

Task 5.1

Labour and product market regulations and vulnerability

Leader: UNIPG, Contributor: IBS

1. Task description

This task will investigate how labour and product market regulations act as moderators of individual employment effects of megatrends on various labour market segments. As regulation indicators, we will use the OECD product market regulation (PMR) indexes and employment protection legislation (EPL) indexes. Data on individuals will come from EU-LFS and EU-SILC and is used to identify labour market segments. For each subsample of workers identified as vulnerable due to megatrends (e.g. parents, older, youth), the role of the moderating factor (PMR/EPL) will be identified by interacting the regulatory indicator and the context variable describing the megatrends (e.g. technology, globalisation).

2. Background / Setting

In the latest years, an increasing anxiety over potential huge negative effects of the last wave of automation technologies on employment, added to concerns for globalisation, demographic and climate changes, and contributed to raise a demand for new research in these fields. The point of view of United Nations on the impact of these megatrends on employment and inequality, is less pessimistic than that reported by media, and supported by the awareness that different kind of institutions may act in mitigating the negative effects (UN, 2020). For example, the available empirical studies focusing on those countries that experienced a massive introduction of robots and ICT technologies, show very different results in terms of employment losses, depending on the production specialisation and institutional context of the country analysed. In the European Union, the concerns for technological unemployment are closely tied to the emergence of other phenomena allegedly related to the technological transformation, such as in-work poverty risks, poor career perspectives of temporary workers, young people not in education, employment or training (European Commission, 2020). This calls for studies analysing the role paid by institutions in avoiding extreme cases of labour market exclusion or atypical jobs.

3. State-of-the-art

Technological transformation, globalisation, demographic and climate changes are rarely jointly analysed in literature. Robert Gordon (2012; 2017) emphasised the risk that, through enlarging income inequality, these forces may work as headwinds curbing economic growth in the US. An increasing number of studies is focusing on the relationship between climate shocks and income inequality, providing evidence about how environmental deterioration may undermine the eradication poverty efforts made in some countries (Cevik and Jalles, 2022; Burzyński et al., 2022). Much larger is the literature analysing the effects of globalization (measured as offshoring and import penetration), technological transformation and ageing on labour demand (see for recent reviews Landesmann and Leitner, 2022; Stehrer and Tverdostup, 2022; Albinowski and Lewandowski, 2022).

The most recent studies on the impact of automation technologies on employment, also control for globalisation and demographic change, and disclose remarkable differences about size and direction of this impact. For the US, Acemoglu and Restrepo (2020) have found a clear negative influence of robot adoption on employment, whereas no significant reduction of hours worked has been found for 17 EU countries by Graetz and Michaels (2018). The latter results for the EU countries have been only partially confirmed by Doorley et al. (2023), as these authors pointed out that robots have not been harmful for employment rates only in Eastern Europe. In any case, besides the effects of automation on total employment, three further questions remain unanswered. The first one pertains the flexibility (and quality) of employment in those workplaces more exposed to robots and ICT. There are very few studies that touch at this question and highlight increasing share of workers with shorter average tenure after introducing automation (Bessen et al., 2019; Humlum et al., 2019; Damiani et al., 2023), even though, no specific focus is dedicated therein to the demographic groups more susceptible to be hired as temporary workers. The second question relates to the investigation of the impact of robots/ICT on employment, by taking into account whether changes in employment rate are associated with changes in unemployment and/or changes in the inactivity rate of working age population. Bachmann et al., (2022) only partially answer this question by analysing job findings and separations induced by robot exposure in 16 European countries, however, they do not take into account the effects of automation on the inactivity rate. The third question sheds light on the potential mediating role that product market regulation (PMR) and employment protection legislation (EPL) may

exert on the effects of automation technologies on employment. This is still an underexplored aspect, as apart from the consolidated literature upon the effects of regulation on employment, productivity and wages (Bassanini et al., 2009; Cingano et al., 2010; Damiani et al., 2016; Pompei and Perugini, 2017), we find more studies from the perspective of EPL inhibiting robot adoption than investigations upon the mitigating role of labour market institutions on the negative effects of automation technologies (Traverso et al., 2022).

4. Advancement compared to the state of the art

This study aims first to provide new descriptive evidence on the potential association between the four megatrends described above and the labour market outcomes. We especially pay attention to the technological change conditioned by climate change (green patents) and investigate whether it contributes together with other automation technologies, globalisation and demographic changes to depict different patterns in the evolution of employment rates over countries and industries. In doing so, we take into account the interactions with different regimes of employment and product market regulation we find across countries.

In the second part of the study, we focus on automation technologies and employment, controlling for demographic characteristics of individuals and globalisation. To fill the research gaps discussed above we investigate whether the exposure to automation technologies in the last years (robots and investments in database and software) differently affected i) employment, ii) unemployment, iii) inactivity and iv) temporary employment rates over different demographic groups and EU countries exposed to different levels of offshoring and import penetration. Next, we analyse whether and how country level PMR and EPL exert heterogeneous mitigating effects over the demographic-country groups.

5. Research to be done

In the first part of the study, we conduct a descriptive analysis and use both aggregated statistics on the four megatrends (Eurostat and OECD databases) and cell level information (gender, education and age groups) for employment status used in second part of the study, to explore their interactions with labour and product market institutions. In this second part of the study, we use individual survey data collected in SES and EU-LFS (and/or EU-SILC), industry level data on robots (IFR statistics) and intangible investments (EUKLEMS). We will map this information at the demographic group level and study the effect of robot

and ICT exposure on the four labour outcomes above. Right after, we will use the country level OECD indicators for PMR and EPL to study the mediating effect of these institutions.

6. Methodology

Besides the statistical descriptive analysis conducted on the four megatrends, employment and institutions at the country-industry level (first part), we perform an econometric analysis in the second part of the study. Here, the unit of analysis is a demographic group defined by gender, education and age (Doorley et al., 2023). At this cell level we calculate i) employment rate, ii) unemployment rate, iii) inactivity rate, iv) temporary employment share.

In the first step of the econometric analysis, we explain the changes in the employment statuses above by means of an indicator of task displacement (TDA) induced by robots and ICT (Acemoglu and Restrepo, 2022; Doorley et al., 2023).

In the second step we study the different mediating effect of changes occurred in product market regulation (PMR) and employment protection legislation (EPL) on the demographic groups, by interacting our variable of interest TDA with the OECD indicators of these institutions.

Due to potential endogeneity of TDA we build an instrument for robot and ICT penetration in a set of countries more advanced in these technologies and not included in our sample (Acemoglu and Restrepo, 2020; Doorley et al., 2023). An additional robustness check may be set out by following the approach of Rajan and Zingales (1998) and its extension to the labour economics empirical studies (Bassanini et al., 2009; Damiani et al., 2016; 2020; Jerbashian, 2019). Here, we perform a diff-in-diff estimation, by assuming that the effect of country level institutions on employment outcomes will be more binding for those demographic groups experiencing relevant task displacement due to robots/ICT exposure.

7. Data sources

- EU-LFS: European Union Labour Force Survey
- EU-SES: European Union Structure of Earnings Survey
- EU-SILC: European Union Statistics on Income and Living Conditions
- IFR: International Federation of Robotics Statistics
- EUKLEMS & INTAN_Prod Statistics (Luiss Lab)

- OECD PMR & EPL: OECD indicators for product market regulation and employment protection legislation.
- OECD patent statistics
- OECD TiVA indicators: statistics for import penetration and offshoring

References

- Acemoglu, D., & Restrepo, P. (2022). Tasks, automation, and the rise in US wage inequality. *Econometrica*, 90(5), 1973-2016.
- Acemoglu, D., and P. Restrepo. 2020. Robots and Jobs: Evidence from US Labour Markets. *The Journal of Political Economy* 128 (6): 2188–2244.
- Albinowski, M., & Lewandowski, P. (2022). The impact of ICT and robots on labour market outcomes of demographic groups in Europe. Research Report UNTANGLED project 1001004776 – _H2020.
- Bachman, R., Gonschor, M., Lewandowski, P., & Madon, K. (2022). The impact of robots on labour market transitions in Europe. IBS Working Papers 1/2022. Instytut Badan Strukturalnych.
- Bassanini, A., Nunziata, L. and Venn, D. (2009). Job Protection Legislation and Productivity Growth in OECD Countries, *Economic Policy*, 24, 349–402.
- Bessen, J. E., M. Goos, A. Salomons, and W. Van den Berge (2019). Automatic Reaction-What Happens to Workers at Firms That Automate? Boston Univ. School of Law, Law and Economics Research Paper.
- Burzyński, M., Deuster, C., Docquier, F., & De Melo, J. (2022). Climate change, inequality, and human migration. *Journal of the European Economic Association*, 20(3), 1145-1197.
- Cevik, M. S., & Jalles, J. T. (2022). For Whom the Bell Tolls: Climate Change and Inequality. International Monetary Fund.
- Cingano, F., Leonardi, M., Messina, J., and Pica, G. (2010) ‘The Effects of Employment Protection Legislation and Financial Market Imperfections on Investment: Evidence from a Firm-Level Panel of EU Countries’, *Economic Policy*, 25, 117–163.
- Damiani, M., Pompei, F., & Kleinknecht, A. (2023). Robots, skills and temporary jobs: evidence from six European countries. *Industry and Innovation*, 1-50.
- Damiani, M., Pompei, F., & Ricci, A. (2020). Labour shares, employment protection and unions in European economies. *Socio-Economic Review*, 18(4), 1001-1038.
- Damiani, M., Pompei, F., & Ricci, A. (2016). Temporary employment protection and productivity growth in EU economies. *International Labour Review*, 155(4), 587-622.
- Doorley, K., Gromadzki, J., Lewandowski P., Tuda D., Van Kerm, P., (2023) Automation and income inequality in Europe, Mimeo.

- European Commission (2020), Joint Employment Report 2020, European Commission Directorate-General for Employment, Social Affairs and Inclusion. 1049 Brussels.
- Gordon, R. J. (2012). Is US economic growth over? Faltering innovation confronts the six headwinds (No. w18315). National Bureau of Economic Research.
- Gordon, R. (2017). The rise and fall of American growth: The US standard of living since the civil war. Princeton University Press.
- Graetz, G., and G. Michaels. 2018. "Robots at Work." *The Review of Economics and Statistics* 100 (5): 753–768.
- Humlum, A. 2019. *Robot Adoption and Labour Market Dynamics*. Princeton: Princeton University.
- Jerbashian, V. (2019). Automation and job polarization: On the decline of middling occupations in Europe. *Oxford Bulletin of Economics and Statistics*, 81(5), 1095-1116.
- Landesmann, M., & Leitner, S. M. (2023). Employment Effects of Offshoring, Technological Change and Migration in a Group of Western European Economies: Impact on Different Occupations (No. 226). The Vienna Institute for International Economic Studies, wiiw. Research Report UNTANGLED project 1001004776 – _H2020.
- Perugini, C., & Pompei, F. (2017). Temporary jobs, institutions, and wage inequality within education groups in Central-Eastern Europe. *World Development*, 92, 40-59.
- Rajan, R. and Zingales, L. (1998) 'Financial Dependence and Growth', *American Economic Review*, 88, 559–586.
- Stehrer, R., & Tverdostup, M. (2022). Demography, Capital Accumulation and Growth. The Vienna Institute for International Economic Studies, wiiw. Research Report UNTANGLED project 1001004776 – _H2020.
- Traverso, S., Vatiello, M., & Zaninotto, E. (2022). Robots and labour regulation: a cross-country/cross-industry analysis. *Economics of Innovation and New Technology*, 1-23.
- United Nations.(2020). *World social report 2020: Inequality in a rapidly changing world*. UN. Department of Economic and Social Affairs.
- Acemoglu, D., and P. Restrepo. 2020. Robots and Jobs: Evidence from US Labour Markets. *The Journal of Political Economy* 128 (6): 2188–2244.
- Bachman, R., Gonschor, M., Lewandowski, P., & Madon, K. (2022). The impact of robots on labour market transitions in Europe. IBS Working Papers 1/2022. Instytut Badan Strukturalnych.
- Bassanini, A., Nunziata, L. and Venn, D. (2009). Job Protection Legislation and Productivity Growth in OECD Countries, *Economic Policy*, 24, 349–402.
- Bessen, J. E., M. Goos, A. Salomons, and W. Van den Berge (2019). Automatic Reaction-What Happens to Workers at Firms That Automate? Boston Univ. School of Law, Law and Economics Research Paper.

- Cingano, F., Leonardi, M., Messina, J., and Pica, G. (2010) 'The Effects of Employment Protection Legislation and Financial Market Imperfections on Investment: Evidence from a Firm-Level Panel of EU Countries', *Economic Policy*, 25, 117–163.
- Damiani, M., Pompei, F., & Kleinknecht, A. (2023). Robots, skills and temporary jobs: evidence from six European countries. *Industry and Innovation*, 1-50.
- Damiani, M., Pompei, F., & Ricci, A. (2020). Labour shares, employment protection and unions in European economies. *Socio-Economic Review*, 18(4), 1001-1038.
- Damiani, M., Pompei, F., & Ricci, A. (2016). Temporary employment protection and productivity growth in EU economies. *International Labour Review*, 155(4), 587-622.
- Doorley, K., Gromadzki, J., Lewandowski P., Tuda D., Van Kerm, P., (2023) Automation and income inequality in Europe, Mimeo.
- European Commission (2020), Joint Employment Report 2020, European Commission Directorate-General for Employment, Social Affairs and Inclusion. 1049 Brussels.
- Graetz, G., and G. Michaels. 2018. "Robots at Work." *The Review of Economics and Statistics* 100 (5): 753–768.
- Humlum, A. 2019. *Robot Adoption and Labour Market Dynamics*. Princeton: Princeton University.
- Jerbashian, V. (2019). Automation and job polarization: On the decline of middling occupations in Europe. *Oxford Bulletin of Economics and Statistics*, 81(5), 1095-1116.
- Perugini, C., & Pompei, F. (2017). Temporary jobs, institutions, and wage inequality within education groups in Central-Eastern Europe. *World Development*, 92, 40-59.
- Rajan, R. and Zingales, L. (1998) 'Financial Dependence and Growth', *American Economic Review*, 88, 559–586.
- Traverso, S., Vatiello, M., & Zaninotto, E. (2022). Robots and labour regulation: a cross-country/cross-industry analysis. *Economics of Innovation and New Technology*, 1-23.