

**“Sustainable Smart, Cognitive Cities, Regions & Communities and Tech for Good” and
“From Industry 4.0 (merging of virtual, physical and biological) to Industry 5.0 (interaction and
collaboration between humans and machines)”**

How ‘zoomshock’ is transforming work, geography and society

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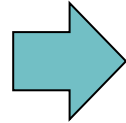


*Third Millennium Governance, Denmark
Danish Technological Institute
City Facilitators, Denmark
Galway University
Bradford University*

Lessons being re-learned: off-site worker productivity and environmental rebounds

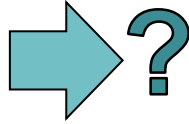
TELEWORKING EARLY 2000s

- Regular: **5%** EU employees (2000)
- Regular: **8%** EU employees (2009)

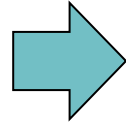
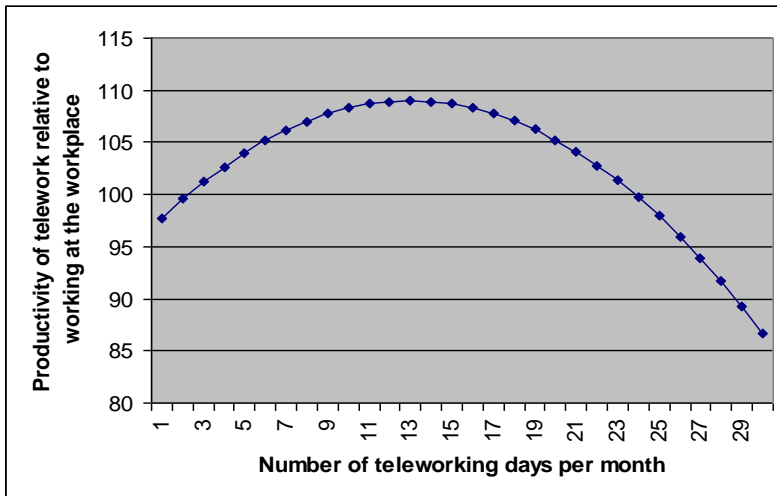


HYBRID WORKING 2019-2020

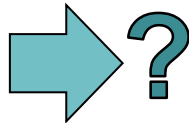
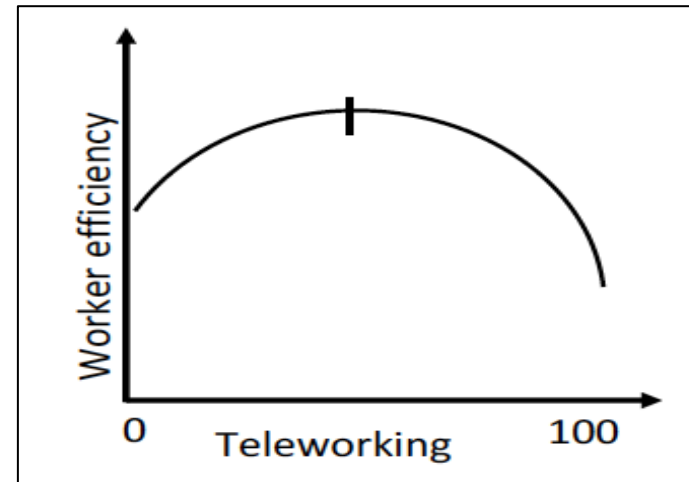
- Regular: **11%** EU employees (2019)
- Full-time: **40%** EU employees (2020)



WORKER PRODUCTIVITY



WORKER PRODUCTIVITY

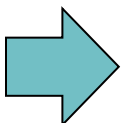


Millard et al (2005)

OECD (September 2020)

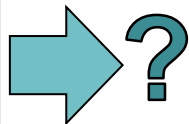
ENVIRONMENTAL IMPACT

Distance driven in private car yesterday (2005)	
Commuter (non-teleworker)	38 km
Teleworker on days working at home	48 km
Teleworker on days working at workplace	60 km



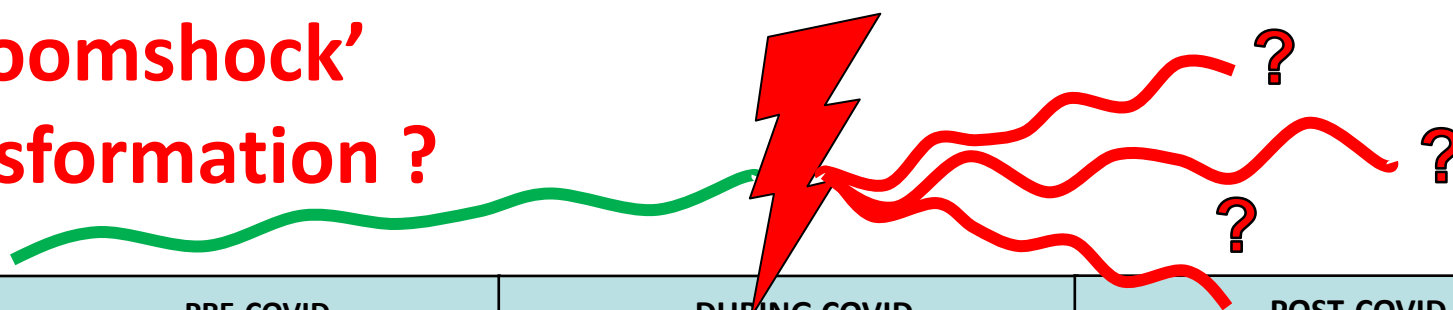
ENVIRONMENTAL IMPACT

REBOUND EFFECTS “..trade-off effects observed between work and non-work trips, which increase CO2 emission levels ... Contrary to the generally accepted idea that commuting trips have a greater environmental impact ... non-work trips account for a significant share of CO2 emissions.”
(Cerqueira et al, 2020)



Millard et al (2005)

'Zoomshock' transformation ?



	PRE-COVID	DURING COVID	POST-COVID ?
SYSTEM CONTEXT OF WORK	<ul style="list-style-type: none"> • Technology-driven • Incremental innovation • Evolutionary, piecemeal top-down work organisation change • Stable labour market initially, increasingly replaced by tech-enabled global outsourcing with significant worker exploitation, 'gig' work, etc. • Both internal & external structural adjustments based on largely predictable responses • Experimental moves to suburban /rural 'telecentres' & hot-desking; while commuting & agglomeration continue to grow 	<ul style="list-style-type: none"> • System shock-driven, technology enabled • Extreme disruptive innovation • Fast, systemic and uncoordinated bottom-up and top-down work organisation change • Highly unstable labour market with c. 40% unemployment & furloughing • Both internal and external structural tipping points based on largely risk reactive responses • Major shut down of city and suburban centres and, plummeting city-centre commercial real-estate values 	<ul style="list-style-type: none"> • Combination of multiple environmental, societal, geo-political and technology shocks • Ubiquitous innovation • Continuous systemic, radical & multi-directional work organisation change • Highly variegated labour-market, significant re-shoring, opportunity for 'open strategic autonomy' • Both internal & external structural change based on resilience-seeking responses • Spatial mixing of work & population; renewed focus on co-working centres, hot-desking away from cities; merits of agglomeration questioned ??
WORK DEVELOP- MENT	<ul style="list-style-type: none"> • Largely voluntary, selective and low telework uptake from 5% in EU 2000 to about 11% in 2019 • Mainly home-based telework with beginnings of mobile telework Telework uptake mainly in highly advantaged demographics and highly specialised job types with others largely left out. 	<ul style="list-style-type: none"> • Largely coercive and widespread telework uptake, 40% plus of working population • Almost all home-based telework • Telework uptake across most demographics and all relevant job types, but mainly only highly advantaged enjoy benefits whilst many more disadvantaged often only experiencing disadvantages 	<ul style="list-style-type: none"> • Hybrid uptake approaching 100% • Mainly 'hybrid work' and 'working from anywhere', with strong return to mobile and flexible work. • Uptake across almost all demographics & job types, but still with threat of 2 classes of workers: the advantaged enjoying the benefits, with a (large) minority of most disadvantaged who experience mainly disadvantages