as inflation relaxes constraint

$$\downarrow F_L(a_t, s_{i,t}, \uparrow L_{i,t}) = \downarrow MC_{i,t},$$

Interpretation of micro-fact

► Paper: $L_{i,t} \uparrow$ driven by a $\downarrow MC_{i,t}$ as inflation relaxes constraint

$$\downarrow F_L(a_t, s_{i,t}, \uparrow L_{i,t}) = \downarrow MC_{i,t},$$

Alternative interpretation of fact: $F_K(a_t, \uparrow s_{i,t}, L_{i,t}) \rightarrow \uparrow L_{i,t}$

► High initial leverage may select firms w/ high inv. opportunities

Interpretation of micro-fact

▶ Paper: $L_{i,t} \uparrow$ driven by a $\downarrow MC_{i,t}$ as inflation relaxes constraint

$$\downarrow F_L(a_t, s_{i,t}, \uparrow L_{i,t}) = \downarrow MC_{i,t},$$

Alternative interpretation of fact: $F_K(a_t, \uparrow s_{i,t}, L_{i,t}) \rightarrow \uparrow L_{i,t}$

▶ High initial leverage may select firms w/ high inv. opportunities

    ▶ Inv. opportunities vary within industry (immune to industry-time FE)

Interpretation of micro-fact

▶ Paper: $L_{i,t} \uparrow$ driven by a $\downarrow MC_{i,t}$ as inflation relaxes constraint

$$\downarrow F_L(a_t, s_{i,t}, \uparrow L_{i,t}) = \downarrow MC_{i,t},$$

Alternative interpretation of fact: $F_K(a_t, \uparrow s_{i,t}, L_{i,t}) \rightarrow \uparrow L_{i,t}$

▶ High initial leverage may select firms w/ high inv. opportunities

  ▶ Inv. opportunities vary within industry (immune to industry-time FE)

  ▶ High growth option borrowers high funding needs $\Rightarrow$ Lev high

Interpretation of micro-fact

▶ Paper: $L_{i,t} \uparrow$ driven by a $\downarrow MC_{i,t}$ as inflation relaxes constraint

$$\downarrow F_L(a_t, s_{i,t}, \uparrow L_{i,t}) = \downarrow MC_{i,t},$$

Alternative interpretation of fact: $F_K(a_t, \uparrow s_{i,t}, L_{i,t}) \rightarrow \uparrow L_{i,t}$

▶ High initial leverage may select firms w/ high inv. opportunities

  ▶ Inv. opportunities vary within industry (immune to industry-time FE)

  ▶ High growth option borrowers high funding needs $\Rightarrow$ Lev high

  ▶ High long-term debt share selects on more recently issued debt

Interpretation of micro-fact

▶ Paper: $L_{i,t} \uparrow$ driven by a $\downarrow MC_{i,t}$ as inflation relaxes constraint

$$\downarrow F_L(a_t, s_{i,t}, \uparrow L_{i,t}) = \downarrow MC_{i,t},$$

Alternative interpretation of fact: $F_K(a_t, \uparrow s_{i,t}, L_{i,t}) \rightarrow \uparrow L_{i,t}$

▶ High initial leverage may select firms w/ high inv. opportunities

    ▶ Inv. opportunities vary within industry (immune to industry-time FE)

    ▶ High growth option borrowers high funding needs $\Rightarrow$ Lev high

    ▶ High long-term debt share selects on more recently issued debt

    ▶ Uncorrelated with current/past profit (Growth firms $\pi_t < 0$)

Interpretation of micro-fact

▶ Paper: $L_{i,t} \uparrow$ driven by a $\downarrow MC_{i,t}$ as inflation relaxes constraint

$$\downarrow F_L(a_t, s_{i,t}, \uparrow L_{i,t}) = \downarrow MC_{i,t},$$

Alternative interpretation of fact: $F_K(a_t, \uparrow s_{i,t}, L_{i,t}) \rightarrow \uparrow L_{i,t}$

▶ High initial leverage may select firms w/ high inv. opportunities

  ▶ Inv. opportunities vary within industry (immune to industry-time FE)

  ▶ High growth option borrowers high funding needs $\Rightarrow$ Lev high

  ▶ High long-term debt share selects on more recently issued debt

  ▶ Uncorrelated with current/past profit (Growth firms $\pi_t < 0$)

  ▶ Lead to higher employment / investment growth

Interpretation of micro-fact

▶ Paper: $L_{i,t} \uparrow$ driven by a $\downarrow MC_{i,t}$ as inflation relaxes constraint

$$\downarrow F_L(a_t, s_{i,t}, \uparrow L_{i,t}) = \downarrow MC_{i,t},$$

Alternative interpretation of fact: $F_K(a_t, \uparrow s_{i,t}, L_{i,t}) \rightarrow \uparrow L_{i,t}$

▶ High initial leverage may select firms w/ high inv. opportunities

    ▶ Inv. opportunities vary within industry (immune to industry-time FE)

    ▶ High growth option borrowers high funding needs $\Rightarrow$ Lev high

    ▶ High long-term debt share selects on more recently issued debt

    ▶ Uncorrelated with current/past profit (Growth firms $\pi_t < 0$)

    ▶ Lead to higher employment / investment growth

    ▶ Lead to higher stock return and pot. wealth accumulation

Interpretation of micro-fact

▶ Paper: $L_{i,t} \uparrow$ driven by a $\downarrow MC_{i,t}$ as inflation relaxes constraint

$$\downarrow F_L(a_t, s_{i,t}, \uparrow L_{i,t}) = \downarrow MC_{i,t},$$

Alternative interpretation of fact: $F_K(a_t, \uparrow s_{i,t}, L_{i,t}) \rightarrow \uparrow L_{i,t}$

▶ High initial leverage may select firms w/ high inv. opportunities

   ▶ Inv. opportunities vary within industry (immune to industry-time FE)

   ▶ High growth option borrowers high funding needs $\Rightarrow$ Lev high

   ▶ High long-term debt share selects on more recently issued debt

   ▶ Uncorrelated with current/past profit (Growth firms $\pi_t < 0$)

   ▶ Lead to higher employment / investment growth

   ▶ Lead to higher stock return and pot. wealth accumulation

   ▶ Tease out investment opportunities from debt devaluation channel

Suggestions

1. Further exploit rich data

   ▶ Which firms / industries were more affected than others?

      ▶ Huge upheaval: pre-war rapid industrialization and growth, urbanization, yet preindustrial industries remained backwards; while early years post WWI highly unstable, scope for dispersion in growth opport.

   ▶ Paying off debt (preserve debt capacity for future project) or investing?

   ▶ Investment rates, type of investment /patents?

   ▶ In which markets, products, consumer types firms expanded?

Suggestions

1. Further exploit rich data

    ▶ Which firms / industries were more affected than others?

        ▶ Huge upheaval: pre-war rapid industrialization and growth, urbanization, yet preindustrial industries remained backwards; while early years post WWI highly unstable, scope for dispersion in growth opport.

    ▶ Paying off debt (preserve debt capacity for future project) or investing?

    ▶ Investment rates, type of investment /patents?

    ▶ In which markets, products, consumer types firms expanded?

2. Explore mechanism in quantitative model in spirit of Begenau-Salomao-2019; Ottonello-Winberry-2020

Suggestions

1. Further exploit rich data

   ▶ Which firms / industries were more affected than others?

      ▶ Huge upheaval: pre-war rapid industrialization and growth, urbanization, yet preindustrial industries remained backwards; while early years post WWI highly unstable, scope for dispersion in growth opport.

   ▶ Paying off debt (preserve debt capacity for future project) or investing?

   ▶ Investment rates, type of investment /patents?

   ▶ In which markets, products, consumer types firms expanded?

2. Explore mechanism in quantitative model in spirit of Begenau-Salomao-2019; Ottonello-Winberry-2020

3. Relate to literature on investment / financial constraint

   ▶ E.g., Kaplan-Zingales-97, Gomes-01, Whited-Wu-06, Hennessy-Levy-Whited-07

   ▶ Use more recent data (Compustat) to enrich analysis

Inflation and Bankruptcies in the 1970s and 1980s

Inflation and Corporate Defaults
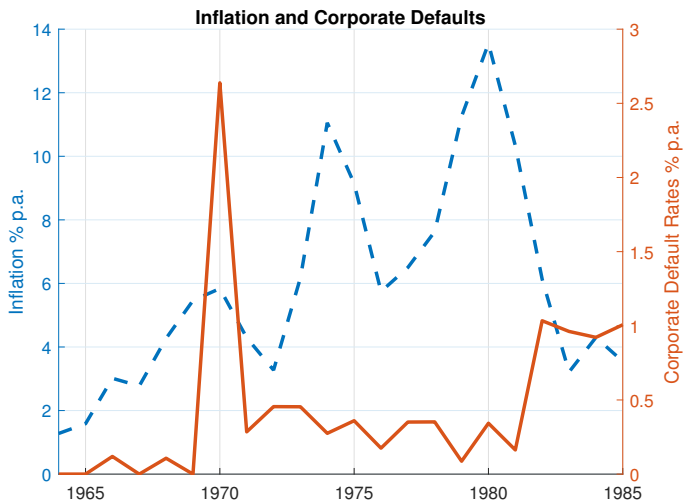
- ▶ Inflation associated with reduction in bankruptcies
- ▶ Employment also grew (2-3% p.a.) https://www.bls.gov/opub/mlr/1984/02/art5full.pdf

Cross-sectional fact 1970s and 1980s Compustat
# Initial high leverage firms expand labor

$y_{i,t} = \gamma_i + \alpha_{s,t} + \beta Lev_{i,\bar{t}} \cdot I_{t \geq \bar{t}} + \theta X_{i,t} + \varepsilon_{i,t}$ Data: Compustat	$100 \times$ log Emp		
	1964-70	1970-75	1978-83
Debt/Asset	18.79 (6.83)	13.19 (5.49)	1.16 (3.13)
Controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Industry-Time FE	Yes	Yes	Yes
Adjusted R^2 N	0.98 11,907	0.98 21,199	0.98 40,910

▶ Similar XS fact as Post WW1 Germany

▶ Additional data to tease out inv. opp from debt inf: high lev firms $\rightarrow$ investment growth, reduction in leverage, large increase in cash

▶ Suggestive of authors' channel

Inflation and Bankruptcies in post 1985s

Inflation and Corporate Defaults
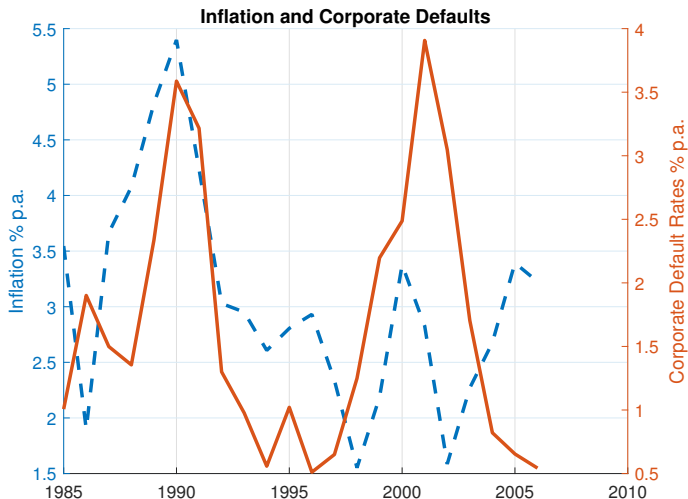
▶ Much lower inflation not associated w/ decline in bankruptcies

Placebo Non-Inflation Years (Great Moderation)
High leverage firms do not expand employment

$y_{i,t} = \gamma_i + \alpha_{s,t} + \beta Lev_{i,\bar{t}} \cdot I_{t \geq \bar{t}} + \theta X_{i,t} + \varepsilon_{i,t}$ Data: Annual Compustat	$100 \times$ log Employment		
	1964-70	1993-96	2002-06
Debt/Asset	18.79	-0.40	1.37
	(6.83)	(3.13)	(1.21)
Controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Industry-Time FE	Yes	Yes	Yes
Adjusted R^2	0.98	0.97	0.98
N	11,907	45,296	47,326

▶ Placebo low inflation & no crisis years: no expansion in employment

Conclusion

▶ Compelling narrative of an important & topical question!

▶ Inflation has redistributed wealth & pot. stimulating econ. effects

▶ Interesting to quantify magnitudes of debt-inflation channel