

AGGREGATE EARNINGS AND MACROECONOMIC SHOCKS: THE ROLE OF LABOUR MARKET POLICIES AND INSTITUTIONS

by

Andrea Bassanini (OECD, ERMES and IZA)

Web Appendix: The business cycle and the earnings distribution

One key finding of the recent US-based literature on earnings inequality is that the dispersion of the wage and salary annual earnings distributions (and to a minor extent of that of hourly wages) is counter-cyclical (see e.g. Heathcote *et al.*, 2010). That is, the distribution of annual earnings becomes less equal during recessions and more equal during booms. This has been attributed to spikes in the incidence of unemployment for low-skilled (low-paid) workers around business-cycle troughs. Trivially, for a given hourly wage, the longer the time an individual spends jobless, the lower his/her annual earnings. To the extent that low-paid workers appear to suffer from greater increases in joblessness hazards in a recession, this would explain why the effect is more evident within the earnings rather than the wage distribution (see e.g. Robin, 2011).

Data on the earnings distribution at a relatively high frequency (at least annual) are not available for many countries, which makes it difficult to see whether this phenomenon occurs outside the United States. One alternative way to look at this issue – that is exploited in this section – is to examine the distribution of total gross real annual earnings of wage and salary employees by level of education using data derived from the EUKLEMS database (see Section 2 in the main text). In fact, to the extent that differences in employment, hours worked and pay across different educational attainment levels are among the main drivers of earnings disparities, the ratio between total gross annual earnings of the high- and low-educated workers¹ provides a measure of the dispersion of the earnings distribution, which compounds the impacts of relative wage and employment fluctuations.

Figure W1 shows the elasticity of the cyclical component of this ratio with respect to the output gap. Several elements emerge from it:

- First, in most countries, relative earnings by educational attainment appear to fluctuate counter-cyclically, although with important cross-country differences. In other words the earnings distribution becomes more unequal around the troughs of the business cycle. This has important equity consequences. To the extent that low-educated/low-paid workers are less able to shield themselves against income shocks, they will suffer a greater welfare reduction in bad times than

1. The term “high-educated” identifies here those with more than upper secondary education, the “low-educated” are those with less than upper secondary education, while “medium-education” denotes those with upper-secondary education.

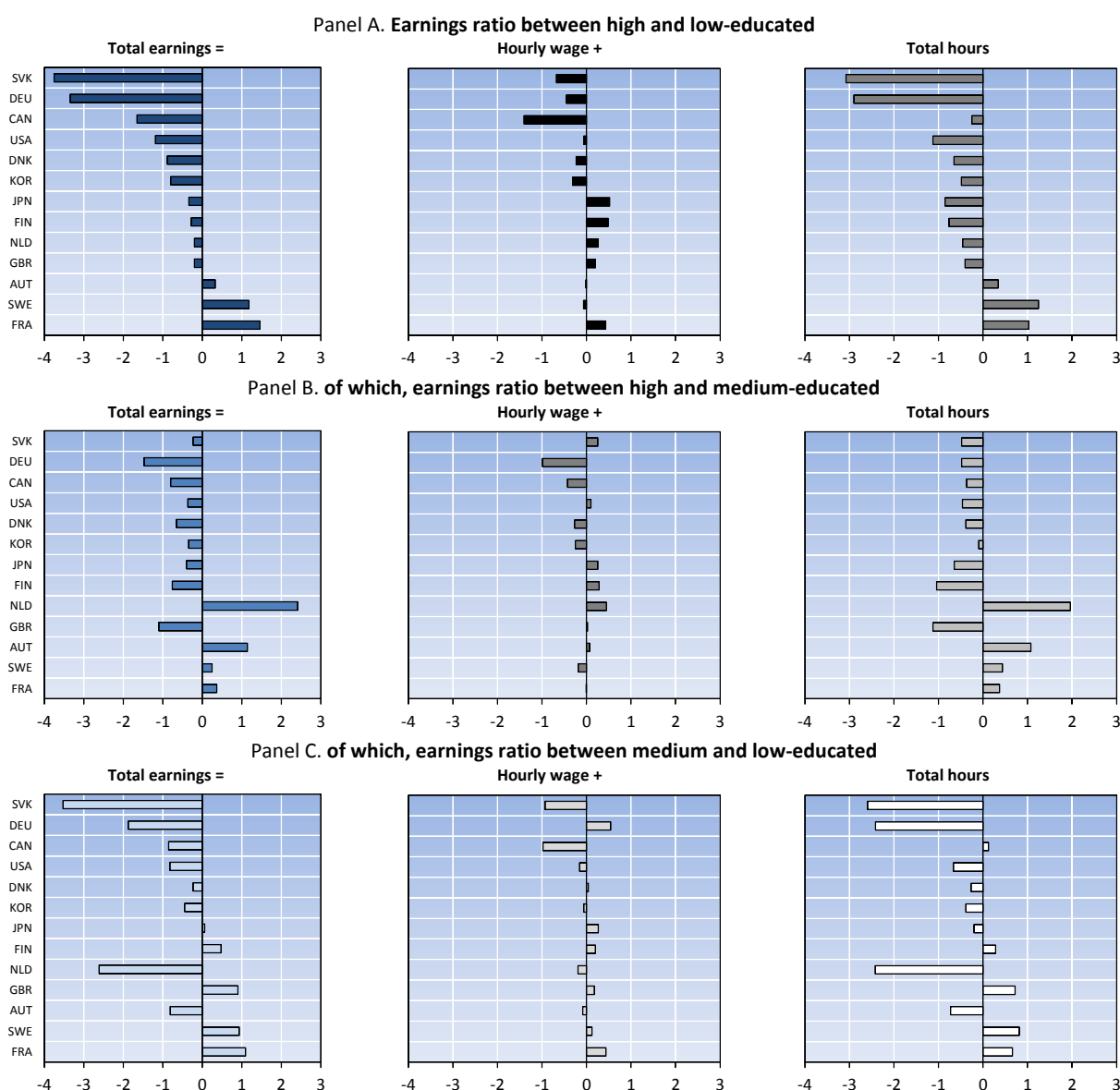
high-educated/high paid workers, in the absence of policy interventions to compensate their loss of labour income.

- Second, cyclical fluctuations in total hours levels by education are the main driver of cyclical fluctuations of the earnings distribution (Canada being the only exception), confirming the generality of similar findings of the US literature. This is generally true both at the top and bottom end of the distribution (see Panels B and C). These findings appear consistent with the fact that the lower the level of educational attainment, the greater the risk of incurring in spells of joblessness – and therefore of working few or no hours in a year and having thus low labour income – in bad times.² Allowing for lagged effects of macroeconomic shocks does not alter this result.³
- Third, in the United States, patterns of fluctuations of the earnings distribution by educational attainment appear to replicate those reported in the literature for the percentiles of the earnings distribution. In particular, the distribution by level of educational attainment appears to fluctuate counter-cyclically, and the elasticity with respect to the output gap seems greater at the bottom end of the distribution.
- Fourth, countries differ markedly in the relative sensitivity to shocks at the bottom and at the top of the distribution. Beside in the United States, the earnings distribution appears to be more counter-cyclical at the bottom end in only five other countries (Slovak Republic, Germany, Korea, Netherlands, and Austria). In the other countries, fluctuations of the top segment of the distribution appear to dominate those of the bottom end, suggesting that both the medium- and the low-educated are more affected by adverse shocks than the high-educated.

2 . These findings appear consistent with the few available studies in the literature (see for example Dustmann *et al.*, 2010).

3. Detailed figures are available from the author upon request

Figure W1. Elasticity of the cyclical component of the earnings ratio between high and low-educated workers to the output gap



Notes: 1974-2004 for the United States; 1980-2003 for Denmark; 1982-2002 for France; 1984-2003 for Austria; 1987-2003 for the United Kingdom; 1987-2004 for Finland; 1991-2004 for Canada; 1992-2002 for Japan; 1992-2002 for the Netherlands; 1992-2004 for Germany; 1993-2004 for Sweden; 1993-2005 for Korea; and 1999-2004 for the Slovak Republic.

As a first step into the investigation of the effect of labour market institutions on the transmission of aggregate shocks to the earnings distribution, I estimate aggregate regressions – based on the same methodology as in Sections 1.1 and 3.1 in the main text – where the dependent variable is the ratio of earnings of the high-educated to the low educated. Table W1 presents aggregate cross-country/time-series evidence on the extent to which specific institutions amplify or mitigate the counter-cyclical of relative earnings, wage and hours across educational attainment groups. I include in the specifications those institutions considered in the analysis of institutional determinants of aggregate earnings fluctuations (Section 3.1). Positive coefficients imply that the related policy mitigates the tendency of the business-

cycle to make these distributions more unequal in bad times (cf. Figure W1). However, great caution is required when drawing conclusions from these findings because the sample size is small and estimates are, therefore, relatively imprecise. Moreover, the small sample size suggests that it is important to be parsimonious in terms of covariates.⁴ For this reason, country and year dummies are not included in the estimated specifications, given that statistical tests suggest that they are jointly insignificant (and due to the way the dependent variable is constructed there is no strong theoretical argument to include them in aggregate regressions). Nevertheless, all significant coefficients in Table W1 appear robust to exclusion of insignificant covariates. Moreover, even though these coefficients might become insignificant upon exclusion of specific countries in the sample (which is not surprising given the small number of countries and observations), the impact on point estimates of the exclusion of countries one-by-one always remains within one standard error of parameters estimated on the full sample.⁵

As discussed in the previous section, the tax wedge and unemployment benefit generosity have a strong shock-amplification effect on average wages and earnings. By contrast, evidence presented in Table W1 tentatively suggests that, while they have an impact on the cyclicalities of relative hourly wages, they do not have any significant effect on the cyclicalities of relative total earnings, possibly due to opposite or heterogeneous effects on fluctuations of relative hours worked. In fact, there is some evidence that the average tax wedge makes the hourly wage premium to education less counter-cyclical (or more pro-cyclical) while the opposite is found in the case of unemployment benefit generosity. To the extent that the marginal tax wedge on relatively high incomes is a key driver of the pro-cyclicalities of gross wages, it is intuitive that this effect is likely to be greater for the highly-educated. By contrast, the negative relationship between unemployment benefit generosity and the cyclicalities of the wage distribution is consistent with those equilibrium models of the labour market in which the slope of the wage curve depends on the level of the replacement rate (e.g. Belot and van Ours, 2004). To the extent that the replacement rate is likely to be higher for low-paid workers, employment fluctuations of a similar magnitude across groups are likely to translate in larger wage fluctuations for low-educated/low-skilled workers, thereby making the wage distribution more unequal during recessions.

There is also some evidence that a greater degree of centralisation/coordination of the wage bargaining reduces the pro-cyclicalities of relative wages, while making the relative position of the low-educated worse in bad times. One could interpret this finding as being due to the fact that negotiated minimum wages are more rigid in the short-run under centralised industrial relations regimes, because contracts cannot be re-negotiated every year. This makes short-term wage adjustment at the bottom of the wage distribution more sluggish, with consequent greater employment adjustment. However, the estimated coefficients of corporatism become insignificant if employment protection or unemployment benefits are dropped from the specification (not shown in the table), suggesting that coefficients on coordination presented in Table W1 might reflect multi-collinearity, rather than a true causal effect.

4. Time series on earnings by educational attainment are also too short to analyse persistence, therefore dynamics models are not estimated in this section.

5. Detailed results available from the author upon request.

Table W1 Institutions and amplification/mitigation of the cyclical of earnings ratios by educational attainment

	Relative earnings gap		Relative hourly wage gap		Relative hours worked gap	
	(1)	(2)	(1)	(2)	(1)	(2)
Output gap	-0.295 (1.006)	-0.306 (1.126)	-0.034 (0.189)	0.061 (0.369)	-0.261 (1.084)	-0.367 (1.544)
EP	1.028 ** (2.119)	0.923 * (1.907)	-0.219 (0.679)	0.049 (0.150)	1.247 *** (3.491)	0.874 ** (2.473)
Average tax wedge	0.008 (0.193)	0.008 (0.180)	0.066 ** (2.363)	0.063 ** (1.976)	-0.058 (1.375)	-0.055 (1.206)
PMR	-0.207 (0.551)	-0.256 (0.692)	-0.073 (0.641)	-0.084 (0.699)	-0.134 (0.347)	-0.172 (0.449)
Bargaining coverage	0.014 (1.228)	0.012 (1.005)	-0.001 (0.130)	-0.006 (0.928)	0.015 (1.370)	0.018 (1.616)
ARR	-0.031 (0.784)	-0.035 (0.893)	-0.034 *** (2.830)	-0.021 * (1.762)	0.002 (0.060)	-0.014 (0.332)
Corporatism (BD)	-0.531 (1.601)		0.542 ** (2.145)		-1.073 *** (4.438)	
Corporatism (ICTWSS)		-0.186 (0.893)		0.184 (1.116)		-0.37 ** (2.194)
Level effect of institutions	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	No	No	No
Time dummies	No	No	No	No	No	No
Observations	187	187	187	187	187	187
R-squared	0.126	0.119	0.136	0.111	0.117	0.09

Notes: In the first row the table reports the elasticity to the output gap for each dependent variable, estimated at the sample average of each institution. The other rows report the estimated effect of a one unit change of each institution on this elasticity. For each variable, the term "relative gap" indicates the log difference between actual and trend values of the high/low-educated ratio for that variable. EP: Employment Protection, measured on a 0-6 scale. PMR: Product Market Regulation (time-varying index), measured on a 0-6 scale. Two alternative measures of corporatism are included: BD: Bassanini and Duval index, measured on a 1-3 scale; ICTWSS: ICTWSS index measured on a 0-5 scale. All other variables are measured in percentages. ARR: Average gross unemployment benefit replacement rate. Absolute values of robust t-statistics in parentheses. ***, **, *: statistically significant at the 1%, 5% and 10% level, respectively.

Finally, Table 13 shows that EP is the only policy for which I estimate an unambiguous effect on the elasticity of the earnings distribution by educational attainment to the output gap. Yet, point estimates appear somewhat too large to be plausible. However, I implement an industry-level difference-in-difference analysis of the effect of EP based on the same methodology as in Section 3.2 in the main text (see also Section 1.2).⁶ Estimates confirm that EPR dampens the tendency of the earnings distribution to become more unequal around business-cycle troughs (Table W2, Panel A). Moreover, point estimates also appear more realistic. Taken at face value, the estimates suggest that in a country where the indicator of stringency of EPR is one unit above the OECD average, fluctuations of the earnings ratio between the high- and low-educated to the output gap would be 32% less counter-cyclical than in the average OECD country.⁷ This pattern appears to be almost equally due to the effects of dismissal regulations on the wage and employment distribution. In fact, the effect of a one-unit shift of the EPR indicator on mitigating the

6. Again, in order to make the model as parsimonious as possible, I include the minimal set of dummies required for identification.

7. This figure is obtained from the ratio of the first and the second row in column 1 of Panel A of Table W2.

tendency of the ratio between the high- and low-educated to become greater in bad times is as large as 40% and 28% in the case of hourly wages and total hours, respectively.⁸

Table W2. Dismissal regulation and industry-level fluctuations in the earnings ratio between high and low-educated workers

Panel A. Ratio of high to low-educated			
	Total earnings	Hourly wages	Hours worked
EPR x DR x output gap	27.012 *** (2.737)	11.077 * (1.916)	15.937 * (1.670)
DR x output gap	-83.791 *** (3.599)	-27.677 ** (2.088)	-56.117 *** (2.588)
Industry dummies	yes	yes	yes
Country x time dummies	yes	yes	yes
Observations	1,458	1,458	1,458
R-squared	0.259	0.285	0.200
Panel B. Ratio of high to medium-educated			
	Total earnings	Hourly wages	Hours worked
EPR x DR x output gap	6.639 (0.843)	6.376 * (1.859)	0.265 (0.035)
DR x output gap	-36.760 * (1.889)	-17.685 ** (2.075)	-19.080 (0.998)
Industry dummies	yes	yes	yes
Country x time dummies	yes	yes	yes
Observations	1,458	1,458	1,458
R-squared	0.239	0.307	0.235
Panel C. Ratio of medium to low-educated			
	Total earnings	Hourly wages	Hours worked
EPR x DR x output gap	20.372 ** (2.537)	4.700 (1.101)	15.672 * (1.828)
DR x output gap	-47.031 ** (2.428)	-9.993 (1.064)	-37.037 * (1.909)
Industry dummies	yes	yes	yes
Country x time dummies	yes	yes	yes
Observations	1,458	1,458	1,458
R-squared	0.257	0.174	0.222

Note: The dependent variables are industry-level gaps defined as differences between the logs of actual and trend values. EPR: employment protection for regular contracts. DR: average industry-specific US dismissal rate. Other interactions required for identification are included. Absolute values of robust t-statistics in parentheses. ***, **, *: statistically significant at the 1%, 5% and 10% level, respectively.

The available data also allow me to analyse separately the effect of firing restrictions on the cyclicalities of earnings inequality in the top and bottom halves of the distribution (Table W2, Panels B and C). The estimates suggest that dismissal regulations have a strong dampening impact on the counter-cyclicalities of earnings inequality in the bottom half of the earnings distribution, but have no significant impact on fluctuations in the top half, notably because of the lack of any effect on relative employment fluctuations in this segment of the distribution. Taking estimates at face value, they suggest that a one-unit increase of the

8. These estimates appear robust to excluding countries one-by-one from the sample and including additional controls. More precisely, if the full list of institutions of Table W1 is added to the specification (interacted with US dismissal rates and the output gap), all co-variables become insignificant, possibly due to multicollinearity and the small sample size. However, if other institutions are included one-by-one, they are never significant both with and without the simultaneous inclusion of EPR.

EPR indicator from the OECD average would reduce the tendency of the bottom halves of the distributions of earnings, wages and hours worked to widen in recessions by between 42% and 47%.

References

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