Wage Dispersion over the Business Cycle

Morin, Annaïg

Document Version
Accepted author manuscript

Published in:
Economics Letters

DOI:
10.1016/j.econlet.2019.04.013

Publication date:
2019

Citation for published version (APA):
Morin, A. (2019). Wage Dispersion over the Business Cycle. *Economics Letters*, *181*, 17-21. https://doi.org/10.1016/j.econlet.2019.04.013

Wage Dispersion over the Business Cycle

Annaïg Morin

Journal article (Accepted manuscript*)

Please cite this article as:
Morin, A. (2019). Wage Dispersion over the Business Cycle. Economics Letters, 181, 17-21. https://doi.org/10.1016/j.econlet.2019.04.013

DOI: https://doi.org/10.1016/j.econlet.2019.04.013

Wage Dispersion over the Business Cycle

Annaïg Morin*
Copenhagen Business School

February 2019

Abstract

In this paper, I provide robust evidence that fluctuations in wage dispersion are independent of the business cycle, while residual wage dispersion, i.e. dispersion of wages within narrowly defined demographic and skill groups of workers, increases during booms and lessens during recessions. Moreover, I show that the procyclical fluctuations in residual wage dispersion are mainly generated by cyclical changes in the upper half of the residual wage distribution.

Keywords: Wage dispersion; Business cycles
JEL classification: J31; E32

*Copenhagen Business School, Department of Economics, Porcelaenshaven 16A, 2000 Frederiksberg, Denmark. Phone: +45 38155636, E-mail: amo.eco@cbs.dk. I am grateful to Árpád Ábrahám, Jérôme Adda, Alberto Alesina, Michael Burda, Tito Boeri, Szabolcs Deák, Aurélien Eyquem, Gunes Gokmen, Jeremy Lise, Ramon Marimon, Claudio Michelacci, Nicola Pavoni, Dario Pozzoli, Alain Sand, and Antonella Trigari for many discussions, comments and suggestions that have improved this paper. I have also benefited from comments received at Bocconi internal seminars, the EUI macro workshop, the 2018 EALE conference, the Econometric Society Winter Meeting 2012, the EEA 2012 conference, the OFCE-Skema workshop on Inequality and Macroeconomic Performance, the IEA 2011 conference, the 2015 conference on Labour Market Models and Their Applications, as well as seminars at Copenhagen Business School, Bristol University, Universitat Autonoma de Barcelona, the New Economic School, and Bilkent University.

1 Introduction

The literature largely points to the countercyclicality of income inequality (Storesletten et al., 2004; Castaneda et al., 1998; Bonhomme and Hospido, 2017; Barlevy and Tsiddon, 2006; Hoover et al., 2009; Heathcote et al., 2010). Because the sources of income are greatly diverse, identifying the main components driving this cyclicality is key to the discussion over the relationship between the business cycle and inequality.[1] First, wage dispersion is recognized as the most important driver of income inequality.[2] Second, residual wage dispersion, i.e. the dispersion in wages within narrowly defined demographic and skill groups of workers, is arguably the main component of wage dispersion.[3] Despite the prominent role played by residual wage dispersion in driving economic inequality, little evidence exists on its behavior over the business cycle.[4]

In this paper, I examine the cyclical properties of both wage dispersion and residual wage dispersion. One would naturally hypothesize that the cyclical properties of income inequality derive from the cyclical properties of wage and residual wage dispersion. However, I find that, contrary to this hypothesis, the cyclical properties of residual wage dispersion do not pass on to the cyclical properties of wage dispersion and income inequality. Indeed, I show that residual wage dispersion behaves procyclically in the U.S. over the period 1967-2014. Measured by the variance of log wages, the mean-min ratio, and percentile ratios, residual wage dispersion is negatively correlated with the unemployment rate and positively correlated with GDP. In contrast, wage dispersion does not significantly vary over the business cycle. Documenting this stark contrast in cyclicality lays the ground for further analyses of the potential mechanisms generating these different cyclical patterns.

The procyclical properties of residual wage dispersion have normative implications. Many labor market institutions (e.g., minimum wage, unemployment benefits, public education) and fiscal policies (e.g., progressive taxation) are designed to reduce economic inequality. Therefore, understanding how residual wage dispersion evolves over the business cycle appears as a prerequisite for the optimal design of redistributive measures. For instance, the high residual wage dispersion observed in periods of low unemployment would warrant a stronger progressivity of the tax system during expansions.

Moreover, I investigate whether the business cycle affects workers throughout the

[1] Income generally includes earnings, social security benefits, unemployment compensation, public assistance, retirement benefits, income from rents, and dividends, while earnings primarily reflect hourly wages and hours worked.

[2] The OECD (2011) report on the rise in inequality observed for the past fifty years identifies greater inequality in wages and salaries as the main factor that caused an intensification of economic inequality within OECD countries.

[3] See Krueger and Summers (1988) and Mortensen (2005) for an estimation of the magnitude of residual wage dispersion. See Eckstein and Nagypál (2004) and Katz and Autor (1999) for an assessment of the importance of residual wage dispersion in driving the long-run growth of wage inequality.

[4] See Robin (2011), who documents the cyclical pattern of wage deciles.

entire (residual) wage distribution. I find that the cyclical fluctuations in residual wage dispersion are mainly generated by fluctuations in the upper half of the distribution. Specifically, as unemployment grows, the drop in residual wages experienced by the highest decile is larger and more systematic than the increase in residual wages experienced by the lowest decile, while the residual wage of the median worker is stagnant.

The structure of the remainder of this paper is as follows: data and methodology, results, and discussion.

2 Data and Methods

The data come from the U.S. Current Population Survey - March database provided by the Integrated Public Use Microdata Series for the period 1967-2014, which covers seven recessions. The construction of the sample follows the methodology proposed by Heathcote et al. (2010). I delete all observations with negative weightings, all observations with positive earnings but zero week of work, and all observations with missing age. To address the top-coding issue, I use the top decile of the observed income distribution (below the top-code threshold) to predict the distribution of income beyond the top-code threshold. I adjust the top-coded observations for each type of income.

Nominal earnings, composed of labor income and two thirds of self-employment income, are deflated using the consumer price index.[5] I generate an hourly wage series by dividing real annual earnings by the total number of hours worked.[6] By construction, hourly wages are oversensitive to the number of hours worked, therefore I restrict the sample to full-time workers to minimize the effect of the fluctuations in hours.[7] Moreover, I restrict the sample to male head workers, aged 25-60, whose real hourly wages are above half the minimum wage. The final sample contains 1,037,654 observations, with an average of 21,618 workers per year.

I obtain residual wages by estimating a Mincerian wage equation controlling for demographic variables (age (minus 25), a quadratic in age, twelve education dummies, and three race dummies), 3-digit occupation dummies, 3-digit industry dummies, and year fixed effects.

[5]Labor income includes wages, salaries, commissions, cash bonuses and tips. Labor income is composed of wage and salary income until 1987, and of wage and salary income from longest job plus wage and salary income from other work from 1988 onwards. Self-employment income is composed of farm income plus non-farm business income until 1987, and farm income plus non-farm business income from longest job and from other job from 1988 onwards.

[6]Before 1976, the database does not include any data on usual hours worked per week. I compute total hours worked per year by multiplying the number of weeks worked per year by the number of hours worked in the last week. After 1976, I compute total hours worked per year by multiplying the number of weeks worked per year by the usual number of hours worked per week.

[7]I.e., more than 1,750 hours per year. This restriction also allows to minimize the noisiness of the estimate of total hours worked documented by Autor et al. (2005) and Lemieux (2006). The results are not sensitive to this assumption; such a robustness check can be provided upon request.

I focus on five inequality measures: the variance of log wages, the mean-min ratio, and three percentile ratios (90/10 P-ratio, 90/50 P-ratio, and 50/10 P-ratio). The mean-min ratio is the ratio between the average wage and the 5th percentile of the wage distribution. In the case of residual wage dispersion, I first exponentiate the residual wage distribution before to derive the mean-min ratio. The i/j P-ratio is the i^{th}/j^{th} percentile (residual) log wage differential. The decomposition of the 90/10 P-ratio into the 90/50 and 50/10 P-ratios allows to assess the relative importance of changes in the lower and upper halves of the wage distribution to changes in the overall wage inequality.

Figure 1 displays the evolution of residual wage dispersion and compares it to the evolution of wage dispersion, both dispersion series being measured by the variance of (residual) log hourly real wages. Over the period, residual wage dispersion accounts for around two thirds of total wage dispersion. Moreover, the residual wage distribution widens substantially during the first three decades of the sample before to stabilize after 2000, and this trend passes on to the trend of wage dispersion.[8] This observation confirms a common result in the literature that most of the long-run growth in wage dispersion cannot be accounted for by changes in observable characteristics over time.[9]

3 Cyclical Properties

Analyzing the cyclical properties of these inequality measures requires the series to be stationary. Consistent with the observed increasing trend in wage inequality, Dickey-Fuller stationarity tests indicate that all the five inequality series, for both wages and residual wages, are non-stationary.[10] I apply an HP-filter of parameter 6.25 on all inequality series to study the co-movements at business cycle frequencies between inequality and two HP-filtered macroeconomic times series, namely the unemployment rate and real GDP.[11]

Table 1 reports the cross-correlations between the residual wage inequality measures and the two business cycle indicators. All residual wage inequality measures are negatively and significantly correlated with contemporaneous unemployment, and

[8] For analyses of the increasing trend before 2000, see for example Heathcote et al. (2010), Autor et al. (2008), Card and DiNardo (2002), Lemieux (2006) and Katz and Murphy (1992), while for a documentation of the recent plateau, see Autor (2014).

[9] Changes in the relative wage paid to different groups of workers distinguished by observable characteristics such as gender, education, experience, or race, have still played a moderate role in shaping the increasing trend of wage dispersion (Katz and Autor, 1999; Eckstein and Nagypál, 2004). See Bound and Johnson (1992) and Katz and Murphy (1992) for the importance of the increasing college/high school wage premium since the 1970s.

[10] Given the sensitivity of the Dickey-Fuller test, I perform the test with different options: default specification, no constant and trend.

[11] Ravn and Uhlig (2002) advocate a parameter value of 6.25 for annual data. Sources: Unemployment rate: BLS, Labor Force Statistics from the Current Population Survey, Unemployment rate, Civilian non institutional population 16 years old and over; GDP: BLS, Major Sector Productivity and Costs, Real gross domestic product in the non farm business sector.

most of the inequality measures are positively and significantly correlated with either contemporaneous or lagged GDP. The procyclical property of residual wage dispersion is robust to the choice of covariates used in the OLS wage regression generating residual wages: (1) demographic variables only; (2) demographic variables and year fixed effects; (3) demographic variables, occupation, and year fixed effects; (4) demographic variables, 3-digit occupation dummies, 3-digit industry dummies, and year fixed effects (baseline specification).

Moreover, the stronger cyclicality of the 90/50 P-ratio compared to the 50/10 P-ratio indicates that the fluctuations in residual wage dispersion are mainly generated by fluctuations in the upper part of the distribution. This result is confirmed by Figure 2, which shows that, when unemployment is above trend, the drop of the 95th percentile is more pronounced and consistent than the increase in the 5th percentile, while the median residual wage fluctuates independently of the business cycle.

In contrast, Table 2, specification (1), shows that wage dispersion does not fluctuate significantly over the business cycle, even though the signs of the correlations are in line with the cyclical properties of residual wage dispersion. Ultimately, while residual wage inequality drives most of the level and trend of overall wage inequality, as shown in Figure 1, its cyclical properties do not pass down to wage dispersion.

As a robustness check, I apply other detrending procedures, namely an HP-filter with parameter 100, first differencing, and a Baxter and King band pass filter. Table 3, for residual wage dispersion, and Table 2, specifications (2)-(4), for wage dispersion, display the cross-correlations for these alternative detrending methods. The results are qualitatively and quantitatively very similar. While residual wage dispersion features procyclical fluctuations, wage dispersion does not significantly react to the business cycle.

4 Discussion and Conclusion

This paper documents the procyclicality of residual wage dispersion and the acyclicality of wage dispersion. This difference in cyclical properties suggests that the observed composition of the employed is cyclical, in line with the evidence put forward by Solon et al. (1994) and Mueller (2017) that the typical employed worker is more skilled in recessions. It is also consistent with studies on the stronger countercyclicality of the unemployment rates of less-skilled individuals and minorities (Clark and Summers, 1981; Kydland, 1984).

This difference in cyclicality also opens up at least two avenues for further investigation, both related to the mechanisms generating the procyclical features of residual wage dispersion. First, changes in the unobservable characteristics of the employed might trigger procyclical fluctuations in the residual wage distribution if the composition of workers would shift away from high-type workers, i.e. workers with high residual wages, during recessions. However, such a cyclicality would be at odds with the evolution of observed worker characteristics over the business cycle. Second, the firms'

monopsony power, i.e. their power to impose wage levels on workers, might change over the business cycle, depending on the degree of firm competition over workers and on the workers' outside options. The resulting change in the firms' wage policy could generate procyclical fluctuations in residual wage dispersion.

References

Autor, D. (2014): "Skills, education, and the rise of earnings inequality among the "other 99 percent"," *Science*, 344, 843–51.

Autor, D. H., L. F. Katz, and M. S. Kearney (2005): "Rising Wage Inequality: The Role of Composition and Prices," *NBER working paper no. 11628*.

——— (2008): "Trends in U.S. Wage Inequality: Revising the Revisionists," *The Review of Economics and Statistics*, 90, 300–323.

Barlevy, G. and D. Tsiddon (2006): "Earnings inequality and the business cycle," *European Economic Review*, 50, 55–89.

Bonhomme, S. and L. Hospido (2017): "The Cycle of Earnings Inequality: Evidence from Spanish Social Security Data," *Economic Journal*, 127, 1244–1278.

Bound, J. and G. Johnson (1992): "Changes in the Structure of Wages in the 1980's: An Evaluation of Alternative Explanations," *American Economic Review*, 82, 371–92.

Card, D. and J. E. DiNardo (2002): "Skill-Biased Technological Change and Rising Wage Inequality: Some Problems and Puzzles," *Journal of Labor Economics*, 20, 733–783.

Castaneda, A., J. Diaz-Gimenez, and J.-V. Rios-Rull (1998): "Exploring the income distribution business cycle dynamics," *Journal of Monetary Economics*, 42, 93–130.

Clark, K. B. and L. H. Summers (1981): "Demographic Differences in Cyclical Employment Variation," *Journal of Human Resources*, 16, 61–79.

Eckstein, Z. and v. Nagypál (2004): "The evolution of U.S. earnings inequality: 1961-2002," *Quarterly Review*, 10–29.

Heathcote, J., F. Perri, and G. L. Violante (2010): "Unequal We Stand: An Empirical Analysis of Economic Inequality in the United States: 1967-2006," *Review of Economic Dynamics*, 13, 15–51.

Hoover, G. A., D. C. Giedeman, and S. Dibooglu (2009): "Income inequality and the business cycle: A threshold cointegration approach," *Economic Systems*, 33, 278–292.

Katz, L. F. and D. H. Autor (1999): "Changes in the wage structure and earnings inequality," in *Handbook of Labor Economics*, ed. by O. Ashenfelter and D. Card, Elsevier, vol. 3 of *Handbook of Labor Economics*, chap. 26, 1463–1555.

Katz, L. F. and K. M. Murphy (1992): "Changes in Relative Wages, 1963-1987: Supply and Demand Factors," *The Quarterly Journal of Economics*, 107, 35–78.

Krueger, A. B. and L. H. Summers (1988): "Efficiency Wages and the Inter-industry Wage Structure," *Econometrica*, 56, 259–93.

Kydland, F. E. (1984): "Labor-force heterogeneity and the business cycle," *Carnegie-Rochester Conference Series on Public Policy*, 21, 173–208.

Lemieux, T. (2006): "Increasing Residual Wage Inequality: Composition Effects, Noisy Data, or Rising Demand for Skill?" *American Economic Review*, 96, 461–498.

Mortensen, D. T. (2005): *Wage Dispersion: Why Are Similar Workers Paid Differently?*, vol. 1 of *MIT Press Books*, The MIT Press.

Mueller, A. I. (2017): "Separations, Sorting, and Cyclical Unemployment," *American Economic Review*, 107, 2081–2107.

OECD (2011): "Divided We Stand: Why Inequality Keeps Rising," *OECD Publishing, ISBN Number: 9789264111639*.

Ravn, M. O. and H. Uhlig (2002): "On adjusting the Hodrick-Prescott filter for the frequency of observations," *The Review of Economics and Statistics*, 84, 371–375.

Robin, J. (2011): "On the Dynamics of Unemployment and Wage Distributions," *Econometrica*, 79, 1327–1355.

Solon, G., R. Barsky, and J. A. Parker (1994): "Measuring the Cyclicality of Real Wages: How Important is Composition Bias?" *The Quarterly Journal of Economics*, 109, 1–25.

Storesletten, K., C. I. Telmer, and A. Yaron (2004): "Cyclical Dynamics in Idiosyncratic Labor Market Risk," *Journal of Political Economy*, 112, 695–717.

Table 1: Cross-Correlations: Residual Wage Inequality

	(1)		(2)		(3)		(4)	
Covariates for residual wage	X		X + year FE		X + year FE + Occ		X + year FE + Occ + Ind	
Panel A: Unemployment Rate For each specification: $\{corr(ur_t, ineq_t), corr(ur_t, ineq_{t+1})\}$								
varlogs	-0.280^{*}	-0.153	-0.287^{**}	-0.149	-0.304^{**}	-0.213	-0.323^{**}	-0.216
mean-min	-0.310^{**}	-0.199	-0.330^{**}	-0.184	-0.380^{***}	-0.167	-0.382^{***}	-0.152
90/10	-0.420^{***}	-0.136	-0.464^{***}	-0.132	-0.463^{***}	-0.045	-0.479^{***}	-0.168
90/50	-0.399^{***}	-0.177	-0.425^{***}	-0.138	-0.523^{***}	-0.234	-0.486^{***}	-0.279^{*}
50/10	-0.278^{*}	-0.037	-0.333^{**}	-0.078	-0.186	0.158	-0.247^{*}	0.015
Panel B: GDP For each specification: $\{corr(gdp_t, ineq_t), corr(gdp_t, ineq_{t+1})\}$								
varlogs	0.104	0.286^{*}	0.110	0.285^{*}	0.088	0.320^{**}	0.110	0.317^{**}
mean-min	0.137	0.269^{*}	0.161	0.268^{*}	0.172	0.275^{*}	0.157	0.239
90/10	0.260^{*}	0.321^{**}	0.298^{**}	0.336^{**}	0.320^{**}	0.209	0.281^{*}	0.307^{**}
90/50	0.346^{**}	0.347^{**}	0.364^{**}	0.341^{**}	0.377^{***}	0.396^{***}	0.353^{**}	0.435^{***}
50/10	0.062	0.165	0.118	0.205	0.113	-0.070	0.080	0.043

Note: The time series of the five inequality measures, the unemployment rate, and log GDP are detrended using an HP-filter of parameter 6.25. In each specification (1) to (4), a different set of covariates is used to obtain residual wages: (1) only demographic variables X (age (minus 25), a quadratic in age, twelve education dummies, and three race dummies); (2) demographic variables X and year fixed effects; (3) demographic variables X, 3-digit occupation code, and year fixed effects; (4) demographic variables X, 3-digit occupation code, 3-digit industry code, and year fixed effects. Inequality measures: *varlogs* denotes the variance of the residual log wages. $mean - min$ refers to the mean-min ratio as measured by the ratio between the mean and the 5th percentile of the exponentiated distribution of residual log wages. i/j is the i^{th}/j^{th} percentile residual log wage differential. Panel A reports the correlation between inequality measures at time t and $t+1$ and the unemployment rate at time t, ur_t. Panel B reports the correlation between inequality measures at time t and $t+1$ and log GDP at time t, gdp_t. The sample is restricted to male head full-time workers. *, **, and *** indicates significance at the 10% level, 5% level, and 1% level.

Table 2: Cross-Correlations: Wage Inequality

	(1)		(2)		(3)		(4)	
	HP 6.25		HP 100		1st diff.		BK	
Panel A: Unemployment Rate For each specification: {$corr(ur_t, ineq_t)$,$corr(ur_t, ineq_{t+1})$}								
varlogs	−0.094	−0.082	−0.191	−0.070	−0.030	−0.091	−0.120	−0.092
mean-min	−0.121	−0.022	−0.185	0.005	−0.136	−0.139	−0.185	−0.044
90/10	−0.103	0.045	−0.150	0.060	−0.135	−0.088	−0.137	0.065
90/50	−0.042	0.068	−0.095	0.028	−0.048	−0.066	−0.046	0.105
50/10	−0.063	−0.032	−0.07	0.041	−0.079	−0.021	−0.093	−0.062
Panel B: GDP For each specification: {$corr(gdp_t, ineq_t)$,$corr(gdp_t, ineq_{t+1})$}								
varlogs	0.020	0.204	0.165	0.140	0.035	0.126	0.038	0.243
mean-min	0.002	0.134	0.148	0.082	0.083	0.199	0.061	0.216
90/10	0.103	0.060	0.193	0.041	0.030	0.212	0.153	0.072
90/50	0.168	0.052	0.216	0.069	−0.077	0.056	0.157	0.028
50/10	−0.089	0.003	−0.020	−0.032	0.094	0.170	−0.032	0.044

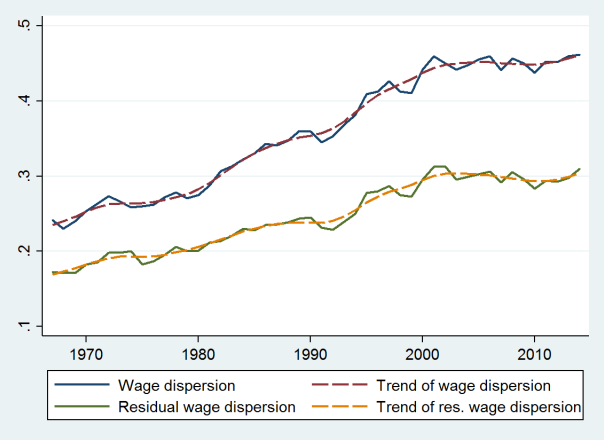
Note: The time series of the five inequality measures, the unemployment rate, and log GDP are detrended using (1) an HP-filter of parameter 6.25; (2) an HP-filter of parameter 100; (3) first difference; and (4) a Baxter and King band pass filter (parameters 2, 8, 3). Inequality measures: *varlogs* denotes the variance of the log wages. $mean - min$ refers to the mean-min ratio as measured by the ratio between the mean and the 5th percentile of the wage distribution. i/j is the i^{th}/j^{th} percentile log wage differential. Panel A reports the correlation between inequality measures at time t and $t+1$ and the unemployment rate at time t, ur_t. Panel B reports the correlation between inequality measures at time t and $t+1$ and log GDP at time t, gdp_t. The sample is restricted to male head full-time workers. *, **, and *** indicates significance at the 10% level, 5% level, and 1% level.

Table 3: Cross-Correlations: Residual Wage Inequality, Alternative De-trending

	(1)		(2)		(3)	
	HP 100		1st diff.		BK	
Panel A: Unemployment Rate For each specification: $\{corr(ur_t, ineq_t), corr(ur_t, ineq_{t+1})\}$						
varlogs	-0.366^{**}	-0.219	-0.303^{**}	-0.173	-0.360^{**}	-0.220
mean-min	-0.354^{**}	-0.127	-0.353^{**}	-0.182	-0.450^{***}	-0.149
90/10	-0.503^{***}	-0.210	-0.424^{***}	-0.136	-0.510^{***}	-0.174
90/50	-0.519^{***}	-0.332^{**}	-0.470^{***}	-0.273	-0.473^{***}	-0.285^{*}
50/10	-0.274^{*}	-0.006	-0.206	0.022	-0.298^{*}	0.020
Panel B: GDP For each specification: $\{corr(gdp_t, ineq_t), corr(gdp_t, ineq_{t+1})\}$						
varlogs	0.247^{*}	0.262^{*}	0.261^{*}	0.255^{*}	0.130	0.358^{**}
mean-min	0.253^{*}	0.189	0.257^{*}	0.236	0.212	0.290^{*}
90/10	0.382^{***}	0.295^{**}	0.340^{**}	0.264^{*}	0.289^{*}	0.343^{**}
90/50	0.414^{***}	0.410^{***}	0.436^{***}	0.375^{**}	0.338^{**}	0.432^{***}
50/10	0.189	0.062	0.122	0.069	0.101	0.090

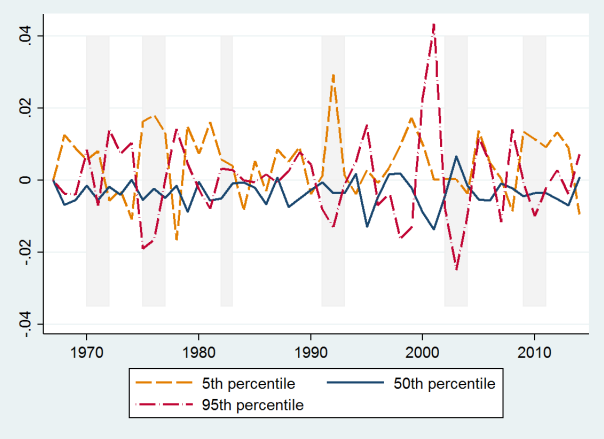
Note: The time series of the five inequality measures, the unemployment rate, and log GDP are detrended using (1) an HP-filter of parameter 100; (2) first difference; and (3) a Baxter and King band pass filter (parameters 2, 8, 3). Residual wages are obtained by estimating an OLS wage equation using the following covariates: demographic variables (age (minus 25), a quadratic in age, twelve education dummies, and three race dummies), 3-digit occupation code, 3-digit industry code, and year fixed effects. Inequality measures: *varlogs* denotes the variance of the residual log wages. $mean - min$ refers to the mean-min ratio as measured by the ratio between the mean and the 5th percentile of the exponentiated distribution of residual log wages. i/j is the i^{th}/j^{th} percentile residual log wage differential. Panel A reports the correlation between inequality measures at time t and $t+1$ and the unemployment rate at time t, ur_t. Panel B reports the correlation between inequality measures at time t and $t+1$ and log GDP at time t, gdp_t. The sample is restricted to male head full-time workers. *, **, and *** indicates significance at the 10% level, 5% level, and 1% level.

Figure 1: Residual Wage Dispersion and Wage Dispersion



Note: Both residual wage dispersion and wage dispersion are measured by the variance of (residual) log hourly real wages. The trends of wage dispersion and residual wage dispersion are obtained by applying an HP-filter of parameter 6.25 on both time series. Residual wages are obtained by estimating an OLS wage equation using the following covariates: demographic variables (age (minus 25), a quadratic in age, twelve education dummies, and three race dummies), 3-digit occupation code, 3-digit industry code, and year fixed effects.

Figure 2: Percentiles of Residual Wage Distribution



Note: The 5th, 50th, and 95th percentiles refer to the exponentiated distribution of residual log wages. Residual wages are obtained by estimating an OLS wage equation using the following covariates: demographic variables (age (minus 25), a quadratic in age, twelve education dummies, and three race dummies), 3-digit occupation code, 3-digit industry code, and year fixed effects. The cyclical components of the percentiles are obtained by detrending all time series using an HP-filter of parameter 6.25. Shaded areas represented periods during which the cyclical component of the unemployment rate is positive.