

Footprints on the road
*Carbon emissions and commuting in Tuscan
manufacturing*

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California's climate apocalypse

Fires, heat, air pollution: The calamity is no longer in the future — it's here, now

Oregon residents standing ground



By [Name] in [Location]

As the smoke from wildfires in California fills the air, Oregon residents are standing ground. They are not leaving their homes, but they are demanding action from the state government. The state is facing a climate crisis that is no longer in the future — it's here, now.

Aim of the work

- Despite the recognized importance of going towards net-zero emissions in order to fight climate change, carbon emissions computation guidelines do not include commuting to workplaces (see, e.g., UN, 2000)
- However, emissions due commuting might be high and depend upon different spatial distributions of population of workers and firms
- In this work we start extending carbon emission analysis to commuting data (in the manufacturing sector) in order to see whether the latter phenomenon might affect the environmental impact of production

Plants, workers and commuting data

Locating plants:

- Data on plants from different statistical and administrative archives (ASIA, Tax declarations)
- Municipality, Sector, Number of employees, Value added, Production, Employer ID

Locating workers:

- Data on workers from tax declarations (730, 770)
- Municipality, Income, Working days, Sex, Age, Nationality, Employer ID

A linked employer-employee database:

- We linked data on employees to plant level data via employer ID at the municipality level
- Hp: We first saturate plants in which employee and plant municipalities do coincide

Commuting related emissions

Between municipalities (done):

- Centroid distances in terms of meters
- Transportation choices (car, train, bus)
- Emissions (per passenger) (www.carbonindependent.org, ourworldindata.org): we use the lower bound

Within municipalities (to be done):

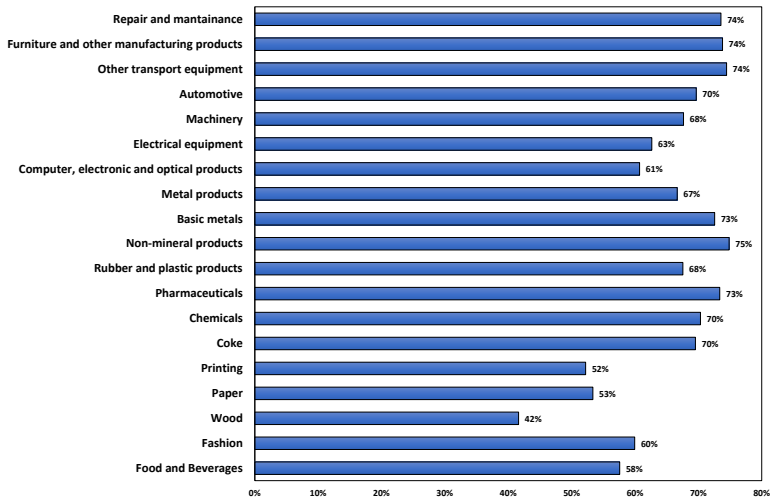
- An average walked distance per employee?
- Transportation choices

Annual emissions are computed multiplying emissions-per-kilometer-per-passenger by employees by kilometers by 260 working days. Production-related emissions by sector are assumed to be constant at the regional level.

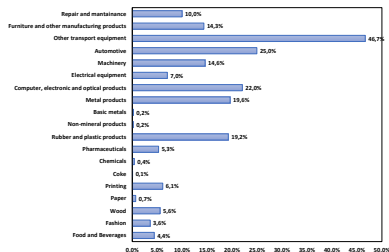
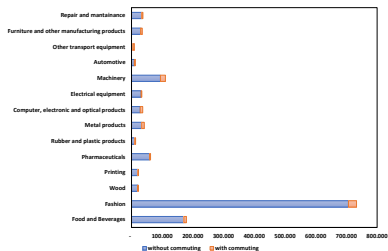
Remote work potential

- We exploit Duranti et al (2020) and consider the share of occupations which can be performed remotely in each sector
- Whereas labor markets in specific sectors can be more spread in space (pushing emissions upward), the latter ones could demand a higher share of such occupations (pushing emissions due to commuting downward)
- In this presentation: an occupation is either performed remotely or not.. however, we might go beyond this dichotomic definition
- Notice that transportation emissions do not go to zero due to a partial substitution effect; there might be also an increase in demand for other energy inputs (e.g., electricity)

Manufacturing workers and inter-municipality commuting



Manufacturing emissions w/wo commuting

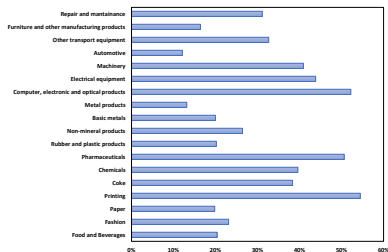


Emissions w/wo commuting

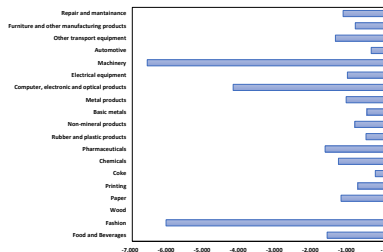
Shares due to commuting

Although marginal with respect to the contribution of “proper” production activity, emissions from inter-municipality commuting are not irrelevant and represent more than 1 fifth of CO2 emissions in some sectors.

Adding remote work potential



Share of remote work



Sectoral reduction in CO2

Implementation of remote work would help in curbing emissions stemming from some sectors, especially those combining relatively high number of employees with high share of occupations which can be performed remotely.

Next steps

- Improving the algorithm to compute commuting
- Adding intra-municipality commuting
- Improving commuting-related emissions estimates with, e.g., traffic data
- Linking emissions to tasks performed at the regional level
- From “localization” approach to a proper “footprint” approach
- As to remote work, going further a dichotomic definition and estimate a share of weekly working hours which can be performed remotely; moreover, are commuters those employed in occupations with higher remote working potential?
- Going beyond manufacturing: for services the share of emissions due to commuting is expected to be much larger