

## II biannual Workshop on

### Technological change, health, inequality and data for policy evaluation

24 and 25 February, 2022

Torino, Piazza Arbarello 8 – Collegio Carlo Alberto

A joint initiative of:

Youth employment  
partnerSHIP

<https://yepartnership.carloalberto.org/>



## ABSTRACTS

### Thursday 24 February

#### Session 1: Technological change

The past few years have witnessed the rise in the development and adoption by firms of 4IR-related technologies, which include, among others, artificial intelligence, automation, and machine learning. The potential effects of these technologies on the economy and society are huge, and the labor market is likely to be particularly affected. 4IR-related technologies promise to drastically change the firms' production processes as well as the organization of human resources within firms. While academic interest on these topics is increasing, relatively few studies have investigated the labor market consequences of 4IR technologies up to now from a firm-level or worker-level perspective. The use of firm-level, worker-level and linked employer-employee data offers unmatched opportunities to study the dynamics of technological change in the workplace, and allows answering important research questions. What is the impact of 4IR-related technologies on wages and employment? Are wages and employment outcomes different for low- and high-skilled workers and routine and non-routine jobs? How do rent-sharing dynamics differ across these types of jobs? In other words, is wage inequality increasing as the 4IR paradigm becomes more pervasive?

Maria Savona (SPRU, University of Sussex and DEF, LUISS University)

**"Automation and occupation. A systematic literature review"** – Keynote speech

Michele Battisti, Massimo Del Gatto, Antonio Francesco Gravina, Christopher F. Parmeter

**"Robots versus labor skills: A complementarity/substitutability analysis"**

The rise of artificial intelligence and automation is fueling anxiety about the replacement of workers with robots and digital technologies. Relying upon a (country-sector-year) constructed measure of

robotic capital (RK), we study the extent of complementarity/substitutability between robots and workers at different skill levels (i.e., high-, medium- and low-skilled workers). The analysis points to a higher elasticity of substitution (EoS) - i.e., higher substitutability - between RK and unskilled labor, compared to skilled labor with a high degree of heterogeneity across time, sectors, countries. Interestingly, in most cases we found evidence of increasing RCSC over time with a steeper trend from the end of '90s and some hints of polarizing effects, according to which middle-skilled workers, typically employed in intermediate routine and/or codifiable tasks, are the most vulnerable to robotization.

Mauro Caselli, Andrea Fracasso, Sergio Scicchitano, Silvio Traverso, Enrico Tundis

**“Stop worrying and love the robot: An activity-based approach to assess the impact of robotization on employment dynamics”**

This work investigates the impact that changes in the exposure to robots had on Italian local employment dynamics over the period 2011-2018. A novel empirical strategy focusing on a match between occupations' activities and robots' applications at a high level of disaggregation makes it possible to assess the impact of robotization on the shares of workers employed as robot operators and in occupations deemed exposed to robots. In a framework consistently centered on workers' and robots' activities, rather than on their industries, the analysis reveals for the first time reinstatement effects among robot operators and heterogeneous results among exposed occupations.

Giorgio Brunello, Désirée Rückert, Christoph T. Weiss, Patricia Wruuck

**“The impact of training and advanced digital and automation technologies on productivity and wages”**

We compare the payoff of introducing advanced digital technologies - in terms of productivity, wages and employment - with the payoff of employer training using firm – level data that cover 28 European countries (the EU member states and the UK) and the US. We find that both digital adoption / intensity and training positively affect productivity and wages. We estimate that adopting at least one digital advanced technology is as effective for productivity as increasing training investment per capita by roughly 100 percent with respect to the sample mean. We also find evidence of wage compression, as both digital adoption / intensity and training increase productivity more than wages. Partly because of this, employment is positively affected by either investment.

Filippo Bontadini, Rinaldo Evangelista, Valentina Meliciani, Maria Savona

**“Asymmetries in global value chain integration, technology and employment structures in Europe: country and sectoral evidence”**

This paper provides empirical evidence on the complex role played by technology in affecting the relationship between the participation of EU countries and industries in Global Value Chains (GVCs) and their employment structure over the period 2000-2014. The empirical analysis is based on country-industry level data for 21 EU countries on employment, trade in value added, patents and

investments in intangible assets, and focusses on backward linkages within GVCs. The role of technology is analysed by taking into account both the technological intensity of offshoring industries and that of their GVC partners. We study the employment structure by looking at the shares of managers and manual workers, which reflect the “functional specialisation” of the country-sector within GVCs. We find that pre-existing asymmetries in the functional specialisation are highly persistent over time, with little sign of convergence over our observed period. Furthermore, GVC participation is not related to changes in the employment structure. However, this relationship appears to be mediated by country-industries’ initial technological performance. Technological leader industries exhibit, in fact, larger shares of employment in headquarter functions, and this functional specialisation tends to be strengthened as they increase their integration into GVCs. In contrast, country-industries that start off as technological laggards see integration into GVCs accompanied by an increase in the share of employment in fabrication functions. The technological profile of the partners is also found to play a role in the relationship between GVC integration and the functional specialisation of the offshoring country/industry, although different patterns emerge depending on the nature of the partner (manufacturing vs service).

Bernardo Caldarola, Marco Grazzi, Martina Occelli, Marco Sanfilippo  
**“Mobile internet, skills and structural transformation in Rwanda”**

This paper looks at the relation between mobile internet, skills and structural transformation in Rwanda. We combine the GSMA network coverage maps with individual information from national population censuses and labor force surveys, creating a district-level dataset of Rwanda that covers the period 2002 - 2019. Using an instrumental variable approach that exploits the distribution of lightning strikes across Rwandan districts, we analyze three sets of outcomes: the size of employment, the distribution of workers by skill level and the distribution of workers across sectors. Our results show that an increase in mobile internet coverage results in an increase in employment opportunities, especially in high skilled occupations, and is related to a shift of employment from agriculture to modern industries. Education, migration and firms dynamics can help rationalize our findings.

## Session 1's Posters

Fabio Berton, Stefano Dughera, Andrea Ricci,

### **“Are unions detrimental to innovation? Theory and evidence”**

In this paper we develop a Cournot duopoly model to assess how the asymmetric presence of firm-level bodies of employee representation affects process and product innovation. In the spirit of the literature on voice, we consider a framework where the local bodies decrease labor turnover, acknowledging that this may nullify the innovation-discouraging effect of central wage bargaining. Our predictions suggest that locally organized firms have greater product innovation incentives, while the effect on process innovation is less clear-cut. We then estimate an IV model on a large and representative sample of Italian firms and, consistently with the theory, find that firm-level bodies are responsible of 15.8 (25.6) extra percentage points in the probability of undergoing product (process) innovation. We also find that the presence of firm-level entities reduces workers' turnover – which supports our voice interpretation – and that pooled OLS, fixed-effect and correlated random effect models underestimate all our findings.

Andrea Borsato, André Lorentz

### **“Data production and the co-evolving AI trajectories: An attempted evolutionary model”**

This paper elaborates on the mutual and co-evolving relationship between AI technologies and the production of data. We develop an agent-based model in which firms compete in a Schumpeterian environment through the production and commercialisation of data and AI. The production of data takes place in two different submarkets, according to the information data embody, i.e., generic, or specialised. Entrepreneurs undertake innovative search to improve the quality of data sold and the AI capital stock through the hiring of scientists. The model is enriched by the presence of a public sector whose main goals consist of training scientists for the labour market and of sustaining aggregate production with the purchase of data and AI. The development of this model allows the analysis of the pattern of each technological trajectory in terms of a) the kind and the quantity of data produced, b) their related AI technologies, and c) the emerging market structure. It is important to note as the public sector has a pivotal role in accommodating or contrasting market tendencies on the basis of its demand for data and its policy concerning the training of scientists. This latter activity helps the economy deal with problems of labour shortage.

Francesco Carbonero, Jeremy Davies, Ekkehard Ernst, Frank M. Fossen, Daniel Samaan, Alina Sorgner,  
**“The impact of artificial intelligence on labor markets in developing countries: A new method with an illustration for Lao PDR and Viet Nam”**

AI is transforming labor markets around the world. Existing research has focused on advanced economies but has neglected developing economies. Different impacts of AI on labor markets in different countries arise not only from heterogeneous occupational structures, but also from the fact that occupations vary across countries in their composition of tasks. We propose a new methodology to translate existing measures of AI impacts that were developed for the US to countries at various levels of economic development. Our method assesses semantic similarities between textual

descriptions of work activities in the US and workers' skills elicited in surveys for other countries. We implement the approach using the measure of suitability of work activities for machine learning provided by Brynjolfsson et al. (2018) for the US and the World Bank's STEP survey for Lao PDR and Viet Nam. Our approach allows characterizing the extent to which workers and occupations in a given country are subject to destructive digitalization, which puts workers at risk of being displaced, in contrast to transformative digitalization, which tends to benefit workers. We find that workers in Lao PDR are less likely than in Viet Nam to be in the "machine terrain", where workers will have to adapt to occupational transformations due to AI and are at risk of being partially displaced. Our method based on semantic textual similarities using SBERT is advantageous compared to approaches transferring AI impact scores across countries using crosswalks of occupational codes.

Stefano Dughera, Francesco Quatraro, Andrea Ricci, Claudia Vittori

**"Technological externalities and wage premium: new evidence from Italian labor markets"**

In this paper, we investigate the relationship between local wages and the internal structure of the regional knowledge base. The purpose is to assess if the workers' compensations are somewhat related to the peculiarities of the technological space where they supply their labor services. Since knowledge generation has been found to be key to industrial development, one may expect that firms in well-performing cognitive environments exhibit faster productivity growth and that this will eventually feed through into higher wages. To test this hypothesis, we apply the concepts of related and unrelated variety to the firms' patenting activity, we assess if wages grow more in a framework of "knowledge deepening" (generated by firms innovating in related technological domains) or in one of "knowledge widening" (generated by firms innovating in unrelated technological domains). The empirical analysis is carried out using a unique employer-employee dataset that contains around 17 million observations and combines both administrative and sample data. First, using OECD-PATREG data on patent filing, we build two information entropy indexes that capture the degree of technological relatedness in the regions' innovative activities. Second, we regress these indexes against individual wages following the two-stage approach proposed by Combes et al. (2008). Our results suggest that workers employed in regions with a diversified knowledge structure earn higher premia.

Valerio Intraligi, Claudia Vittori, Andrea Ricci

**"Job polarization in Italy: structural change and routinization"**

This paper analyzes the role of structural change and the routinization hypothesis as concurrent explanations for job polarization in Italy over the period 2004-2019. Even though the structural change pattern of Italian employment is characterized by the pronounced contraction of the most routine-intensive sector of the economy - i.e. the manufacturing sector – the disappearance of routine employment seems to be a more generalized phenomenon affecting transversally all sectors. By means of a standard shift-share decomposition method, the contraction of routine employment in Italy turns out to be marginally driven by the structural change pattern and the decline of the manufacturing sector – with only 20 percent of the total contraction attributable to the between-

industry dimension. By exploiting industry-province cell variations with OLS and 2LS models, we instead find robust evidence in favor of the technological argument. Routine-tasks specialization does significantly increase employment in low-skill occupations for 6 out of 8 broad industries.

Giovanni Minchio,

**“Impact of the amendment to art.18 on Piedmont workers’ skills”**

In this paper we analyze the effects of Employment Protection Laws (EPL) reduction, introduced by the so-called “Jobs Act” (L. 184/2014), on skills reallocation and if such reallocation follows the Routine-Biased Technical Change framework (RBTC). Seven latent variables were discovered, applying factor analysis on a set of skill variables from the Indagine Campionaria delle Professioni. The effects of this EPL reduction on their dynamics were computed using Difference-in-Difference average treatment effect estimation. No latent factor that fitted the RBTC theoretical framework was found. The “Jobs Act” EPL reduction was found having no statistically significant effects on skill dynamics. One of the implications of this result is that Piedmont’s firms are not stimulated by institutional changes when making economical decisions. A slight trend is found only on the Education and Training dimension, hinting that large firms might prefer growing their knowledge base to improve their employed workforce skill matching.

Friday 25 February

## Session 2: Data and models for the design, monitoring and evaluation of labour market policies at local level (in Italian)

In recent decades, policies which aim to improve the conditions of specific groups of subjects - individuals, families, firms - by offering a service, providing an incentive, or some combination thereof have assumed increasing importance. At the same time, there is an increasing need of providing clear and detailed answers to the questions: "Was the intervention effective? Has the target it was designed for actually been reached?". The growing availability and knowledge in the use of administrative data for statistical purposes is helping answering these questions more and more precisely. The aim of the workshop is to compare initiatives implemented in different regions and local contexts, to present the results and to discuss which opportunities are already available and which are the most interesting future prospects. It will also be an opportunity to present some international best practices developed within the **Youth Employment partnerSHIP** project which analysed youth employment policies in 4 countries (Italy, Spain, Poland and Hungary).

[See separate program \(in Italian\)](#)

## Session 3: Health and inequalities

Health inequality is the difference in health between different groups of people. It can include differences in life expectancy, differences in getting a particular disease or functional limitation, and differences in recovering due to unequal access to good quality care. These differences are the result of multiple mechanisms and factors, among which the inequalities in material and immaterial resources and opportunities that stem from the labor market play a crucial role. Disparities in education, income, employment protection, job quality and satisfaction, physical and psychological conditions, are just few of the many dimensions that can be related to unequal health. At a time when income and health inequalities across the world are widespread and often increasing, even due to the pandemic, the 2nd LABOR Workshop provides a forum where evidence relevant to the measurement and analysis of the relationship between inequalities that originate in the labor market and health – or viceversa - can be discussed and shared.

Giuseppe Costa (University of Torino and Epidemiology Unit of Piedmont Region),  
**“Building back fairer: policy response to health inequalities in Europe at the time of the pandemic”**  
- Keynote speech

Monica Galizzi,  
**“Incentives and outcomes for injured workers in the 21st century: lesson learned, unanswered questions, and directions for future research”** - Invited speech

WHO's estimates showed that by 2017 occupational injuries and diseases caused losses of 4-6% of GDP for most countries. In order to help guide policies to reduce such costs, over the last 40 years economic research has highlighted some of the factors leading to occupational injuries. Selected outcomes of workers' compensation systems have also been studied. This presentation will discuss the validity of the assumptions of the main theories influencing such research such as hedonic wage and moral hazard models. It will also highlight how insights from behavioral economics can inform a research agenda on occupational health and safety. It will stress the need to better understand the

variety of socioeconomic outcomes associated with such injuries. Finally, it will present some new research questions and challenges for economists who want to study the relationship between health and work in new labor markets that are affected by phenomena such as the growth of gig economy, care work, remote work, and climate change.

David Blane

**“Measurement of health in labour market economics: perspectives from other disciplines”** - Invited speech

Labour market economics often includes health in its thinking and empirical analyses. David Blane’s talk sketches the numerous ways in which other disciplines conceptualise and measure health, including all-cause & cause specific mortality, self-reported morbidity & self-assessed health and functional and objective health; ending with the World Health Organisation’s definition of health, noting that so far it has not been operationalised.

Armanda Cetrulo, Dario Guarascio, Maria Enrica Virgillito,

**“Working from home and the explosion of enduring divides: Income, employment and safety risks”**

Why are there so many non-teleworkable occupations? Is teleworking only a matter of ICT usage or does it also reflect the division of labour inside organizations? What does it happen to those workers not able to telework in terms of socio-economic risks, and how does the gender dimension interact with risk stratification? Hereby, we intend to shed light on these questions using a detailed integrated dataset at individual and occupational level which provides information on different nature of risks (income, employment and safety). Our results entail that, first, class attributes, intended as execution of tasks, degrees of autonomy in doing the job, layers of the occupational categories, influence the chance of working from home; second, those individuals who are not able to work remotely are more exposed to unemployment, low wages, safety and health risks; third, being woman and employed with a temporary contract significantly amplify risk stratification.

Carlo Lallo e Sergio Ginebri,

**“Social Inequalities and their Impact on Projected Italian Pension Expenditure”**

We developed a methodology to forecast Italian pension expenditure disaggregated by education level. First, we disaggregated the ISTAT demographic projections for Italian population by social groups, identified by their level of education. Second, we estimated transition matrixes among different employment positions, which capture the main features of the work careers and are strongly differentiated between different social groups. We show that official forecasts hide a composition effect that makes Italian population life expectancy grow faster than sub-group life expectancies, even keeping constant mortality differentials. The distribution of pension expenditure by social status will be increasingly unequal because the lower educated group show not only an increasing lower life expectancy with respect to the Italian average, but also lower incomes and less brilliant careers in terms of employment continuity, entry income and income increase over time. The gradual transition to the NDC system of pension computation will increase such disparities



Paolo Brunori, Davillas Apostolos, Andrew M. Jones, Giovanna Scarchilli

**“Model-based recursive partitioning to estimate unfair health inequalities in the United Kingdom Household Longitudinal Study”**

We measure unfair health inequality in the UK using a novel data- driven empirical approach. We explain health variability as the result of circumstances beyond individual control and health-related behaviours. We do this using model-based recursive partitioning, a supervised machine learning algorithm. Unlike usual tree-based algorithms, model-based recursive partitioning does identify social groups with different expected levels of health but also unveils the heterogeneity of the relationship linking behaviors and health outcomes across groups. The empirical application is conducted using the UK Household Longitudinal Study. We show that unfair inequality is a substantial fraction of the total explained health variability. This finding holds no matter which exact definition of fairness is adopted: using both the fairness gap and direct unfairness measures, each evaluated at different reference values for circumstances or effort.

### Session 3’s Posters

Ainoa Aparicio Fenoll, Judit Vall Castello

**“The impact of job security on workers’ health”**

Job security has the potential to affect health through reductions in workers’ stress, effort, and risks. Using data from the Spanish National Health Survey, we estimate the effect of job security on health. To address endogeneity, we draw upon a reform that incentivized secure labor contracts for young (under 30) and female workers in Spain by reducing payroll taxes paid by employers. Combining Instrumental Variables and Differences-in-Differences estimation methods, we find that having a secure labor contract increases health measured by a one to five index by 0.21 while it has no effect on mental health.

Elena Bassoli, Agar Brugiavini, Irene Ferrari

**“Care provision at the time of the Covid-19: who suffers most”**

This paper focuses on the changes in care provision at the time of the COVID-19 outbreak by exploiting variation in lockdown policies across Europe. We use the SHARE-COVID-19 survey, which involves about 50000 respondents of age 50 and over in 26 countries, to investigate how the stringency of the policy measures have affected care provision. Our study is based on the linkage of the SHARE-COVID-19 data with an individual specific “stringency index” which measures the intensity of the restriction policies and the degree of individual’s exposure. We find that older individuals, low-income individuals and people affected by limitations in everyday life faced a higher probability of receiving help because of the lockdown policies. Women and people in the age group 50-65 were more likely to provide help/care. Lockdown policies hit hard individuals who were already receiving care as they experienced a form of rationing, both due to higher financial costs and travelling restrictions. Since these individuals

are already among the most fragile in society, our evidence raises concern and calls for a re-design of the welfare system.

Enrica Croda

**“The socioeconomic status gradient in pain: A cross-country analysis”**

Chronic pain has an important impact on peoples’ lives and is a fundamental dimension of well-being. Most research so far has focused on the US, where chronic pain has been deeply intertwined with the opioid crisis (Case and Deaton, 2015, 2017, 2021), but little is still known about pain in Europe.

In this paper, I investigate the existence of sex disparities in chronic pain and the extent to which chronic pain is associated with socioeconomic status in mid-life in fourteen European countries (Luxembourg, Switzerland, the Netherlands, Austria, Denmark, Sweden, Germany, Belgium, France, Italy, Spain, Czech Republic, Slovenia, and Estonia) and the United States. Specifically, I exploit newly available data from SHARE and HRS to study whether (i) sex-based differences in pain are relatively similar across countries, (ii) country-specific characteristics matter the most for people in the bottom of the income distribution (Chetty et al., 2016), and (iii) greater use of pain medication reduces aggregate pain.

Jennifer Chubinski, Sarah E. Walsh

**“Exploring mental health and coping among the most vulnerable older adults in the early months of COVID-19 in the United States”**

The global health pandemic exasperated existing inequalities in the US health care and safety net systems. This study explores the mental health impacts of the pandemic on older users of Meals on Wheels (MOW) to determine if this population’s response was different from older adults without MOW support. The study was conducted using secondary data from a large nationally representative sample of Medicare enrollees ([www.nhats.org](http://www.nhats.org)).

On average, health and demographic characteristics for MOW users were significantly different than non-users. Despite these differences, MOW users did not substantively differ from non-users on several key measures of mental health during the early stages of the pandemic. Given the higher level of vulnerability among MOW users, this is a positive. Further study is needed to determine if these results were attributable to a protective effect of MOW services and whether these outcomes would persist or worsen in subsequent waves of the pandemic.

Simone Chinetti

**“Late-in-life investments in human capital: Evidence from the (unintended) effects of a pension reform”**

This paper provides a novel empirical test of human capital formation by studying whether forced increases in the residual working life, determined by a restrictive pension reform, induce additional training activities. By exploiting a sizable Italian pension reform, in a Difference-in-Differences setting, I find that a lengthening of the working horizon increases, through training, workers' human capital. Additionally, I show that the response to the reform appears very heterogeneous and depends on gender, age, education, marital status, sector of employment and firm size. My estimates suggest, furthermore, that these individual positive effects are not attributable to employers' sponsorship.

Cinzia Di Novi, Paolo Paruolo, Stefano Verzillo

**“The role of employment protection legislation in shaping the impact of job disruption on older workers’ mental health in times of COVID-19”**

This study exploits individual data from the 8th wave of the Survey of Health, Ageing and Retirement in Europe (SHARE) and the SHARE Corona Survey to investigate the mental health consequences of COVID-19 job disruption across different European countries. It focuses on older workers who were exposed to a higher risk of infection from COVID-19 and were also more vulnerable to the risk of long-term unemployment and permanent labour market exits during economic downturns. The relationship between job disruption in times of COVID-19 and older workers’ mental health is investigated using differences in country-level employment legislation regimes in EU. Results reveal a clear EPL gradient: job disruption has a positive and significant impact on older workers’ psychological distress especially in those countries where EPL is more binding. These findings suggest policy responses targeted to prevention of pandemic-related job losses and of the widening of workers’ mental health inequalities across European countries and labour markets