SUPPLEMENTARY MATERIAL

WHISING FOR MORE: TECHNOLOGICAL CHANGE, THE RISE OF INVOLUNTARY PART-TIME EMPLOYMENT AND THE ROLE OF ACTIVE LABOUR MARKET POLICIES

Appendix 1. Technical background estimation method

For our analysis, we use a partial adjustment model. This model captures both transitory and permanent effects (De Boef and Keele, 2008; Williams and Whitten, 2012), which enables us to analyse both the direct effect of the decline of middle-skill jobs but also the way this contributes to the structural change in the dynamics at the bottom end of the labour market. We estimate the following equation:

$$\Delta Y_{i,t} = \alpha + \beta_0 Y_{i,t-1} + \beta_1 X_{i,t} + t\tau + \varepsilon_{i,t} \qquad (1)$$

Here, Δy_{it} represents the first difference in the share of involuntary part-time employment in country i at time t, whilst $Y_{i,t-1}$ refers to its lagged level. α represents the intercept, ε denotes the error term, and τ parametrises a linear time trend. The latter is included as unit root tests provide evidence that our main dependent variable, the share of middle-skill employment, is trend-stationary. The direct effect of X, a vector of independent variables, is captured by β_1, which is the contemporaneous value of the covariate. This effect, also known as the short-term or transitory effect, captures the impact of a one-unit change in X on Y at time t (De Boef and Keele, 2008). We also analyse the permanent effect of X on Y at time t distributed in the long run; steady-state or long-run equilibrium of the model. This is captured by the long-run multiplier, which is given by $(\widehat{\beta_1}/-\widehat{\beta_0})$. Moreover, we calculate its standard errors using the delta method (Papke and Wooldridge, 2005).

Finally, we control for remaining autocorrelation by specifying our error term to follow a country-specific AR(1) process, estimated with Prais-Winsten transformation. Additionally, panel-corrected standard errors are used to correct for panel-heteroscedasticity and contemporaneous spatial correlation (Beck and Katz, 2011).

Appendix 2. Dependent and independent variables for 16 European countries, 1999-2010

Variable	Measure	N	Mean	SD	Source(s)
Dependent variable					
Involuntary part-time employment[1]	Number of individuals in part-time employment that indicate that they wish to work more than the current number of hours as a proportion of total individuals in low-skill employment	176	7.92	4.14	Eurostat (2019)
Independent variables					
Size of middle-skill employment	Number of hours worked in middle-skill employment as a proportion of total hours worked	192	37.57	5.28	Eurostat (2019)
Effort on training	Sum of public and mandatory private expenditure on vocational training per unemployed as a share of GDP per capita	192	8.42	6.18	OECD (2020a, 2020b)
Effort on employment incentives	Sum of public and mandatory private expenditure on employment assistance per unemployed as a share of GDP per capita	192	4.79	3.86	OECD (2020a, 2020b)
Effort on direct job creation[2]	Sum of public and mandatory private expenditure on direct job creation per unemployed as a share of GDP per capita	189	3.07	3.99	OECD (2020a, 2020b)
Effort on PLMPs	Sum of public and mandatory private expenditure on PLMPs per unemployed as a share of GDP per capita	192	34.25	18.88	OECD (2020a, 2020b)
EPL[3]	Summary indicator of employment protection legislation on protection on regular contracts (individual and collective dismissals)	183	2.44	0.80	OECD (2020c)
Firm involvement in training	Share of upper secondary students in vocational education programmes combining school- and workplace-based training.	186	50.73	18.30	Eurostat (2022)
Union density[4]	Net union membership as a proportion of wage and salary earners in employment	192	38.18	20.94	Visser (2019)
Bargaining centralisation	The predominant level at with bargaining takes place (in terms of coverage), while accounting for: the incidence of and control over additional bargaining at enterprise level; the 'space' that central or sectoral agreements assign, delegate or allow for such additional bargaining to take place; and the degree to which agreements can be perforated through the use of 'opening clauses'	192	2.64	0.89	Visser (2019)
Government partisanship	Cabinet posts of social democratic and other left parties in percentage of total cabinet posts	192	41.22	38.80	Armingeon et al. (2021)
GDP growth	Growth of real GDP in percentage change from previous year	192	2.06	2.80	OECD (2020c)
Unemployment	Number of individuals unemployed in percentage of the civilian labour force	192	7.12	3.37	Eurostat (2019)

[1] For Denmark, (prior to 2000), Germany (prior to 2005), Italy (prior to 2002), the Netherlands (prior to 2000), Norway (prior to 2001), and Sweden (prior to 2000) our dependent variable is not available as the question whether a respondent wishes to work more than the current number of hours is not available in the European Union Labour Force Survey (Eurostat, 2019).
[2] For Luxembourg data for effect on direct job creation are available from 2002 onwards.
[3] For Luxembourg data for EPL are available from 2008 onwards.
[4] We linearly interpolate union density for Greece, Luxembourg and Portugal.

Appendix 3. Robustness tests of middle-skill employment in several sensitivity analyses

	Standardised beta coefficient	LRM
Original result from Table 1 (first column)	-0.094***	-0.767***
	(0.028)	(0.167)
Different samples		
Extended period (1999-2018)	-0.074***	-0.510***
	(0.023)	(0.124)
Total employment	-0.041***	-0.346***
	(0.017)	(0.098)
Prime age (25-54)	-0.101***	-0.806***
	(0.032)	(0.219)
Men only	-0.047***	-0.844**
	(0.015)	(0.363)
Women only	-0.124***	-0.726***
	(0.040)	(0.726)
Different methodological specifications		
Share low-skill employment in 1999	-0.090***	-0.660***
	(0.027)	(0.152)
Country FE	-0.098*	-0.227*
	(0.057)	(0.156)
Country and Year FE	-0.099*	-0.312*
	(0.056)	(0.169)
General error correction model	-0.308***	-0.711***
	(0.073)	(0.264)

Each row represents an individual estimation. Unless otherwise specified, the model specification and included variables are similar to our baseline estimation. * p<0.1, ** p<0.05, *** p<0.01

Additional references only listed in the appendix

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