The Intensive and Extensive Margins of Real Wage Adjustment

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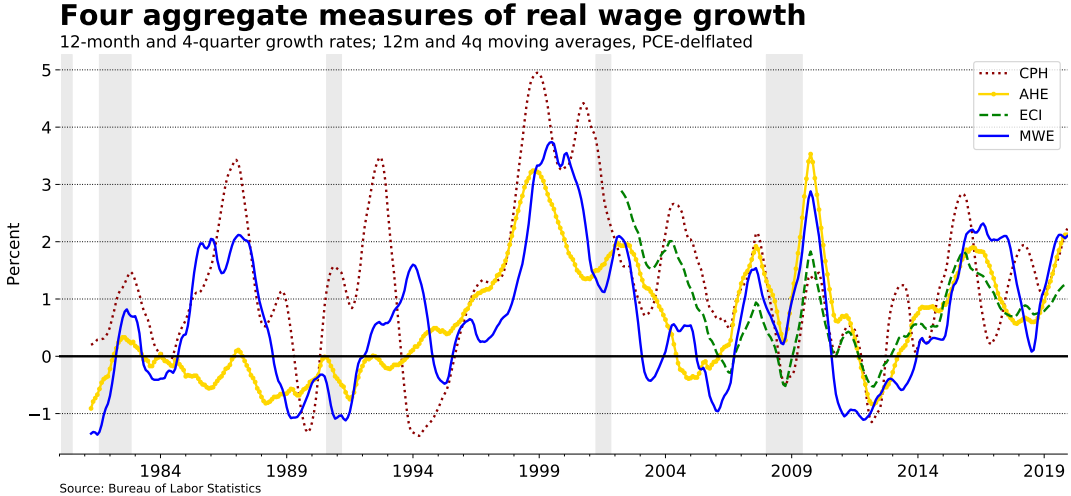
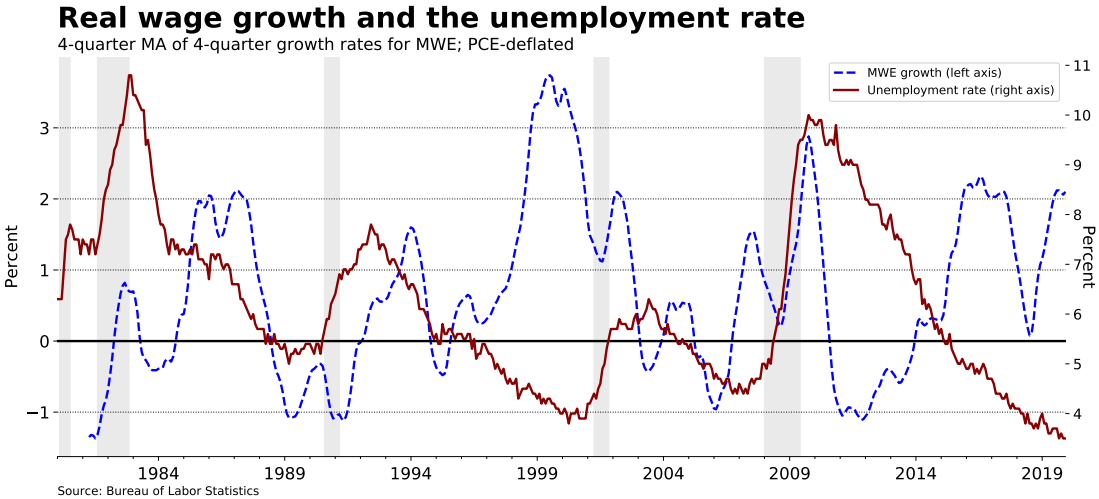
[1] The views expressed in this paper are those of the authors and do not necessarily reflect the position of the Federal Reserve Bank of San Francisco or the Federal Reserve System.

Measures of real wage growth in the United States



Real wage growth is a perennial puzzle



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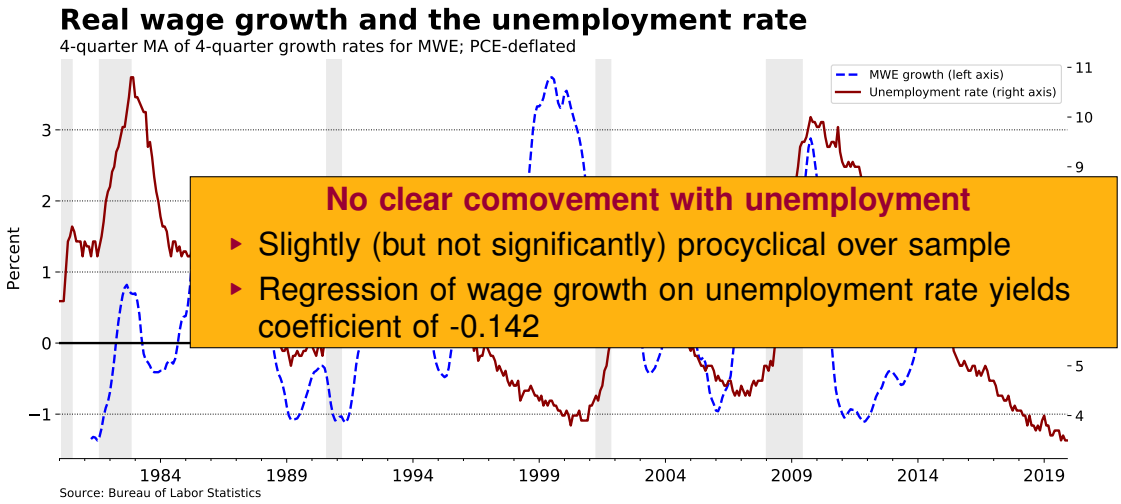
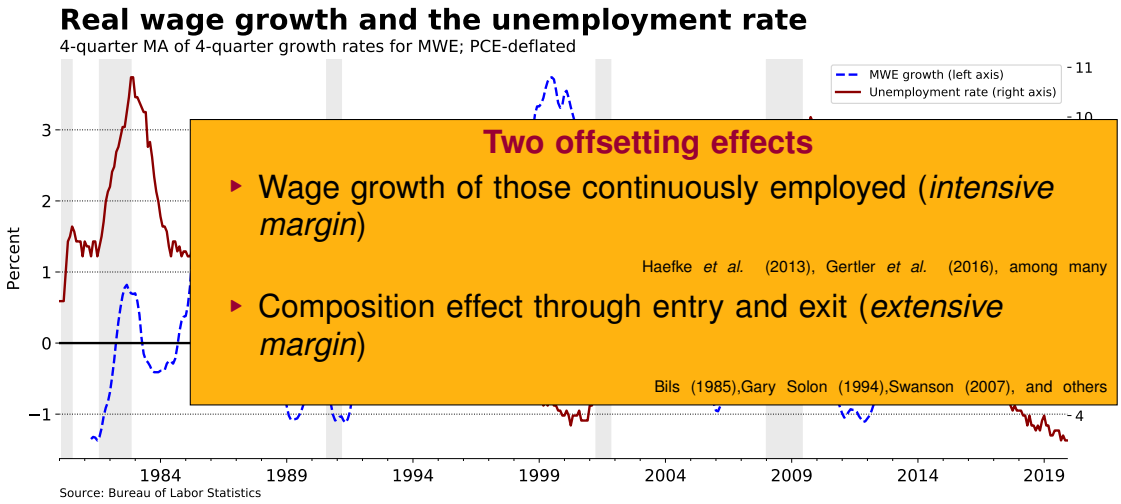


No clear comovement with unemployment

- Slightly (but not significantly) procyclical over sample
- Regression of wage growth on unemployment rate yields coefficient of -0.142

Real wage growth is a perennial puzzle



Two offsetting effects

- Wage growth of those continuously employed (*intensive margin*)

  Haefke *et al.* (2013), Gertler *et al.* (2016), among many

- Composition effect through entry and exit (*extensive margin*)

  Bils (1985),Gary Solon (1994),Swanson (2007), and others

Main contributions of this paper

Do formal decomposition of measure of aggregate real wage growth

- Use MWE because that is measure for which we have underlying individual-level data
- Requires *non-standard decomposition method* because it is a median
- Account for importance of components for fluctuations and cyclicality of real wage growth

Relate to flows into and out of (full-time) employment

- Instead of demographics, we consider importance of different labor market flows

Show how relative importance of effects changes over business cycles and across recessions

- Great Recession different from previous recession

Quantify importance of previously identified effects

Margins have opposite effect on real wage growth

- Intensive margin contributes to procyclicality, especially “job-changers”
- Extensive margin subdues procyclicality

Importance varies over business cycle, across recessions, and by flows-source

- Intensive margin important during expansions, extensive margin during downturns
- Extensive margin particularly important in Great Recession
- Outsized role for part-time margin.
- Participation margin as important as unemployment one

Relative unimportance of unemployment flows due to two offsetting effects

- Incidence of unemployment goes up during recessions
- Higher share of unemployment occurs above MWE

Data

Median Usual Weekly Earnings (MWE) growth decomposed

Published MWE definition

- "...earnings before taxes and other deductions and including any overtime pay, commissions, or tips usually received (at the main job in the case of multiple jobholders) "
- Covers full-time wage and salary workers
- Published at a *quarterly* frequency

MWE is measure for which individual-level data available

- Based on CPS data
- Only aggregate for which we have earnings and labor market status flows
- Imputed job-to-job flows (imperfectly)

Five categories of workers based on labor-market flows

	I State (I)	II Flow	III Beginning of year	IV End of year
			Intensive margin	
1.	Same job (S)	Full-time employed	Full-time employed	Still employed in the same job
2.	Job changers (C)	Full-time employed	Full-time employed	Employed in a different job
			Extensive margin	
3.	Part-time/self-employed (P)	Entry Exit	Part-time or self-employed Full-time employed	Full-time employed Part-time or self-employed
4.	Unemployed (U)	Entry Exit	Unemployed Full-time employed	Full-time employed Unemployed
5.	Not-in-labor-force (N)	Entry Exit	Not in the labor force Full-time employed	Full-time employed Not in the labor force

Whether workers are S or C is (imperfectly) imputed comparing industry-occupation with year ago (Card & Hyslop, 1997)

Method

Decomposition of growth of
median usual weekly earnings.

Main intuition through basic summary statistics

I		I $\phi(I)$ Share of full-time wage earners in state	II $\gamma(I)$	III $F(w\|I)$ Share of group below the median	IV $G(w'\|I)$
	Intensive margin	Beginning of period	End of period	Beginning of period	End of period
1.	Same job (S)	41.5	41.3	45.2	44.0
2.	Job changers (C)	45.2	45.0	50.2	49.0
	Extensive margin	Exit	Entry	Exit	Entry
3.	Part-time/self-employed (P)	6.1	7.4	64.1	69.0
4.	Unemployed (U)	2.5	2.5	63.7	71.7
5.	Not-in-labor-force (N)	4.7	3.7	64.3	76.6

All shares reported are average shares 1982-2019Q4 and are reported in percentages.

Because decompose median, focus on distribution functions

Compare median at beginning, w, and end, w', of the year

$$1/2 = F(w) = G\left(w'\right). \tag{1}$$

Use that distribution function is marginal-weighted average of conditionals

$$F(w) = \sum_{l} \phi(l) F\left(w' \mid l\right) \tag{2}$$

$$G\left(w'\right) = \sum_{l} \gamma(l) G\left(w' \mid l\right) \tag{3}$$

Shift-share-type decomposition on distribution functions

Decompose change in distribution function at w

$$
\begin{aligned}
F(w) - G(w) \;=\; & \sum_{l \in \{S,C\}} \phi(l)\,[F(w \mid l) - G(w \mid l)] \\
+ \; & \sum_{l \in \{P,U,N\}} \phi(l)\,[F(w \mid l) - 1/2] - \sum_{l \in \{P,U,N\}} \gamma(l)\,[G(w \mid l) - 1/2] \\
- \; & \sum_{l \in \{S,C\}} (\gamma(l) - \phi(l))\,[G(w \mid l) - 1/2]\,.
\end{aligned}
\tag{4}
$$

Do the same for the change at w'

Shift-share-type decomposition on distribution functions

$$
\begin{aligned}
&[F(w) - G(w)] + \left[F\left(w'\right) - G\left(w'\right)\right] \\
= &\sum_{l \in \{S,C\}} \{\phi(l)\left[F(w \mid l) - G(w \mid l)\right] + \gamma(l)\left[F\left(w' \mid l\right) - G\left(w' \mid l\right)\right]\} \\
&+ \sum_{l \in \{P,U,N\}} \phi(l)\left\{\left[F(w \mid l) - 1/2\right] + \left[F\left(w' \mid l\right) - 1/2\right]\right\} \\
&- \sum_{l \in \{P,U,N\}} \gamma(l)\left\{\left[G(w \mid l) - 1/2\right] + \left[G\left(w' \mid l\right) - 1/2\right]\right\} \\
&- \sum_{l \in \{S,C\}} (\gamma(l) - \phi(l))\left\{\left[F\left(w' \mid l\right) - 1/2\right] + \left[G(w \mid l) - 1/2\right]\right\}.
\end{aligned}
\tag{5}
$$

Translating changes in CDFs into changes in the median

Rearrange changes in the distribution functions

$$\begin{aligned} \left[F(w) - G(w)\right] + \left[F\left(w'\right) - G\left(w'\right)\right] &= \left[1/2 - G(w)\right] + \left[F\left(w'\right) - 1/2\right] \quad (6) \\ &= \left[G\left(w'\right) - G(w)\right] + \left[F\left(w'\right) - F(w)\right]. \quad (7) \end{aligned}$$

Apply the mean value theorem

$$\left[G\left(w'\right) - G(w)\right] + \left[F\left(w'\right) - F(w)\right] = q^* \times \left(w' - w\right), \text{ where } q^* = \left[f\left(w^*\right) + g\left(w^*\right)\right]. \quad (8)$$

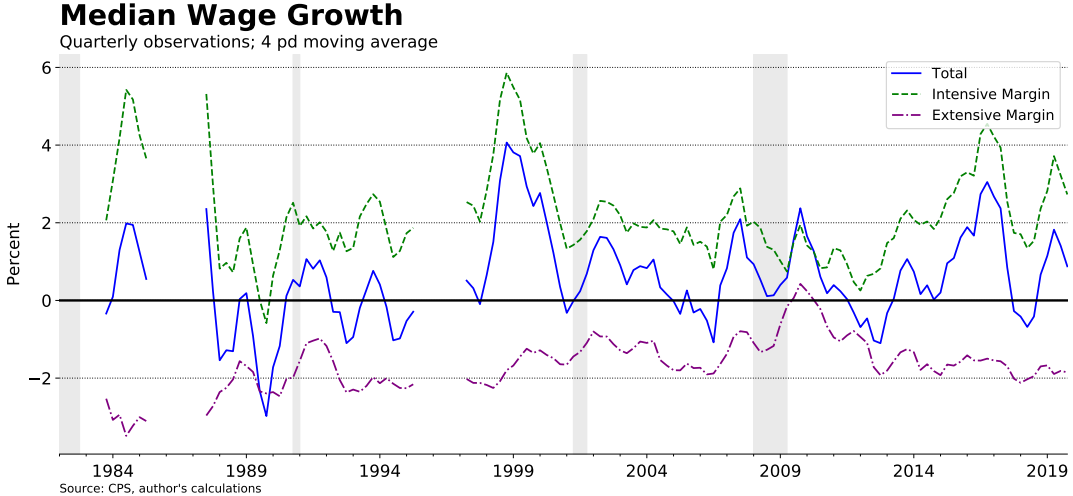
Here q^* translates shifts in the distribution functions into log changes in the median.

Alternative interpretation: Additive decomposition through first-order approximation

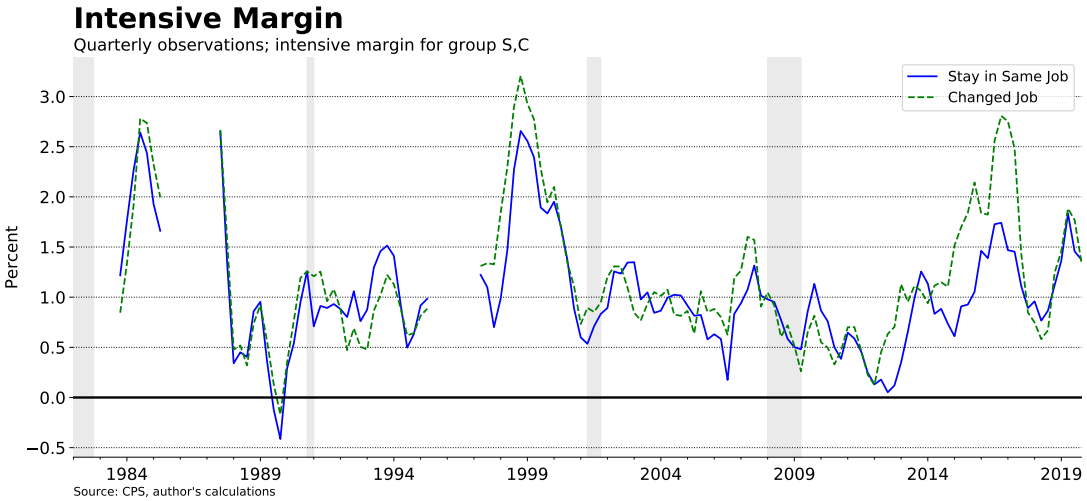
Fortin *et al.* (2011)

Time-series results

Bulk of movements in MWE growth due to intensive margin

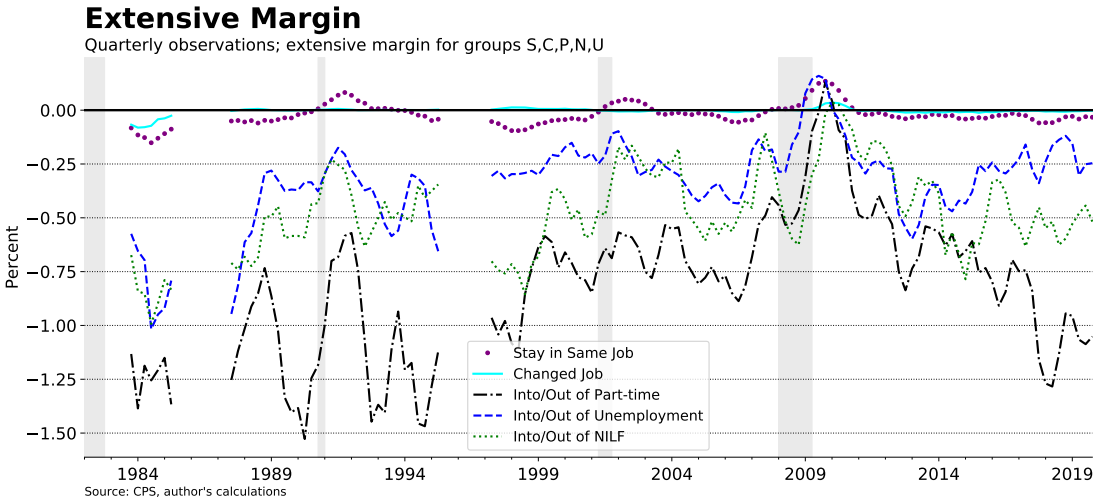


Intensive margin largely driven by job changers



Whether workers stay or switch jobs imputed by comparing industry and occupation with a year earlier (Card & Hyslop, 1997). Similar to Gertler *et al.* (2016).

Extensive margin largely driven by part-time employed



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Adding it all up

Contributions of margins to fluctuations in and cyclicality of real wage growth.

Intensive margin accounts for bulk of fluctuations

	State	Variance	Cyclicality
	Total	3.1	−0.142 (−2.15)
	A. Intensive margin		
1.	Same job (S)	41.8	−0.074 (−2.37)
2.	Job changers (C)	46.2	−0.147 (−4.09)
	B. Extensive margin		
	Entry and exit components		
3.	Part-time of self-employed (P)	8.6	0.053 (2.97)
4.	Unemployed (U)	1.4	−0.022 (−2.023)
5.	Not in the labor force (N)	1.7	0.038 (3.5)
	Share components		
6.	Same job (S)	0.2	0.008 (3.28)
7.	Job changers (C)	0.1	−0.002 (−1.98)

Total is variance of 4q MA of 4q percent growth of MWE. Rows 1-7 are the percent contribution to this variance for the components of the decomposition

Extensive margin subdues a third of procyclicality

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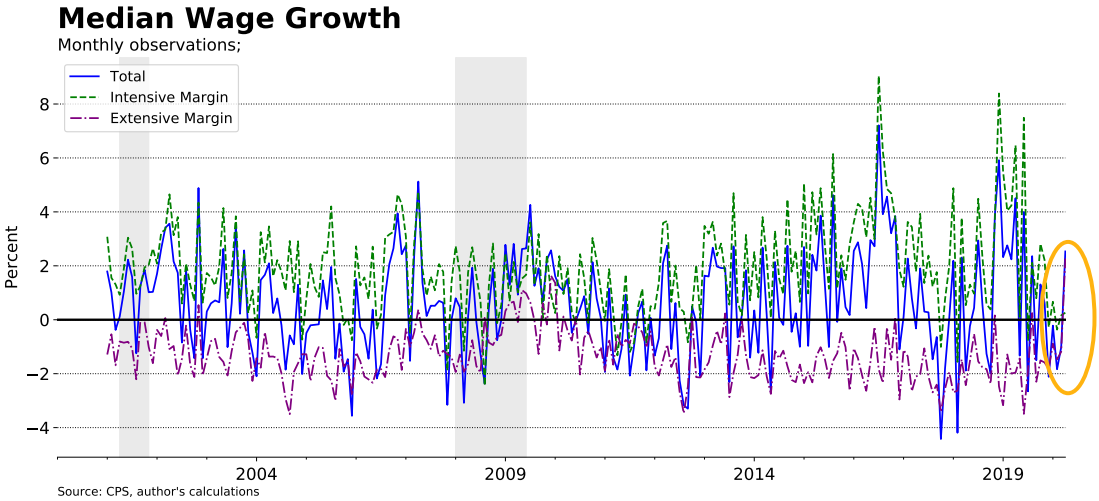
Between parentheses are t-values of regression of 4-q MA of 4-q growth contribution of component on constant and average unemployment rate in the quarter.

Recent evidence from COVID-“Recession”

Extensive margin on steroids.

Extensive margin pushes up MWE growth by 2 p.p.



MWE growth calculated from monthly ORG (MIS16) group. Last observation is April 2020.

Conclusion

Intensive and extensive margins of wage growth important to understand cyclical dynamics

Role of margins varies over the business cycle

- Intensive margin, especially job-to-job transitions, important in expansions
- Extensive margin important in downturns, especially in Great and COVID recessions
- Part-time employment (hours adjustment) bulk of extensive margin
- Participation margin as important as unemployment margin

Tracking extensive margin crucial for understanding wage dynamics in COVID recession

- COVID recession is extensive margin on steroids

Note: The use of steroids is not FDA approved against COVID-19

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