

The exposure of Tuscany's local market areas to lockdown and social distancing measures *An inter-LMAs value chain approach*

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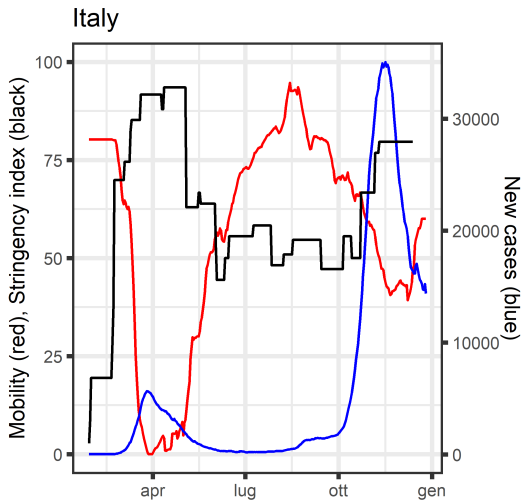
IRPET



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Italy: Covid-19, containment measures and mobility



Covid-19 and input-output research in Irpet in 2020

- **The China shock**

The impact of Chinese lockdown on the Italian regional economies (see Ferraresi and Ghezzi, 2020)

- **The exposure of Italian regions**

On the economic and health impact of the Covid-19 shock on Italian regions: a value chain approach (see Ferraresi et al., 2021)

- **Simulating the unfolding of the Covid-19 shock**

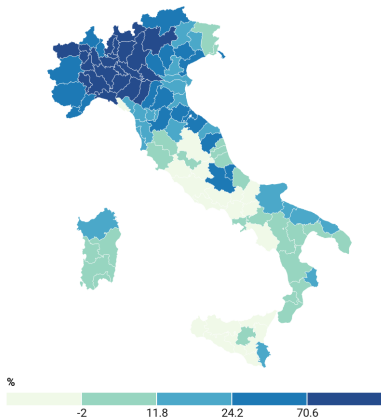
Assessing the Economic Impact of Lockdowns in Italy: A Computational Input-Output Approach (see Reissl et al., 2021)

- **Going more local**

The exposure of Tuscany's local market areas to lockdown and social distancing measures: An inter-LMAs value chain approach (see Ferraresi et al., 2020)

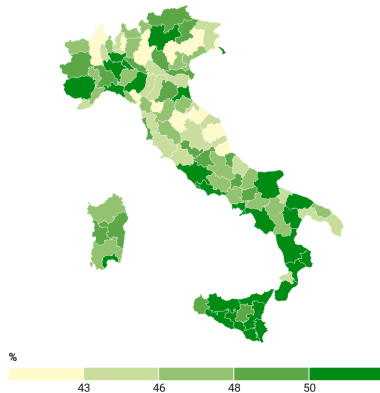
The demand for a regional and sectoral approach

Excess mortality



Source: Elaborations on ISTAT data - Created with Datawrapper

Employment in sectors providing essential goods and services



Source: Elaborations on ISTAT data - Created with Datawrapper

The demand for an interregional-intersector approach

Production steps:
manufacturing, business
services, logistics,
commercial services



Localized final demand
activates
geographically
dispersed production



Each production step
can be thought as a
collection of tasks,
each characterized by
a different degree of
contagion risk, as well
as a different remote
work potential

Why going to LMAs?

- From an economic point of view, the LMAs represent the smallest geographical unit that maintains the basic characteristics of an economic system → self-contained home-work commuting
- From the health point of view, again due to the self-containment of daily mobility flows, LMAs represent the minimum geographical unit within which to identify potential outbreaks of the epidemic (Azzimonti et al., 2020; Bisin and Moro, 2020; Fajgelbaum et al., 2020; Glaeser et al., 2020; Goolsbee and Syverson, 2020; Monte, 2020)

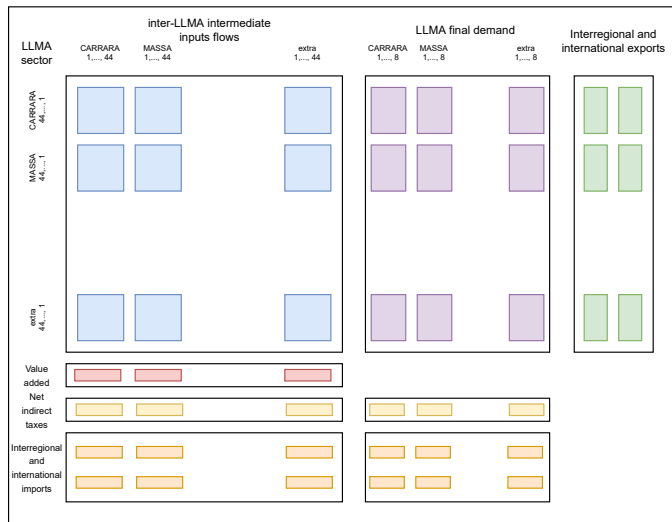
Our work in a nutshell

1. We build up inter-LMAs value chains from a final demand perspective and distinguish the places of consumption from those of production
2. For each value chain we estimate – by LMA and sector – activated production and employment
3. To each occupation we attach a risk of being infected by Covid-19 and a probability for telework

Two pieces of data: the interregional IRPET-ICIO table

Region	Intermediates			Final demand			
	Pie	Vda	r	ROW	Pie	Vda	ROW
Sector	1..32	1..32	1..32	1..32	1..5	1..5	1..5
Pie	32..1						
Vda	32..1						
s	32..1						
ROW	32..1						
Value added							
Indirect taxes							
Transport margins							

Two pieces of data: the inter-LMAs table



The value chain of the work..

1. Start with the interregional value chains: estimating production activation at the sector/region level (see Ferraresi et al., 2021)
2. Recompute the interregional trade matrix linked to a specific value chain
3. Distributing the shock to LMAs
4. Estimate production and employment activation linked to each value chain
5. Covid-19 risk and remote work potential

The value chains through the Leontief inverse



$$\begin{array}{cccc}
 l_{11} & \dots & l_{1j} & \dots & l_{1r} \\
 l_{21} & \dots & l_{2j} & \dots & l_{2r} \\
 \vdots & & & & \vdots \\
 l_{s1} & & l_{sj} & \dots & l_{sr} \\
 \vdots & & \vdots & & \vdots \\
 l_{r1} & \dots & l_{rj} & \dots & l_{rr}
 \end{array}
 \times
 \begin{array}{c}
 Fd_1 \\
 \vdots \\
 Fd_s \\
 \vdots \\
 Fd_r
 \end{array}
 =
 \begin{array}{c}
 \sum l_{1j} Fd_j \\
 \vdots \\
 \sum l_{sj} Fd_j \\
 \vdots \\
 \sum l_{rj} Fd_j
 \end{array}$$

$$Fd + AFd + A(AFd) + \dots + A(A^{n-1})Fd$$

$$(I + A + A^2 + \dots + A^n)Fd$$

$$(I - A)^{-1}Fd = LFd$$

The **value chain**

⇐ The activation of each sector/region to directly/indirectly serve final demand needs

Our value chains

Internal consumption	<i>Essential</i> Food Beverages Health	<i>Medium</i> Communication Housing Transport Education	<i>Others</i> Clothing Furnishing Recr. & culture Restaurants & hotels Misc.
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Internal investment	Construction investment Other investment
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Exports	Australia, Austria, Belgium, Bulgaria, Brazil, Canada, Chile, China, Cyprus, Czech Rep., Germany, Denmark, Spain, Estonia, Finland, France, UK, Greece, Croatia, Hungary, Indonesia, India, Ireland, Japan, South Korea, Lithuania, Luxembourg, Latvia, Mexico, Malta, Netherlands, Norway, Poland, Portugal, Romania, Russia, Slovakia, Slovenia, Sweden, Turkey, Taiwan, US, Rest of World
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Distributing intra-regional and interregional shocks at the LMA level

1. Given each interregional demand shock for Tuscany, shock vectors of internal, interregional and international demand directly faced by the region have been constructed
2. These vectors, with as many elements as the sectors of the input-output table, were then split between the different LMAs according to the contribution of each sector of each LMA to the satisfaction of that particular item of expenditure at the regional level
3. The activation picture that emerges from the different scenarios in the inter-LMAs framework is therefore consistent with the analytical framework resulting from the interregional analysis

Attaching employment, Covid-19 risk and remote work

1. Once estimated production activated by each demand shock we compute employment by multiplying by regional/sector employment per euro of production (i.e., $L_{i,j,z} = \frac{L_{i,j}}{Y_{i,j}} \times Y_{i,j,z}$ where i = region, j = sector, z = value chain).
2. We compute Covid-19 related risk and the teleworkability of each profession by relying upon INAPP (ICP) and ISTAT (Forze di Lavoro) data (years: 2016, 2017, 2018)

Covid-19 risk

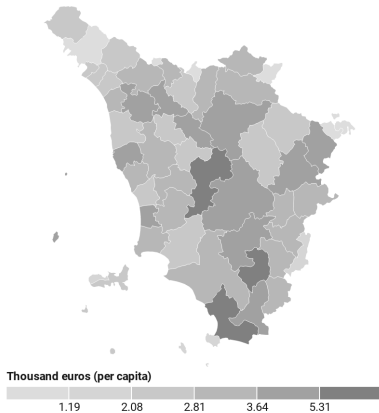
1. INAPP survey: exposure to infections, physical proximity
2. No substitution among dimensions: Covid risk index as a $\max(x, y)$; alternative: the two dimensions are kept separated so as to capture two different aspects of Covid related risk
3. Matching with FDL survey in order to get sectors of employment at the regional level
4. We considered as at risk the occupations displaying a risk index above the average

Remote work

1. INAPP survey which captures different aspects of working life at 5 digits level
2. Teleworkable professions at 4 digits as identified in Duranti et al. (2020): <http://www.irpet.it/wp-content/uploads/2020/06/cr-covid-19-n-1-29-05-2020-1.pdf>; alternative: index built as in Barbieri et al. (2020)... however: they allow for substitution among dimensions...
3. Matching with FDL survey in order to get sectors of employment at the regional level
4. We then considered as at risk the employees i) with a Covid-19 risk above the average and ii) who cannot work from home

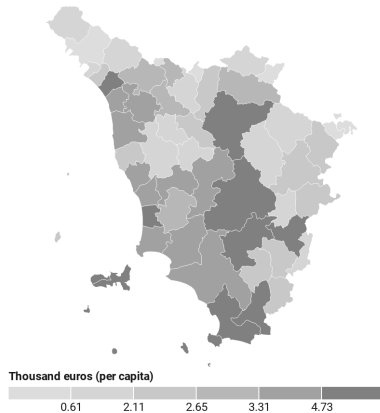
Economic exposure: examples

Food



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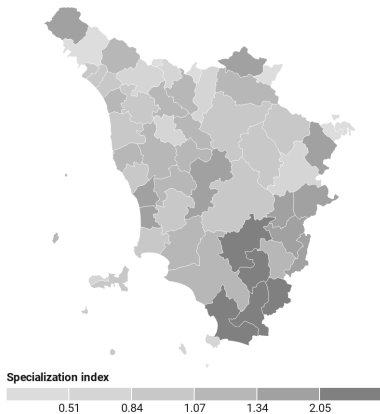
Accommodation and restaurants



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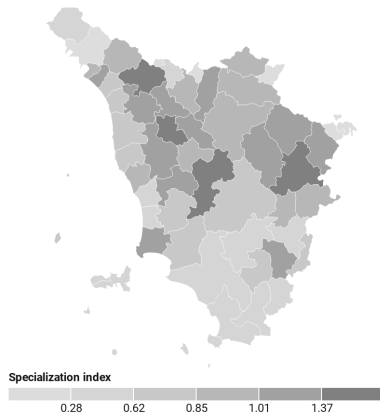
Economic exposure: territorial specializations

Essential goods and services



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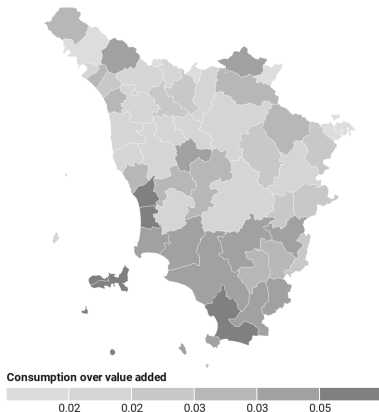
Exports



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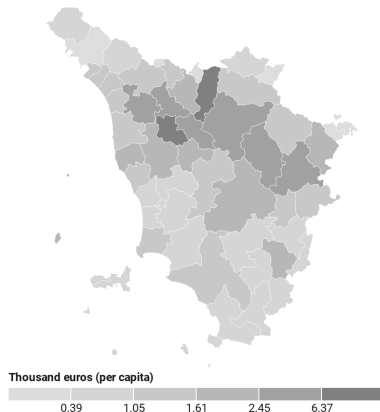
Places of consumption vs. places of production

Clothing: consumption



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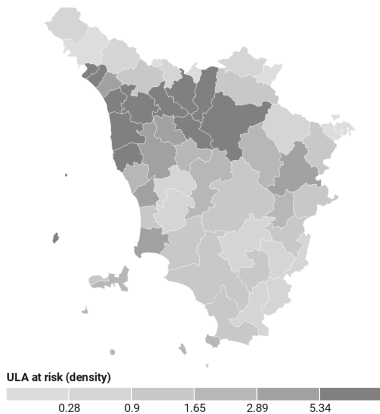
Clothing: production



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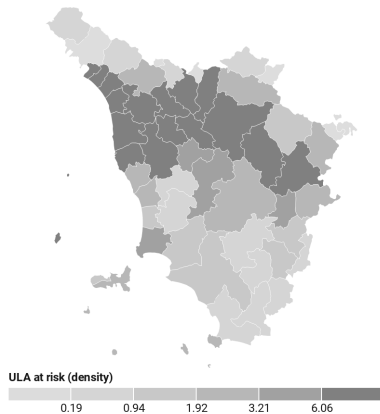
From economic vulnerability to health risk

Essential goods and services



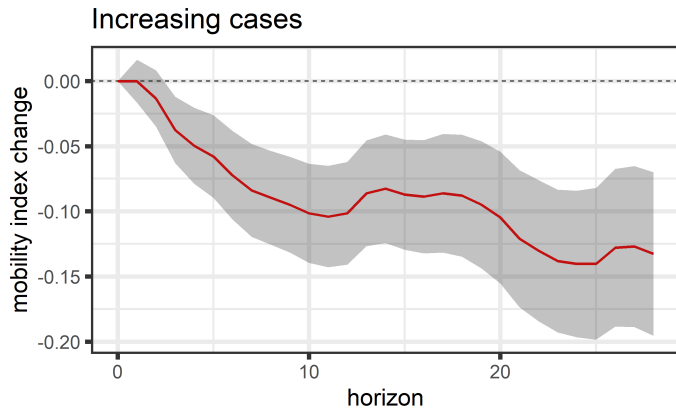
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Exports



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A trade-off between health and the economy?



Discussion

- We assessed the economic and the health exposures to the Covid-19 of Tuscan LMAs via a value chain approach
- In order to do that we linked places of consumption and those of production
- From our analysis a heterogeneous economic exposure at the territorial level emerged
- As to the health risk, this was particularly high in densely populated LMAs, especially those combining high daily mobility with a high level of high-contact activities

Beyond the pandemic: Covid-19 as a natural disaster

- A bunch of extensions dealing with
 - the impact natural disasters
 - the impact of FDIs, firms bankruptcies and relocations
 - digitization and green transition
- ..through the building of micro-macro links via agent- or quasi-agent based models (and inter-LMAs models for all Italian NUTS2 regions)
- and an extension to commuting data and inter-LMAs wage flows