# Wage-Price Spirals: What is the Historical Evidence?

RESERVE BANK OF AUSTRALIA RESEARCH CONFERENCE
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Motivation

- Inflation has risen markedly in many advanced economies since 2021.

  - Supply-side drivers:

    - pandemic-related supply chain disruptions

    - commodity price shocks

  - Demand-side drivers:

    - policy support (monetary and fiscal)

    - consumer demand (initially goods and shifting to services)

- Labor markets tight.

  - demand impulse stimulating labor demand across sectors

  - labor supply dropped with COVID shock, but responding more slowly to recovering activity

Recent Price and Unemployment Dynamics
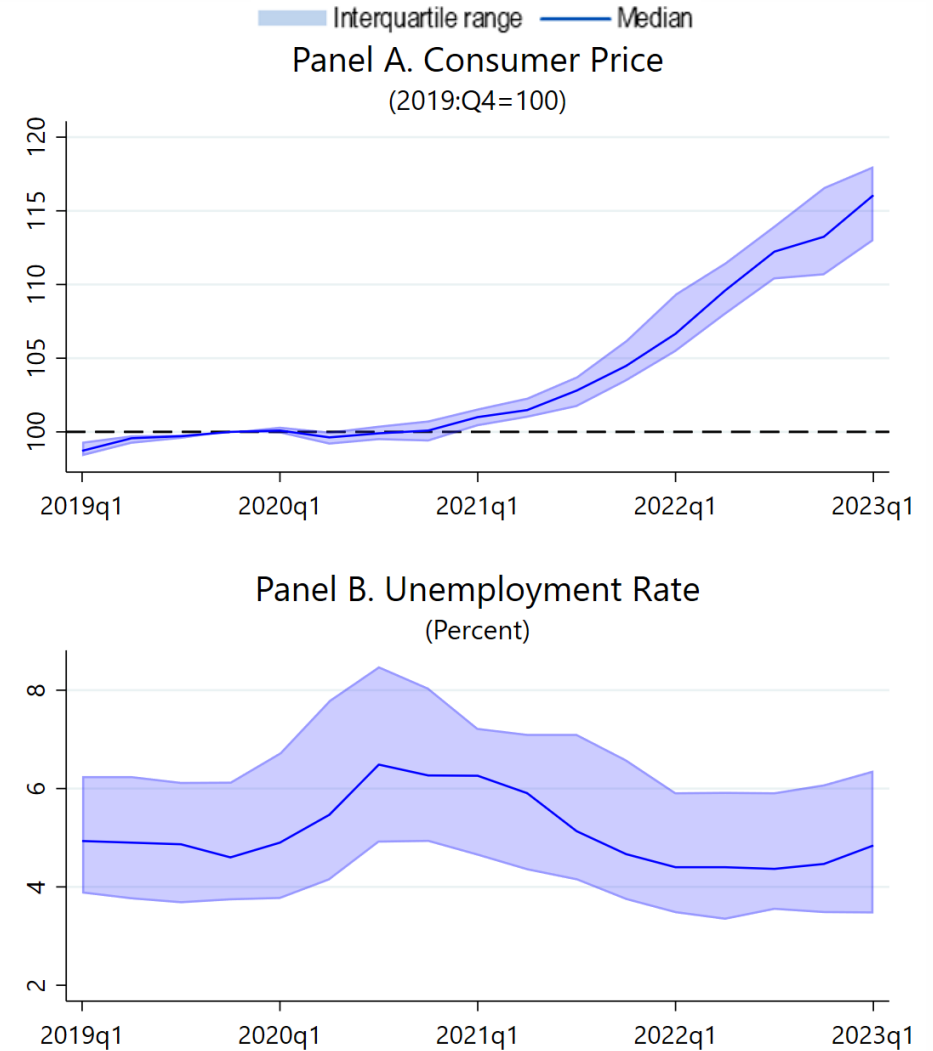
Sources: Haver Analytics; International Labor Organization; Organisation for Economic Co-operation and Development; and author calculations.
Note: Sample includes 31 advanced economies (Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Taiwan Province of China, United Kingdom, United States).

Motivation

- Nominal wage growth has risen on average, but generally below inflation.

  o Seems mostly extension of earlier trend.

  o Real wages declining or flat recently.

- Some observers argue that this could change, with workers aiming for wages to catch-up to, or even exceed, inflation.

  o Real wages would start rising faster than productivity.

- Worries that the inflationary pressures from wage growth could be sustained or spiral.

  o Blanchard (2022)

  o Domash and Summers (2022)
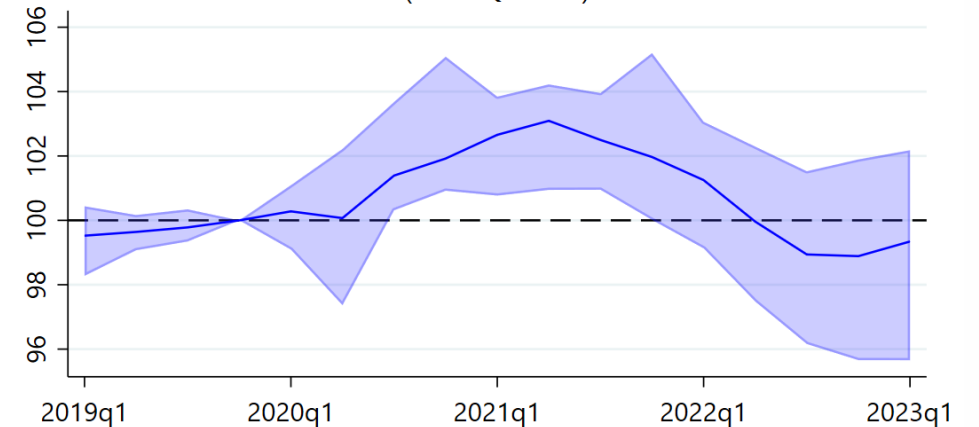
  o Schwartzman and Waddell (2022)

Recent Wage Dynamics

Interquartile range — Median

Panel A. Nominal Wage
(2019:Q4=100)
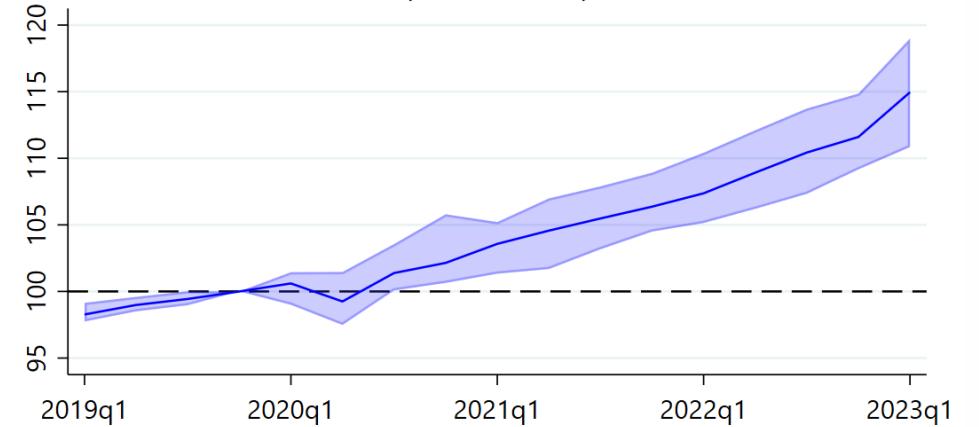
Panel B. Real Wage
(2019:Q4=100)

Sources: Haver Analytics; International Labor Organization; Organisation for Economic Co-operation and Development; and author calculations.
Note: Sample includes 31 advanced economies (Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Taiwan Province of China, United Kingdom, United States).

Key questions

- **How common are wage-price spirals and what happened in their aftermath?**

- **What accounts for the wage dynamics of such episodes?**

- **How did past episodes similar to the pandemic recovery evolve?**

1. How common are wage-price spirals and what happened in their aftermath?

What is a wage-price spiral?

- No clear definition of a wage-price spiral

- Seminal paper: Blanchard (1986)
  - Workers wish to preserve real wages; firms preserve markups
  - Wages and prices are sticky $\Rightarrow$ inflationary shock takes longer to dissipate
  - No spiral if adjustments are instantaneous

- Wage-price spiral: prolongs inflation; does not accelerate it
  - Zeira (1989); Helpman and Leiderman (1990); Ball (1994); Musy and Pereau (2010)

- Recent discussion: wage inflation is a cost-push shock $\Rightarrow$ accelerates inflation
  - Blanchard (2022); Boissay and others (2022)

An empirical definition of wage-price spiral episode

- Motivated by defining a wage-price spiral as a situation where prices and wages both accelerate (inflation and wage growth are rising) for a sustained period.

- An episode where both price and nominal wage inflation increase successively for at least three out of four consecutive quarters.

- If criteria hold several times within three years, only select the first episode.
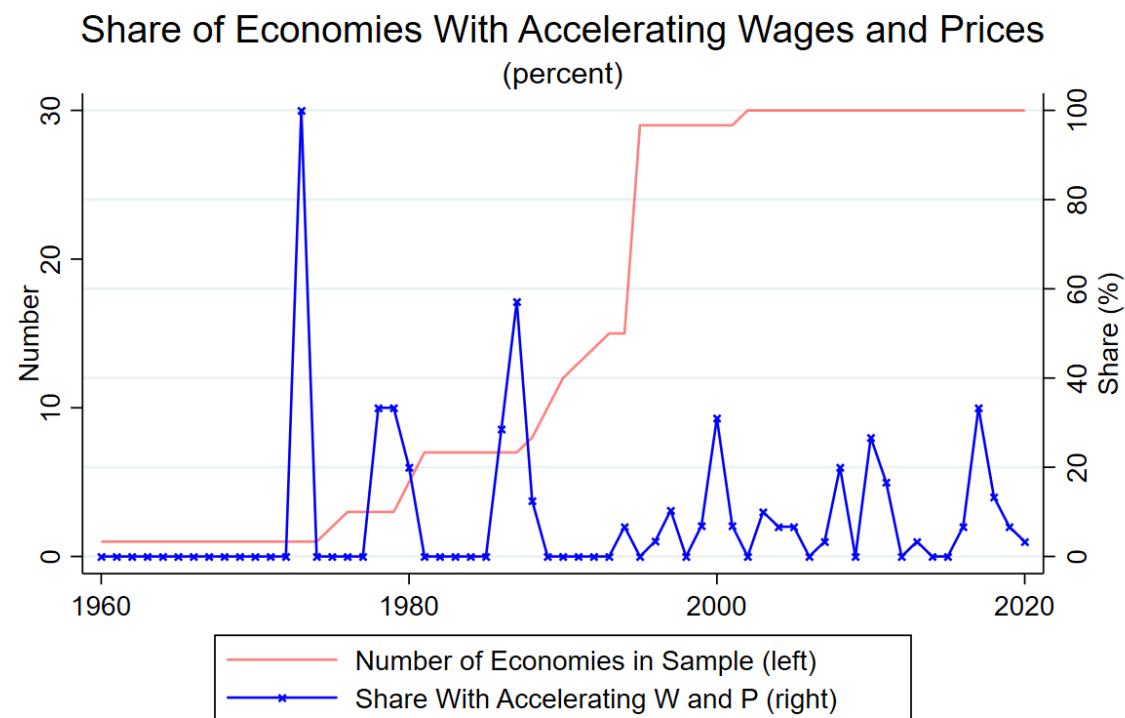
Data

- Wage data at quarterly or higher frequency scarce until recently. Assemble and harmonize from multiple sources to maximize economy and time coverage.

    - Core variables are: CPI inflation, economy-wide nominal wage per employed, hourly manufacturing-only nominal wage, overall unemployment rate, real GDP (chained PPP).

    - OECD, ILO, IMF WEO, national sources. If combining to expand time coverage, splice forward/backward using growth rates.

    - Final series seasonally adjusted (X-13 ARIMA-SEATS)

- 31 advanced economies (current) over past 60 years.

    - Stretching as far back as 1960:Q1 up through 2022:Q4 (unbalanced).

- Identify wage-price spiral episodes (pre-pandemic).

    - 79 wage-price spiral episodes using economy-wide wages.

    - 100 episodes using manufacturing-only wages.

Historical Experience

- Looking at aggregate *average* wages

- 79 episodes of wage-price spirals pre-pandemic
  - First episode: 1973 (USA)
  - Last episode: 2018 (FIN, NOR)

- Wage-price spirals have become less prevalent since the 1980s

- Fairly stable shares since the 2000s

Share of Economies With Accelerating Wages and Prices
(percent)

Legend:
- Number of Economies in Sample (left)
- Share With Accelerating W and P (right)

Longer Series

Wage-price spirals episodes did not typically last long

Changes in Macroeconomic Variables after Past Episodes with Accelerating Prices and Wages
(differences relative to first quarter where criteria is fulfilled; percentage points)
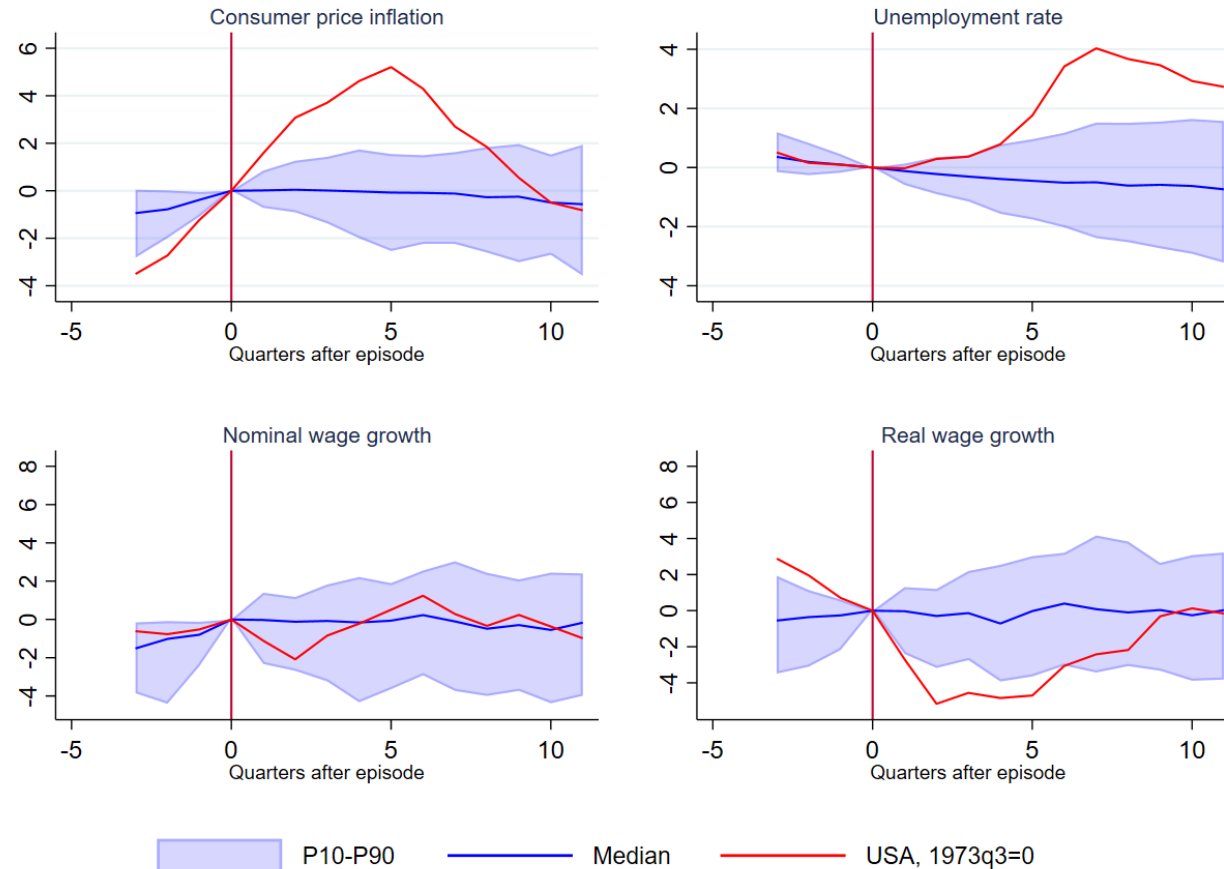
- For a sustained period ($t=-3$ to $t=0$), identified cases had both:

  1. Accelerating prices (rising inflation)
  2. Accelerating wages (rising wage growth)

- A period of stable wage growth and very slowly declining inflation typically followed past episodes.

  - Means that inflation could remain elevated for a while after an episode
  - US in 1973 is an extreme episode
    - Price inflation surged for five additional quarters
    - Spurred by the first OPEC oil embargo of the 1970s

Sources: Organisation for Economic Co-operation and Development; International Labour Organisation; US Bureau of Economic Analysis; and Author Calculations.
Note: The figure shows the developments following episodes in which at least three of the preceding four quarters have (1) accelerating prices (rising price inflation) and (2) accelerating nominal wages (rising nominal wage growth). 79 wage-price spiral episodes are identified for a sample of 31 advanced economies, the earliest going back to 1960. The bands indicate the 10th–90th percentile of the outcomes in the identified episodes.

Similar findings when using longer time sample based on manufacturing-only wages

Changes in Macroeconomic Variables after Past Episodes with Accelerating Prices and Manufacturing Wages
(differences relative to first quarter where criteria is fulfilled; percentage points)
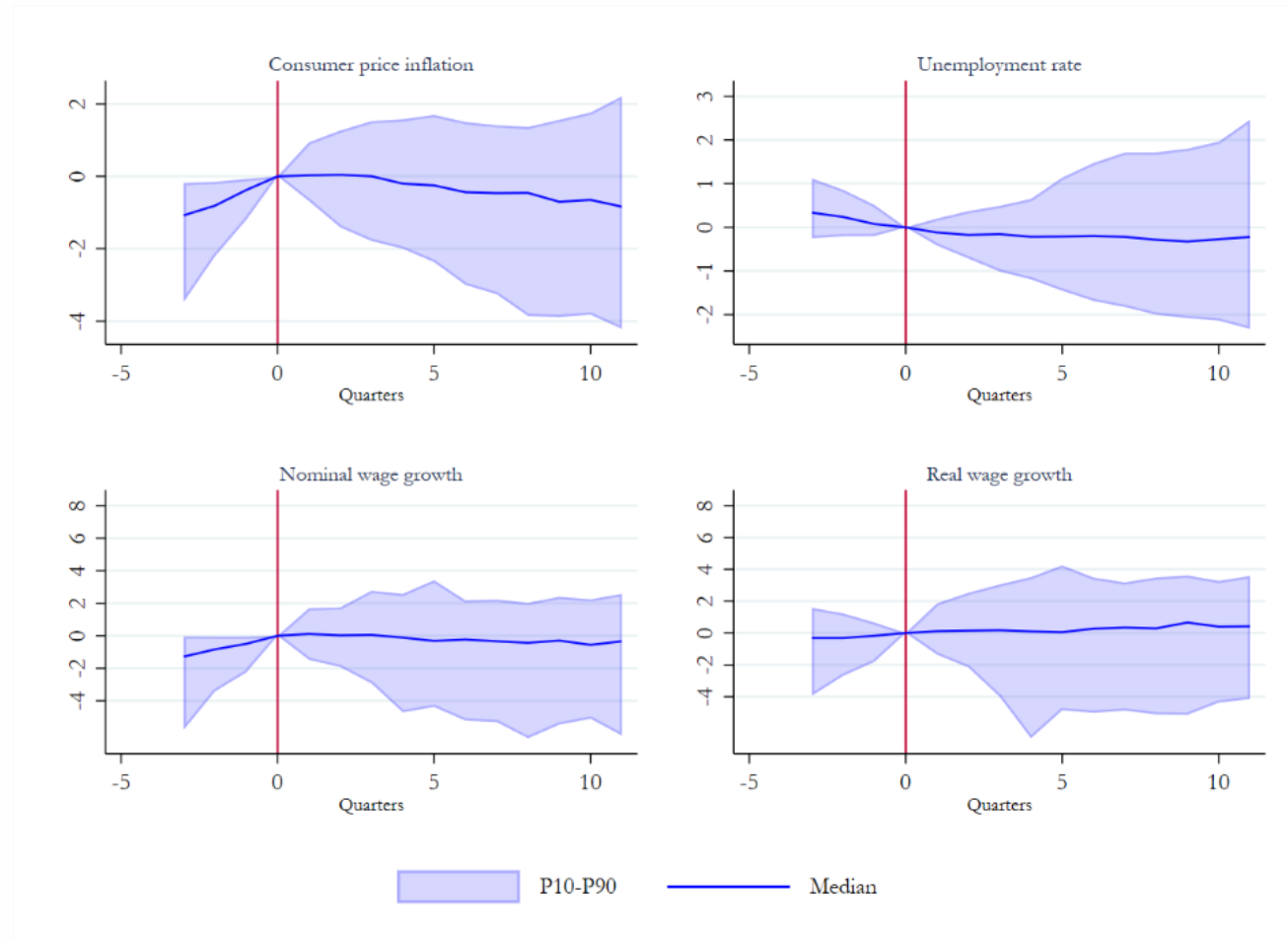
- For a sustained period ($t=-3$ to $t=0$), identified cases had both:
  1. Accelerating prices (rising inflation)
  2. Accelerating manufacturing wages (rising manufacturing wage growth)

- A period of stable wage growth and slowly declining inflation typically followed past episodes – consistent with the shorter time sample using aggregate wages.

Sources: Organisation for Economic Co-operation and Development; International Labour Organisation; US Bureau of Economic Analysis; and author calculations.
Note:The figure shows the developments following episodes in which at least three of the preceding four quarters have (1) accelerating prices/rising price inflation and (2) accelerating nominal wages/rising nominal wage growth. 100 such episodes are identified within a sample of 31 advanced economies, the earliest going back to 1960. The bands indicate the 10th–90th percentile of the outcomes in the identified episodes.

2. What accounts for wage dynamics in wage-price spiral episodes and their aftermath?

Nominal wage growth is related to lagged inflation and labor market tightness

- Wage Phillips curve estimated (inspired by Gali 2011):

$$\pi_{c,t}^w = \alpha_c + \phi_t + \beta\pi_{c,t-1}^p + \gamma_1 u_{c,t} + \gamma_2 \Delta u_{c,t} + \theta g_{c,t} + \varepsilon_{c,t}$$

- Relates nominal wage growth to lagged price inflation, indicators of labor market tightness (unemployment rate gap and its change), and labor productivity growth

- Use this model to explore:
  - Patterns in past wage-setting processes
  - Drivers of recent wage growth movements

- Consistent with much earlier research:
  - Estimated negative relationship with unemployment and positive relationship with lagged inflation expectations.

Coefficients

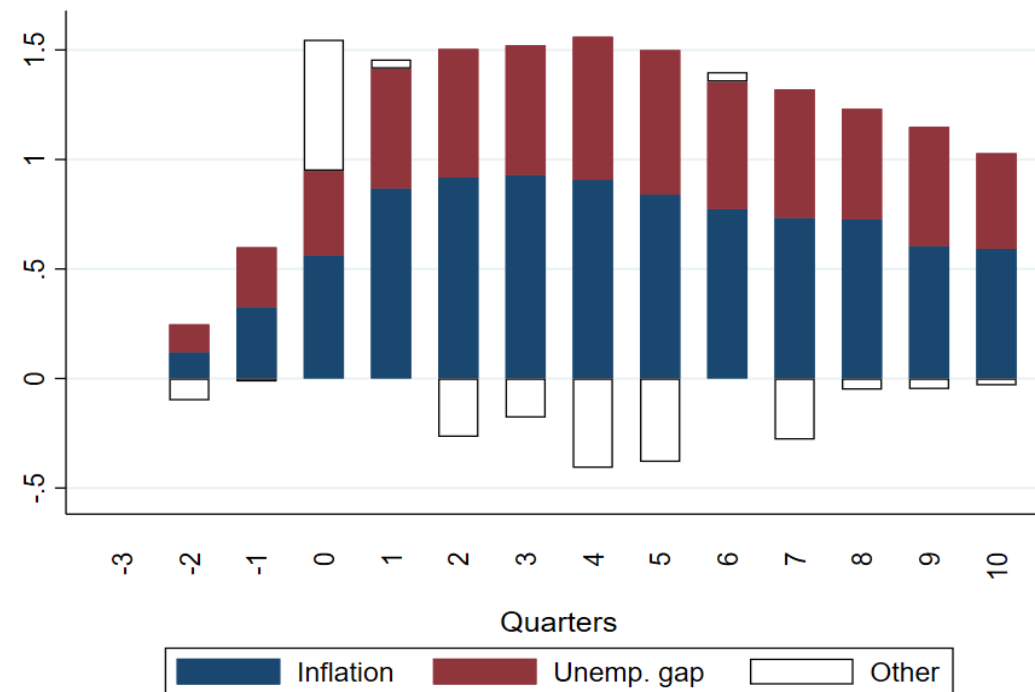**Wage Phillips Curve Coefficients**
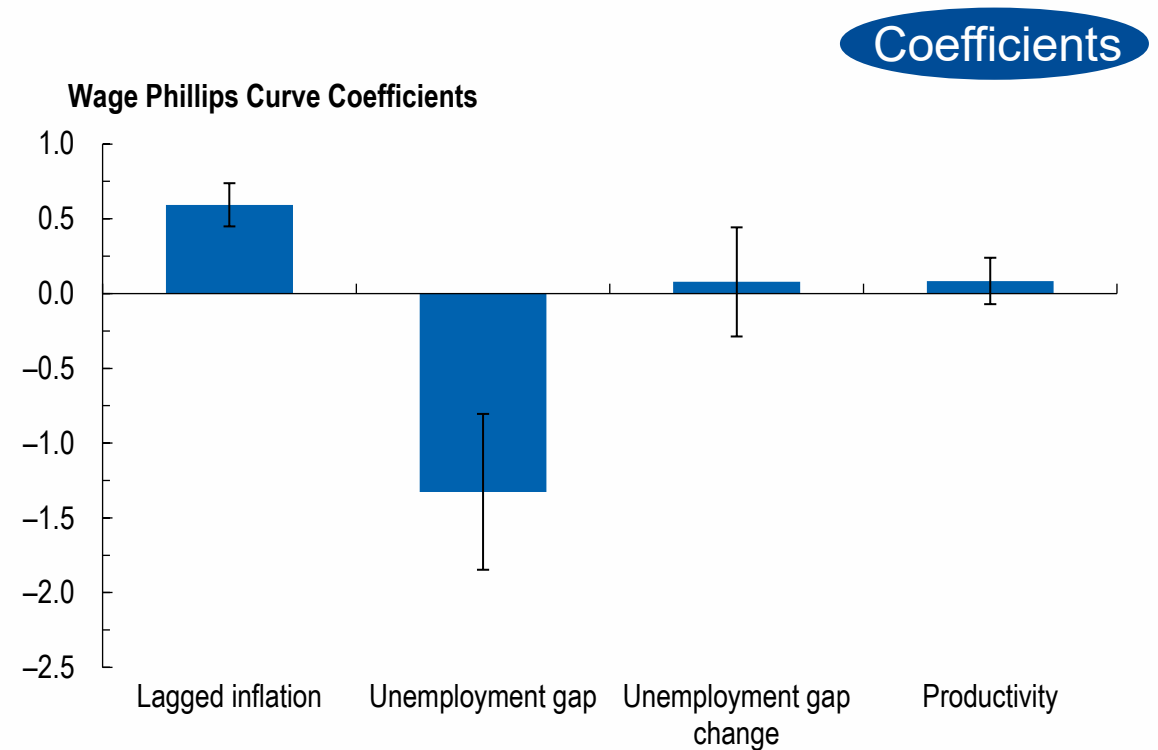
Source: Author's estimates.
Note: Estimated coefficients from 1 percentage point rises in the indicated variables from a wage Phillips curve regression. The sample covering 2000:Q1-19:Q4 consists of 31 advanced economies. Whiskers indicate 90 percent confidence intervals.

After a wage-price spiral episode, nominal wage growth came down very gradually, in line with inflation and labor market tightness

- Wage growth tends to stay steady and then gradually comes down 5 quarters after the identified wage-price spiral episode.

- Decomposition indicates initial developments are driven by higher inflation and tighter labor markets, which then decrease about 1.5 years later.

- On average, inflation explains around 60 percent of wage growth, while unemployment gap explains much of the rest.

- Other component increases rapidly during start of episode, but then subsides.

Decomposition of Nominal Wage Growth for Average Episode
(Difference in wage growth relative to start of identified episode; percent)

Sources: Author calculations.
Notes: Contributions using pooled wage Phillips Curve coefficients from column (5) of Table 4.1. Bars show average contributions across episodes of each component relative to the contributions observed at the start of the episode window (t=−3). "Other" component includes the contributions from short-term changes in unemployment gap, productivity growth, time fixed effects, and the residual. Horizontal axis shows the quarters after an episode is identified (t=0, which is the first quarter where the selection criteria holds).

3. How did past episodes similar to the pandemic recovery evolve?

Recent circumstances have occurred before but no evidence of wage-price spirals afterwards

Changes in Macroeconomic Variables after Past Episodes Similar to 2021
(differences relative to first quarter where criteria is fulfilled; percentage points)
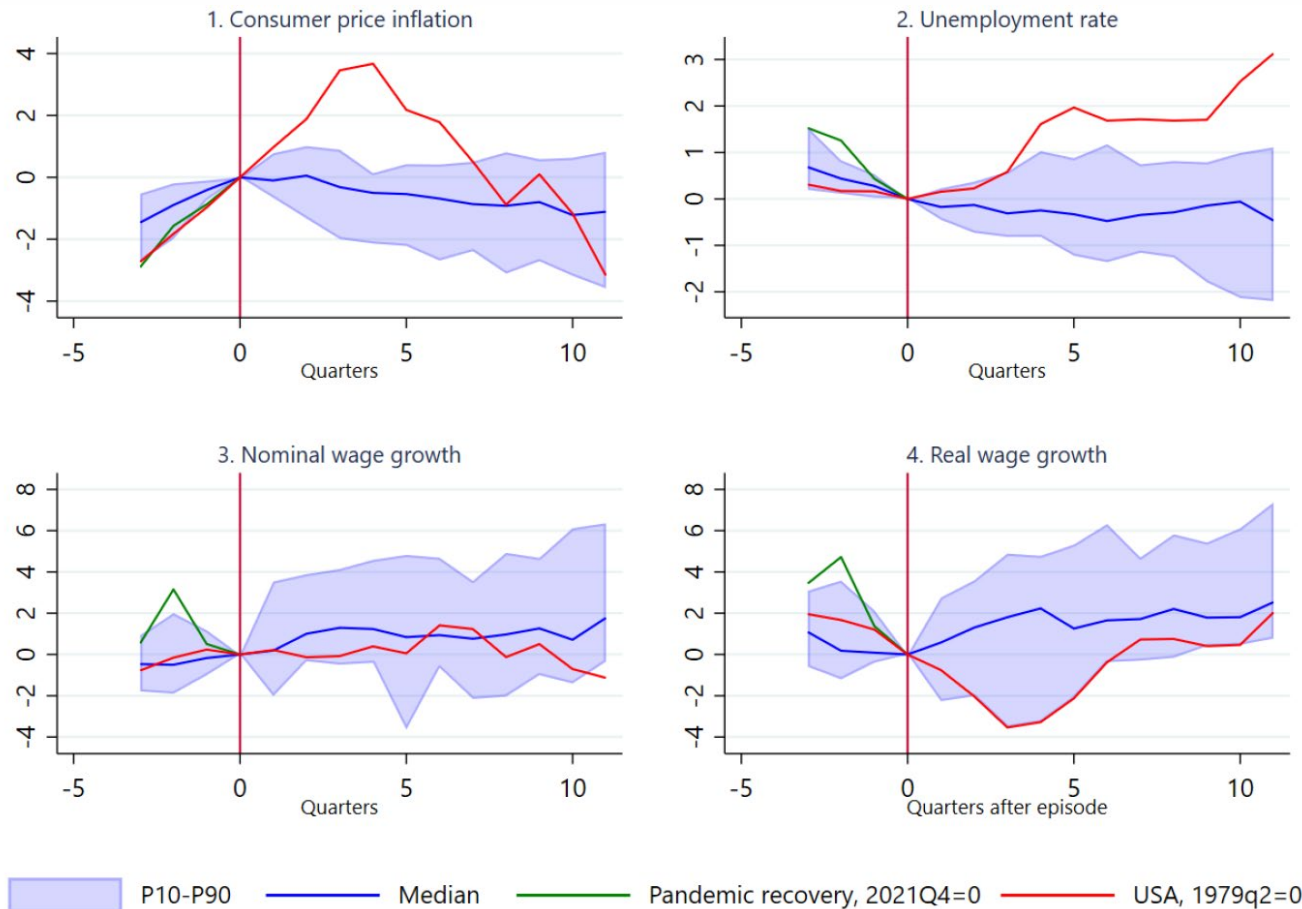
- Episodes selected with pre-trends similar to average circumstances in 2021 for advanced economies:
    1. Accelerating prices (rising inflation)
    2. Positive nominal wage growth
    3. Flat or falling real wages
    4. Flat or falling unemployment rate

- Similar past episodes do not show wage-price acceleration/spiral on average afterwards, but wide heterogeneity.
    - US in late 1979 is an extreme episode
        - Rising inflation for longer.
        - But also falling real wages and rising unemployment.

Sources: Organisation for Economic Co-operation and Development; International Labour Organisation; US Bureau of Economic Analysis; and author calculations.
Note: The figure shows the developments following episodes where at least three out of the last four quarters has (i) rising inflation, (ii) positive nominal wage growth, (iii) falling or constant real wages, and (iv) declining or flat unemployment (similar to 2021 experience for average advanced economy). 22 such episodes are identified within a sample of 31 advanced economies going back to 1960. The pandemic episode (illustrated in green) is an average of countries in our sample for the period starting in 2021:Q4.

Even conditioning on energy price inflation, the overall picture changes little.

Changes in Macroeconomic Variables after Past Episodes Similar to 2021, based on energy price inflation
(differences relative to first quarter where criteria is fulfilled; percentage points)

- Episodes selected with pre-trends similar to average circumstances in 2021 for advanced economies – focusing on energy price shock:
  1. Accelerating energy prices (rising energy price inflation)
  2. Positive nominal wage growth
  3. Flat or falling real wages
  4. Flat or falling unemployment rate

- Only 13 past episodes identified (down from 22 when based on headline inflation criterion).

- But overall picture changes little – similar past episodes do not show wage-price acceleration/spiral on average afterwards, but wide heterogeneity.
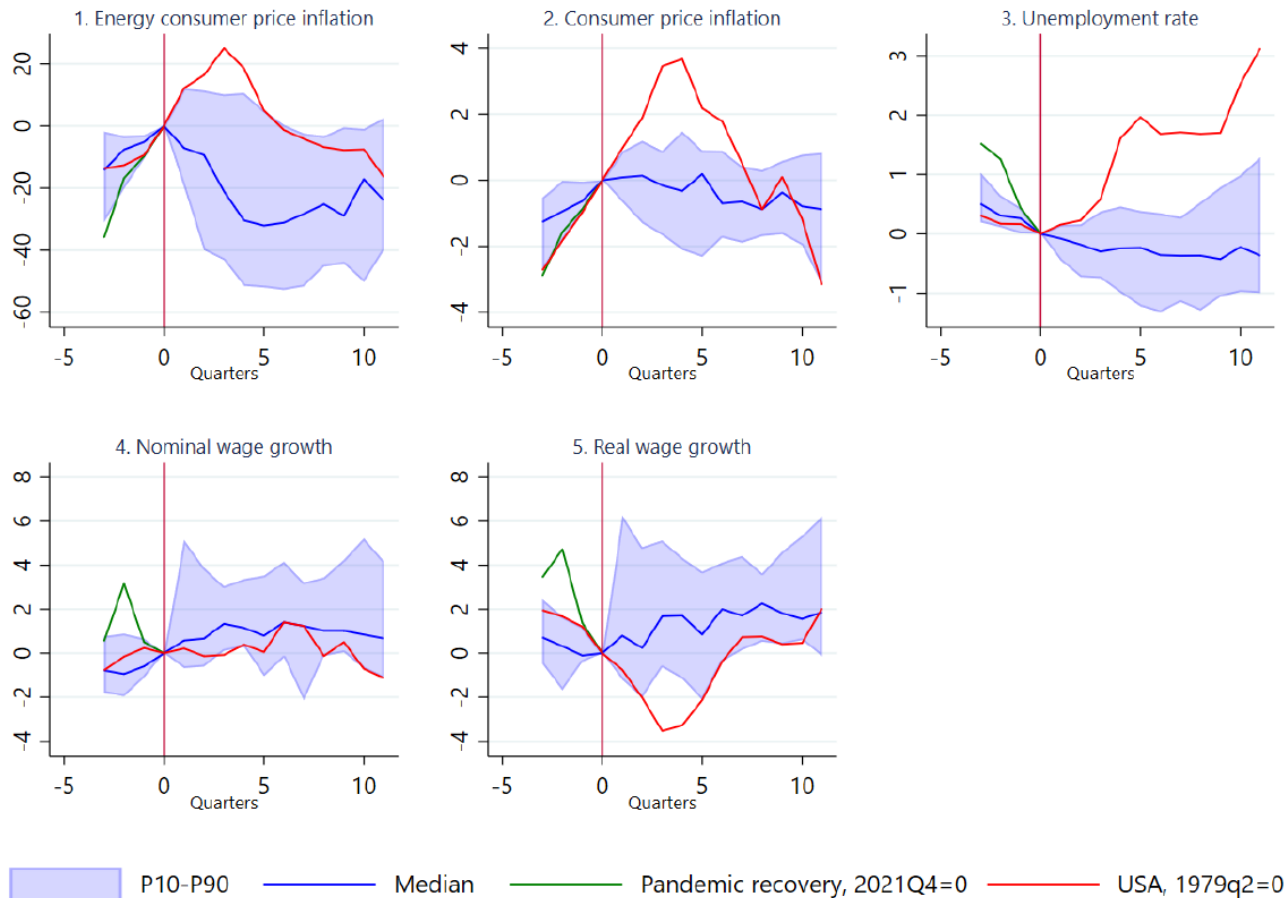 - US in late 1979 is again identified and again an extreme episode

Sources: Organisation for Economic Co-operation and Development; International Labour Organisation; US Bureau of Economic Analysis; and author calculations.
Note:The figure shows the developments following episodes in which at least three of the preceding four quarters have (1) accelerating prices/rising price inflation and (2) accelerating nominal wages/rising nominal wage growth. 100 such episodes are identified within a sample of 31 advanced economies, the earliest going back to 1960. The bands indicate the 10th–90th percentile of the outcomes in the identified episodes.

After past episodes similar to 2021, nominal wage growth also came down very gradually, in line with inflation and labor market tightness

- Wage growth tends to stay steady and then very gradually comes down 4 quarters after the identified episode similar to 2021.

- Decomposition indicates initial developments are driven by higher inflation and tighter labor markets, but a larger share due to "other" component early on than with wage-price spirals.

- Compared to episodes with wage-price acceleration, wage growth stronger and longer-lasting.

- Consistent with gradual catch-up of nominal wages needed to recoup the initial decline in real wages.

Average Decomposition of Wage Growth After Past Episodes Similar to 2021

(Difference in wage growth relative to start of identified episode; percent)
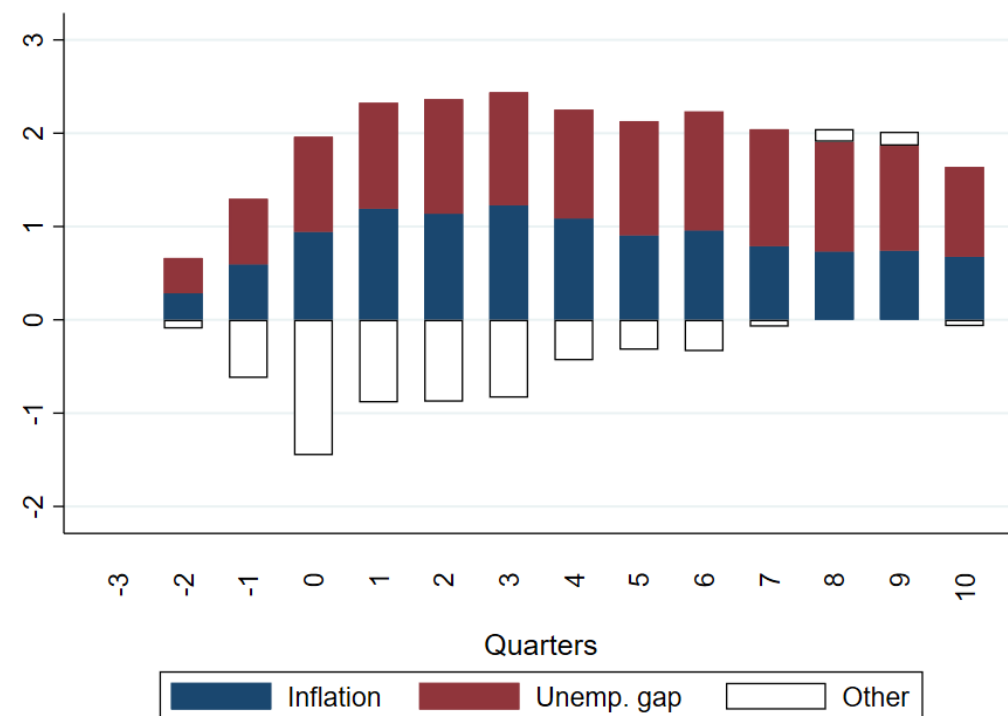
Sources: Author calculations.
Notes: Contributions using pooled wage Phillips Curve coefficients from column (5) of Table 4.1. Bars show average contributions across episodes of each component relative to the contributions observed at the start of the episode window (t=−3). "Other" component includes the contributions from short-term changes in unemployment gap, productivity growth, time fixed effects, and the residual. Horizontal axis shows the quarters after an episode is identified (t=0, which is the first quarter where the selection criteria holds).

Conclusions

- Out of 79 identified wage-price spiral episodes, only a few saw further acceleration after eight quarters.

- In cases similar to the pandemic recovery in 2021 (with both real wages and unemployment rates falling on average):
  - Nominal wage growth rates stabilize at a higher level (but no acceleration)
  - Inflation declined, leading real wage growth to pick up and then stabilize

- Accelerating wages does not necessarily mean a wage-price spiral will take hold. History suggests that nominal wages can pick-up/accelerate while inflation comes down, but it can take a while.

Wage-Price Spirals: What is the Historical Evidence?

THANK YOU!

EXTRA SLIDES

Data

Table 2.1. Variable Description

Indicator	Unit	Frequency	N	Sources
Price level	Consumer price index	Quarterly, 1960:Q1 – 2021:Q4	36	Haver Analytics; IMF; OECD
Energy price index	Period average end-use energy price index	Quarterly, 1960:Q1 – 2021:Q4	38	Haver Analytics; IEA; IMF
Nominal wage	Average per person (local currency, index)	Quarterly, 1960:Q1 – 2021:Q4	31	Haver Analytics; OECD
Nominal wage (manufacturing)	Avg hourly earnings (local currency, index)	Quarterly, 1960:Q1 – 2021:Q4	29	OECD
Unemployment	Rate	Quarterly, 1960:Q1 – 2021:Q4	38	Haver Analytics; ILO; IMF; OECD
Real GDP	Output-side, Chained PPP (mil. 2017 USD)	Annually, 1950 – 2019	31	PWT
Productivity	TFP level at current PPP (USA=1)	Annually, 1950 – 2019	31	PWT

Note: N indicates the number of economies for which data is available. IMF: International Monetary Fund; OECD: Organisation for Economic Co-operation and Development; ILO: International Labour Organization; PWT: Penn World Table 10.0
Source: IMF staff compilation.

Data

Table 3.1. Data Sample for Historical Episodes

Economy	Aggregated Wages		Manufacturing Wages		Economy	Aggregated Wages		Manufacturing Wages	
	Start	End	Start	End		Start	End	Start	End
Australia	1976:Q3	2021:Q4	1983:Q4	2021:Q4	Israel	1995:Q1	2021:Q2	1995:Q1	2021:Q4
Austria	1995:Q1	2021:Q4	1967:Q1	2021:Q4	Italy	1980:Q1	2021:Q4	1960:Q1	2021:Q4
Belgium	1995:Q1	2021:Q4	1960:Q1	2021:Q4	Japan	1980:Q1	2021:Q4	1960:Q1	2021:Q4
Canada	1981:Q1	2021:Q4	1978:Q4	2021:Q4	Korea	1989:Q1	2021:Q4	1992:Q1	2021:Q4
Switzerland	1995:Q1	2021:Q3			Lithuania	1995:Q1	2021:Q4	2000:Q1	2021:Q4
Czech Republic	1995:Q1	2021:Q4	1993:Q1	2021:Q4	Luxembourg	1988:Q1	2021:Q4	1988:Q1	2021:Q4
Germany	1985:Q1	2021:Q4	1969:Q1	2021:Q4	Latvia	2002:Q1	2021:Q4	2002:Q1	2021:Q4
Denmark	1990:Q1	2021:Q4	1971:Q1	2021:Q4	Netherlands	1995:Q1	2021:Q4	1970:Q1	2021:Q4
Spain	1981:Q1	2021:Q4	1981:Q1	2021:Q4	Norway	1995:Q1	2021:Q4	1972:Q1	2021:Q4
Estonia	1995:Q1	2021:Q4	2000:Q1	2021:Q4	New Zealand	1989:Q1	2021:Q4	1989:Q1	2021:Q4
Finland	1975:Q1	2021:Q4	1973:Q1	2021:Q4	Portugal	1995:Q1	2021:Q4	2000:Q1	2021:Q4
France	1990:Q1	2021:Q4	1990:Q1	2021:Q4	Slovak Republic	1995:Q1	2020:Q3	1993:Q1	2021:Q4
United Kingdom	1992:Q2	2021:Q3	1971:Q1	2021:Q4	Slovenia	1995:Q1	2021:Q4	1998:Q1	2021:Q4
Greece	1995:Q1	2021:Q4			Sweden	1993:Q1	2021:Q4	1971:Q1	2021:Q4
Ireland	1995:Q1	2021:Q4	1983:Q1	2021:Q4	United States	1960:Q1	2021:Q4	1960:Q1	2021:Q4
Iceland			2005:Q1	2021:Q4					

Sources: Haver Analytics; International Labour Organization; Organisation for Economic Co-operation and Development;and IMF staff calculations.

Economies in Sample

| Economy	ISO 3 Code	Economy	ISO 3 Code	Economy	ISO 3 Code
Australia	AUS	United Kingdom	GBR	Malta	MLT
Austria	AUT	Greece	GRC	Netherlands	NLD
Belgium	BEL	Hong Kong SAR	HKG	Norway	NOR
Canada	CAN	Ireland	IRL	New Zealand	NZL
Switzerland	CHE	Iceland	ISL	Portugal	PRT
Cyprus	CYP	Israel	ISR	Singapore	SGP
Czech Republic	CZE	Italy	ITA	San Marino	SMR
Germany	DEU	Japan	JPN	Slovak Republic	SVK
Denmark	DNK	Korea	KOR	Slovenia	SVN
Spain	ESP	Lithuania	LTU	Sweden	SWE
Estonia	EST	Luxembourg	LUX	Taiwan Province of China	TWN
Finland	FIN	Latvia	LVA	United States	USA
France	FRA	Macao SAR	MAC		
Source: IMF staff compilation; economies in orange are not necessarily available for all exercises					

Past Episodes With Accelerating Wages and Prices

	Economy	Time		Economy	Time		Economy	Time		Economy	Time
1	Australia	1979:Q3	21	Czech Republic	2017:Q1	41	Greece	2008:Q2	61	Netherlands	2008:Q2
2	Australia	1986:Q1	22	Germany	1989:Q4	42	Greece	2017:Q1	62	Netherlands	2019:Q2
3	Australia	2000:Q3	23	Germany	2010:Q4	43	Ireland	2000:Q2	63	Norway	2001:Q2
4	Australia	2010:Q2	24	Germany	2017:Q1	44	Ireland	2011:Q1	64	Norway	2011:Q3
5	Austria	2011:Q1	25	Denmark	1994:Q3	45	Israel	2008:Q3	65	Norway	2018:Q4
6	Austria	2018:Q2	26	Spain	1986:Q1	46	Italy	1987:Q4	66	New Zealand	2004:Q3
7	Belgium	1999:Q4	27	Spain	2000:Q2	47	Italy	2003:Q3	67	New Zealand	2016:Q1
8	Belgium	2005:Q3	28	Estonia	2001:Q2	48	Italy	2010:Q2	68	Portugal	2017:Q2
9	Belgium	2010:Q2	29	Estonia	2007:Q1	49	Italy	2017:Q1	69	Slovak Republic	2003:Q3
10	Belgium	2016:Q1	30	Estonia	2017:Q2	50	Japan	1988:Q4	70	Slovak Republic	2017:Q2
11	Canada	1987:Q2	31	Finland	1980:Q3	51	Japan	1997:Q1	71	Slovenia	2016:Q4
12	Canada	1997:Q3	32	Finland	1987:Q2	52	Japan	2003:Q1	72	Sweden	2002:Q1
13	Canada	2011:Q1	33	Finland	2000:Q1	53	Japan	2010:Q2	73	Sweden	2008:Q3
14	Canada	2017:Q4	34	Finland	2005:Q2	54	Korea	2010:Q3	74	United States	1973:Q3
15	Switzerland	2000:Q4	35	Finland	2018:Q3	55	Lithuania	2000:Q4	75	United States	1978:Q4
16	Switzerland	2004:Q4	36	France	2001:Q2	56	Lithuania	2005:Q1	76	United States	1987:Q3
17	Switzerland	2013:Q3	37	France	2008:Q2	57	Lithuania	2017:Q1	77	United States	1996:Q4
18	Switzerland	2017:Q1	38	France	2011:Q4	58	Luxembourg	1997:Q4	78	United States	2000:Q3
19	Czech Republic	2000:Q3	39	United Kingdom	2003:Q4	59	Luxembourg	2017:Q3	79	United States	2017:Q3
20	Czech Republic	2010:Q2	40	United Kingdom	2016:Q1	60	Latvia	2010:Q4			

Sources: International Labour Organization; Organisation for Economic Co-operation and Development; US Bureau of Economic Analysis, and IMF staff calculations.

Share of Economies With Accelerating Wages and Prices
(Hourly Manufacturing Wages; percent)

Number of Economies in Sample (left)
Share With Accelerating W and P (right)
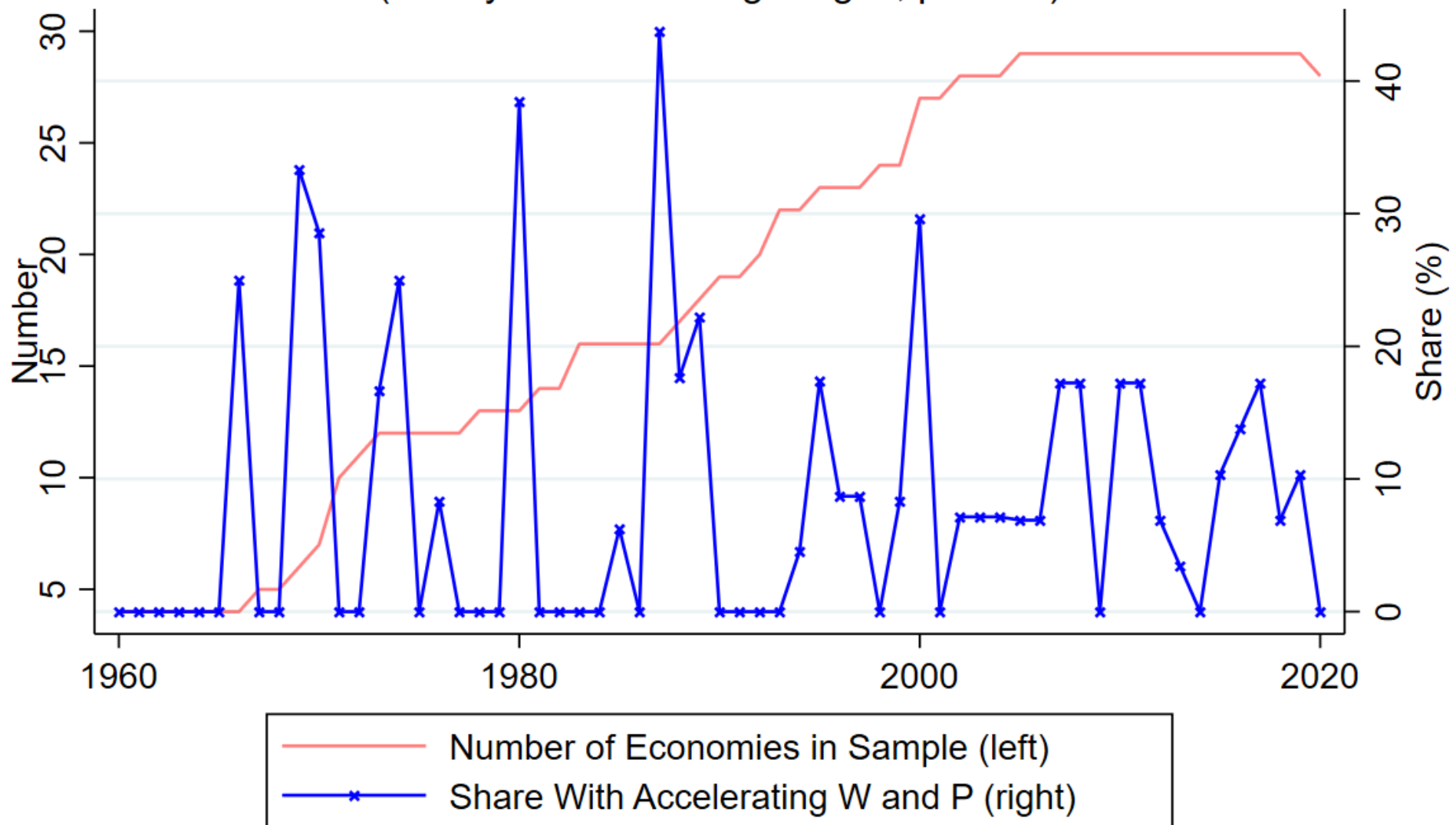
Wage Philips Curve Estimation

	(1)	(2)	(3)	(4)	(5)	(6)
Lagged Inflation	0.734***		0.585***	0.582***	0.593***	0.718***
	(0.142)		(0.0873)	(0.0902)	(0.0876)	(0.0709)
Unemployment gap		-1.497***	-1.321***	-1.329***	-1.326***	-1.100***
		(0.352)	(0.306)	(0.310)	(0.317)	(0.274)
Unemployment gap change				0.0795	0.0786	-0.117
				(0.222)	(0.222)	(0.186)
Productivity					0.0843	0.114
					(0.0943)	(0.0956)
Economy fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Quarterly fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	2,400	2,392	2,392	2,391	2,391	3,289
Adjusted R^2	0.488	0.523	0.567	0.566	0.567	0.602
First year of sample	2000	2000	2000	2000	2000	1990

Source: IMF staff calculations.

Note: Unbalanced sample of 31 advanced economies. Columns 1-5 cover the period from 2000Q1 to 2019Q4. Column 6 extends the sample, for available economies, back to 1990Q1. Clustered standard errors reported in parentheses. *** $p<0.01$; ** $p<0.05$; * $p<0.1$.