IT AND EMPLOYMENT:

NEW INSIGHTS ON PEOPLE'S FEELINGS TOWARDS THE EMERGENCE OF NEW TECHNOLOGIES

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- Technology is widely considered the main source of economic progress, but it has also generated **cultural anxiety** throughout history

- In this context, our study aims to run a **sentiment analysis** that will help us understand the current feelings of people towards the emergence of new technologies, hidden in their tweets. As a proxy for technological change we chose the **Tesla-Bot**, a humanoid robot designed and developed to perform tedious everyday tasks or dangerous jobs such as manual labour.

- Tesla says the robot is being proposed as a **“**non-automotive robotic**”** — meaning it will operate through **artificial intelligence** — and will function through the company’s Dojo advanced neural network, the same that help Tesla vehicles navigate through roads and streets without human assistance.

- We want to emphasize that, since the **Tesla-Bot** has not been commercialized yet, the results of the sentiment analysis will not return some kind of customers satisfaction, but rather the feelings of people towards **the occurrence of an event** that, in the specific case, reflects a future in which physical work won’t be required anymore.

- After all, **Elon Musk** itself was quoted as saying he thinks the Tesla Bots will be “quite profound” and foresees physical work being a choice for humans in the future. “If you want to do it, you can,” he said, “**but you won’t need to do it**.”

STRUCTURE

01

The different forms that **anxiety over technology** can take and their role over time. Focus on those worries that are based on the "optimistic" view that technology will continue to grow and perhaps accelerate.

02

A look at the current perception of technological innovation through a **sentiment analysis** based on those tweets that contains the hashtag #TeslaBot: (i) Retrieve the data from the Twitter API and then use natural language processing (NLP) to clean them up; (ii) score each text by combining sentiment score of each word through the use of dictionaries that contains a list of negative/positive/neutral words.

STRUCTURE

03

Display and **discussion of the results** obtained from the analysis, the possible causes and their implications: a look at the different effects of investments in automation and and more in general of the Artificial Intelligence on different economic variables.

04

Conclusions and policy implications

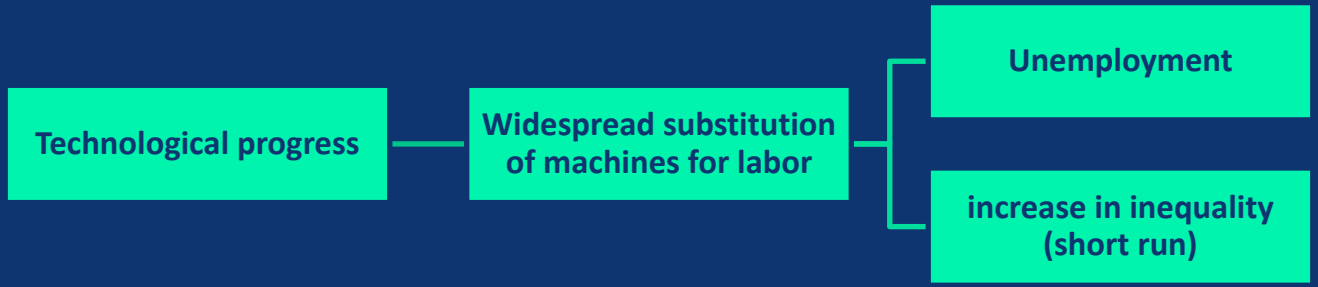
01

ANXIETY OVER TECHNOLOGY

ANXIETY OVER TECHNOLOGY

- Widespread substitution of machines for labor
- Moral implications of technological process for human welfare
- Technological pessimism

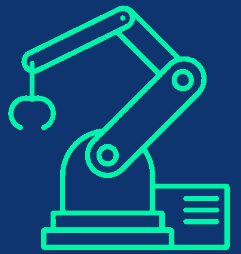
WIDESPREAD SUBSTITUTION OF MACHINES FOR LABOR



Many writers conceded possibly negative effects of machinery on employment in the short run

PARTICULARY FAMOUS OPINIONS:

- **Karl Marx**
- **Mokyr**



MORAL IMPLICATIONS OF TECHNOLOGICAL PROCESS FOR HUMAN WELFARE

KEYNES THOUGHTS

- **Future machines will be able to carry out these human capabilities**
- A rise in "**robotic productivity** can result in declines in consumption
- With the **decline of work**, man must face the problem of how to occupy his leisure.

RELATIVE CONSIDERATIONS

Possible effects of the substitution of capital for labor:

1. Leisure has increased over the medium term and in the long term.
2. High-quality leisure activity can be accessed by all at low average cost and near-zero marginal cost.

TECHNOLOGICAL PESSIMISM

Technological pessimism: the rate of technological discoveries plateaus, leading to secular stagnation. Stationary states need not being gloomy, they have also been theorised as equilibria in which no more progress would be necessary.

A new wave of technological pessimism. This is especially in relation with AI and the possibility of automating **cognitive tasks.**

Two key aspects appear of relevance for the future of work:

1. How much people will work on average.
2. How will this work be distributed.

TODAY AND TOMORROW: PERSONAL CONSIDERATIONS

There is **growing polarization** of labor-market opportunities between high and low-skill jobs, unemployment and underemployment especially among young people, stagnating incomes for a large proportion of households, and income inequality. Migration and its effects on jobs has become a sensitive political issue in many advanced economies

ASPECTS TO CONSIDER

- As **machines** evolve and acquire more advanced performance capabilities that **match or exceed human** capabilities, the adoption of automation will pick up. However, the technical feasibility to automate does not automatically translate into the deployment of automation in the workplace and the automation of jobs
- A second element is the **cost of developing** and deploying both the hardware and the software for automation
- **Supply-and-demand dynamics for labor :** if workers with sufficient skills for the given occupation are in abundant supply and significantly less expensive than automation, this could slow the rate of adoption
- **The benefits of automation beyond labor substitution:** including higher levels of output, better quality and fewer errors, and capabilities that surpass human ability.

SMART SOLUTION

- **Evolving education systems** or by pursuing public-private partnerships to stimulate investment in enabling infrastructure

02

SENTIMENT ANALYSIS

SENTIMENT ANALYSIS

- Mined more than 22000 English-language tweets
- We used **Twitter's API**
- Only the tweet between 19th August and 12th November.
- **#TeslaBot**

CODE

UNSUPERVISED DICTIONARY BASED SENTIMENT ANALYSIS:

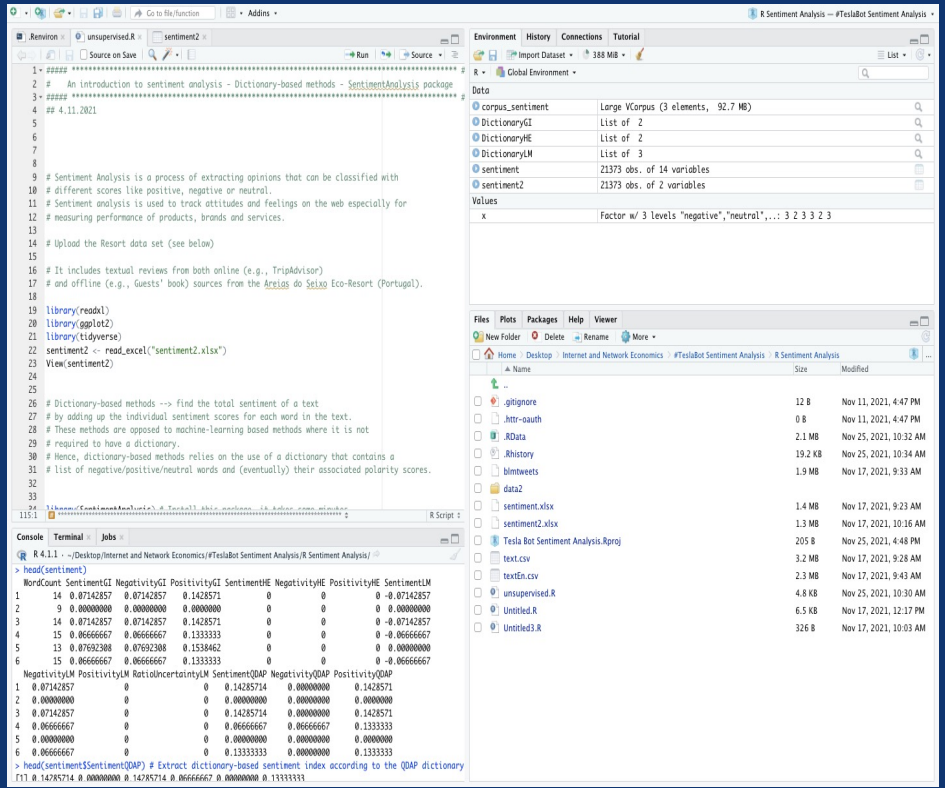
- Less time consuming

USED LIBRARY:

- Tm library -> for the corpus
- Readx1 library -> for importing the data from excel
- SentimentAnalysis library -> composed of four dictionary

IN THE NLP WE DEFINED:

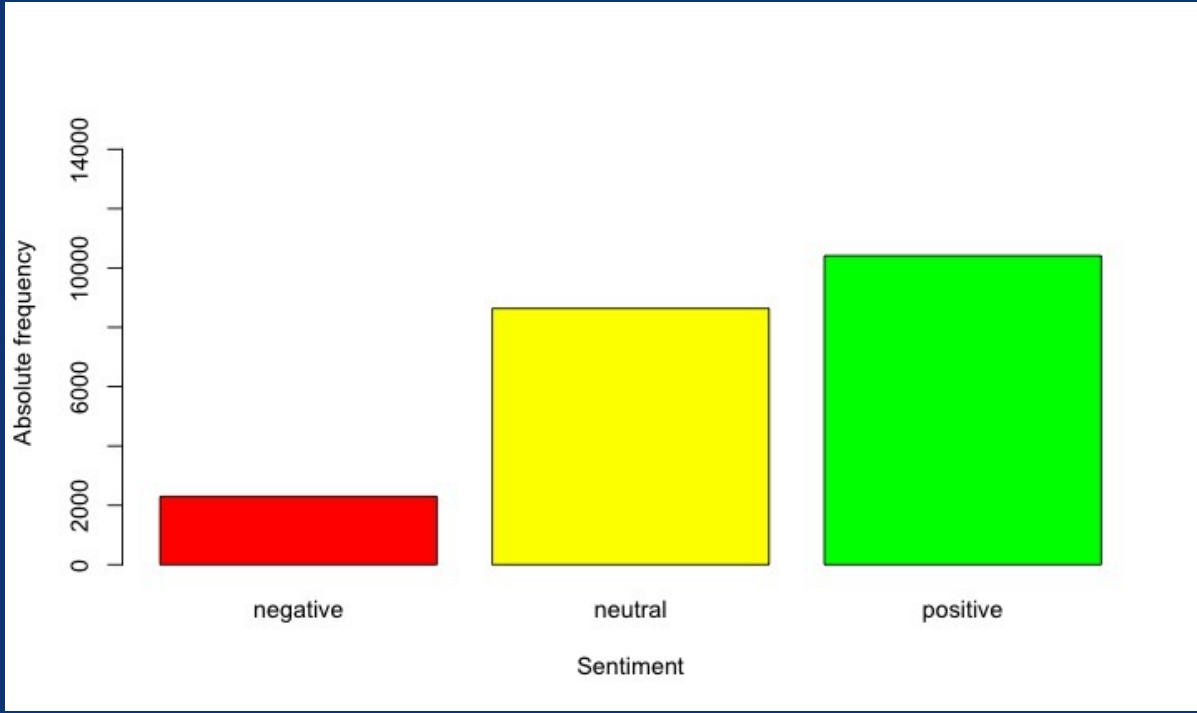
- The language -> english
- Removed stop-words, punctuation and numbers
- Reduced all letters to lower-case
- Performed the STEMMING process



CODE II

- Using **analyseSentiment** we get a matrix of numerical values (four values for each tweet)
- These values are converted in positive/neutral/negative
- We get **4 different sentiment analysis**, one for each dictionary
- Then we plotted all 4 analysis in a single one which is an average

RESULTS


Absolute frequency
0
2000
6000
10000
14000
negative
neutral
positive
Sentiment

03

RESULTS DISCUSSION AND LITERATURE OVERVIEW

ECONOMIC OUTCOMES OF INVESTMENTS IN AUTOMATION

TWO PERSPECTIVES:

AGGREGATE LEVEL

- “Robots and Jobs: Evidence from US labor markets” by Acemoglu and Restrepo
- “Automatic Reaction – What Happens to Workers at Firms that Automate?” by Bessen, Goos, Salomons and van der Berge

FIRM LEVEL

- “For whom the bell tolls: the effects of automation on wage and gender inequality within firms” by Domini, Grazzi, Moschella and Treibich
- “Robots and firms” by Koch et al.

AGGREGATE LEVEL PERSPECTIVE

- Robotics technology advanced significantly in the 1990s and 2000s, leading to a **fourfold rise** in the stock of (industrial) robots in the United States and western Europe between 1993 and 2007.

- There are considerable **variation** in robot adoption across industries that show how the same industries are rapidly adopting robots in both the United States and Europe.

- On an industrial level, there is no strong positive correlation between robot adoption and any of the other major trends affecting US local labor markets, such as import competition from China and Mexico, offshoring, the decline of routine tasks, investments in information technology (IT) capital, and overall capital deepening.

- The **employment effects** of robots are most pronounced in manufacturing and particularly in industries most exposed to robots. They are also concentrated in routine manual, blue-collar, assembly, and related occupations.

AGGREGATE LEVEL PERSPECTIVE II

- Advancing technologies are increasingly able to fully or partially **automate** a broad range of **job tasks**, even ones that had previously been considered non-routine

- That automation at the firm increases the probability of **workers separating** from their **employers**. For incumbent workers, this firm separation is followed by a decrease in annual days worked, leading to a 5-year cumulative wage **income loss** of about 8% of one year's earnings.

- While the related economic literature on technological change is large, little of it specifically addresses questions about automation. Indeed, empirical work on automation has so far mostly focused on robotics, a prime example of an automation technology, albeit one that has penetrated only a limited number of sectors, and on aggregate outcomes.

- However, to understand how automation affects work, it is critical to also study its effects on **individual** workers.

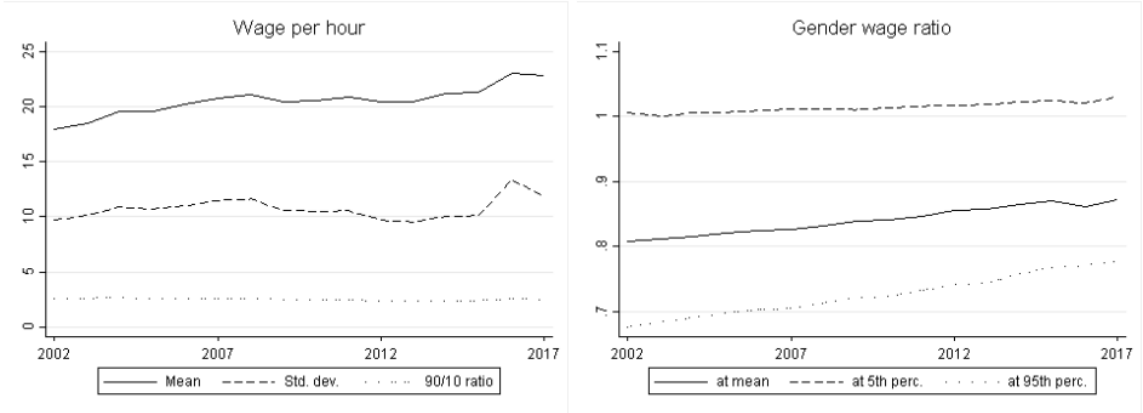
FIRM LEVEL PERSPECTIVE

EFFECTS OF AUTOMATION ON WAGE AND GENDER INEQUALITY WITHIN FIRMS

- The paper investigates the impact of investment in **automation** and **AI-related goods** on within-firm wage **inequality** in the French economy during the period 2002-2017.
- Automation investments spikes are not followed by an increase in within-firm **wage** and gender inequality
- Wages tend to increase at **different percentiles** of the **distribution**

FIRM LEVEL PERSPECTIVE

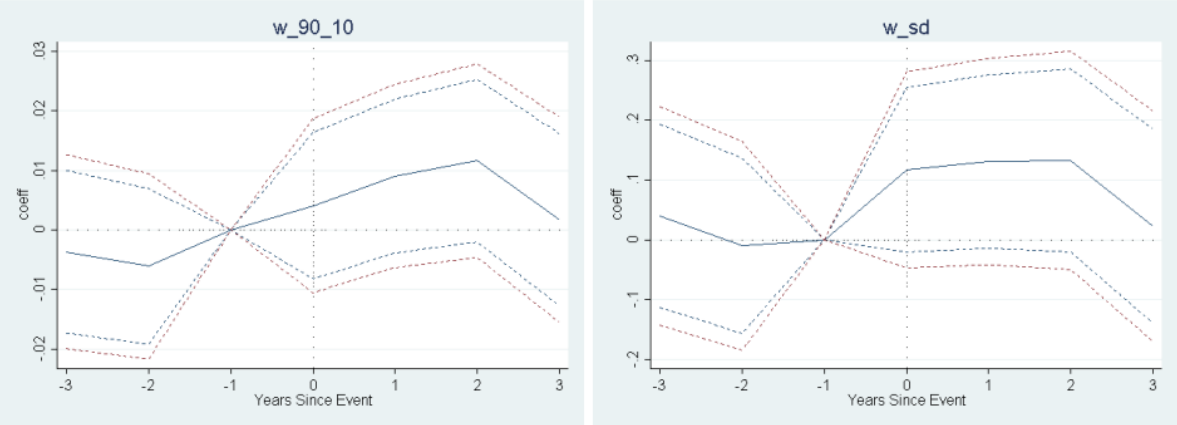
Figure 2: Evolution of wage characteristics over time, sample 3, 2002-2017.



Source: our elaborations on DADS and DGDDI data. Sample 3: Firms importing automation and AI related goods at least once, above 10 employees.

FIRM LEVEL PERSPECTIVE

Figure 3: Automation/AI spikes and within-firm wage inequality.



Note: the solid line reports coefficients β_{-3} to β_3 from the estimation of Equation 1, while the blue and red dotted lines represent confidence intervals at the 5% and 10% significance level, respectively.

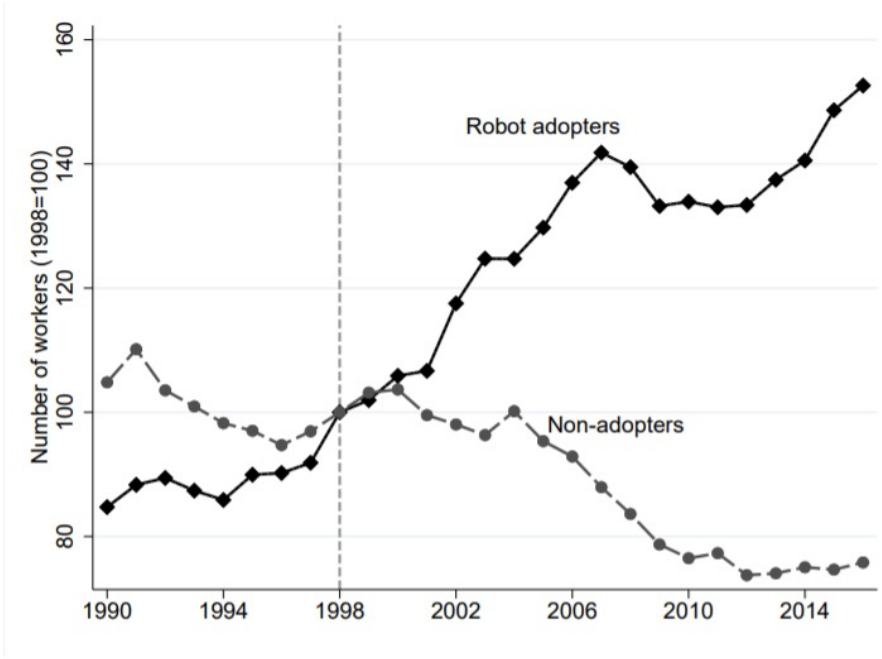
FIRM LEVEL PERSPECTIVE

EFFECTS OF AUTOMATION ON FIRMS

- Implications of **robot adoption** on Spanish firms from 1990 to 2016
- Which firms adopt robots?
- What are the **labor market effects** of robot adoption at the firm level?
- How does the firm **heterogeneity** in robot adoption affect the industry equilibrium?

FIRM LEVEL PERSPECTIVE

Figure 1: Evolution of firm-level employment (1990-2016)



FIRM LEVEL PERSPECTIVE

EFFECTS OF AUTOMATION ON FIRMS: MAIN RESULTS

- Robot adoption shows **positive** selection
- Robot adoption accounts for two-thirds of the productivity gains, labor reallocation to the remaining third
- More skill-intensive firms are less prone to invest in automation
- **Output increases** generated by automation are around 20-25% of the initial output within 4 years
- Automating firms raise **employment** by around 10%

04

CONCLUSIONS

Conclusions 

- A change of course: those **fears** and **worries** discussed earlier seem to be **subsiding**
- Volunteer **bias**?
- The diffusion of **mechanisms** that let us **share** those **rents** rents coming from **automation** and let us focus on finding new job **opportunities**, more adequate to **our nature**

THANKS FOR YOUR ATTENTION !