

Composition, Selection, and Aggregate Real Wage Growth

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The business cycle dynamics of real wage growth remain a macroeconomic puzzle; specifically, aggregate real wages exhibit less procyclicality than most models predict. In this paper we use 35 years of Current Population Survey data to confirm (Solon, Barsky and Parker, 1994) that the puzzling behavior of wages largely owes to changes in the *composition* of the employed over the business cycle.

We go on to show that the cyclical nature of the composition effect relates to changes in both the number and the relative wage levels of those entering and exiting. The changing gap in wages of entrants and exiters is especially important for the unemployed. Consistent with Mueller (2012), a large part of this wage gap turns out to reflect *selection* of entrants and exiters with respect to their Mincer residuals rather than on their observable characteristics.

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I. Mean log wage changes

Our real wage measure is the log of real weekly earnings of a full-time employed individual i in quarter t , denoted by $w_{i,t}$, from the Current Population Survey (CPS).¹ We decompose the time series of $\Delta \bar{w}_t = \bar{w}_t - \bar{w}_{t-4}$. Here \bar{w}_t is the average log wage for those rotating out of the sample and \bar{w}_{t-4} is the average when they reported their wages a year before.

Not everyone who has a full-time job at the end of the year had such a job a year earlier and vice versa. To capture these entry and exit margins we divide workers into four groups based on labor market status flows. These are denoted by $f \in \{E, P, U, N\}$, where (E) is persons who had a full-time job at the beginning ($t-4$) and end of the year (t), (P) persons who were part-time employed, (U) persons who were unemployed, and (N) workers that were not-in-the-labor-force at either the beginning or end of the year. Relevant for our analysis is the fact that average wage levels vary considerably across groups.

¹We use the PCE deflator to deflate the nominal wages to obtain real wages.

II. Total wage growth decomposed

The aggregate mean log wage can change for two reasons. First, the average wage of workers in each group can change. This is the *within-group wage growth* effect. Second, the share of workers in each group, each with different average wage levels, can change. What we call the *between-group composition effect*. The importance of these two effects can be quantified using the following shift-share decomposition:

$$(1) \quad \Delta \bar{w}_t = \frac{1}{2} \sum_f (s_t^f + s_{t-4}^f) \Delta \bar{w}_t^f + \frac{1}{2} \sum_f (\bar{w}_t^f + \bar{w}_{t-4}^f) \Delta s_t^f,$$

where \bar{s}_t^f is the share of the population in group f and \bar{w}_t^f is the average wage of each group f . The first, shift-, term captures the change in the average real wage due to *within-group wage growth*. The second, share-, term captures the change in the average wage due to changes in the size of the groups—the *between-group composition*.²

Figure 1 shows the results of this simple decomposition. The dashed line is aggregate wage growth labeled “Total”. The solid line is the *within-group wage growth* effect and the dotted line is the *between-group composition* effect.

The figure confirms that changes in the composition of the employed play a crucial

role in determining the cyclicity of real wage growth. Consistent with earlier studies, we find that the *between-group composition* effect partially offsets the procyclicality of aggregate real wage growth. During labor market downturns the average wage is boosted by the disproportionate net exit of workers with lower than average wages. Our contribution is to show that this effect has risen somewhat over the past 35 years, boosting wages more in the 2001 recession than in the early 1990s recession and more in the Great Recession than in 2001. Notably, the effects of compositional changes were relatively persistent in the Great Recession, boosting wage growth during and for some time after the downturn.

III. A further decomposition

To better understand how compositional changes affect aggregate wages we further decompose the *within-group wage growth* effect plotted in Figure 1. Specifically, we quantify how the wage growth effect is driven by (i) economy-wide wage pressures, (ii) the composition of entrants and exiters in terms of their observable characteristics, and (iii) the selection of individuals into and out of full-time employment according to their unobservable characteristics.

To distinguish between the influence of observable and unobservable characteristics we fit a standard Mincer regression of the

²In all of our calculations involving transitions, period t refers to transitions into full-time employment and period $t-4$ refers to transitions out of full-time employment.

form:

$$(2) \quad w_{i,t} = \delta_t^f + \mathbf{x}'_{i,t}\beta + \varepsilon_{i,t}.$$

Here $\mathbf{x}_{i,t}$ is a set of standard variables used in wage regressions. We let the intercept, δ_t^f , vary across groups, f , to capture the selection of individuals entering and exiting employment with respect to their unobservable characteristics.³

This regression allows us to write the change in the group-specific average log wage as

$$(3) \quad \Delta \bar{w}_t^f = \Delta \delta_t^E + (\Delta \delta_t^f - \Delta \delta_t^E) \\ + (\Delta \bar{\mathbf{x}}_t^f)' \beta$$

The first term, $\Delta \delta_t^E$, captures *constant-composition wage growth* of the baseline group in our sample. Namely those who are in a full-time job at the beginning and end of the year (E). We interpret it as a measure of economy-wide wage pressure. The second component, $\Delta \delta_t^f - \Delta \delta_t^E$, captures the *selection* of entrants and exiters into full-employment based on their average Mincer regression residuals. The third component represents the change in *composition* of the group in terms of observables.

Figure 2 shows that the bulk of the *within-group wage growth* in Figure 1 is due to the *constant-composition wage growth* effect, $\Delta \delta_t^E$. Changes in observables, *within-group composition*, contribute positively to

within-group wage growth. This is because the members of the E group, who make up the bulk of the employed, move up their life-cycle earnings profile and increase their educational attainment. What is remarkable is that once we control for the *between-group composition*, as we did in Figure 1, the *within-group composition* effect is not very cyclical.

Importantly, the final line in the figure shows that changes in the unobservables also play an important role in determining wage dynamics. Overall, the *selection* effect is negative and largely offsets the positive effect of observables on *within-group wage growth*. Since, by construction, the *selection* effect is zero for the E group, the contribution of selection owes only to the dynamics of entry and exit. The findings show that on average entrants to employment have smaller Mincer residuals than exiters. This finding is consistent with employers letting go of workers who are paid above their marginal product and hiring workers who are paid at or below their marginal product. Whatever the reason, the data show that the selection effect has consistently exerted downward pressure on aggregate wage growth over the course of our sample. This downward pressure has eased since the mid-1990s but remains a meaningful contributor to overall wage growth. Selection also has an impact on the cyclicity of wage growth, mainly due to flows into and out of unemployment.

³We use a quarterly rolling 8-quarter sample.

IV. Unemployment margin

The effect of selection on the cyclical-ity of wage growth mainly works through the unemployment margin. Figure 3 illustrates this by splitting the *within-group wage growth* of the unemployed, $\Delta\bar{w}_t^U$, into the parts derived in (4).

The first thing to note from the figure is that those who exit from unemployment earn about 12.5 percent less than those who enter. This can be seen from the *within-group wage growth* time series. This gap is larger in recessions than expansions.

The second thing to note is that this gap owes almost entirely to the *selection* effect. The importance of selection for unemployment has been documented by Mueller (2012). Our analysis shows how this effect matters for aggregate wage growth.

Changes in the composition of the unemployed in terms of their observables, the *within-group composition* part of Figure 3, are much less important than the *selection* effect and contribute only a small part to the procyclicality of the *within-group wage growth* of the unemployed in the Figure.

V. In sum

Our paper confirms that changes in the composition of the labor market are important for understanding aggregate real wage growth. Our additions to this literature are (1) to provide a full time series accounting of the composition effect, (2) to link it to

labor market transitions, and (3) to show that both changes in observables and unobservables are important.

The key results are as follows. Between groups, the countercyclicality of the *between-group composition effect*, as captured in (2) by their average wages, offsets a large part of the procyclicality of wage growth. Within groups, those who enter employment tend to make less than those who exit, putting downward pressure on aggregate wage growth. The gap between entrants and exiters mainly reflects selection along unobservables, i.e. the Mincer residuals in (2). This is especially true for flows into and out of unemployment.

A better understanding of what forces drive this selection is important for enhancing our comprehension of aggregate real wage dynamics that continue to baffle macroeconomists.

REFERENCES

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- Solon, Gary, Robert Barsky, and Jonathan A. Parker.** 1994. “Measuring the Cyclicity of Real Wages: How Important is Composition Bias?” *The Quarterly Journal of Economics*, 109(1): 1–25.

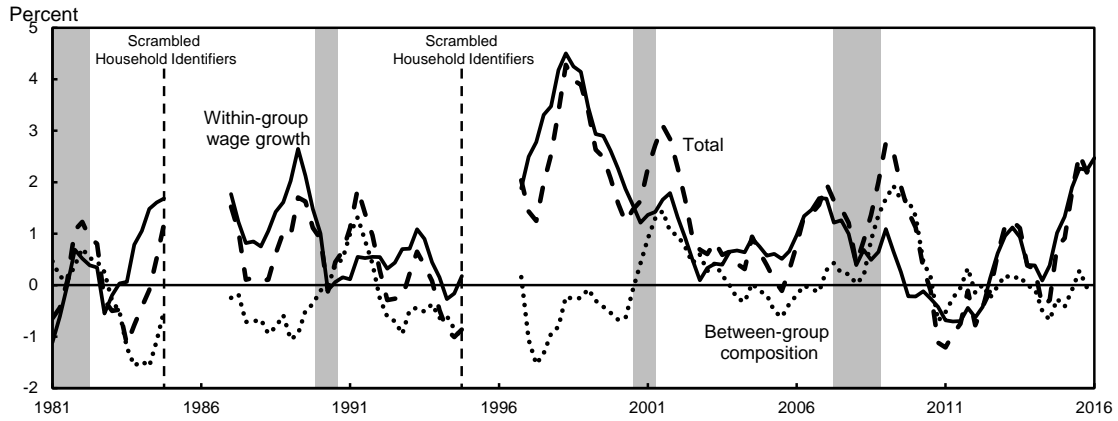


FIGURE 1. WITHIN-GROUP WAGE GROWTH AND BETWEEN-GROUP COMPOSITION EFFECTS.

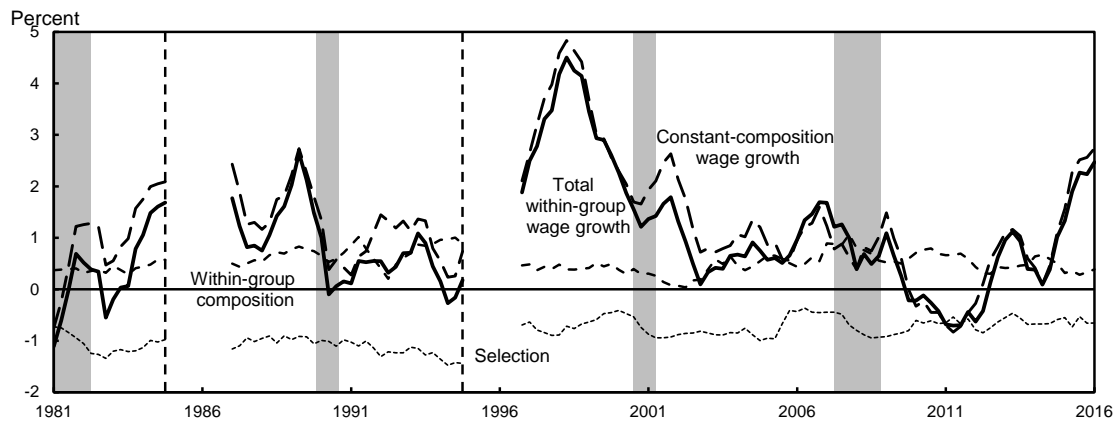


FIGURE 2. WITHIN-GROUP WAGE GROWTH EFFECT DECOMPOSED.

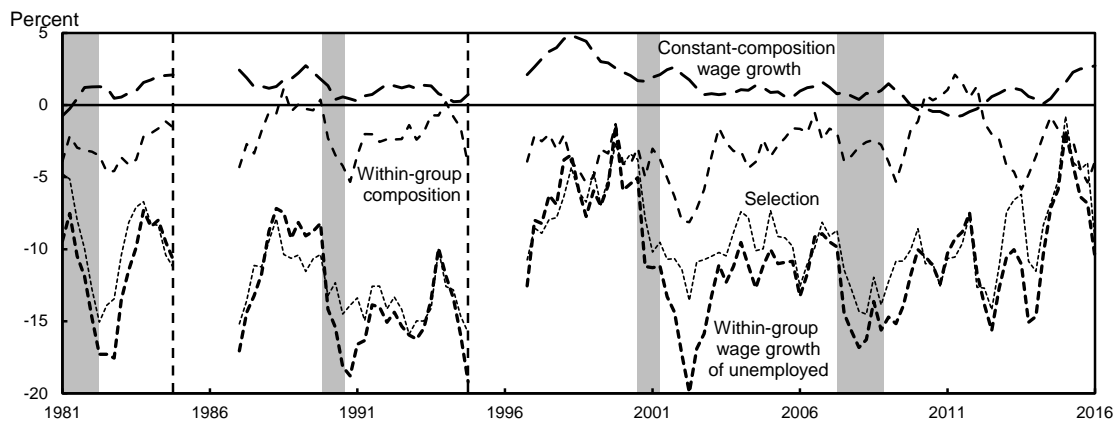


FIGURE 3. WAGE GROWTH OF UNEMPLOYMENT FLOWS DISSECTED.

Notes: 4-quarter moving average of 4-quarter changes of average log wages and its underlying components.
 Source: Current Population Survey and authors' calculations.