

Regulation 2025

Spectrum of Regulatory Responses

cognitus



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1. Introduction

This report provides a high-level review of the spectrum of regulatory responses (i.e. interventions, or approaches) that commonly arise in developed economies. The review is of regulation in general, but with frequent references to transport regulation. The observed spectrum of regulatory responses is explained in terms of technological innovations in both regulated industries and regulation itself, affecting both whether and how to regulate. Hence, the report highlights the main changes of regulatory approaches, and their drivers. The rationales for different regulatory approaches are summarised, as are their pros and cons. Finally, some likely future directions in transport regulation are discussed, including particular reference to the regulatory challenges and opportunities presented by tracking technologies, unmanned vehicles (e.g. driverless cars), and alternative passenger transport services (e.g. Uber).

2. Regulation as Overlapping Forms of Governance

In this report “regulation” refers to deliberate actions taken by government or government agencies to influence the behaviours of producers and/or consumers. This includes coercion, but also softer approaches such as self-regulation and persuasion. As such, regulation can be considered to be a subset of “governance”, which refers to modes of action coordination more generally (Ricketts (2006), Feick and Werle (2010)).

In practice regulation is often classified as either “economic regulation” or “social regulation” (Veljanovski (2010)), although economically speaking there is significant intersection between the two and the distinction is moot. Economic regulation is generally regarded as industry-specific, directly addressing matters such as firms’ pricing, quantity and/or quality of output, industry entry or exit, investment, risk (e.g. security of supply) and industry structure. It typically seeks to introduce administrative solutions where pure market-based solutions are considered to be undesirable. By contrast, social regulation is commonly regarded as addressing other matters relating to producer-consumer interactions. These include protecting consumers against dangerous products or deceptive producers, protecting work conditions and worker safety, and protecting the environment. They also include third-party safety (e.g. protecting pedestrians from drivers), security (e.g. in aviation), and asset protection (e.g. of roads used by heavy vehicles). While the focus of social regulation might not appear directly economic, it can have direct economic consequences, such as on producers’ technology choices and costs. Figure 1 illustrates this commonly-used dichotomy between economic and social regulation (emphasising their overlaps).

Figure 1 – Commonly-Used Dichotomy between Economic and Social Regulation¹



Regulation can be applied to varying degrees. At one extreme is laissez-faire competition. In this case, consumers and producers are free to interact. Government does not seek to influence those interactions beyond providing enabling institutions such as defined ownership rights, contract laws, and courts to resolve disputes. At the other extreme lies comprehensive “command and control” regulation, with government using its powers of coercion to force producers or consumers to act in certain ways. This might even involve direct government ownership of producers, or control over consumers’ consumption decisions (including via prohibitions). In between lie a range of alternatives, involving mixtures of coercion and/or persuasion by government, various ownership models, and otherwise free interactions between producers and consumers.

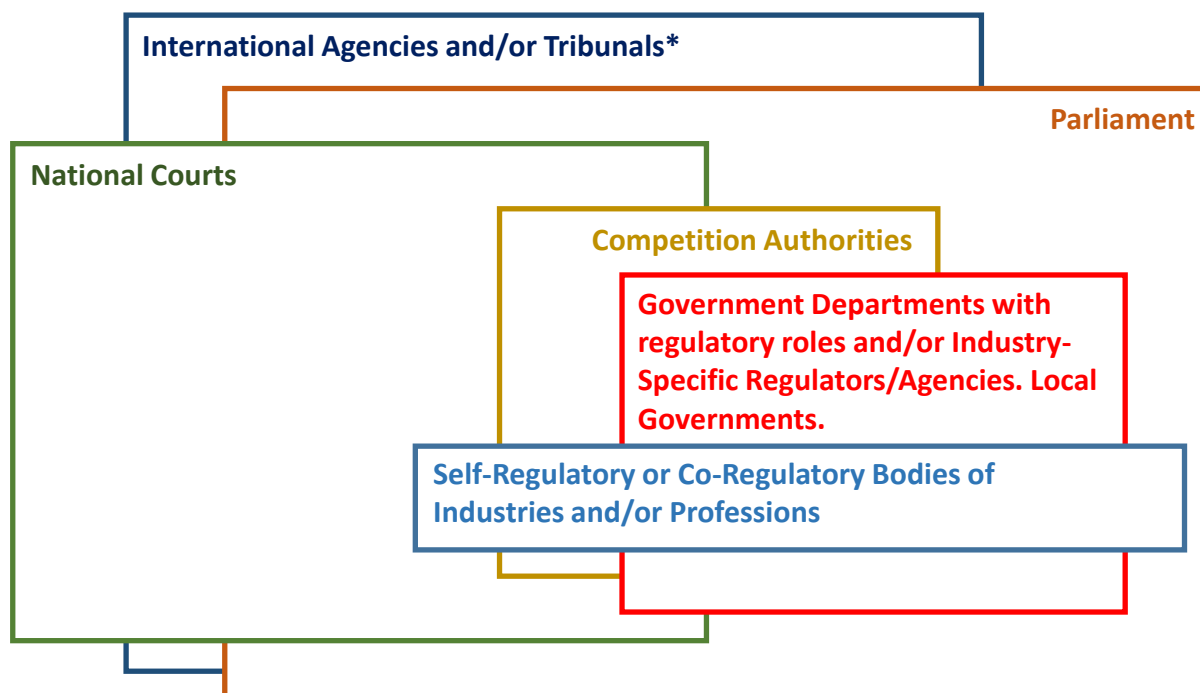
Regulation can be created and enforced at many, possibly overlapping levels. It can be created directly by parliament in the form of legislation, enforced by the courts and other enforcement institutions (e.g. the police, or tax department). Such legislation might implement international agreements (e.g. for aviation security).

Alternatively, regulatory authority can be delegated to specialist agencies (with varying degrees of political independence and discretion). These include government departments and/or specialist industry regulators creating “ex ante” (i.e. before the fact) rules to guide industry conduct. Such regulators can operate in lieu of, or subject to, general competition/antitrust authorities charged with protecting consumers and/or firms by protecting the competitive process itself. They do so by making “ex post” (i.e. after the fact) interventions in response to violations of pre-specified competition rules. They also act ex ante in terms of merger clearances, and by providing guidance to producers as to acceptable or unacceptable conducts. Some or all regulatory authority can be delegated to industries or professions, which then are self- or co-regulatory.

Finally, regulatory laws and regulatory agencies operate alongside the courts, which also implement their own norms for market behaviour (e.g. for honouring contracts, or acting in good faith). Figure 2 illustrates the overlapping, distinct or nested layers of regulatory authority.

¹ The overlaps appear clearer, and the distinction less helpful, when it is considered that economics has many branches. These include not just industrial organisation and the theory of regulation (which are clearly “economic”), but also those dealing with environmental, health, labour and other “social” regulation.

Figure 2 - Overlapping, Distinct or Nested Layers of Regulatory Authority



* Where governments or other national agencies opt into international regulatory regimes.

Rationales for Regulatory Interventions

2.1. Normative Rationales – Why Should We Regulate?

The classical rationale for why regulation should be imposed lay in the perceived need to compensate for some form of market failure (Baldwin and Cave (1999), King (2007), Veljanovski (2010)). One such failure includes the presence of market power (e.g. monopoly), in which price and quantity are predicted to diverge from their socially optimal values. Public goods present another example, in which consumption is non-rival (i.e. one person's consumption does not reduce another's) and non-excludable (i.e. open to all). A consequence of such features is that private production can fall short of socially desirable levels due to free-riding problems (i.e. some consumers might not contribute to public good funding and cannot be excluded from consuming the good).²

Positive or negative “externalities” are also possible causes of market failure. Such externalities arise when production and/or consumption decisions give rise to private benefits or costs that diverge from social benefits or costs. Examples include the production of goods for which producers do not bear the full costs of any associated pollution (e.g. noise or air pollution) or risks to the public (e.g. car crashes).

² The classic (though controversial) public good example is a lighthouse. Once it has been built and is operating, any party can benefit from its services without paying. This inability to exclude consumption makes it difficult for the lighthouse owner to recoup their investment and operating costs, possibly resulting in too few lighthouses being built. When lighthouse users can be charged for usage, e.g. via port fees, this can relieve free-riding and financing problems.

Based only on their private production costs producers are likely to supply more than the socially desirable output level, and hence cause excessive pollution and/or inadequate safety. Another example involves consumption externalities – i.e. when consumption gives rise to benefits or costs to other consumers (e.g. passive smoking).³

Another important class of potential market failures relates to asymmetric or inadequate information. This includes producers having superior knowledge regarding product quality/safety than consumers, or regarding production process safety than workers. Alternatively, it might involve healthcare consumers having better knowledge of their health status than medical insurers. In each case market provision can diverge from the socially optimal, for example with market prices – reflecting assumptions of bad quality, safety or risk – driving good producers or consumers from the market.⁴ Related to this source of market failure is cognitive biases, or decision-makers acting in apparently non-rational ways (e.g. making apparently poor choices even when fully informed).

Finally, missing markets, poor property rights and/or high transaction costs can impede efficient market trading. Such “market failures” can give rise to regulatory interventions to facilitate market trading (Ricketts (2006)), such as through the creation of electricity markets.⁵

2.2. Positive Rationales – Why Do We Regulate?

The normative view of regulation has been criticised for neglecting the facts that 1) regulation itself is often faulty in its conception or application (Ricketts (2006)), and 2) that the availability of regulation induces demand for regulation that benefits special interest groups at the expense of others. Indeed, the US experience of regulation is often one in which regulation is introduced in response to producer demands to limit competition, and has been associated with adverse consumer and producer impacts (Viscusi et al. (2005), Rose (2014), Carlton and Picker (2014)).⁶

As a consequence, positive rationales for regulation allow for self-interested regulators and/or politicians responding to pressure from industry, consumers and other interest groups such as environmental lobbies (Viscusi et al. (2005), Ricketts (2006)). These include the theory of regulatory capture (e.g. regulators becoming beholden to industry). They also include vote-seeking, rather than welfare maximisation, by politicians. Other positive theories of regulation include competing interest groups vying to influence regulation to their own ends, and rent-seeking (i.e. parties vying to capture any excess profits generated by regulation, such as from controls on prices or competitive entry).

³ The “Mohring effect” in transportation is an example, in which passenger transport usage increases the frequency of public transport provision, benefitting other users (Ponti (2011)). Another example is the public health benefits of private vaccination decisions.

⁴ This is the famous “lemons” problem first discussed in Akerlof (1970).

⁵ Distributional concerns such as a desire for all citizens to have access to merit goods such as education or healthcare, regardless of their financial means, can also motivate market intervention.

⁶ For example, the Interstate Commerce Act 1887 was introduced as much to limit competition among railroads as it was to reduce price discrimination among customers. The subsequent Motor Carrier Act 1935 was introduced to control competition against railroads from trucking, but resulted in increased trucker salaries and carriage prices. In airlines, the Civil Aviation Board established in 1938 enabled cross-subsidies from profitable routes so less-profitable routes could be served, but resulted in both excessive prices and quality. Good summaries of regulation in these and other US sectors is given in Carlton and Picker (2014).

One important theme from such theories is that regulation can reflect concentrated interests – with high potential net returns from influencing regulation (e.g. producers) – prevailing over much more diffuse interests having low individual potential net losses from regulation (e.g. consumers).⁷ Box 1 summarises the normative and positive rationales for regulation.

Box 1 – Summarising the Normative and Positive Rationales for Regulation

“Normative” – Why Should we Regulate?

Regulate if the net benefits of regulation, after accounting for the costs of regulation, outweigh the costs of not addressing “market failures”. Such costs can include those arising from:

- **Market power** – e.g. monopoly
- **Externalities** – i.e. costs imposed on third parties
- **Public goods** – i.e. market under-provision due to free-riding on non-exclusive and non-rival goods
- **Information asymmetries** – i.e. market break-down or undesirable behaviour when certain parties are more informed than others
- **Cognitive biases** – i.e. people acting in apparently irrational ways

“Positive” – Why Do we Regulate?

Recognise that real-world regulation, which involves normative motivations, also has a “political economy” dimension:

- **Nirvana view** – wise/benevolent regulators act in society’s best interests
- **Regulatory capture** – producers instigate or influence regulation to protect them from competition
- **Vote-seeking** – politicians create regulations to capture votes
- **Interest groups** – regulation reflects the outcome of rival interests vying to influence outcomes
- **Rent-seeking** – regulation creates excess returns which interest groups fight to secure

3. Main Sources of Variation in Observed Spectrum of Regulatory Responses

3.1. Different Paths taken in the US and Other Developed Countries

Before exploring selected drivers of regulatory developments, it is worth commenting that regulation in the US and other developed countries has taken significantly different paths. An important feature of the US approach is that regulation arose in the context of privately owned producers, with regulation introduced to protect producers as much as consumers (or ending up that way even if not intended).⁸ However, regulation impeding competitive processes often also achieved distributional aims such as airlines servicing unprofitable routes, by enabling otherwise untenable cross-subsidies. This necessitated other regulatory methods such as entry and exit controls, and often regulatory creep into competing sectors.

⁷ Viscusi et al. (2005) discuss the case of the US peanut programme, limiting both peanut imports and the number of US farmers. Over 1982-1987 each of 23,046 US peanut farmers (i.e. concentrated interests) enjoyed a net transfer of US\$11,100 on average, while on average far more numerous consumers (i.e. diffuse interests) paid only an extra \$1.23 each per annum.

⁸ The first industry-specific US regulation was that of railways, via the Interstate Commerce Act 1887. It was soon followed by general antitrust legislation, the Sherman Act 1890 (see Carlton and Picker (2014)).

Deregulation – which in fact often entailed simply a change of regulatory form (i.e. was “re-regulation”, Rose (2014)) – followed periods of poor performance, for producers or consumers.⁹

Other developed countries typically began under a welfare state model, with state ownership of key sectors that otherwise would likely have faced regulation. State ownership was used to achieve distributional aims (as in the US, e.g. through cross-subsidies), and was itself subject to capture by interest groups (e.g. unions). By the early 1980s, after years of poor performance, state sector reforms were initiated in the UK, EU, New Zealand and elsewhere to improve efficiency (Ricketts (2006), King (2007)).¹⁰ These involved privatising state-owned producers, alongside the introduction of varying degrees of regulation. Such regulation was primarily to protect consumer interests, and to promote the development of competition in sectors that had often been state-owned monopolies.¹¹

3.2. Responses to Shocks

One major driver of regulation has been shocks, or the unexpected arrival of new information. These include economic shocks such as the Great Depression, and the Global Financial Crisis. Both resulted in the introduction of strict financial sector regulation. Conversely, macroeconomic shocks such as economic stagflation and fiscal crises have also been drivers of market liberalisation, such as in the US in the 1970s, and the UK and New Zealand in the 1980s.

Regulation-inducing shocks also include unexpected events such as industry disasters. Thus major oil spills, explosions on trains or ships carrying hazardous cargo, or major bus, train or airplane crashes involving significant loss of life, have also spawned regulatory responses. These include clean-up obligations, or tighter controls on transport safety. They can involve political knee-jerk responses, but also reflect accumulated knowledge and considered risk-assessments. Notably, such events result in new or revised international regulation where they involve supranational risks, such as in airline security following the 11 September 2001 attacks.¹²

3.3. Changes in Norms

Changes in social norms (i.e. values, beliefs, customs and traditions) are also drivers of regulatory change. For example, the Great Depression and Global Financial Crisis each resulted in a change in “regulatory mood”, with undermined confidence in market-based approaches resulting in calls for stricter regulation (Viscusi et al. (2005), Baldwin et al. (2010)). Conversely, the rise of neo-liberal politics in the US, UK, New Zealand and elsewhere in the 1980s reduced regulation, and redistribution via pricing policies, in favour of more decentralised governance and economic efficiency. This shift induced deregulation and/or pro-competitive regulation.¹³

⁹ Airline deregulation in the US in the 1970s is credited with spawning other US reforms (Viscusi et al. 2005).

¹⁰ This shift from “welfare state” to “regulatory state” is characterised by a greater emphasis on market-based governance, and the achievement of economic efficiency rather than distributional equity (Ricketts (2006)).

¹¹ New Zealand was unusual for initially relying on general competition/antitrust protections rather than industry-specific regulation, as had been introduced in the UK (e.g. see Evans and Meade (2005a)).

¹² The introduction of lockable aircraft cockpit doors following the 11 September 2001 attacks also illustrates the potential for regulation to induce shocks. In part, the crash of Germanwings Flight 9525 in March 2015 can be attributed to the pilot not having the ability to unlock the cockpit door to re-enter the cockpit.

¹³ Notable figures behind such reforms include Reagan in the US, Thatcher in the UK, Pinochet in Chile, and Douglas in New Zealand.

Regulatory mood changes are often cyclical, with periods of regulatory loosening being replaced with stricter regulation following adverse outcomes under looser regulation. Alternatively, strict regulations are often loosened following sustained periods of poor outcomes under stricter regulation.

Another change in norms affecting regulation is the abandonment of the “nirvana view” that regulation is conducted by informed and benevolent governments (Ricketts (2006)). This view suggested that regulation could completely “cure” economic and social issues. However, by the 1970s experience revealed that regulators often had insufficient information to regulate perfectly, and often served agendas other than welfare maximisation. This gave rise to a more cautious view of regulation, balancing its likely costs as well as its intended benefits – mindful of likely unintended consequences – and comparing outcomes feasibly achievable by different regulation schemes.¹⁴

Finally, other relevant norm changes include rising incomes, political changes, and growth in associated constituencies. For example, unions and the wider society in developed countries make calls for stronger workplace safety. Likewise, societies demand higher transportation safety and greater environmental protection as they become wealthier and more developed.

3.4. Innovations in Regulatory Technology

One important regulatory innovation has been the rise of “incentive regulation” in many liberalised utility sectors, notably in the UK following privatisation of public utilities. It addressed known shortcomings with the “cost of service” or “rate of return” regulation model commonly applied in the US. That model effectively reimburses firms for costs, and relies on firms truthfully revealing their costs to regulators. By contrast, incentive regulation caps firms’ prices (or revenues) for a predetermined period, often imposing price reductions. This forces firms to bear more risk, and to use their private information (e.g. regarding costs) to improve efficiency so as to increase profits.

Another important innovation has been the tendering of public contracts (i.e. franchise bidding, or public-private partnerships (PPPs)). Such contracts can be for the building and/or operation of public services such as toll roads, schools, hospitals or prisons. Competitive tendering has been facilitated by developments in both auction theory and contract theory. Where those contracts involve market power issues, competitive tendering replaces “competition in the market” with “competition for the market.” Furthermore, PPP contracts can include other regulatory requirements, such as minimum service quality and/or safety standards.

Classically, taxes and subsidies have been common instruments when regulating private producers, particularly when dealing with externalities. Increasingly market-based mechanisms are used, involving the creation of property rights such as emission permits, as well as trading mechanisms to lower the transaction costs of trading. These reflect the important law and economics insight contained in the “Coase Theorem” (Coase (1960)).

¹⁴ For example, via regulatory cost-benefit analyses. British economist Ronald Coase argued that imperfect market outcomes should not be compared with unattainable ideals, but rather only with alternatives (such as regulation) that are feasible. Such alternatives also involve costs and imperfections. Williamson (2000, p. 601) formalises this in his “remediableness criterion”: “an extant mode or organization for which no superior feasible alternative can be described and implemented with expected net gains is presumed to be efficient. . . . analysts can no longer condemn extant modes because they deviate from a hypothetical ideal”

This states that if trade in an externality is possible, and transaction costs are low, bargaining between rights-holders will lead to an efficient outcome regardless of the initial allocation of rights.¹⁵ Another example of regulatory property right creation includes the creation of statutory guarantees as to quality.¹⁶

Another classical regulatory instrument, particularly of command and control regulation, is the use of prescriptive standards. Such standards relate either to activities (i.e. controlling what producers or consumers do) or processes (i.e. controlling how they do it). Common examples include prohibitions on certain practices, or prescribed forms of technology. These are commonly used when performance is too costly or impossible to monitor. However, increasing use of performance standards has arisen with improved information technologies. These standards specify performance but allow producers or consumers to determine the best way to meet them.

Improvements in information technologies also affect the feasibility and efficacy of regulating through information disclosure requirements. Mandatory information disclosures are often required to address informational deficits (e.g. of consumers regarding quality, or consumers or workers regarding safety). The rise of social media in particular now enables regulators to monitor at lower cost, and to place less emphasis on providing consumers with information and more on standardising, simplifying and warranting such information.

Relatedly, insights from psychology and behavioural economics are increasingly used to both trial new regulatory approaches as controlled experiments, and to simplify the information consumers face so that they can make more considered choices (Lunn (2014)).¹⁷ This can be more important as consumers face increasingly vast volumes of information to process, which exacerbate problems of “cognitive biases” (i.e. making apparently non-rational choices). Social media also present opportunities for regulators to influence social preferences, rather than trying to regulate behaviour simply taking those preferences as given.¹⁸

Other regulatory innovations include the use of competition/antitrust law that is increasingly founded on economic rather than purely legal principles.¹⁹ They also include a growing acceptance of customer ownership as a protection against supplier market power (e.g. in network distribution monopolies), and supplier ownership of downstream monopolies (e.g. in agricultural processing).²⁰ The forced ownership separation of retail subsidiaries from parent companies supplying those subsidiaries (i.e. “legal unbundling”) to facilitate retail competition is another regulatory innovation (e.g. in rail or telecommunications networks). So is allowing firms with control of bottleneck facilities such as rail networks to remain integrated, but requiring that those facilities be made available to rival (e.g. train service) operators at regulated access prices.

¹⁵ Coase developed this idea in the context of regulating radio frequency allocations, which were prone to congestion externalities. Such an approach could in principle apply to other congestion-prone activities.

¹⁶ For example, consumer guarantees under New Zealand’s Consumer Guarantees Act 1993.

¹⁷ Innovations in this area are often referred to as “behavioural insights”, with “nudge” being a particular way of applying the findings of behavioural economics to policy questions (Lunn (2014)).

¹⁸ An open question remains as to where to draw the boundary between socially appropriate and inappropriate influencing of preferences by government, with tensions between democratic choice and the attainment of socially-desirable outcomes.

¹⁹ US law and economics exponent Richard Posner described the state of US antitrust law in the 1970s as an intellectual disgrace. It is now more well-founded on economic principles (Carlton and Picker (2014)).

²⁰ See Hansmann (1996) for a comprehensive survey of how ownership can address market contracting issues.

A related innovation is the provision of coordination assistance, such as the facilitation of negotiated settlements between consumer coalitions and producers instead of price regulation in utility sectors (Littlechild (2008)).²¹ This substitutes consumers' industry knowledge and combined bargaining power for the coercive powers of possibly less well-informed regulators.

Finally, important regulatory innovations have occurred in the use of self-regulation. This conventionally involves producers and/or professions setting and monitoring performance against their own standards. A related innovation includes meta-regulation, in which government prescribes requirements of producers, often with the threat of more direct regulation if those standards are not met (Coglianese and Mendelson (2010), Gunningham (2010), Rostain (2010), Baldwin et al. (2010)). This treats producers as a surrogate regulator, with government taking a more risk-management role, monitoring producers' internal compliance systems rather than actual conduct.

3.5. Innovations in Technology more generally

Innovations in regulatory technology, as well as the rationale for regulation, have also reflected technology changes in regulated sectors themselves. One example is the decline in the minimum scale of efficient electricity generation (Crew and Parker (2006)). This meant that former monopoly generators could face competition from smaller independent generators, and hence need not be regulated as monopolies. Another is the improvement in car safety due to collision control, crumple zones and airbags, as well as improved roading technologies. Each has reduced the danger to car passengers, and to some extent pedestrians, reducing the relative role of drivers in the frequency and seriousness of road incidents.²²

Another example, with conflicting regulatory implications, includes the advent of mobile telephony. On the one hand, this reduced the need for market power regulation of fixed line telephone monopolies. On the other, mobile termination rates and roaming charges have become the subject of regulation. Furthermore, the advent of voice-over-internet further reduces the rationale for regulating fixed line companies. However, it potentially increases the need to consider the regulation of mobile phone providers as the use of smart phones becomes more ubiquitous. An even greater challenge in the internet age is the rise of producers of services that have large positive consumption externalities (i.e. network effects). These can result in winner-takes-all competition, with de facto standard setting by the winner. Producers like Amazon, Google and Facebook have become dominant in this way, posing the need for a fresh look at regulatory rationales and means.

The rise of GPS tracking technology raises new regulatory challenges and possibilities. Privacy issues are one area of possible regulatory concern. Conversely, the use of telematics by trucking firms now enables real-time tracking of truck location, speed, weight, driver rests, cornering, breaking, etc.

²¹ Relatedly, regulators might also coordinate the formation of buyer groups to enhance their bargaining position relative to imperfectly competitive suppliers, such as the 2012 Big Switch initiative in UK electricity.

²² More classical examples include the rise of trucking in competition with rail, and before then the rise of rail in competition with canals. Also, mass motorisation and commercial aviation each raised safety issues not featuring or less common in earlier transportation modes.

This raises new possibilities for monitoring road damage and driver safety, and managing road traffic coordination and congestion. Likewise, the ubiquitous use of GPS-equipped smartphones enables insurance companies to offer better pricing plans to drivers that submit to having their driving monitored. It also offers transport regulators greater opportunities to monitor driver safety.

Relatedly, smartphones and social media provide new means for consumers to share information about a range of matters such as taxi quality and traffic congestion. These diminish the traditional rationale for taxi regulation, and provide regulators with additional information sources when monitoring and managing traffic congestion. Social media also offer new ways to influence social attitudes, such as towards drug or alcohol consumption and driving.²³

Finally, unmanned vehicles – i.e. Remotely Piloted Aircraft Systems (RPAS) and driverless cars – also raise new regulatory challenges and possibilities. New safety and privacy issues are created by RPAS, which also offer new tools for locating and monitoring traffic issues (e.g. coordination and crashes). Driverless cars possibly improve passenger and pedestrian safety while creating new liability issues (e.g. should crashes occur). They also raise the possibility of driverless taxis, further changing regulatory issues. They might also worsen city congestion, for example with “zombie cars” roaming city streets rather than being parked.

3.6. Experience, Experimentation and Learning

Finally, the evolution of regulatory responses also reflects an ongoing process of learning-by-doing. Historically this has been largely by imitation and adaptation, as well as through trial and error, with international benchmarking of approaches used to learn from the experiences of other jurisdictions. Increasingly, though, this involves the deliberate use of controlled experiments to trial what works best in different circumstances, as advocated by proponents of behavioural economics (Lunn (2014)). Box 2 summarises some of the key drivers of regulatory change.

Box 2 – Some Key Drivers of Regulatory Change

Supply Side (“Push”) Drivers

- **Regulatory innovation** – e.g. incentive regulation of utilities, toll road auctions
- Experience, experimentation, learning

Demand Side (“Pull”) Drivers

- **Shocks** – e.g. global financial crisis, 11 September 2001 attacks
- **Changing norms** – e.g. increasing demand for safety or environmental sustainability
- **Changing technology** – e.g. horse-drawn carts replaced by canal boats, replaced by trains, replaced by trucks and cars, replaced by aeroplanes and driverless vehicles
- Protecting consumers after privatisation of state-owned monopolies
- Competition between consumer, producer, political or environmental interests

²³ UK experience suggests that social media reduce binge drinking by providing alternative uses of time, as well as greater risk of embarrassment (The Independent (2015a)).

4. Pros and Cons of Different Forms of Regulatory Response

4.1. Main Tools of Economic Regulation

4.1.1. Command and Control – Prices, Quality, Entry and Exit

Traditional command and control regulation is informationally demanding, requiring the regulator to know the socially desirable level of price, quantity and quality to specify now and into the future. Where it creates economic rents (e.g. producing profits above competitive levels), this creates incentives for entry by new firms, particularly on profitable market segments when they are used to cross-subsidise less-profitable segments. This then necessitates entry control, as well as controls to stop incumbent firms from exiting unprofitable segments. It further necessitates control of industries that compete with the regulated industry in case economic activity shifts there.²⁴ Such rents also invite rent-seeking behaviour and capture of the regulatory process by special interests.

Finally, command and control can lead to quality distortions when prices are regulated. This can involve “quality shading”, or economising on quality to save costs (see Box 3). Alternatively, it can involve excessive quality as a form of non-price competition, such as excessively-frequent flight schedules as experienced in the US airlines industry under price regulation (Viscusi et al. (2005)). For these reasons, other regulatory approaches are often now used instead of command and control.

Box 3 – Quality Shading²⁵

- Quality shading arises when the pursuit of one objective (e.g. lower consumer prices) gives rise to sacrifices of other product or service dimensions such as quality (e.g. product safety). This can especially be the case when quality dimensions are hard to measure.
- When quality shading is possible, high levels of price competition, or a strong regulatory focus on achieving low prices, can have unintended and adverse impacts on quality.
- In some cases, however, the pursuit of both pricing and quality objectives might in fact be mutually reinforcing rather than conflicting.
- Also, mechanisms such as brand- and reputation-building can serve to reduce any quality shading risks.

4.1.2. Rate of Return Regulation and Incentive Regulation

Rate of return regulation is a particular form of command and control regulation most common in the US. As described in Section 4.4, it effectively compensates firms for their costs, and relies on firms truthfully revealing their costs. It thus produces weak incentives for efficiency, and induces over-investment. While prices may be unduly high, a possible advantage of this over-investment is that it can be socially less costly than under-investment. However, entry controls often associated with rate of return regulation can impede innovation by impeding entry by innovative firms.

²⁴ That is, “regulatory creep” is necessitated to avert “regulatory arbitrage” or “regulatory disintermediation”. An expression of this problem is “Meltzer’s Law” (Rose (2014, p. 17)): “[T]he first law of regulation is: Lawyers and bureaucrats write regulations. Markets learn to circumvent the costly ones.”

²⁵ See Appendix F.3 of New Zealand Productivity Commission (2015) for a wider discussion of quality shading.

Incentive regulation, by contrast, shifts greater risk and efficiency incentives onto firms by capping growth in their prices or revenues. It explicitly allows for firms' informational advantage relative to the regulator, seeking to exploit their profit motive to generate cost savings as well as price reductions for consumers. However, to preserve this incentive it is necessary that not too much risk is transferred to firms, and also that the regulator commits not to appropriate firms' profits from efficiency gains ex post (Ricketts (2006)). These conditions are not always satisfied in practice, in which incentive regulation is applied with elements of rate of return regulation.

Additionally, providing strong incentives for cost efficiencies can result in "quality shading", or the sacrifice of costly quality provision. This has resulted in incentive regulation often including minimum quality standards, though determining the appropriate standards is itself informationally demanding. Furthermore, the length of the relevant regulatory period has important issues for efficiency gains, as well as for long-term investment. Variations on incentive regulation such as profit sharing are emerging as compromise solutions to some of these issues (Hauge and Sappington (2010)), as are alternatives such as negotiated settlements (Littlechild (2008)).

An important criterion for assessing both forms of regulation is dynamic efficiency, or the efficient delivery of socially desirable outcomes over time. This is to be contrasted with static efficiency, which focuses on just current efficiency without consideration of long-term investment or innovation, each of which can be critical for achieving dynamic efficiency. In this regard, the investment inefficiencies of rate of return regulation might be less than under poorly-implemented incentive regulation, since they involve over- rather than under-investment. However, it is not clear that rate of return regulation delivers superior innovation, so its dynamic efficiency may in fact be better or worse than that under incentive regulation, depending on the particular industry.²⁶ Box 4 summarises key differences between static and dynamic efficiency.

Box 4 – Static and Dynamic Efficiency

Static Efficiency

- Maximises short-term "snapshot" of consumer and producer welfare, taking investment decisions as given
- Typically requires short-term profits to be driven to zero (i.e. no "excess returns")
- Can make past investments non-viable by not allowing sufficient returns to sustain them – deters new investment
- Does not recognise trade-off between static efficiency and need to protect returns that support investment and innovation benefitting consumers

Dynamic Efficiency

- Maximises long-term consumer welfare, which depends on investment and innovation (under uncertainty)
- Typically focuses on supporting competitive entry and innovation, and allows non-zero profits (i.e. "excess returns") to fund long-term investments benefitting consumers
- Allows past investments to be made non-viable through technology change and industry entry by competitors
- Recognises trade-off between static efficiency and need to protect returns that support investment and innovation benefitting consumers

²⁶ More generally, regulation can either impede or stimulate innovation (OECD (1996)).

4.1.3. Franchise Bidding/Public-Private Partnerships (PPPs)

The tendering of long-term contracts by central and local authorities to private providers, including for projects with potential market power (e.g. toll roads, bus services) has become widespread in developed as well as many developing countries.²⁷ By using private financing they reduce calls on government finances. They also involve task bundling, such as the design, building, financing and operation of facilities. Such bundling can help to alleviate quality shading issues when there are complementarities between different tasks (e.g. when better design and build reduces future operating costs or enhances facility quality). If the operator of a facility also designs and builds it, then they bear the costs of quality shading in the form of higher operating costs. This reduces incentives to shade quality in design and build.

More fundamentally, like incentive regulation PPPs shift risk to private providers, which can be helpful for providing performance incentives. However, there are limits to how much risk should be transferred. Importantly, shifting risk to operators is desirable when they can affect demand through good facility design and build or operation. However, it is less desirable when operators cannot affect demand, or face other risks (e.g. macroeconomic shocks) beyond their control, since operators must be paid large risk premia to bear such risks. The risk and incentive effects of PPPs are also affected by how they are financed, and by the length of PPP contracts. This further complicates the determination of when PPPs are to be preferred to traditional procurement methods (such as tendering for individual project components).

In short, PPPs are predicted to be efficient devices in some but not all circumstances (Iossa and Martimort (2011), Meade (2011)). Well-known limitations of PPPs include the risk of cost-overruns, and also the risk of contract renegotiation (by either governments or providers). This undermines the incentive power of such contracts, and hence their efficacy. Furthermore, the evidence on PPP efficacy is mixed, with many examples of failures (e.g. due to forecast demand on new toll roads not materialising), though also of successes (surveyed in Iossa and Martimort (2011)).

4.1.4. Competition/Antitrust Law

Since the inception of both industry-specific regulation and general competition/antitrust laws in the 19th century US, there has been evolving debate about the appropriate boundary between each. Industry-specific regulation by specialist regulatory authorities in the absence of effective competition is favoured where producers are given affirmative duties ex ante, and where specialised industry knowledge is required (Carlton and Picker (2014)). However, this comes at the cost of possible regulatory capture, by producers, politicians, or other interest groups. Hence, generalist competition authorities as ex post protectors of the competitive process, are to be preferred over specialist regulators when capture risks are high and/or specialist industry knowledge is not required.

²⁷ See Appendix F.4 of New Zealand Productivity Commission (2015) for a wider discussion of procurement. Iossa and Martimort (2011) survey the global growth in PPP projects in transport and other sectors.

This is due to their likely greater independence, as well as insulation from producers and special interests.²⁸ However, it comes at the cost of their relatively lower specialist expertise. Carlton and Picker (2014) argue that competition authorities also provide useful checks on regulatory behaviour if regulators allow increased market power to achieve other social ends such as cross-subsidies. Competition authorities in such cases can scrutinise regulators trade-offs between market power and social objectives, providing an independent test of their rationale.

4.1.5. Ownership

Ownership – in lieu of regulation – can often effectively address market contracting issues such as market power and asymmetric information. This is so when the costs of internal organisation and collective decision making associated with ownership are not as severe as the costs of contracting in the market (Grossman and Hart (1986), Hansmann (1996), Williamson (1999)).²⁹ Such organisational and decision making costs are more likely to be low when there is a high level of common interest among the suppliers or customers of an organisation who together face the risk of market power abuse by that organisation (or if they share asymmetric information issues such as unverifiable product quality, insurance/lending risk, etc). For this reason, customer- or producer-cooperatives are often observed in agriculture, insurance and banking, and can be regulated differently from investor-owned firms.³⁰ Indeed, customer-owned monopolies are often self-regulating (Meade (2014)).

Ownership can substitute for regulation in other ways. State ownership, for example, can be the least inefficient ownership form if private ownership gives rise to severe contracting issues (including quality shading) and effective regulation is too costly to implement (e.g. due to prohibitive monitoring and enforcement costs). This in part explains why many quality-sensitive services with public good attributes such as justice and defence have been dominated by state providers in many countries. Conversely, even unregulated private ownership can be least inefficient in the presence of severe market contracting issues, if effective regulation is impossible and performance incentives for efficiency are sufficiently strong (Meade (2005)). This might be the case, for example, in highly innovative industries in which the most successful innovators eliminate their rivals (e.g. Amazon, Google). In such cases, impeding innovation might be more costly than regulating market power.

Finally, “vertical integration” and “vertical separation” each offer possible benefits substituting for or as an instrument of regulation. In imperfectly competitive industries, it can be desirable to allow upstream firms to integrate with the downstream firms (e.g. retailers) that they supply so as to remove successive price mark-ups (i.e. “double marginalisation”, Meade (2012)). This alleviates the need for price regulation.

²⁸ The independence of antitrust enforcement in the US is likely to be greater than in jurisdictions with specialist antitrust authorities. This is due to the constitutional separation of powers in the US, while antitrust authorities often share administrative law foundations with regulators in other jurisdictions.

²⁹ See Appendix F.3 of New Zealand Productivity Commission (2015) for a wider discussion of ownership.

³⁰ Meade (2014) discusses the different regulatory treatment of customer- and investor-owned utilities, noting that customer-owned utilities are often exempted from regulation, as in New Zealand electricity distribution. Evans and Meade (2005b) provide a more general discussion of the pros and cons of cooperative ownership.

Conversely, the forced vertical separation of firms owning bottleneck facilities such as transmission or rail networks, with regulated access pricing, is often used to encourage competition among firms accessing those networks. However, such separation can introduce double marginalisation, and reduce coordination, offsetting separation benefits.³¹

4.2. Tools Used in Both Economic and Social Regulation

4.2.1. Taxes and Subsidies

Traditional regulatory instruments such as taxes and subsidies provide clear price or revenue signals to affect the behaviour of regulated parties, and can be simple to collect or pay. They can also be efficient, with each agent equating the marginal benefits (costs) of their activity with the tax (subsidy). However, taxes can also be regressive, disproportionately affecting low-income taxpayers. Also, setting the right level of tax or subsidy to induce the desired level of quantity response can be informationally demanding, requiring knowledge of both demand and supply conditions. Likewise, it can be costly for regulators to monitor the activity that is taxed (e.g. heavy vehicle road usage, inner city driving during peak times, or pollution), although information costs are falling rapidly with new monitoring and communication technologies. Hence, simpler-to-specify standards are often used instead (see Section 5.3.4).

Moreover, conventionally taxes and subsidies are regarded as providing clear price signals while leaving quantity responses uncertain. However, tax or subsidy levels are often adjusted on political grounds, or by trial and error. Hence, the possibility of future tax or subsidy changes means even those price signals are uncertain. Such uncertainties can be disruptive in situations requiring long-term investments, and counter-productive if those long-term investments are necessary to achieve the aims of the intervention (e.g. cleaner technologies to achieve emission reductions).

4.2.2. Behavioural Insights – Compensating for Cognitive Biases

Applying empirical insights and methods from behavioural economics and psychology in regulation, such as through the “nudge” approach pioneered in the UK, is an emerging area in regulation (Lunn (2014)).³² It is based on empirical findings that decision makers often act in apparently non-rational ways – i.e. exhibit cognitive biases. It also adopts a more experimental approach to determining effective regulatory approaches, such as through the use of controlled experiments to assess intervention effectiveness empirically (instead of being based on assumptions about rational decision making).

One example of the approach is the use of simplified pricing information to address issues such as market power. This is because behavioural economics points to decision makers adopting heuristic rather than optimising decision rules when confronted with large amounts of information.

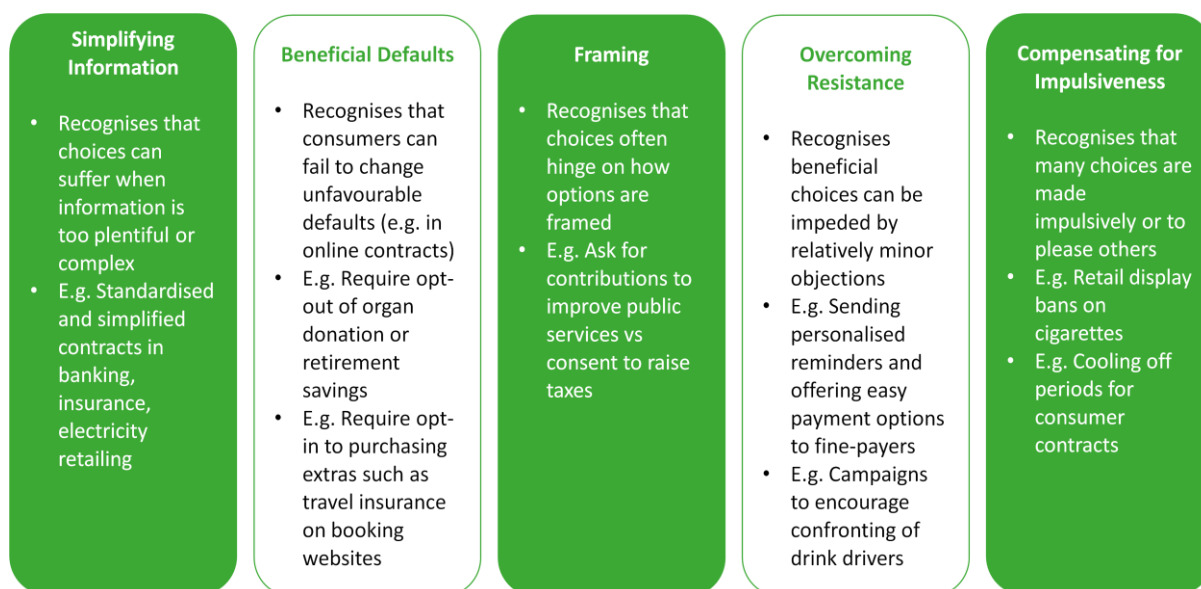
³¹ Ponti (2011) discusses these costs in relation to vertically separated rail operators.

³² The “nudge” approach is also described as “libertarian paternalism”, since it involves authorities influencing the choices of target groups without restricting the choices of those groups (Lunn (2014)).

Producers might seek to exploit this, for example to reduce customer switching by creating multiple and complex pricing plans.³³ This points to a possible tension between conventional information-disclosure based regulation, which increases the information confronting decision makers, and the possible need to simplify information (i.e. reduce information costs) to relieve cognitive biases.

Other examples of regulation based on behavioural insights are summarised in Box 5. In the New Zealand transport sector, one example is the “Ghost Chips” campaign targeting young Māori males in situations where associates are too drunk to drive. It seeks to reduce resistance to confronting would-be drunk drivers (e.g. due to social embarrassment) by highlighting the worse consequences of failing to act. Another example is the “Mistakes” campaign, targeting drivers who speed but feel they are in control. It reframes the way people regard their own speeding by emphasising that speeding can cause road fatalities not because of their own mistakes, but due to those of others.

Box 5 – Examples of Regulation based on Behavioural Insights (Based on Lunn (2014))



The approach is controversial, and it is not yet possible to evaluate the efficacy of compensating for cognitive biases.³⁴ However, its use of controlled experiments to evaluate policies, particularly in areas where informed or rational decision making cannot be assumed, should assist regulators to improve regulatory design.

³³ Emerging areas of the economics literature on industrial organisation which address such issues include models of “rational inattention”, as well as “confusopoly” (i.e. firms strategically making it harder for consumers to compare rival product offerings, such as by using complex price plans). The welfare implications of such apparently anticompetitive firm strategies are not settled.

³⁴ Reasons why behavioural economics finds “empirical regularities” at odds with conventional economic theory of consumer behaviour include conventional theory being construed too narrowly, conventional theory remaining to be refined to explain those apparent regularities, or those regularities being statistical illusions.

4.3. Tools Applied Particularly in Social Regulation

4.3.1. Liability Rules

Establishing legal liability for adverse events (e.g. environmental damage, passenger transportation accidents, workplace accidents) is a clear and strong, though blunt, regulatory tool. It represents a strategy of deterrence rather than compliance (Gunningham (2010)). The approach has adversarial features, in that it rests on detection, prosecution and penalties. In its pure form, it assumes that regulated parties are fully aware of their liability from taking certain actions, and respond rationally to the associated incentives. It also assumes that the probability of detecting breaches, and breach sanctions, are sufficient to induce desired behaviours. Where deterrence is adversarial rather than cooperative, it can undermine cooperative behaviour that might otherwise be forthcoming from regulated parties. Being adversarial can also induce minimal compliance, and resistance to enforcement.³⁵ However, the adversarial use of liability rules remains a useful strategy as implemented by public or private agencies where cooperative behaviour cannot be assumed, and/or if the risks of non-cooperative behaviour by even a few are severe.

4.3.2. Market-Based Regulation – Cap-and-Trade

Market-based regulation such as cap-and-trade emissions permit schemes can provide a greater degree of certainty as to quantity outcomes than taxes or subsidies. This is because cap-and-trade schemes fix a cap on the allowed level of regulated activity. However, they introduce uncertainty as to permit price, which adjusts to equate permit supply and demand. Instead of requiring knowledge of individual agents' marginal benefits and costs of the activity to be regulated, in setting the desired quantity outcome the regulator instead must determine the overall socially desirable level (e.g. of emissions, or number of vehicles driving in the central city). Ensuring compliance still requires some means of measuring individual agents' output of the regulated activity. Taxes and cap-and-trade schemes can be equivalent, but this equivalence fails under uncertainty (Weitzman (1974)).

Provided the traded property rights are well-defined and enforceable, and trading costs are low, in principle cap-and-trade schemes should be efficient. That is, despite initial allocations of permits, trading will occur until marginal compliance costs are equated to permit price across regulated parties. However, whether permits are auctioned or gifted raises equity considerations, as well as dynamic efficiency issues such as stranding sunk investments made prior to scheme introduction.³⁶ Moreover, political uncertainty as to cap levels and the levels of any free allowances, particularly across compliance periods, can undermine cap-and-trade effectiveness, as was experienced in the EU emissions trading scheme.³⁷

³⁵ Additionally, it might encourage self-selection into the regulated activity by parties with expertise in evading detection or contesting enforcement, just as strong extrinsic incentives can reduce intrinsic motivation (Bénabou and Tirole (2013)).

³⁶ Parties that made long-term investments prior to cap-and-trade scheme introduction might object if such schemes result in an uncompensated reduction in the value of their investments. This can deter them from making further investments, reducing dynamic efficiency. Gifting permit allocations to such investors is one means to reduce such impacts. However, where technology changes make long-term investments redundant, these impacts may be less critical.

³⁷ Political commitment issues arise here as they do under incentive regulation, and monetary policy. Some form of credible "independent central bank" governing caps and allowances is yet to be developed.

4.3.3. Self-Regulation and Meta-Regulation

In contrast to deterrence strategies involving legal liability rules administered privately or by public agencies, self-regulation and meta-regulation are founded on assuming either inherent or self-interested cooperative behaviour on behalf of regulated parties. Self-regulation involves a group engaged in a particular sphere of activity agreeing on their own objectives, and how best to achieve them. Meta-regulation, including co-regulation, adds an element of actual or threatened direct regulatory involvement, such as in setting the objectives or methods of self-regulation if voluntary self-regulation fails to achieve regulatory objectives. The latter can involve a focus on regulatory risk-management, with the regulator monitoring how (would-be) regulated parties devise systems to achieve the regulator's aims, rather than directly monitoring the achievement of those aims (Black (2010), Baldwin et al. (2010)).

Self- and meta-regulation are forms of compliance strategies (Gunningham (2010)), and build on an increasing understanding of what motivates cooperative behaviour in collective action situations (Ostrom (2000)).³⁸ An important contributor to cooperative behaviour is the development of norms such as trust and reciprocity. This can result where the relevant group has effective leadership, controls its membership, and shapes and enforces its own rules – as has been common in self-regulating professions (Rostain (2010)).³⁹ Such norms – and hence effective self-regulation – are more likely to emerge in situations where members have shared interests, and are homogeneous and hence face low collective decision making costs. However, if these conditions do not arise, or the group's interests diverge sufficiently from the regulator's, then an added element of compulsion under meta-regulation may be needed.

Each approach is founded on directly assisting the regulated party to achieve the regulator's desired aims, including by way of education and creation of compliance expertise (as opposed to indirectly, via threat of ex post punishment for non-compliance under deterrence strategies). Both self- and meta-regulation can be effective ways of harnessing the regulated group's superior information (e.g. technical expertise), as well as any intrinsic motivation for good performance (such as professional ethics, and peer review). Meta-regulation further relies on the group's members fearing negative repercussions for all, due to the misconduct of one or more "rogue" members, to induce peer monitoring and control. Self-regulation can become more viable when users of the self-regulated activity gain access to better information regarding service quality, such as is increasingly the case with the rise of platforms for consumers to rate their service experiences.

³⁸ See Appendix F.3 of New Zealand Productivity Commission (2015) for a wider discussion of collective action as an alternative to government organisation.

³⁹ Tirole (1988) shows why parties such as professions can favour advertising bans – a form of information non-disclosure. This is because bans enable them to differentiate their services and thereby enhance their market power. Rostain (2006) argues that such market power can be useful to reduce any tension between professional's pursuit of income and output quality.

4.3.4. Standards

Standards represent a form of command and control, with the regulator specifying standards against which they monitor compliance.⁴⁰ However, they can include little more than information disclosure requirements backed up by general competition/antitrust law, as was initially the case in electricity distribution in New Zealand (i.e. being more command than regulatory control).⁴¹ In New Zealand's case such disclosures were intended to enable informal yardstick competition via customer and third party performance benchmarking.

More commonly, standards include tools such as process standards dictating how regulated parties are to undertake their activities. Alternatively they include performance standards, dictating what those activities must achieve. Examples include specifying the use of certain technologies for safety or environmental protection (process), or the attainment of certain levels of each (performance). Process standards are informationally less demanding than either taxes and subsidies, cap-and-trade schemes, or performance standards. This is because the regulator simply needs to know what input processes to mandate. Hence outputs need not be monitored, and compliance is relatively easy to verify. They also provide greater certainty to regulated parties when making investment choices, since likely compliance with process standards is easier to determine. The cost of this approach is that it typically involves imposing uniform or "one-size-fits-all" obligations on possibly very diverse parties (including as to production technologies). This leads to inefficiency, since marginal compliance costs will not be equal across regulated parties, and without opportunities to trade obligations this can force costly exit by those with high compliance costs. Also, the costs of mandating inappropriate processes are potentially large. So are the costs of inducing compliance with the letter of detailed, rule-based standards, instead of with the spirit of principles-based standards (Scott (2010)).⁴²

Performance standards are more informationally demanding than process standards because they require the regulator to monitor the outputs (e.g. safety outcomes, or environmental impacts) of possibly diverse and numerous regulated parties. They also require greater judgement on the part of the regulator and regulated parties as to compliance. This can complicate investment choices where performance standard compliance is difficult to ascertain ex ante, and increases scope for mechanisms such as third-party performance certification. However, performance standards have the important efficiency advantage over process standards of allowing regulated parties to choose the least-cost way in which to achieve compliance. This can also encourage technological innovations to achieve compliance (OECD (1996)), although not always successfully.⁴³

⁴⁰ Criminal law, and prohibitions of undesirable conduct, also fall within this category or regulation.

⁴¹ Bolton and Dewatripont (2005) discuss situations in which mandatory information disclosures can be superfluous, and lead to excessive disclosure when parties have incentives to disclose voluntarily. Good parties may wish to disclose to distinguish themselves from bad parties, which induces bad parties to disclose also (for fear of being assumed worse than they really are). However, mandatory disclosure can remove incentives for excessive disclosures when parties are uncertain about their own types.

⁴² The Global Financial Crisis has as much been attributed to regulatory failings as it has to finance sector misconduct. For example, over-reliance on prescriptive capital adequacy rules – a form of process standard – has been blamed for finance sector firms being free to find innovative ways of creating off-balance sheet financing structures (Scott (2010), Baldwin et al. (2010), Rose (2014), Kroszner and Strahan (2014)). Such structures contributed to the resulting systemic financial problems.

⁴³ Mumford (2011) describes how failures in performance-based regulation contributed to the "leaky buildings" saga in the New Zealand building industry.

4.3.5. Influencing Preferences

Similar to the use of behavioural theories in regulation, directly influencing preferences is also a relatively new approach, aided in particular by the rise of social media and other platforms for mass information exchange. Many regulatory approaches such as taxes, incentive regulation and liability rules take the objectives of the regulated parties as given (i.e. possibly non-conforming and self-interested, as well as rational). Instead they seek to modify those objectives through the use of additional incentives (e.g. penalties or rewards that modify regulated firm's profits). By contrast, regulators are increasingly seeking to change the objectives – i.e. preferences – of regulated parties directly. Social marketing campaigns are an example, such as those in New Zealand to change attitudes towards drink-driving. Like compliance strategies, they seek to assist regulated parties to achieve desired outcomes, rather than punish failure to do so as under more traditional deterrence strategies. They are a natural alternative to try when deterrence strategies are ineffective, such as with repeat drink-drivers, and aim to elicit cooperation rather than to punish.

5. Future Directions in Transport Regulation

5.1. Some Meta-Themes

Transport regulators, like regulators in other sectors, find themselves at a crossroads in regulatory approaches. High-profile events such as the 11 September 2001 attacks on the US, the recent global financial crisis, and New Zealand's "leaky buildings" saga, have drawn calls for stricter regulation. At the same time, almost ubiquitous GPS-equipped smartphones and social media provide regulators with new tools that reduce the costs of informationally-demanding regulatory technologies, particularly in social regulation, which previously might have been too costly to implement. They also introduce new channels for influencing social preferences. Likewise, wireless monitoring technologies are also available in industry (e.g. telematics in trucks), enabling greater use of performance rather than process standards. As such technologies become more widespread and critical, regulators must also confront issues of robustness and resilience (as for security of supply in electricity systems) and hence back-up, because real-time system failures could become increasingly disruptive.

Conversely, rising privacy concerns about mass tracking and data collection might impose constraints on regulators' use of such new information sources. Moreover, the rise of social media in particular means consumers have far greater information at their fingertips, and can share their own information widely with others.⁴⁴ This reduces the rationale for certain forms of regulation, such as those mandating information disclosures when consumers otherwise faced prohibitive information costs, or use of process standards when producers' outputs were harder to monitor.

Consumer ratings shared via social media provide new ways for producers to establish a reputation for quality, reducing the need for regulatory intervention to compensate for an inability to do so.

⁴⁴ We persist with using "consumers" and "producers" in this section for consistency with the rest of the report. In transport, they are more commonly described as "users" and "providers" respectively.

However, it is likely that regulation will evolve to ensure that consumer-level information is not manipulated.⁴⁵

Aside from the need to balance such considerations, regulators face the additional challenge of implementing responsive, yet credible and time-consistent, regulation in the face of the quickening pace of technology changes. Credible and time-consistent regulation is necessary to preserve incentives for investments in long-term assets, and hence for dynamic efficiency. However, such regulation creates inflexibilities that can impede regulators' responsiveness to new regulatory challenges as they arise, and to regulatory opportunities also permitted by new technologies. The challenge for regulators concerned with dynamic efficiency is to support welfare-enhancing innovation, which when disruptive can undermine previous long-term investments, while otherwise not undermining such investments *ex post*.⁴⁶ Box 6 summarises some factors underpinning dynamically efficient regulation.

Box 6 – Factors Supporting Dynamically-Efficient Regulation

- Focus on protecting long-term welfare of consumers
- Preservation of incentives for welfare-enhancing innovation and investment (made under uncertainty)
- Balance between regulatory responsiveness (to changed circumstances) and regulatory commitment (to uphold rules on which previous investments made)

5.2. Selected Transport Regulation Applications

5.2.1 Tracking

One topic of particular relevance to transport regulation is how ubiquitous, GPS-enabled smartphones might affect traffic safety, road pricing and congestion management.⁴⁷ Provided users consent and/or legislators otherwise allow it, regulators could use such technology to track who is using what road at what time and at what speed. This would change the nature of road safety enforcement (e.g. possibly requiring fewer road traffic patrols), and paves the way for sharper pricing of public insurance for traffic accidents.

⁴⁸ It also enables road pricing based on how damaging particular driving behaviours are to roading assets, and/or the use of real-time road pricing as a possible tool for congestion management and road investment decisions.⁴⁹

⁴⁵ For example, just as stock market manipulation is regulated to retain the informativeness of share prices.

⁴⁶ For example, the advent of rail in the 19th century was highly disruptive to, and undermined, the very considerable investments previously made in canals in the UK, US and elsewhere. It was also welfare-enhancing, at least over time until the advent of trucking, which then disrupted rail. Hence regulation to impede the development of rail (or trucking) is unlikely to have been dynamically efficient.

⁴⁷ Where commercial transport operators use telematics for managing truck fleets, this technology more directly offers the same possibilities (since telematics are tied to vehicles that themselves are likely tied to drivers, whereas smartphones by themselves are generally tied to neither vehicles nor drivers).

⁴⁸ For example, drivers' accident compensation levies paid with car registration fees could be tailored to whether or not drivers opt in to allowing tracking of their driving. This reflects the growing use by private insurers of price discounts for drivers that install smartphone apps that track driver behaviour. Additionally, GPS tracking should enable faster emergency responses to accidents, further reducing the road toll, and possibly paving the way for the easing of other driving restrictions aimed at reducing road deaths and injuries (e.g. reduced reliance on speed cameras).

⁴⁹ Indeed, smartphone-based markets could be created for trading (e.g.) inner city driving (or parking) permits, as an alternative to price-based congestion charging. That could provide transport regulators with greater control over vehicle numbers in congested areas.

Smartphones and social media provide road users with new ways to themselves monitor and share information regarding traffic conditions, or to alleviate congestion (e.g. by arranging car-sharing). With such technologies the “public good” nature of currently publicly-owned roading assets might be reduced, potentially providing greater incentives for private roading provision (although the positive network externalities of roading networks might still favour public ownership in many cases). Electronic payment systems using smartphones could both simplify and speed up payments for road use, changing the ways that roading infrastructure is funded.⁵⁰

5.2.2 Unmanned Vehicles

Unmanned vehicles – including pilotless RPAS and driverless vehicles (cars and trucks) – present both regulatory challenges and opportunities. Each raises safety and traffic management issues, while RPAS in particular raise additional privacy issues.

The safety issues surrounding RPAS are in principle similar to those already encountered by transport regulators. While RPAS are pilotless, they remain controlled by a person, and hence existing liability and control regimes might easily be adapted to address RPAS safety.

Conversely, driverless vehicles might require more substantive regulatory innovations. In principle, such vehicles remain under the control of a human being, with one or more passengers being able to resume control in the event of an emergency in much the same way an airline pilot can resume control of an aircraft from an autopilot. In practice, however, this contingent control is likely to be ineffective unless passengers remain alert to dangers and are ready to assume control fast enough to avoid traffic incidents. Instead, effective control will likely be with software and car monitoring systems, raising questions about whether passengers or manufacturers should be licensed.

These systems offer important possible advantages such as automated collision avoidance (i.e. removing the risk of driver error), and shorter following distances at any speed. These imply fewer traffic incidents and greater road capacity utilisation. They also raise liability questions in the (perhaps rare) event of traffic incidents involving driverless cars, and the possibility of even greater road utilisation by people who would otherwise not wish to drive in congested traffic but who treat driverless cars as an alternative to public transport.⁵¹

While safety issues have traditionally been the responsibility of transport regulators, privacy issues arise more generally with the widespread availability of video-camera equipped smartphones and CCTV cameras.⁵² Hence, transport regulators addressing RPAS regulation may find themselves at the forefront of wider initiatives to address modern privacy issues.

⁵⁰ Just as apparently public good lighthouses can assume private good characteristics when payment mechanisms such as port fees can be introduced to charge users of the lighthouse for their usage.

⁵¹ The boundaries between public transport modes and driverless cars might become blurred, particularly if car sharing could be monitored by transport regulators. This raises the question of whether car-sharing in driverless cars should qualify for use of dedicated high-speed transit lanes.

⁵² Indeed, the use of smartphone (or specialised) “dash-cams” in cars also offer new ways of monitoring driver behaviour and traffic conditions.

5.2.3 Uber

Commercial passenger transport regulators worldwide are confronting the apparent regulatory disintermediation caused by the arrival of the Uber system.⁵³ Once again old regulatory models – in this case taxi services – are confronted by a disruptive new technology.⁵⁴ Existing regulation creates vested interests, such as taxi drivers who invested in cabs in the expectation of not having to compete with private taxi service providers, or in cab security cameras not required in private vehicles. The challenge for transport regulators is to weigh the possible consumer benefits (and risks) of Uber against the possible damage to regulatory credibility of allowing taxi providers with sunk investments made under existing regulations to suffer losses from resiling from those regulations.⁵⁵ This is particularly so if Uber offers consumers both better quality and lower prices.⁵⁶

Driver and passenger safety remain an issue for Uber as it does for conventional taxi services. Likewise, quality issues such as vehicle safety and cleanliness, and driver skill and character, are also shared. However, Uber-related technology and the ubiquity of smartphones might provide technology solutions that reduce the conventional rationales for taxi regulation, including for taxis themselves if they adopt the same solution. Instead of a dispatcher, Uber uses matching software. Instead of driver licensing and security cameras, Uber uses the registration of both drivers and passengers (enabling tracking of each). Indeed, being a smartphone-based application, drivers' smartphones might in fact offer just as good video monitoring of passengers (or vice versa) as do cameras installed in taxis. Instead of relying on cab company reputations for quality, Uber relies on user ratings which can be widely shared to other actual or potential users.⁵⁷

Worldwide Uber faces the risk that a single rogue driver might bring about punitive regulation from regulators which already have established regulatory bargains with taxi industries. This represents a de facto form of meta-regulation, obliging Uber to self-regulate to at least a high a standard as existing taxi operators. This should relieve the burden on regulators of ensuring that Uber itself provides adequate service quality. However, it leaves unresolved how regulators will address the concerns of incumbent taxi operators whose livelihood faces challenge from a new entrant. Aside from tradable taxi licences which historically might have been valuable and costly to acquire in some jurisdictions, other taxi operator investments are relatively short-lived. Hence any legacy issues in the transition to new modes of commercial passenger transport might also prove short-lived. This is particularly the case if conventional taxi services adopt Uber-like innovations. In any case, since driverless cars represent a form of private taxi that can be remotely hailed by their user, even Uber's business model faces threats from new technology.

⁵³ Just as hotel regulators face similar disintermediation in respect of accommodation services such as Airbnb.

⁵⁴ Compare with trucks versus rail, and rail versus canals.

⁵⁵ While New Zealand does not limit the total number of taxi licences on issue, such entry restrictions are imposed in other countries, leading to high market prices for licences. For example, taxi licences in Australian capital cities cost between A\$250,000 and A\$300,000 (<http://www.taxi-library.org/ncc01.htm>). Purchasers of such licences can be expected to object to unanticipated regulatory decisions that reduce licence value.

⁵⁶ High taxi prices might in principle be justified if it is associated with higher quality (e.g. safety, responsiveness). However, as has often been the experience with regulated industries, industry-protective regulation can simply result in increased rents to incumbents who do not face competition from conventional entrants due to entry controls such as licensing. High prices but low quality can result (Downes (2013)).

⁵⁷ This emphasises the importance of ensuring consumer information is not subject to manipulation. Relatedly, allegations have surfaced of Uber displaying "phantom" on-screen vehicles to exaggerate driver availability. This suggests another possible need to ensure quality consumer information (The Independent (2015b)).

6. Conclusion

Regulation has historically been subject to the challenges and opportunities of new technology. This has involved both “push” innovations, such as improved regulatory technologies, and “pull” innovations, such as disruptive new producer technologies. Often one has given rise to the other. In many sectors of modern economies, the pace of such innovations has grown very rapidly, and promises to grow even faster in the future. Hence, while the spectrum of regulatory responses has increased rapidly in recent decades, it should be expected to do so even more rapidly in the future, and will need to do so. The innovations critically include faster and cheaper individual communication with network effects, which shifts the balance between centralised and decentralised governance in future transport regulation.

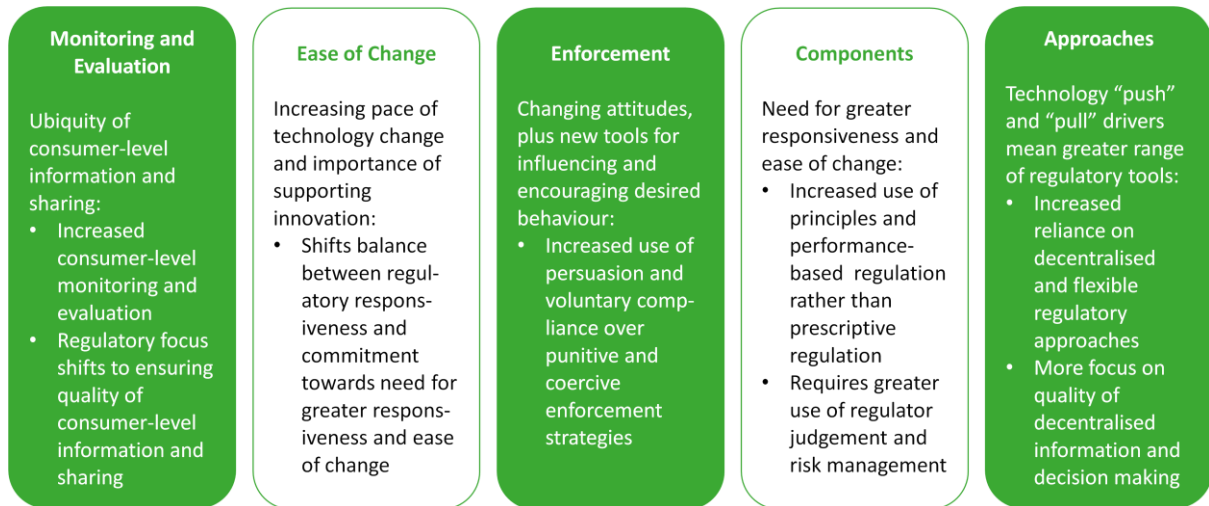
Critical tensions arise between regulation being responsive and easy to change, and regulation being credible. Historically, regulation has often applied to sectors characterised by large, sunk long-term infrastructure investments with relatively stable technologies. Economies of scale and market power issues have been to the fore. Regulators have had to grapple with balancing static efficiency (i.e. efficient short-term pricing) against the importance of preserving incentives for long-term investments (i.e. dynamic efficiency). Credible commitments by regulators not to expropriate sunk long-term investments ex post have therefore been important for regulatory success over time. However, technological innovations threaten the viability of producers using older technologies, and the increasing pace of innovation shortens expected asset lives. This directly affects the case for regulating activities whose natural monopoly characteristics are being undermined by competition from rival technologies.

As the pace of innovation increases, however, particularly in respect of new information technologies, the responsiveness of regulation is now requiring greater attention. Greater use of outcomes- and principles-focused regulation – rather than prescriptive regulation – is both possible and necessary, so as not to impede innovation and to have any hope of remaining abreast of technology changes. New technologies also enable greater use of prescriptive (e.g. process standard) regulation, but threaten the durability of such an approach. With any shift to performance-based regulation comes greater demands on both regulators and regulated parties to be equipped to judge performance rather than processes. This suggests a greater role for third-party certification of performance, and a need to ensure the skill and independence of certifiers.

Regulatory enforcement is affected by both new information technologies and new regulatory approaches. Ubiquitous GPS-enabled smartphones might, in principle, be used to reduce reliance on speed cameras or other speed enforcement technologies. Additionally, behavioural insights, influencing preferences, harnessing incentives for collective action (e.g. building trust and reciprocity) plus changes in social attitudes imply greater use and encouragement of voluntary compliance over punitive and coercive enforcement strategies. Box 7 summarises some of the key forward-looking themes for regulation, reflecting these considerations.

Finally, it should be expected that the spectrum of possible regulatory responses will continually grow, with new tools developing to address new challenges. While some such tools are better suited to addressing particular challenges than others, there are many complementarities between the various tools. Hence each will likely play continuing roles even as new regulatory tools are developed.

Box 7 – Some Forward-Looking Themes for Regulation



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