

Additional File 4 to *Labor market regulation and the cyclicalcy of involuntary part-time work*

Individual Level Analysis

In this additional file, we make use of the individual-level dimension of our data. Similarly to Valletta et al. (2018), we first check whether our finding is robust to the inclusion of individual worker characteristics. Second, we consider the individual probability of being inactive in the labor market as dependent variable which is relevant for understanding the mechanisms underlying unemployment and IPT as we explain in Section 4.2.2 of our paper. Moreover, we investigate potential heterogeneity in the correlation of unemployment and involuntary part-time across groups of workers.

For the first step, we conduct logit regressions with IPT status as the dependent variable. It takes the value one if a person is in IPT and zero otherwise. Thus, we consider all employed, unemployed and inactive individuals in this analysis. As before, the interest lies on the variables capturing macroeconomic cyclical and structural factors. In addition to these, we also include a number of variables which control for individual-level demographic characteristics: interactions of age (five groups) with sex and marital status and four educational levels based on ISCED. The full model is described by the following equation,

$$Pr(Empl_{it} = IPT) = \alpha + \beta u_{s(i,t)} + \gamma u_{s(i,t)}^2 + \delta' X_{it} + \omega' Z_{s(i,t)} + \varphi_s + \phi_t + \epsilon_{it} \quad (1)$$

with X_{it} being the vector of individual level variables that we now control for and $Z_{s(i,t)}$ being the state-level structural factors. The first four columns of Table 1 show the results. The table displays average marginal effects. For a better readability, the coefficients for the individual level controls are not shown as we are interested in the macroeconomic determinants. The results reinforce our findings based on the state panel regression. The unemployment rate is significantly positively related to the individual probability of working in IPT. The quadratic term is negative and significant, suggesting a non-linear relationship between the unemployment rate and the propensity to be involuntarily part-time employed. As before, the structural indicators capturing long-term changes in the labor market are in general not significantly correlated, with the few exceptions of the *Electricity, Gas and Water Supply* and *Other Services* sectors and some demographic groups, for example the share of

women aged 17-26.

We then repeat the same analysis with inactive status as the dependent variable. This is motivated by an observation that we highlight in Section 4.2.2 of our paper: We do not find a relationship between IPT and labour force participation, suggesting that there is no added worker effect underlying the relationship between unemployment and IPT. This argument is corroborated by the results presented in columns (5) to (8): the likelihood to become inactive is not significantly correlated with the regional unemployment rate. Together these results support the argumentation against the presence of an added worker effect, at least against one that is not offset by a discouraged worker effect.

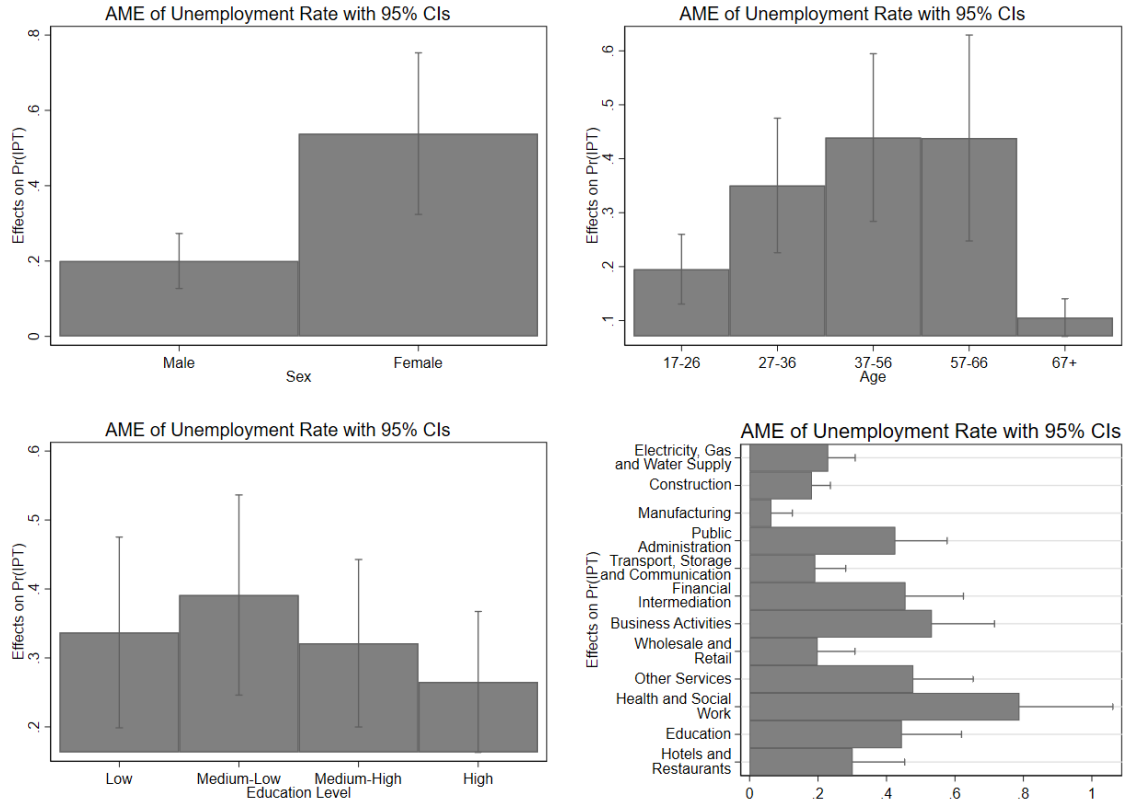
Table 1: Logit Regressions with IPT or Inactive Status as Dependent Variable

<i>Dependent variable</i>	IPT Status				Inactive Status			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Unemployment Rate	0.183*** (0.0424)	0.195*** (0.0456)	0.173*** (0.0365)	0.172*** (0.0360)	-0.124 (0.136)	0.0253 (0.109)	0.0228 (0.0885)	0.0285 (0.0784)
Unemployment Rate Squared	-0.445*** (0.128)	-0.464*** (0.138)	-0.417*** (0.0947)	-0.415*** (0.0931)	-0.499 (0.372)	-0.472 (0.301)	-0.355 (0.236)	-0.363* (0.213)
Manufacturing			-0.0176 (0.0251)	-0.0184 (0.0245)			-0.159*** (0.0451)	-0.159*** (0.0421)
Electricity, Gas and Water Supply			0.132* (0.0715)	0.136* (0.0731)			0.120 (0.135)	0.184 (0.135)
Construction			0.0126 (0.0263)	0.0115 (0.0263)			-0.158* (0.0948)	-0.160* (0.0961)
Wholesale and Retail Trade			0.0680** (0.0305)	0.0669** (0.0299)			-0.109 (0.0695)	-0.111* (0.0634)
Hotels and Restaurants			-0.00612 (0.0363)	-0.00780 (0.0355)			0.0230 (0.0757)	0.00942 (0.0751)
Financial Intermediation			0.0204 (0.0362)	0.0199 (0.0361)			-0.174 (0.115)	-0.174 (0.106)
Business Activities			0.0390 (0.0343)	0.0376 (0.0334)			-0.0679 (0.0614)	-0.0682 (0.0564)
Public Administration and Defence			-0.0205 (0.0211)	-0.0202 (0.0212)			-0.106* (0.0602)	-0.0845 (0.0578)
Education			0.00243 (0.0280)	0.00225 (0.0280)			0.143* (0.0748)	0.158** (0.0659)
Health and Social Work			-0.000497 (0.0240)	-0.000626 (0.0239)			-0.125*** (0.0459)	-0.111*** (0.0425)
Other Services			-0.0225 (0.0234)	-0.0247 (0.0227)			-0.0716 (0.0622)	-0.0836 (0.0661)
Women 17-26			0.242*** (0.0628)	0.242*** (0.0626)			-1.242*** (0.187)	-1.233*** (0.188)
Women 27-36			0.119** (0.0553)	0.121** (0.0576)			-0.858*** (0.112)	-0.832*** (0.0964)
Women 37-56			-0.0255 (0.0557)	-0.0264 (0.0555)			-0.345** (0.137)	-0.368*** (0.128)
Women 57-66			0.0213 (0.0763)	0.0246 (0.0760)			-0.0156 (0.202)	0.0309 (0.181)
Women 67+			0.115 (0.275)	0.115 (0.279)			-1.221** (0.601)	-1.229** (0.586)
Men 27-36			-0.0506 (0.0603)	-0.0534 (0.0600)			-0.0579 (0.159)	-0.0743 (0.153)
Men 37-56			0.0431 (0.0500)	0.0431 (0.0500)			0.0441 (0.213)	0.0562 (0.213)
Men 57-66			0.0683 (0.0756)	0.0676 (0.0750)			-0.347** (0.165)	-0.366** (0.159)
Men 67+			0.326* (0.181)	0.334* (0.184)			-1.886*** (0.694)	-1.805*** (0.671)
GDP Growth				0.00561 (0.00720)				0.0631*** (0.0216)
Demographic Group Dummies		Yes	Yes	Yes		Yes	Yes	Yes
N	4022632	4022632	4022632	4022632	4020276	4020276	4020276	4020276

Notes: IPT status or inactive status of workers as dependent variable. All specifications include year and state fixed effects. Demographic group dummies are interactions of age (5 groups) $\times$ sex $\times$ marital status. Education dummies are 4 categories based on ISCED 97. Standard errors in parentheses clustered at federal states, $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Data sources: European Labour Force Survey and Eurostat, own calculations.

For the second step, we again compute logit regressions as described above, but now we interact the unemployment rate with categorical variables of interest to see whether the relationship between macroeconomic conditions and IPT differs depending on sex, age, education or industry. Figure 1 plots the average marginal effects of the unemployment rate on IPT status for groups of workers in different categories. From the top-left panel it becomes clear that the probability to work in IPT when unemployment is high is much larger for women than for men. This is in line with the interpretation that it is mainly women who expand their labor supply on the intensive margin during economic downswings, which we offer in Section 4.2.3 of our paper. Interestingly, the marginal effects for different age and education groups are not statistically different from each other. With regards to industries, the figure in the bottom-right panel shows that there is a large variation in the connection between unemployment and the individual propensity to work in IPT. It is much higher in those industries which generally have a high share of part-time work.

Figure 1: Effects of unemployment on probability to work IPT for different individual-level dimensions



Notes: Coefficients of logit regressions of Equation 1 with IPT status as dependent variable for different individual-level dimensions. Bars indicate the magnitude of the coefficient of the unemployment rate at the federal-state level, and vertical/horizontal lines indicate 95% confidence intervals. Specifications include year and state fixed effects, dummies for age group, gender, education according to ISCED 97, marital status, occupation according to ISCO-88 and industry according to NACE Rev 1.1. if not dimension of interest. Data source: European Labour Force Survey, own calculations.

References

Valletta, Robert, Leila Bengali, and Catherine Van der List (2018). “Cyclical and market determinants of involuntary part-time employment”. In: *Federal Reserve Bank of San Francisco Working Papers* 2015-19.