On the economic and health impact of the Covid-19 on Italian regions

A value chain approach

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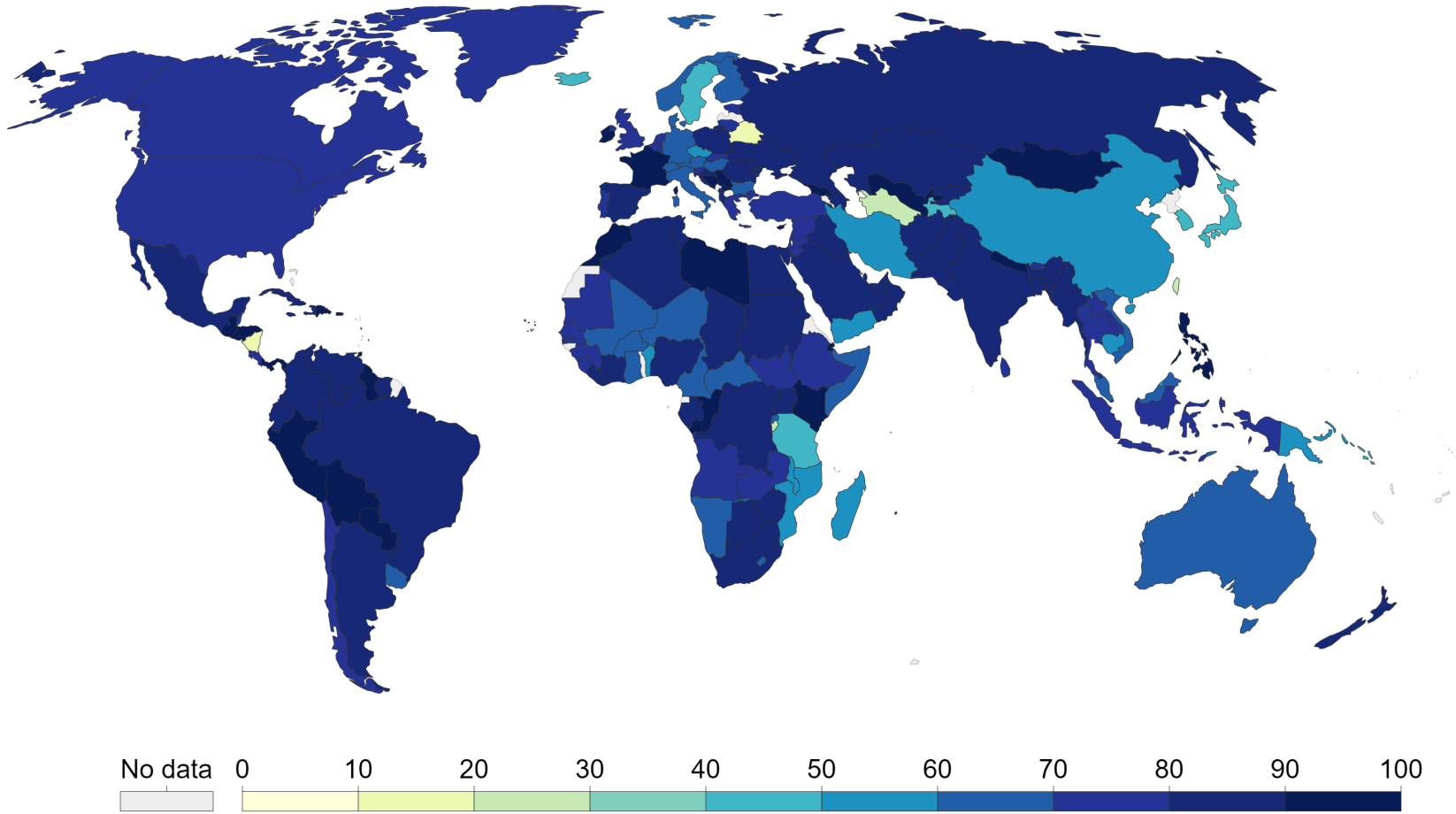
COVID-19: Government Response Stringency Index, May 7, 2020

The Government Response Stringency Index is a composite measure based on nine response indicators including school closures, workplace closures, and travel bans, rescaled to a value from 0 to 100 (100 = strictest response).



Source: Hale, Webster, Petherick, Phillips, and Kira (2020). Oxford COVID-19 Government Response Tracker – Last Updated 5th June.
Note: This index simply records the number and strictness of government policies, and should not be interpreted as 'scoring' the appropriateness or effectiveness of a country's response.
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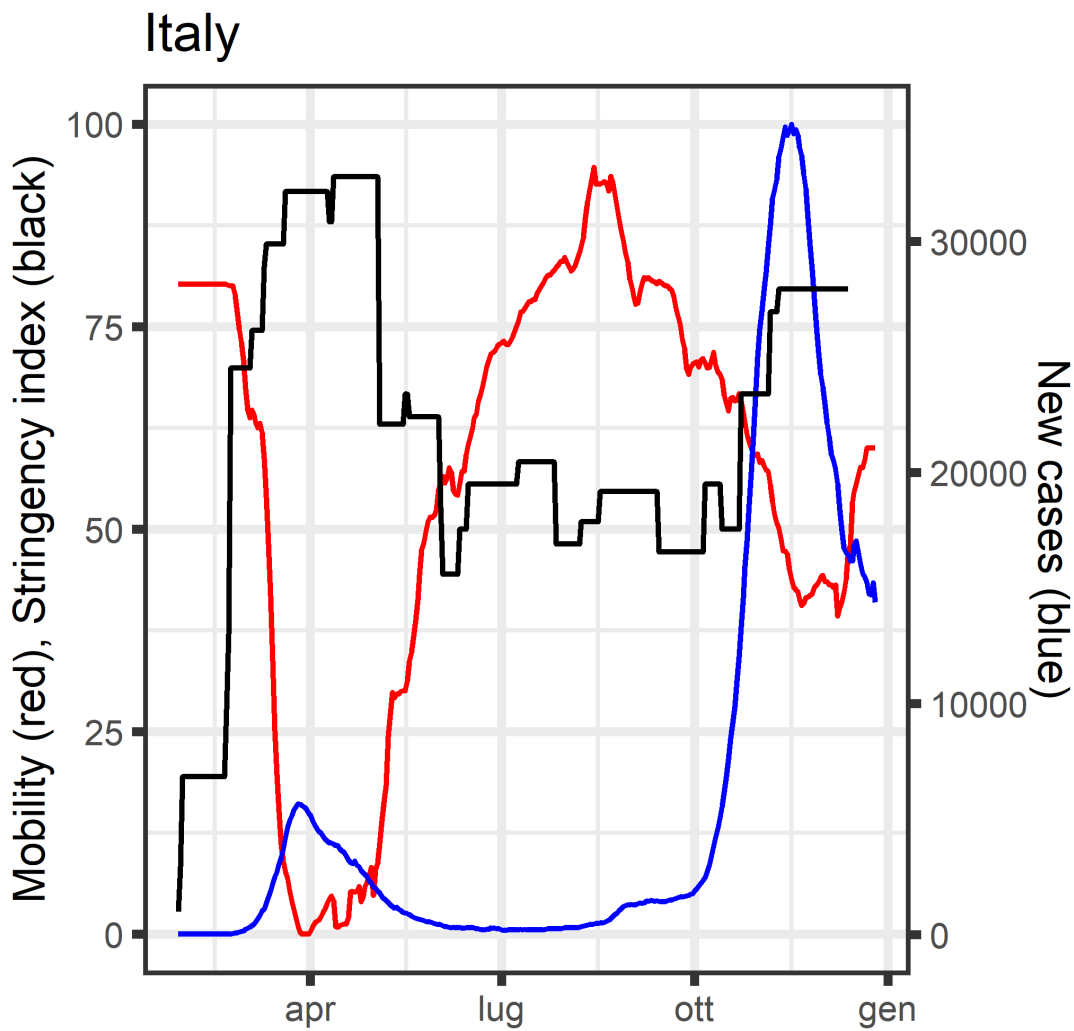
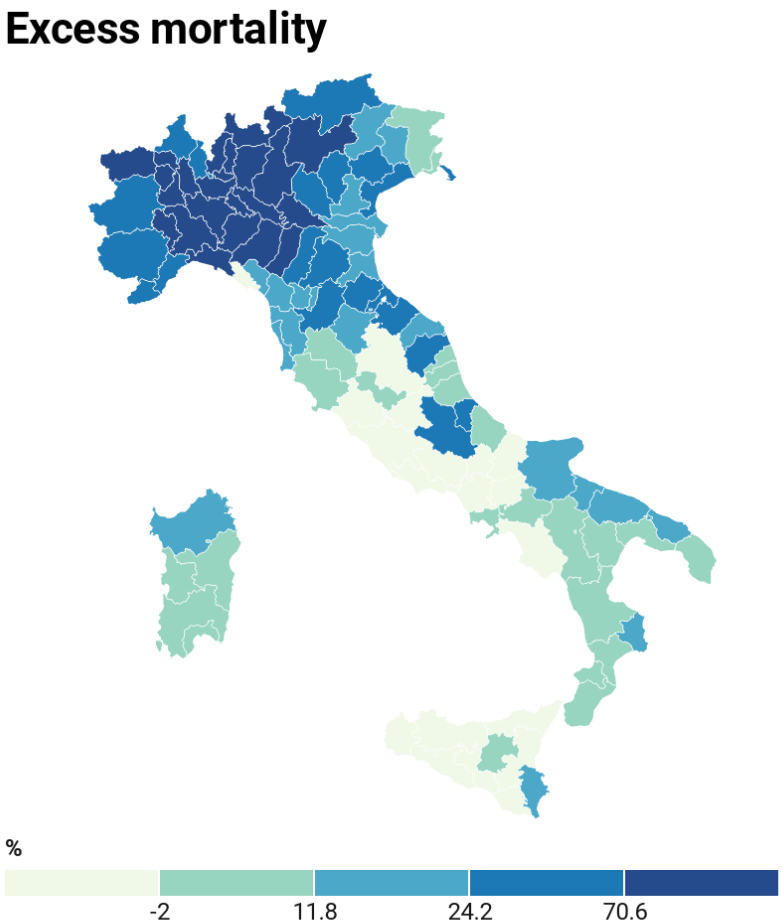
Italy: Covid-19, containment measures and mobility



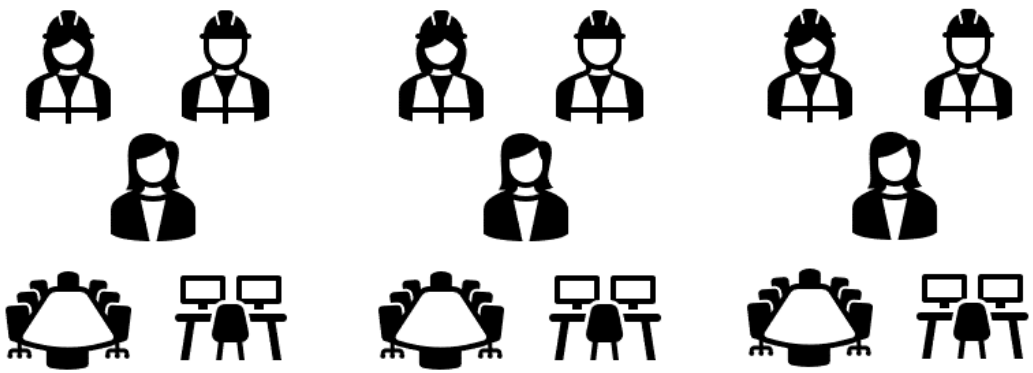
The demand for a regional and sectoral approach



The demand for an interregional-intersector approach

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

Localized final demand activates geographically dispersed production

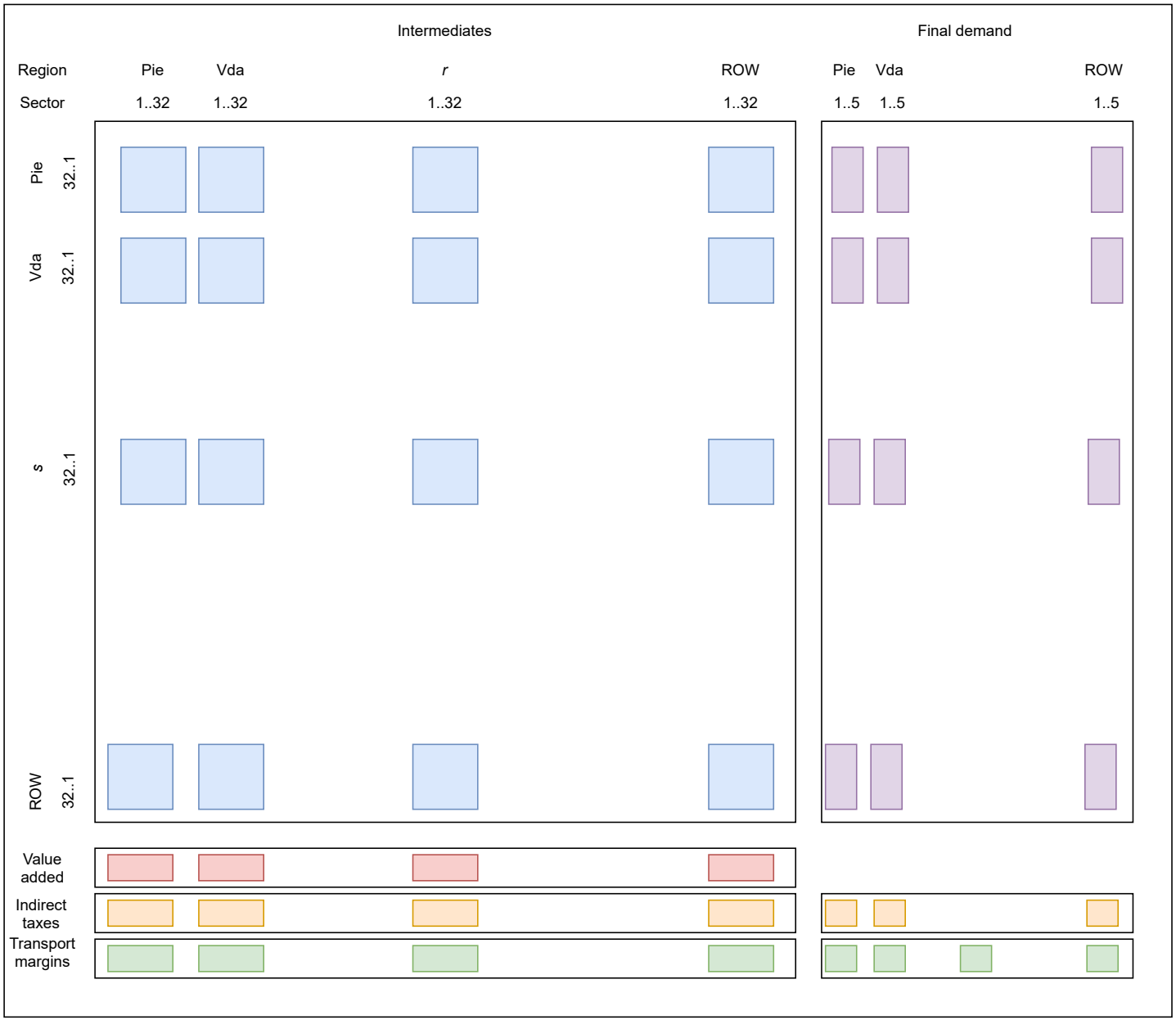


Each production step can be thought as a collection of tasks, each characterized by a different degree of contagion risk, as well as a different remote work potential

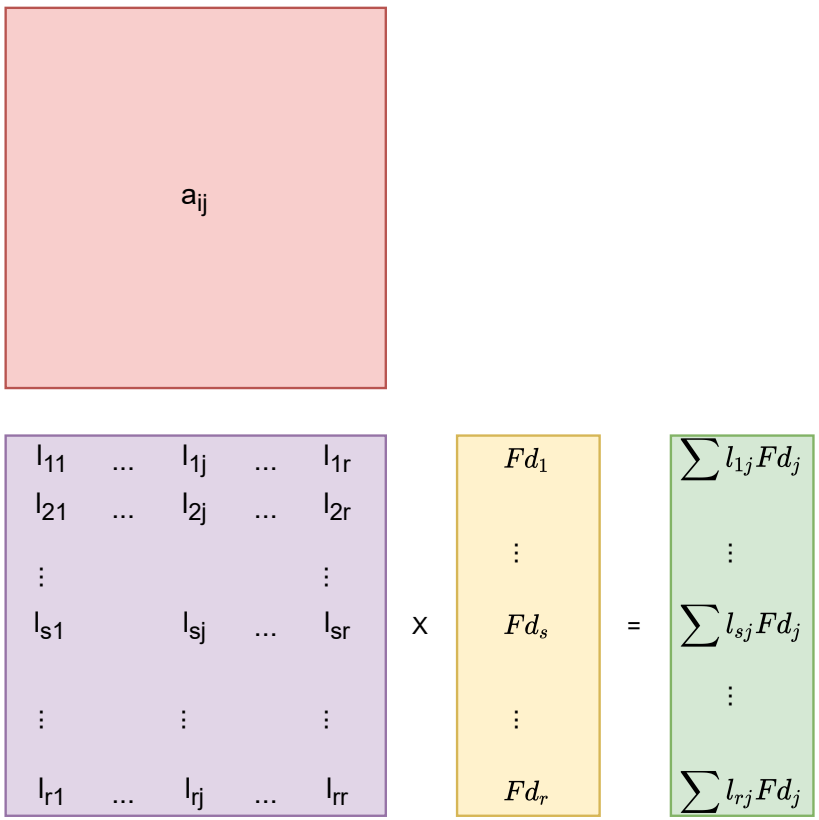
Our work in a nutshell

1. We build up interregional 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 region 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
4. We explore the correlation between economic exposure and health risk
5. We run a policy experiment simulating the impact of non-essential goods and services value chains closures in red regions during the second wave

The IRPET-ICIO database, 2015



The value chains through the Leontief inverse



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

$$(I + A + A^2 + ... + A^n)Fd$$

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

The value chain

$\Leftarrow$ The activation of each sector/region to directly/indirectly serve final demand needs

Our value chains

Internal consumption	*Essential*	*Medium*	*Others*
	Food	Communication	Clothing
	Beverages	Housing	Furnishing
	Health	Transport	Recr. & culture
		Education	Restaurants & hotels
			Misc.
Internal investment	Construction investment		
	Other investment		
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, Lituania, Luxembourg, Latvia, Mexico, Malta, Netherlands, Norway, Poland, Portugal, Romania, Russia, Slovakia, Slovenia, Sweden, Turkey, Taiwan, US, Rest of World		

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)

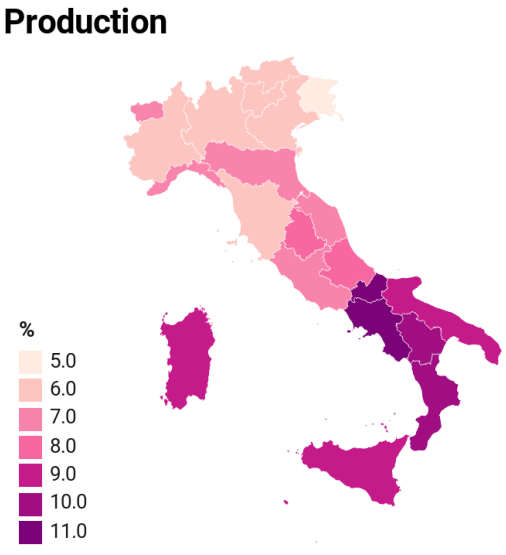
Covid-19 risk

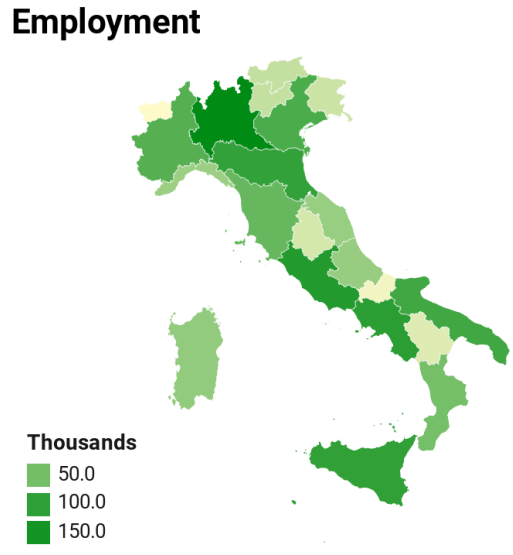
1. INAPP survey: exposure to infections, physical proximity
2. No substitution among dimensions: Covid risk index as a $max(x, y)$; alternative: the two dimensions are kept separated so as to capture two different aspects of Covid related risk
3. Matching with FDL survey in order to get sectors of employment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

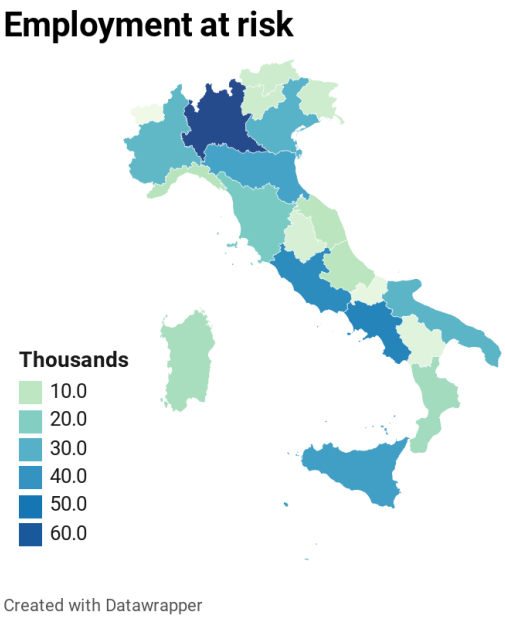
Remote work

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

The food value chain

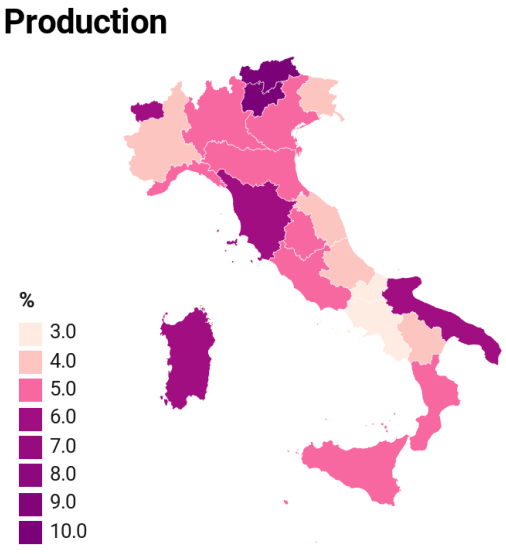


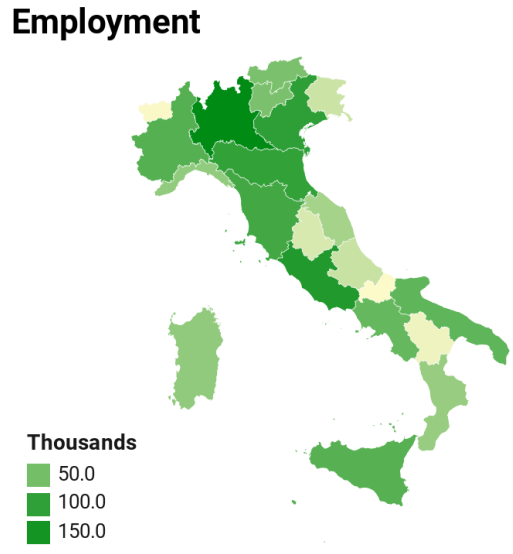


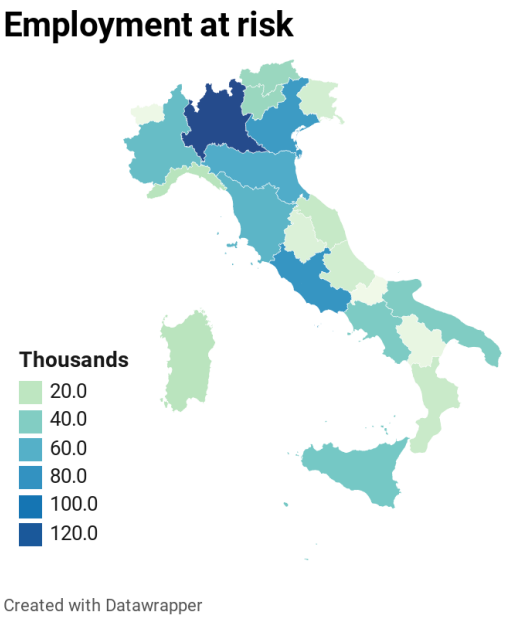


- More than 1 million of employees
- A large share of employment in manufacturing...
- ... and 37.0% of jobs at risk

The accommodation and restaurant value chain

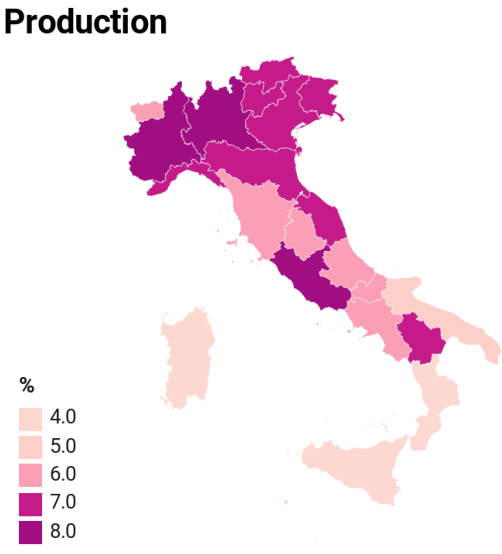


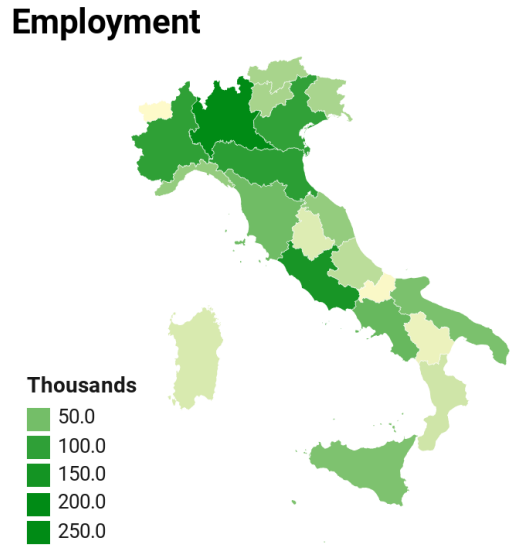


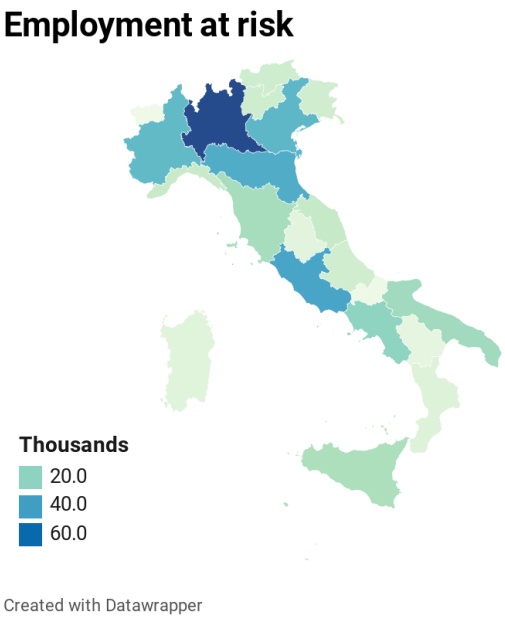


- More than 1 million of employees
- A large share of employment in service sectors...
- ... high Covid risk and low teleworkability (66.9%)

Non-construction investment

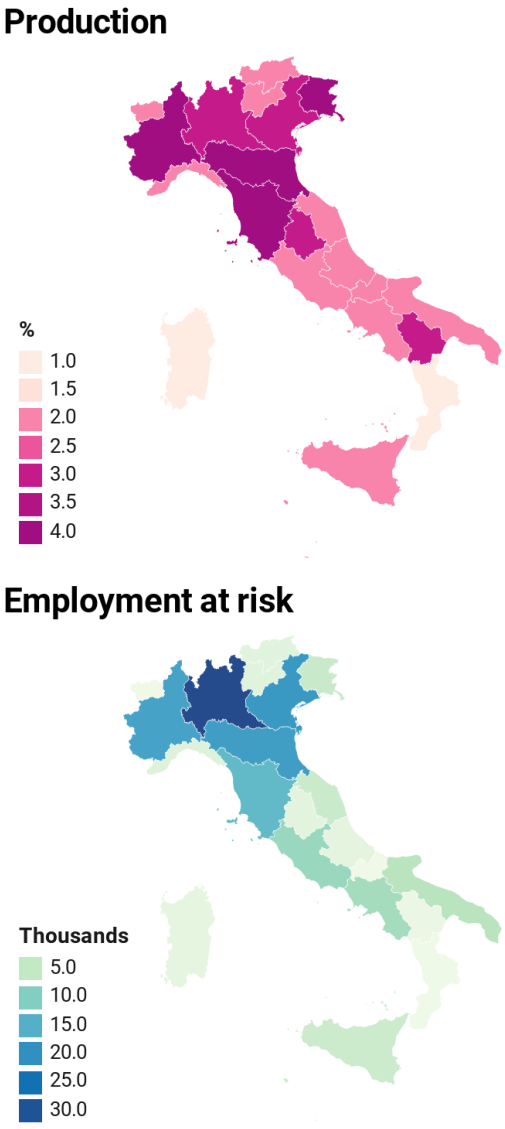


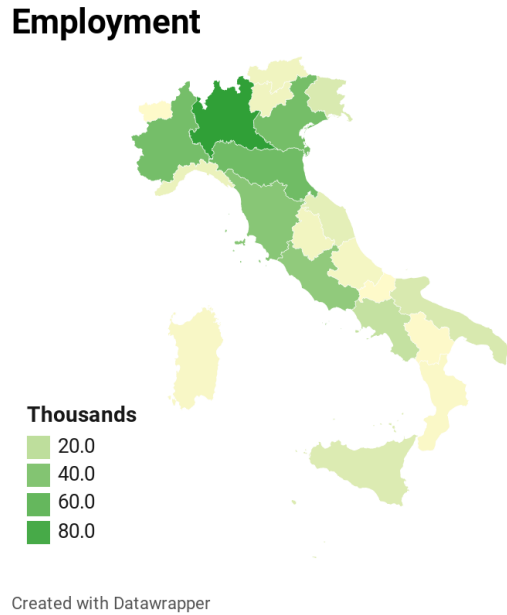




- 1 mil. of employees, mostly in the North
- large share of manufacturing jobs
- less than 1 third of employment at risk

Exports: US





- 400 thousands employees, mostly in the North
- large share of manufacturing jobs..
- 1 third of employment at risk

Economic exposure: a summary

Region	*value-chain group*					
	(1)	(2)	(3)	(4)	(5)	(6)
Piedmont	9%	15%	16%	6%	8%	34%
Aosta Valley	10%	18%	17%	12%	6%	18%
Lombardy	9%	14%	18%	6%	8%	35%
Trentino Südtirol	9%	14%	21%	11%	7%	21%
Veneto	9%	14%	17%	7%	7%	35%
Friuli Venezia Giulia	9%	14%	18%	6%	7%	31%
Liguria	11%	20%	16%	7%	7%	24%
Emilia-Romagna	11%	14%	16%	6%	7%	34%
Tuscany	9%	16%	19%	7%	6%	30%
Umbria	12%	17%	19%	8%	6%	22%
Marche	11%	16%	20%	7%	7%	26%
Lazio	11%	17%	20%	8%	8%	18%
Abruzzo	12%	16%	16%	10%	6%	23%
Molise	16%	18%	16%	10%	6%	14%
Campania	15%	17%	17%	8%	6%	15%
Apulia	13%	20%	19%	8%	5%	15%
Basilicata	14%	15%	15%	12%	7%	22%
Calabria	15%	22%	18%	9%	4%	5%
Sicily	14%	24%	17%	7%	4%	9%
Sardinia	13%	20%	17%	8%	4%	16%

(1): Essential goods and services; (2) Goods and services of medium necessity; (3) Other goods and services; (4) Construction investment; (5) Other investment; (6) Exports

Employment at risk and remote work potential

Region	*Food & beverages*			*Restaurants & hotels*		
	Employees	at risk	but can telework	Employees	at risk	but can telework
Piedmont	70	48%	19%	72	78%	9%
Aosta Valley	2	53%	15%	4	84%	12%
Lombardy	187	45%	24%	198	74%	12%
Trentino Südtirol	19	48%	19%	45	78%	9%
Veneto	77	48%	20%	103	81%	12%
Friuli Venezia Giulia	18	49%	18%	18	77%	9%
Liguria	25	52%	15%	31	82%	11%
Emilia-Romagna	94	47%	21%	96	75%	13%
Tuscany	60	46%	22%	83	78%	13%
Umbria	15	46%	20%	14	77%	13%
Marche	26	49%	16%	24	78%	8%
Lazio	123	45%	23%	127	72%	14%
Abruzzo	26	50%	18%	19	79%	8%
Molise	6	51%	13%	3	79%	12%
Campania	109	48%	14%	59	78%	10%
Apulia	84	40%	15%	64	72%	11%
Basilicata	12	38%	14%	7	72%	10%
Calabria	49	35%	14%	26	66%	7%
Sicily	100	42%	14%	69	72%	11%
Sardinia	30	53%	13%	31	80%	12%

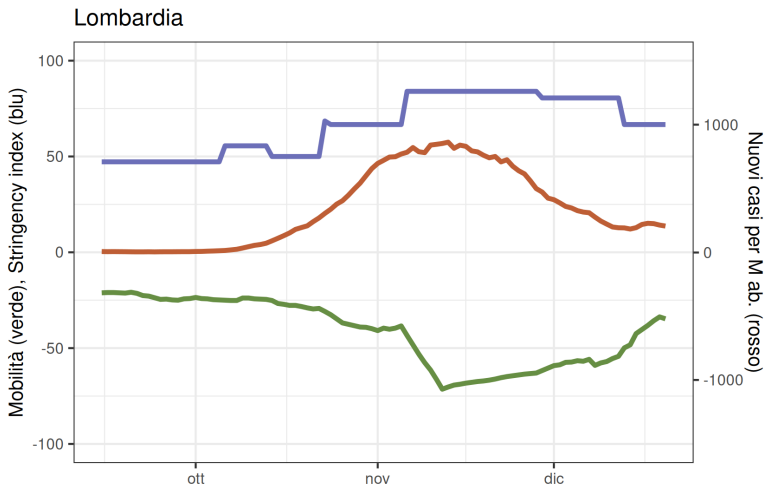
A link between economic exposure and contagion risk?

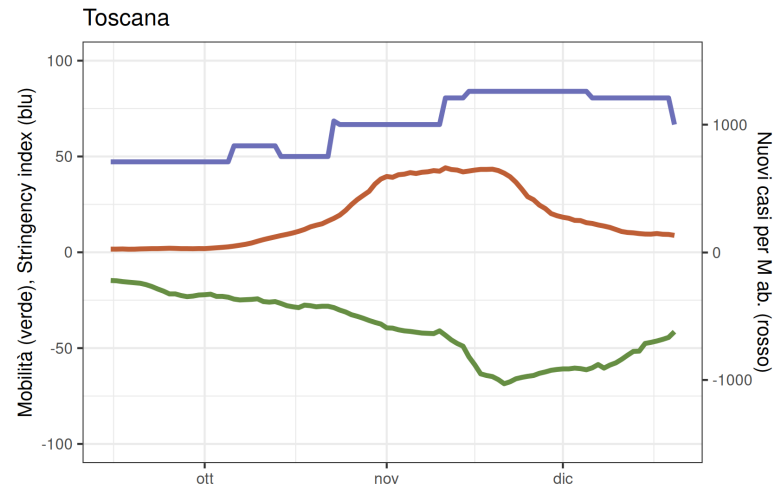
	(1) Workers at risk	(2) Workers at risk (non remote)
Constant	0,551***	0,480***
Beverages	-0,0360	-0,0254
Clothing	-0,235***	-0,166***
Housing	-0,295***	-0,249***
Furnishing	-0,133*	-0,0873
Health	-0,0554	0,0107
Transport	-0,121*	-0,0707
Communication	-0,222***	-0,180***
Recreation & Culture	-0,191***	-0,232***
Education	0,163**	-0,429***
Restaurants & Hotels	0,0408	0,0986*
Misc.	-0,213***	-0,158**
Spec.	-0,0954**	-0,0678**
Beverages x *Spec.*	-0,169*	-0,121
Clothing x *Spec.*	0,209***	0,158***
Housing x *Spec.*	0,132**	0,0950**
Furnishing x *Spec.*	0,0439	0,0119
Health x *Spec.*	0,185***	0,103*
Transport x *Spec.*	0,0560	0,0213
Communication x *Spec.*	0,00646	0,0712
Recreation & Culture x *Spec.*	0,0912*	0,0644
Education x *Spec.*	-0,0816	0,0730
Restaurants & Hotels x *Spec.*	0,107***	0,0765**
Misc. x *Spec.*	0,0794*	0,0584*
Business services	0,0817	-0,164*
Personal services	0,174***	0,124***
N	240	240

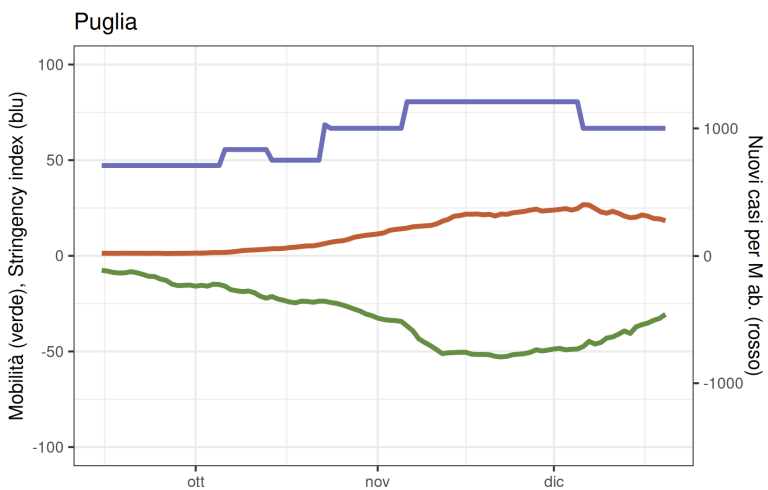
Policy experiment: red zones and second wave

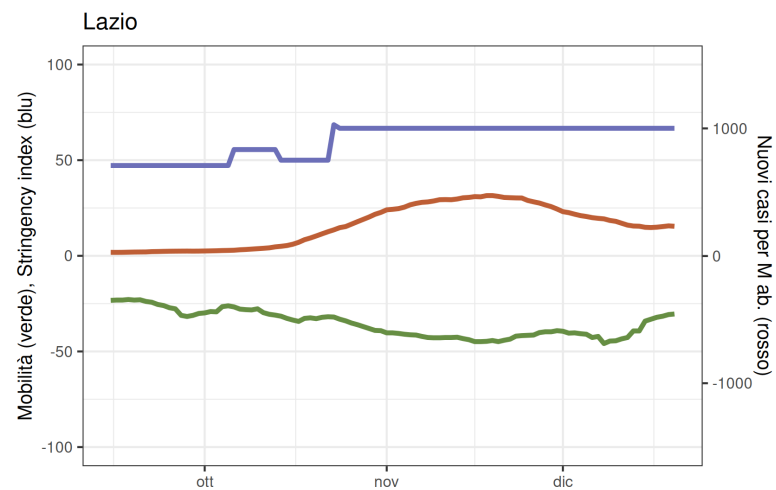
- We simulate the impact of shutting down non-essential goods and services value chains in red regions
- We also push remote work up to full potential in all Italian regions
- We evaluate the economic loss associated to value chains closures
- We estimate the numer of employees preserved from contagion in red regions by value chains closures, remote work, and the by the two policies combined

The second wave in Italy: regional heterogeneity









Policy experiment (1)

Table: Value added loss and employment involvement of closing down non essential consumption value chains in Piedmont, Aosta Valley, Lombardy, Trentino Südtirol, Tuscany, Campania and Calabria for 4 weeks

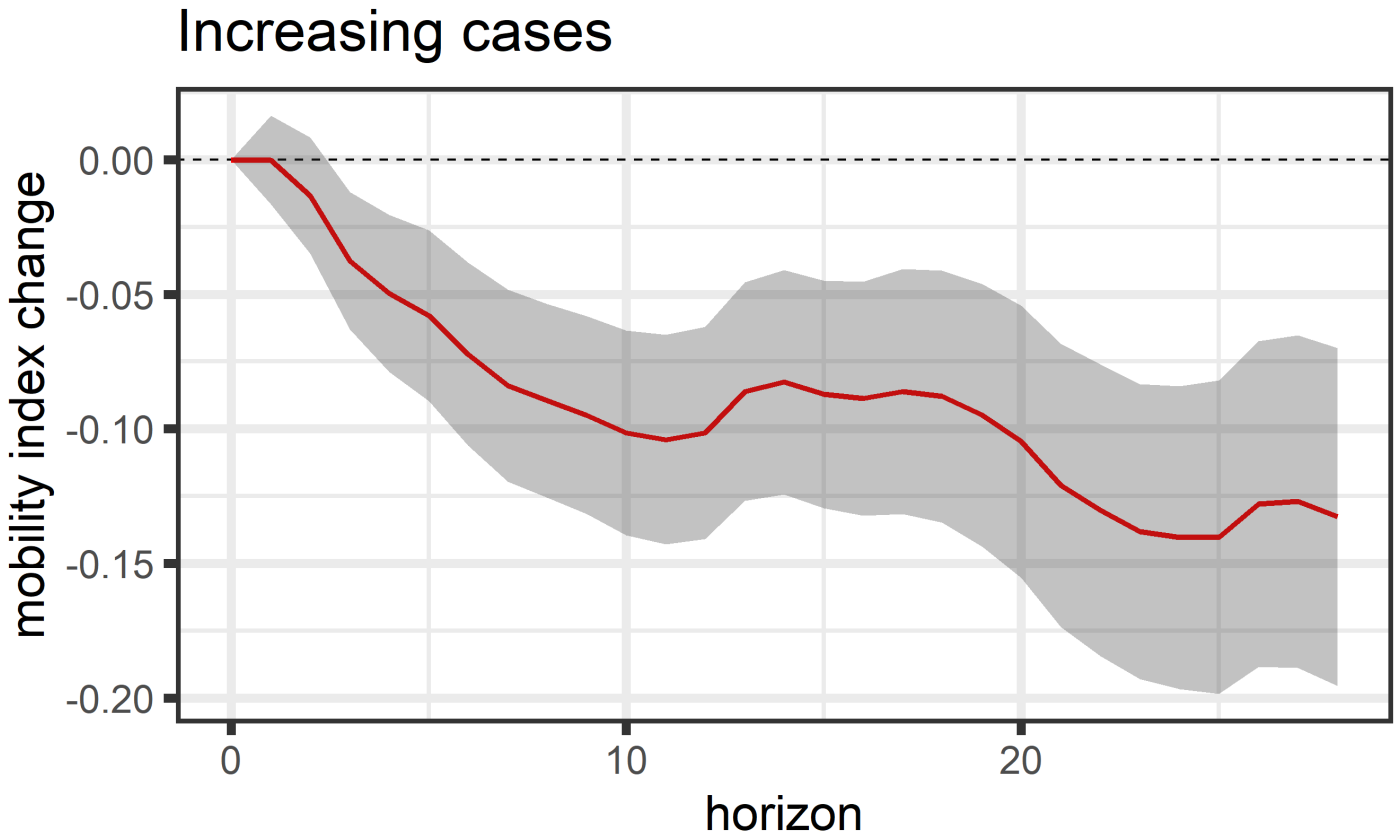
Region	Value added loss (%)	Employment (thousands)
Piedmont	1,2%	202
Aosta Valley	1,3%	7
Lombardy	1,3%	547
Trentino Südtirol	1,6%	73
Veneto	0,2%	30
Liguria	0,2%	7
Friuli Venezia Giulia	0,3%	13
Emilia-Romagna	0,2%	49
Tuscany	1,3%	173
Umbria	0,2%	6
Marche	0,2%	19
Lazio	0,3%	81
Abruzzo	0,1%	12
Molise	0,1%	2
Campania	1,2%	159
Apulia	0,1%	29
Basilicata	0,2%	4
Calabria	1,2%	62
Sicily	0,1%	28
Sardinia	0,1%	4

Policy experiment (2)

Table: Contributions of remote work and value chain closures to COVID-19 risk reduction

Region	*Employees* at risk	*Preserved employees* by remote work	by value chain closures	by both
Piedmont	719	204	115	297
Aosta Valley	26	7	5	11
Lombardy	1.745	543	300	776
Trentino Südtirol	217	59	49	101
Tuscany	632	179	108	265
Campania	724	225	95	303
Calabria	232	76	36	105

A trade-off between health and the economy?



Preliminary discussion

Our method can be interpreted as a toolkit:

1. for **reopening the economy**. We can monitor the number of workers involved in the activities involved in specific supply chains with respect to information on the spread of the virus
2. for **shutting down the economy**. Given a certain production that we want to be able to maintain, we can minimize the level of people at risk COVID-19 put into circulation to reach that level, appropriately choosing which supply chains to close; and which ones to keep open
3. for **measuring the potential loss**. The work returns the image of a fabric of intense relationships between various territories and this allows to evaluate to what extent the various places are exposed to asymmetric shocks, expressing what could be a potential damage deriving from a change in the final demand, internal and external.

Current and future work

1. A simulation model starting from IO tables in order to assess the impact of different lockdown scenarios (see Reissl et al., 2021)
2. Going toward an inter-labor market area approach (Ferraresi et al., 2020)
3. Covid-19 and inequality: e.g., gender inequality (the she-cession)
4. Extension to international value chains, both backward and forward; bottlenecks analysis (for the impact of the Chinese lockdown on Italian regions industrial production see Ferraresi and Ghezzi, 2020)
5. Geographical labor mobility: pressures on public transports; contagion spread
6. Adding contagion data and epidemiological models: the timing of intervention