New Wine in an Old Wineskin? – How Technology Changes affect both How and Why we Regulate

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Outline

• Background.
• Some basics – the standard regulatory challenges.
• What’s changed? – how new technologies are becoming increasingly disruptive.
• Some case studies:
  – Transport;
  – Electricity;
  – AI/Labour – “future of work”.
• Implications for regulation.
Background

• “DNA” of presentation comes from three areas of interest:
  – Electricity reform;
  – Transport futures thinking – e.g. looking out 10-20 years;
  – Impact of alternative ownership forms on organisation and regulation of imperfectly competitive industries.

• Bottom line – pace and nature of technology changes fundamentally change how and why we regulate, with possibly unexpected (and undesirable) consequences.
Background (cont’d)
Basics – The Standard Regulatory Challenges

• Draws on Evans and Meade (2015), Regulation 2025: Spectrum of Regulatory Responses.

• Regulation conventionally justified due to “market failures”:
  – I.e. features of private exchange that cause private choices to diverge from socially-desired ones;
  – Examples – pollution, vehicle safety, “public goods”.

• In practice, this idealistic view tempered by reality:
  – Regulators fail too (information/incentive problems, capture by interest groups, poor regulatory tools, etc).

• Question is: will regulating to remedy a market failure do sufficiently better (or worse) than not regulating?
The Standard Regulatory Challenges (cont’d)

• Related question – what type of regulation might be useful?
  – Old school “command and control”, or “market-based”?
  – Process-based (prescriptive), or performance-based?
  – Centralised, or decentralised (e.g. self-regulation, or risk-based regulation)?
  – By sector (e.g. road transport) or by activity (e.g. safety)?

• At any point in time, technologies determine the types of problems regulators confront:
  – Drones crashing into helicopters only a recent problem ...

• Technologies also affect the tools regulators might use:
  – Drones for remote monitoring/enforcement ...
The Standard Regulatory Challenges (cont’d)

• One dichotomy of particular relevance to innovation – process- vs performance-based regulation, e.g.:
  – Cars should have catalytic converters (process) vs cars should emit no more than x ppm of CO (performance).

• *Process* regulation relatively simple/cheap to specify, implement and monitor (for compliance):
  – But locks in a given technology – what if cheaper technologies emerge for removing CO?

• *Performance* regulation much harder to implement (how to monitor and judge performance of different technologies?):
  – But, better preserves/creates incentives to innovate ...
The Standard Regulatory Challenges (cont’d)

- Some bigger questions to address – what is it that regulation is even trying to achieve:
  - Whose preferences/interests are to be served?
  - How do we balance conflicting preferences/interests? – e.g. young vs old, incumbents vs entrants.
  - How do we preserve incentives to invest? Or to innovate?
  - How much innovation does society really want, and how much risk is it willing to bear with new technologies?
- And in a world of increasingly globalised technology, how much can we influence that technology, and how much freedom do we have to choose our own course?
Why are new technologies so disruptive?

ICT & Internet of Things/Everything

Transport

Electricity

Labour (etc)
Why are new technologies so disruptive? (cont’d)

• The industrial revolution turned industry and society on its head – changing transport and manufacturing technologies redefined what we do, and where we live, work and play.

• What we are witnessing is a pace and type of innovation that is far more wide-reaching:
  – Underpinned by ubiquitous communication technologies that – due to interconnection – diffuse across countries, sectors and individuals;
  – Snowballing improvements in technologies, with feedback – the more you do here, the more you can do there (and vice versa); and
  – Human monopoly on ideas/thinking under challenge.
Why are new technologies so disruptive? (cont’d)

• New technologies underpin new business models which, at their heart, are just decentralised digital market-places:
  – Uber/Lyft, AirBnB, trading spare electricity, etc – price signals affecting choices in wider spheres of activity.

• They give rise to “prosumerism” and “sharing”:
  – Traditional supply/demand boundaries become porous and dynamic – redefines effective supply, and hence “reliability”;
  – Prosumers become the “frenemies” of traditional suppliers and users (cf taxis and passengers)
Why are new technologies so disruptive? (cont’d)

Sell and/or buy services – i.e. PROduce or conSUME those services

Mechanism for matching buyers and sellers, using prices to unlock “latent capacity” – i.e. a “market”.

Disruptive technologies – Transport

• Autonomous vehicles (AVs) – people and freight – reduce:
  – Travel time costs – travel more, and farther;
  – “Last mile” costs – move more freight, faster, with just-in-time mobile manufacturing, and on-the-fly pan-modal logistics, ...;
  – Less possibility of (real-time) human error – travel faster ...

• Real-time tracking technologies enable real-time pricing and greater private infrastructure provision, delivery on-the-fly, ...

• On-demand passenger services disrupt “public transport”.
• VR teleconferencing/tourism – change why we move (or not).
Disruptive technologies – Electricity

• Traditionally dominated by large generators (economies of scale), with energy transported to demand by long-distance by grid and local distribution (both monopolies):
  – Customers just the end of the supply chain.
• Small-scale photovoltaic panels (PVs) and battery storage (including electric vehicles, EVs) becoming economic:
  – Customers can become prosumers – competing with rest of supply chain, or complementing it (dynamically, and actively);
  – Trading to become more decentralised (vs through organised centralised markets) and algorithmic – disintermediation, financialisation ...
Disruptive technologies – Electricity (cont’d)

Falling PV costs …

… and falling battery/EV costs (complementary technologies)
Disruptive technologies – Electricity (cont’d)

Figure 8: The “Big Beyond”

Source: Burger et al. (2015), The “Big Beyond”, ESMT.
Disruptive technologies – Labour markets

• “AI”/machine learning technologies already:
  – “Learning” from what people do;
  – Replacing some human functions.

• Depending on who controls or benefits, can (24/7) either:
  – Substitute for people – e.g. low-cost back-office functions, high-risk/undesirable jobs, skilled jobs requiring more costly human resources;
  – Complement people – e.g. making even unskilled people “super-skilled”.

• Immense potential for distributional/political problems, but ludditism less tenable in a globalised world.
Regulatory implications – Transport

• Drawing on Ministry of Transport (2016), Regulation 2025: Scenarios Summary and Key Findings.
• Project involved four futures scenarios to help think about suitable regulatory responses to new technologies.
• Usefully interacted technology possibilities with social attitudes possibilities:
  – Technologies can be seamlessly connected OR siloed;
  – People can be hesitant about new technologies OR embracing of them.
• Leads to four possibilities ...
Regulatory implications – Transport (cont’d)

Seamless Connectivity

Siloed Connectivity

Hesitant Adoption

Novelty-Chasing
Regulatory implications – Transport (cont’d)

Seamless Connectivity

- People *distrust* new stuff, BUT new stuff presents *boundless* opportunity (since new techs play nice together)
- People *love* new stuff, AND new stuff presents *boundless* opportunity (since new techs play nice together)

Siloed Connectivity

- People *distrust* new stuff, AND new stuff presents *limited* opportunity (since new techs don’t play nice together)
- People *love* new stuff, BUT new stuff presents *limited* opportunity (since new techs don’t play nice together)
Regulatory implications – Transport (cont’d)

Seamless Connectivity

Consider the “high-tech” scenario (note: not forecast!) …

- AVs quickly predominate:
  - Road toll “crashes”;
  - Drink and “drive” as much as you like.
- 24/7 “transport on demand” takes over from part-time, owner-operated vehicles:
  - Passenger trips up, but fleet smaller;
  - Less parking required;
  - Risk of “zombie” fleets.
Regulatory implications – Transport (cont’d)

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Vehicle/driver safety compliance now automatic:
  • No WoFs, licences, …
• Technology-based monitoring enables pan-modal, performance-based regulation:
  • “3 laws”* apply across all transport modes;
  • No speed limits, lanes.
• New priorities include:
  • Standards, hacking/mods, system security, spoofing, congestion pricing …

Novelty-Chasing

* 1. Don’t bump into other things. 2. Don’t go where you are not meant to be. 3. Don’t move in an unfit state.
Regulatory implications – Transport (cont’d)

Seamless Connectivity

Ensure safety, privacy, self-determination (etc), subject to facilitating innovation:
→ Rapid and unfettered innovation/uptake.

Hesitant Adoption

Allow innovation, subject to ensuring safety, privacy, self-determination (etc):
→ Tightly controlled and slow innovation/uptake.

Novelty-Chasing

• Regulatory priorities differ greatly, depending on precise interaction of technology and attitudes!
• The “uptake curve” reflects regulators’ choices, not just innovators’ or uptakers’!

Siloed Connectivity
Regulatory implications – Transport (cont’d)

Seamless Connectivity

- Authoritarian regulation to ensure everyone “on grid”, otherwise light-handed/permissive/responsive.
- Enabling primary legislation, otherwise delegated rule-making.
- Rule-making becoming globalised.

Hesitant Adoption

- Greater reliance on traditional, “hands-on”, prescriptive and modal regulatory tools, to make up for rejection of new approaches.
- Reliance on primary legislation, with limited rule-making delegation.
- Rule-making localised (for now).

Novelty-Chasing

Likewise, best regulatory approaches reflect attitudes as much as technology-driven challenges and possibilities.

Siloed Connectivity
Regulatory implications – Electricity

• PVs and batteries are decentralised and intermittent:
  – Cuts across centralised “least-cost” dispatch:
    ▪ Compulsory centralised wholesale market becomes a side show? → move to UK-style self-dispatch?
  – System reliability challenges – how to ensure parties creating reliability problems bear the costs of remedying them (e.g. network reinforcement, standby generation)?
• Depending on price, households et al. could be competing with former “natural monopoly” distributors one minute, and beholden to them the next:
  – Time to revisit lines regulation? How to define markets that change so dynamically? Who should own the kit?
Regulatory implications – Electricity

• With technologies rapidly changing, and uptake potentially sudden, what does “long-term” mean for regulatory asset bases?

• Ironic twist – status quo regulation represents a choice about the speed of new technologies’ uptake:
  – Variable lines charges to recover fixed network costs likely to become spread over a decreasing (and poorer) customer base, as richer customers adopt self-generation;
  – Incentivises richer customers to uptake sooner (because they can), and poorer ones too (because they eventually can’t afford not to).
Regulatory implications – Labour

• Likewise, health and safety rules might hasten AI-based labour substitution in industries with low-income and dangerous occupations.

• Alternatively, AI might simply push humans into roles that machines remain incapable of filling – e.g. high-risk manual ones – potentially exacerbating safety risks.

• AI has potential to reduce human-related problems – e.g. fraud/dishonesty – but what if:
  – Machine-learning simply replicates human foibles, without ability to sanction misbehaving machines?
  – Genuine AI means machines have agency, and potentially make bad choices ... what rights/duties/sanctions?
Regulatory implications – Pan/Cross-sectoral

• The economics of PVs improves greatly with batteries.
• Some uptakers likely to be deterred by the overall cost of PV + batteries.
• But what if those uptakers were about to replace their car, and EVs are a decent substitute for fossil-fuel cars?
  – Bundling the new vehicle decision with the PV investment could make PVs more viable.
• Conversely, having PVs means charging an EV becomes cheaper, making EVs more viable if you already have PVs.
• Clearly there will be increasing complementarities across traditionally distinct sectors – e.g. electricity and transport.
Pan/Cross-sectoral implications (cont’d)

• This means regulation in one sector will affect new technology uptake in the other, e.g.:
  – If variable lines charges accelerate PV uptake, then this could accelerate EV uptake (again, initially by the rich, ultimately by even the poor);
  – If fuel excise duties to pay for roads fall more and more on (poorer) non-EV uptakers, then this accelerates EV uptake (by all), which in turn accelerates PV uptake. (Or we move to RUCs).
• Hence the reverse is also true:
  – PV uptake will affect transport regulation;
  – EV uptake will affect electricity regulation.
• What about algorithmic/disintermediated trading in electricity? – implications for financial market regulation (or vice versa)? …
Conclusions

• Disruptive new technologies are emerging as a joint consequence of choices made by innovators, uptakers and regulators – potentially changing traditional roles/relationships.

• Technology affects the problems we might (de)regulate, but also the tools available to regulators – either enhancing or reducing the case for regulation.

• Status quo regulation represents a choice about the speed of new technology uptake:
  – Valid to ask whether it is the best choice, recognising the importance of social attitudes towards uptake, not just technological possibilities.

• Technology complementarities mean regulation may need to be increasingly activity-based rather than sectoral:
  – While innovation means regulation itself becomes more responsive/permissive, globalised, and performance-based.