
Drones, dangerous animals and peeping Toms: impact of imposed vs. organic regulation on entrepreneurship, innovation and economic growth

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Abstract: This paper categorises regulations of economies and societies as either *imposed* or *organic*. Imposed regulations – federal, state and local statutes, regulatory agency promulgations and executive orders – rest on top of and interact with organic regulations – social customs, markets, private agreements and common law. We show how organic regulation, with its many distributed control points (courts, markets and individuals) and near-continuous decision making (by individuals and judges), better reflects the complex systems nature of and more closely evolves with economies and societies. Imposed regulations offer efficiencies and uniformity, but their fewer, more-indirect design and control points (legislatures, agencies and officials) are less accountable and invite public-choice concerns unrelated or counter to public welfare. As a result, imposed regulations are more prone to error, corruption and unintended consequences and are less predictable long-term. Greater reliance on organic regulation correlates with greater entrepreneurship, innovation and long-term economic growth. We consider case studies of self-driving vehicles and unmanned aerial vehicles ('drones') and conclude with recommendations for regulators, lawmakers and policy makers.

Keywords: law; regulation; complex systems; drones; entrepreneurship; innovation; economic growth; self-driving vehicles; unmanned aerial vehicles; technology; evolution; common law; public choice; unintended consequences; conflict resolution; regime uncertainty.

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1 Introduction

Most of the news, public discourse and popular mindshare today around regulation of economies and societies pertains to federal, state and local statutes, regulatory agency promulgations and executive orders. Yet these are not the only, or arguably even the most important, forms of regulation of societies and economies. Underlying and alongside these governmental regulations are customs, markets, private agreements and common law, many of which are not even documented, much less codified as rules. These forms of regulation emerge without top-down action by a legislature, parliament, monarch, president, prime minister or dictator, but rather by the distributed decisions and actions of millions of people and thousands of judges taking place in parallel. Some of these latter forms of regulation long pre-date the formation of governments. I call these two forms of regulation *imposed* and *organic*, respectively (Table 1).

How do these intertwined forms of regulation interact and how do they affect (and effect) innovation, entrepreneurship and economic growth?

2 Organic regulation

Organic regulation includes:

- *customs* ('traditional and broadly accepted ways of behaving or performing actions specific to a society, place, or time')
- *common laws* based on and arising from customs
- *markets* that emerge from people exchanging goods and services for mutual benefit
- *private agreements* among individuals, businesses and other organisations.

In humans, customs arise from countless interactions and experiences and include, among much else, notions and practices of childrearing, courtesy, courtship, hospitality, injury, insult, public nuisance and private property. Technology influences customs: use of the pill increased public acceptance of non-marital sex (and vice-versa) and texting has reduced the frequency with which we make phone calls. Such social norms that regulate group behaviour both extend well beyond and pre-date humans, as in packing behaviour in wolves and pecking orders in chickens.¹

Common law originated in the UK in medieval times but has roots dating back to the Magna Carta (1215), which limited the rights of the crown. In common law traditions, independent judges and courts of law seek precedents containing guidance or standards for resolving disputes and enforcing contracts. Those precedents are themselves typically based on earlier precedents, which ultimately reflect the customs of the jurisdiction. If no precedents are seen to apply, judges or juries make law – define resolutions that best suit circumstances, perhaps invoking what would seem reasonable to a 'reasonable person' – and thereby establish precedents. Such 'judge-made' laws from lower courts compete in higher courts. If higher courts concur with a resolution, it can become the law of the land. Invoking precedent – the principle of *stare decisis* ('stand by things decided')

in legal terms – brings continuity, comprehensibility and predictability to society. Over the last two centuries, Australia, Botswana, Canada (except Quebec), Hong Kong, New Zealand, South Africa, the UK and the USA have inherited English common law traditions.

Table 1 Imposed vs. organic regulation

<i>Type of regulation</i> →	<i>Imposed</i>	<i>Organic</i>
Examples	Statutes Regulatory agencies Executive orders	Customs Markets, private agreements Common law
Codified?	Yes	No
How created	<ul style="list-style-type: none"> • By lawmakers, regulators and officials. 	<ul style="list-style-type: none"> • Emergent from social interactions, economic transactions and courtroom decisions.
How it evolves	<ul style="list-style-type: none"> • By lawmakers, regulators and officials. 	<ul style="list-style-type: none"> • Emergence of new social patterns. • Adaptation to new technologies. • Variation (by thousands of judges and juries) and selection (by other judges, juries and higher courts).

Common law, especially early² common law, is open-ended and economical: it does not try to address all cases that may arise in advance; rather, it addresses cases as they arise. It is also uncoded: it exists only in the many decisions handed down by judges and juries and evolves as decisions are handed down. Rather than rules, it provides guidance and standards. Over decades and centuries, customs and common laws reinforce each other, either positively or negatively and thus coevolve with each other and society. A custom is reinforced each time case law (precedent) that embodies the custom influences or determines the outcome of a court case. That custom is then more likely to persist in society and custom and precedent are more likely to be asserted and prevail in future cases. Conversely, customs and cases that are not cited are less likely to persist or influence future cases.

Even if common law and statutes apply, customs may still prevail to resolve disputes. In Shasta County, California, cattle grazing on open ranges – a practice dating back more than a century – may wander onto and damage private property, eat other ranchers' feed, or cause car accidents. But rather than turn to county officials, small claims court, or lawsuits, ranchers assume the cost of damages and maintain an informal community ledger of who owes what to whom. If infractions persist, a rancher may threaten castration or termination of cattle. Ranchers maintain such practices in part to avoid regulations from being imposed on them (Ellickson, 1986).

While many customs arise to resolve conflicts, *markets* arise from buyers and sellers seeking, finding and exchanging goods or services for mutual benefit. Technology, markets and customs all co-evolve with one another: for example, the Internet and global supply chains have incentivised millions around the world to learn English. Both customs and markets are forms of self-organisation that persist as long as they benefit the parties that adopt or participate in them.

Nobel laureate Smith (2008) has demonstrated how markets and the property rights that they pre-suppose can emerge spontaneously and could do so even in pre-agricultural communities well before the appearance of governments. He found that participants in experiments, without external enforcement, created conventions that secured property rights and enabled trade, despite theft being in the participants' self-interest (Kimbrough et al., 2010).³

Like the anthill that arises from the interactions of many ants without deliberate design, customs, markets and common law arise from the interactions of many humans without deliberate design. In contrast, individuals, businesses, clubs, homeowner associations and other organisations deliberately design private agreements. Such forms of private enforcement, self-governance and self-regulation are broadly referred to as private governance (Stringham, 2015). Hasnas (2008) uses the term consent-based law.⁴ Because the parties themselves design, negotiate and voluntarily consent to private agreements, we categorise them as organic regulation.

The human propensity to self-organise for mutual and social benefit defies law and politics. Even in totalitarian states that permit few or no freedoms or free exchange – imposed regulations in extreme form – forbidden languages persist and underground and black markets (unintended consequences of despotic rule) still arise (Remnick, 1990). Let's see how organic regulation reflects the complex systems dynamics of societies, economies and technologies.

3 Societies and economies as complex adaptive systems

Societies, economies, technologies, the environment and the brain are examples of *complex adaptive systems* (Mitchell, 2009):

- *Order* in them emerges not from deliberate design or top-down command and control but bottom-up from the interactions of large numbers of organisms or other actors. Examples: people giving rise to customs; buyers and sellers giving rise to wage and price levels and business cycles; different species giving rise to sustainable ecosystems; and neurons giving rise to large-scale patterns that form thoughts.
- Those interactions also form *feedback loops*, either positive or negative, that can produce non-linear, unpredictable and extreme results. Imperceptible changes and developments today can give rise to major differences in outcomes tomorrow. Examples: the rise of Google and Facebook, booms, busts, best sellers, fads, peacocks' tails and cancers.
- The systems *evolve* through variation and selection and are never at equilibrium (despite what they taught us in Econ 101). Rather, they are dynamic and constantly drawn to lower energy, lower risk, or higher payoff states ('attractors'). The systems are *adaptive* in that actors *adjust* (not merely react) to changes in other actors and the environment. Examples: in economies, people adopt new technologies and abandon old ones. In the environment, foreign species arrive and native species go extinct; species adapt. In human populations, immigrants and emigrants arrive and leave. In workforces, millennials reach working age and baby boomers retire.

- *Diversity* grows with the number of combinations of actors, often exponentially. Examples: the Cambrian explosion and the Industrial Revolution. Diversity tends to make a system both more *robust* (better able to continue functioning when perturbed or shocked) and more *resilient* (able to return to its original state more rapidly after being perturbed or shocked). Examples: genetically similar crops are more vulnerable to parasites, and identical computer operating systems to viruses, than more diverse crops and operating systems, respectively (Page, 2007).
- *Unintended consequences* often arise if the elements in such systems are controlled or constrained from behaving the way they would without such imposed constraints (Norton, 2008). Complex systems behaviour is determined by interacting factors along multiple dimensions; imposed constraints tend to be, if not one-dimensional, of lower dimensionality than the system; forces or tendencies along other dimensions thus adjust to and offset the constraints, giving rise to unintended consequences. Occasionally the unintended consequences are good; usually they are bad. Examples: laws causing police to stop motorcycle riders without helmets reduce motorcycle theft (most thieves don't carry helmets); drug wars foster organised crime; draining of wetlands causes flash floods and droughts; rent controls reduce the quantity and quality of housing and thus drive up rents.

Organic regulation reflects these complex systems dynamics. For example, common law allows for variation (by thousands of judges) and selection (by other judges and higher courts) and thus evolves with societies, economies and technologies. It is also bound to them through real-world cases: in the words of US Supreme Court Justice Oliver Wendell Holmes Jr. (1923), "The life of the [common] law has not been logic; it has been experience". Distributing control among thousands of judges makes it harder to corrupt the system. Financial author Taleb (2012) calls common law 'anti-fragile', meaning that challenges and stressors improve it. Each new case potentially extends or refines a body of common law.

4 Imposed regulations

Imposed regulations – federal and state statutes, regulatory agency promulgations and executive orders – reflect top-down civil law traditions and the policy objectives and interests of lawmakers and regulators, not merely resolving disputes as in common law and self-organisation as in markets. Statutes and regulations are created through new bills being introduced, negotiated by lawmakers and voted into law; and by agencies and political leaders defining and enacting regulations and orders.

Imposed regulations can address issues not efficiently addressed on a case-by-case basis, either because the cases are so numerous (e.g., parking and traffic violations) or because the cases concern public goods or commons where private property and ownership rights are not well defined (e.g., air pollution and public defence). In these cases, setting rules top-down may be more practical than having judges consider circumstances and precedents and adjudicating case by case.

Most of continental Europe, including France, Spain and Germany, has followed civil law traditions. Dating back to Roman times, emperors and legislatures provided rules for judges to follow.⁵ In the early 19th century, Napoleon initiated a comprehensive codification of civil law in France that brought clarity and consistency to the law and

nullified much prior law. Codification helped Napoleon consolidate power: judges became administrators who did not make law but merely applied it to the facts of cases. The central control and efficiency that civil law afforded made it the legal regime of choice for political leaders throughout much of Europe and later the world, particularly through the colonies of continental European powers. In the words of Damaška (1986), civil law is ‘policy implementing’ and common law is ‘dispute resolving’. In jurisdictions where civil law traditions prevail, even if all parties concerned see resolutions counter to statutory law as more equitable and attractive, judges and their litigants have little power to adopt them. In contrast to continental Europe, the UK was late to make widespread use of statutory law. According to Ponzetto and Fernandez (2008, p.403), “Although England has known legislation since the Middle Ages, before the 20th century it was used sparingly and reluctantly”.

While public goods and commons are generally considered the purview of imposed regulations, the late economics Nobel laureate Elinor Ostrom showed that organic regulation has long addressed even these cases on local scales. Tribes, communities and other organisations, even voluntary ones, have managed commons such as fishing lakes and forests without top-down authorities or codified rules for centuries. These self-governing groups optimise commons management using local knowledge, collaboration and graduated sanctions for free riders (Ostrom, 1990). Separately, anthropologist Steve Lansing documents how Balinese rice farmers have evolved collaborative rituals, sanctions, and the use of water temples to conserve and manage fresh water supplies for a millennium, again without top-down authorities or codified rules (Lansing and De Vet, 2012). So even public goods and commons may be organically regulated if free riders can be monitored and managed.

5 Public-choice concerns of imposed regulations

Vermont Law School Professor Goodenough (2011) observes that lawmakers and regulators have multiple objectives in drafting, negotiating and approving legislation and regulations. They seek efficiency, fairness, to better society and to heed popular sentiment. At the same time they try to secure campaign funding, attract special interests, insulate themselves and their agencies from risk and achieve other non-public welfare objectives. Legislators and legal scholars codifying statutes may be distant in geography and time from people and customs to whom and to which the law is applied, reducing both their local knowledge and accountability. A branch of economics – public choice – addresses how economic and other incentives unrelated to public welfare influence the law and regulation made by legislators and agencies. Such incentives invite public-choice concerns, for example:

- 1 Protecting favoured constituents. Examples: many cities prohibit online ride sharing, protecting conventional cab companies from Uber and Lyft. Florida statutes make it illegal to buy or sell beer in 64-ounce reusable containers, protecting major brewers from small craft breweries (CBS, 2014).
- 2 Protecting agencies. Example: a single death from an allowed drug subjects the US Food and Drug Administration (FDA) to criticism and embarrassment. Disallowing drugs eliminates this risk. Many of those thousands with life-threatening illnesses

whose life the drugs could save would, of course, very willingly take them even with their known risks, given the choice. In 1990, Louis Lasagna, chairman of a presidential advisory panel on drug approval, estimated that thousands of lives were lost each year due to FDA delays in approval and marketing of drugs for cancer and AIDS (Pear, 1990). Indeed, it was the inevitable public outcry that finally forced the FDA to approve those life-saving drugs.

- 3 Raising hidden taxes. Example: Philadelphia requires anyone who receives any income reported on Internal Revenue Service (IRS) form 1099 to purchase a 'business privilege' license (\$300) (City of Philadelphia, 2001).

Goodenough (2011) observes that classic law and economics analysis prefers judge-made law in part because it is less susceptible than legislatures to such public-choice effects. Many decision makers make the system harder to corrupt.

6 How imposed and organic regulations evolve

As noted above, common law is created and evolves through real-world cases and use of precedent to resolve disputes, through multiple decisions at many levels taking place in parallel. In effect, benches of judges 'crowdsource' common law-making. Common law evolves continuously as new cases arise.

In contrast, statutes and agency regulations reflect the objectives of the legislatures and regulators that were in place at fixed points in time: when the statutes and regulations were drafted, vetted and enacted; and when they are revised. When statutes codify common law as it stands at that point in time, the law's evolution converts from crowdsourced, parallel and continuous, to centralised, serial and periodic. Legislators and administrators may try to predict cases and circumstances, but with ever-accelerating technological change, doing so is increasingly difficult. In 2011, the Federal Communications Commission predicted that wireless spectrum was running out of bandwidth, a crisis averted by WiFi. In 2010, the US Joint Forces Command predicted that the US would experience major shortfalls in oil by 2012, a crisis averted by fracking and horizontal drilling (Chisholm, 2013). Anderlini et al. (2008) conclude that when an environment is sufficiently homogeneous and static, statute law is superior; but when more heterogeneous and dynamic, case law is superior.

In *Crisis in Leviathan*, Higgs (1987) shows that imposed regulations ratchet up in national emergencies such as wars, depressions, terrorist attacks and financial crises. The regulations rarely return to their original states after the crises are over and thus grow over time. For example, passports were temporary wartime measure during World War I but have now persisted for over a century (Dumitru, 2016). According to the US Congressional Research Service (Federal Register, 2014), in ten years, the 2012 Code of Federal Regulations' 174,545 pages increased by over 21% and in just five years, the number of binding rules they contain rose by 11.2% (Martin and Von Laer, 2016).

Because of the time and effort required to draft, negotiate and pass legislation, successive groups of lawmakers do not automatically revisit statutes and regulations as do judges with case law. Lawmakers may even try to block updates and revisions to avoid the risk of either unwanted amendments or reversals. Nonetheless, when enacted, either new or revised legislation can cause dramatic changes in regulation with little regard for precedent. The US Affordable Care and Sarbanes-Oxley Acts alone

represented tens of thousands of pages of law and supporting regulation. So statutes evolve and grow in less frequent but larger and more unpredictable steps than common law.

7 How organic and imposed regulations interact

In jurisdictions with both traditions, statutory law and common law are deeply intertwined and strongly influence each other. For example, in most US states, criminal statutes are primarily codifications of pre-existing common law (*The Economist*, 2013). In the UK, Atiyah (1985) surveyed the ways that statutory law influences common law. From least to strongest influence, they include judges:

- 1 interpreting statutes strictly and narrowly (thus minimally influencing common law)
- 2 using statutes as sources of values and analogies for developing common law
- 3 reasoning by analogy from statutes as if they were case law
- 4 giving statutes precedence as analogies over case law.

The greater use that judges make of 1 and 2, the more common law is free to evolve with and track real-world case experience. The greater use that judges make of 3 and 4, the more legislation imposes on common law.

Across both common and civil law jurisdictions, legislators and judges collaborate, often implicitly. Lawmakers increasingly rely on judges and courts to flesh out details of or fix problems with statutes (Atiyah, 1985). These trends improve statutory law by subjecting it to real-world test cases, but also constrain judges and litigants to conform to legislative and regulatory dictates. Calabresi (1982, p.1) asserts that in the last 50 to 80 years the US has “gone from a legal system dominated by the common law, divined by courts, to one in which statutes, enacted by legislatures, have become the primary source of law.” USC Law School Professor Hadfield (2006) concurs that judge-made precedent governs a declining proportion of litigation worldwide.

8 Unintended consequences of imposed regulations

Given that societies and economies are complex adaptive systems, unintended consequences predictably arise when regulations restrict people from or force them into interactions that are different from what they would voluntarily choose or agree to. Such restrictions include controls that limit buyers’ and sellers’ ability to self-organise for mutual benefit. For example:

- Pierre and Scarpetta (2013) show that employment regulations shift employment from permanent to temporary. The US Affordable Care Act (ACA), which imposes costs on businesses for employees working thirty or more hours per week, has caused many formerly full-time employees to be converted to part time, bad for businesses and employees alike.
- Johnson et al. (2000) finds that the codified rules of civil law allow corporate insiders to structure legal transactions that expropriate outside investors, a form of

self-dealing known as ‘tunnelling’. In contrast, the broader standards of common law such as fiduciary duty deter tunnelling more effectively.

- Minimum wage laws incentivise employers to reduce their use of low-skilled labour, accelerate their use of automation and robots and shift work overseas. According to Neumark and Wascher (2006), “A sizable majority of the studies surveyed ... give a relatively consistent (although not always statistically significant) indication of negative employment effects of minimum wages. In addition, among the papers we view as providing the most credible evidence, almost all point to negative employment effects, both for the USA as well as for many other countries”. If minimum wage laws preclude managers from affording and hiring employees who would eagerly accept lower wages, both parties are again worse off. Such laws are creating high youth unemployment in much of North America and Europe.
- If the FAA unduly restricts testing and export of unmanned aerial vehicles (drones), US manufacturers will move to other countries with markets less hamstrung by regulations, or lose global market share to non-US competitors (see case study).
- If taxes on alcohol or cigarettes are too high, black markets in these goods arise.

Imposing further regulations to plug loopholes does not eliminate unintended consequences. Just the opposite: adding rules creates more opportunities for gaming. Complicated and subjective regulations take time and money to explore and comprehend, imparting advantage to the best funded, most influential or suitably connected. These individuals can afford the best legal teams and the most protracted legal wrangling; they have the influence to win favourable interpretations or exemptions; or they have the means to discover loopholes and determine how best to leverage and exploit them [Acemoglu, (2009), p.10]. Having fewer, simpler and less obtrusive laws that can be readily and widely understood and complied with by everyone mitigates these effects.

9 Impact on entrepreneurship

Since 1992, I have founded or co-founded three software companies in Silicon Valley. Starting a company has become easier in the past 25 years in most respects, thanks to technology. Many more products and services exist today than 25 years ago, creating more opportunities for unique specialisation and differentiation and many more niches that startups can occupy or consolidate. Much technical knowledge and many skills can be acquired free online. Platforms have become more functional and smarter, enabling start-ups to do more with smaller teams. Geographically separated teams can more easily collaborate. Customers, suppliers and collaborators are all easier to find through online search. Entrepreneurs generally need less funding to get started and can more easily identify and qualify funding sources.

In my experience, only regulatory compliance has made starting and growing a business harder. In the US, imposed regulations deter entrepreneurship in at least three ways:

- 1 Getting started. Examples:

- a Worker status. When I started my first company, Decisive Technology (now part of Google) in 1992, you could freely hire a programmer or other contractor for as many hours or days per week as you could afford and as the individual was available. As your business grew, you could gradually increase the hours the contractor worked until you could afford to make him or her employee. It made starting a cash-strapped business possible for a novice entrepreneur.
Today it is much harder: complicated, subjective rules govern whether any worker, even one working just a few hours a week, is considered a contractor or an employee. If deemed an employee, you must withhold income taxes, withhold and pay social security and medicare taxes, pay unemployment taxes and comply with many other laws, rules and regulations. Each has its own supporting documents and forms – for example, the six-page Form SS-8 and its instructions, “determination of worker status for purposes of federal employment taxes and income tax withholding”⁶ (Internal Revenue Service, 2014). Satisfying the IRS that your worker is a contractor often requires a tax specialist or attorney, or having another firm hire the contractor as an employee and contract that person to you – a significant management burden and expense in either case, especially for first-time and less-skilled entrepreneurs.
 - b Occupational licensing. About one-third of US workers, whether self-employed or otherwise, now require licenses to pursue their chosen occupations (Carpenter et al., 2012). For example, over half of US states require a license to braid hair, a simple and safe practice dating back thousands of years. In some cases, braiders – many of them young black women who can ill afford the expense – must take irrelevant courses in cosmetology costing thousands of dollars (Avelar and Sibilla, 2014).
- 2 Innovation. Start-up research and development budgets go not into innovation but increasingly to compliance with regulations that are often out-dated. Example: until recently, restaurants and commercial kitchen ventilation suppliers had to comply with 1950s regulations that long predated demand ventilation and solid-state controls.⁷ See also ‘impact on innovation’.
 - 3 Expansion. Examples: zoning and building codes raise costs of offices, warehouses and factories. The Americans with Disabilities Act can require costly facilities to accommodate the disabled such as elevators and dedicated parking spaces that may be rarely or never used. Many conditions of the ACA kick in when a company reaches fifty or one hundred employees.

The imposed regulations that most burden fledgling companies vary widely by industry, type of business and company. Table 2 shows some candidates for the USA (Chisholm, 2015).

According to a 2012 study of the US census bureau longitudinal business database, the number of new businesses created for every 10,000 working-age Americans has declined from approximately 27 in the 1980s to 25 in the 1990s to 22 in the 2000s (Lynn and Khan, 2012). Using data from the Bureau of Labour Statistics, the study also showed that the percentage of working-age Americans who are self-employed dropped by 13.6% from 1994 to 2011. As a percentage of all businesses, new firms dropped from 16% in 1977 to less than 8% in 2010.

Since 2009, through entrepreneurship workshops and my book, *Unleash Your Inner Company* (Chisholm, 2015), I have advised or mentored thousands of entrepreneurs on five continents. Define any metric that you wish of potential entrepreneurs that combines ratings of such qualities as skill, passion, perseverance, self-confidence, ambition and resources. Your metric will distribute the entrepreneurs along a curve, perhaps bell-shaped. No matter how the metric is defined, many potential entrepreneurs, especially those at the low end of the scale, in my experience, are being blocked by regulations.

Table 2 Candidates for most burdensome regulations by industry or business type

<i>Industry or business type</i>	<i>Most burdensome regulations: candidates</i>
Software development	Limit on number of allowed H-1B visas
Medical devices	Food and drug
Construction	Occupational health and safety
Aerial vehicles	Federal aviation
Self-driving vehicles	Transportation
Real estate	Zoning; environmental protection
Delivery services	Transportation; municipal laws
Employ many teenagers	Minimum wage laws

10 Impact on innovation

In *A Concise History of the Common Law*, Theodore Plucknett (2001) credits English common law with enabling the Industrial Revolution. Common law had long been in place in England by the 18th- and early 19th-century, by which time the country was a hotbed of new technologies such as machinery and steam power. Common law also enabled new legal innovations such as contract and bankruptcy law and shares of jointly owned enterprises, enabling the larger capital investments that new technologies required. Technological, financial and legal innovation thus developed in parallel in England.

Organic regulation relies on liability and responsibility, thus allowing experimentation and enabling innovation while protecting others' lives and property. In contrast, imposed regulations rely on prohibitions and penalties, which discourage or disallow experimentation and innovation. Graphics help visualise the effects of imposed regulations on innovation. Say that ten years ago, a rule restricted what law allowed, perhaps for drones, or provision of taxi services, or use of gaming devices (Figure 1). Now fast-forward ten years to today with the rule still in place. Innovations in technology – perhaps AI, social networks and neuroscience – have enabled unexpected solutions to human needs along new dimensions – solutions that the rule now precludes. During that time, perhaps, innovation has enabled intelligent UAVs, or Uber and Lyft crowdsourced taxi services, or neurogaming helmets that increase concentration and speed reflexes during game play. What had previously been a single dimension of human

needs disallowed by the rule are now *multiple* dimensions disallowed by the same rule (represented by three dimensions in Figure 2).

Figure 1 Ten years ago, a rule (vertical line) bounded what was allowed and disallowed by law (see online version for colours)

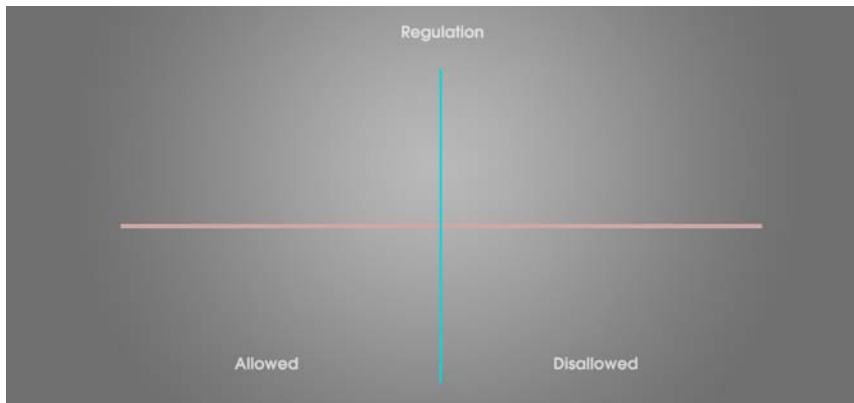
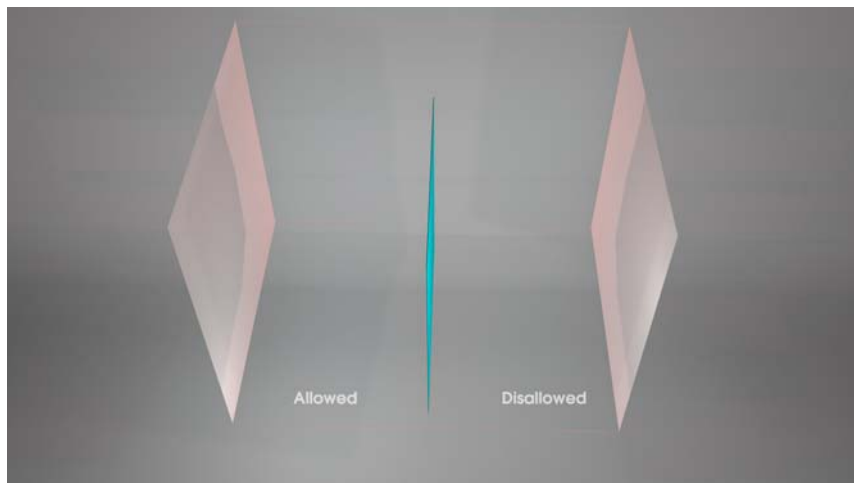


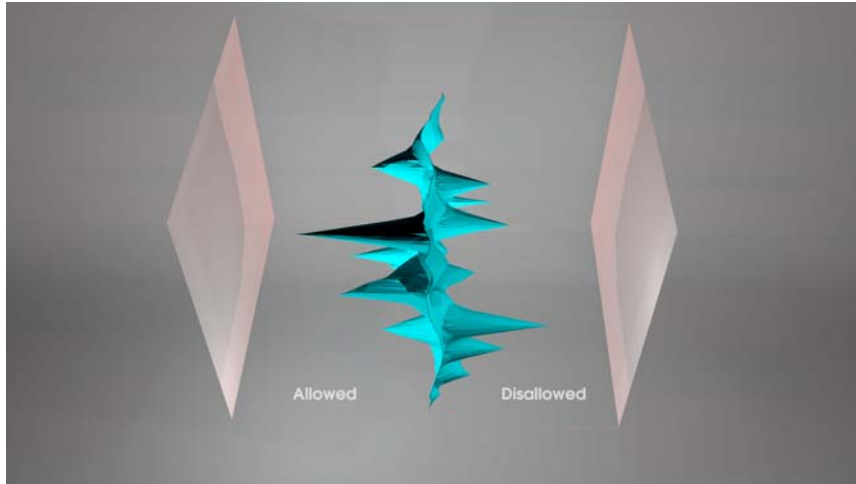
Figure 2 Ten years later (today) (see online version for colours)



Notes: Innovation has enabled new dimensions of human needs to be satisfied. The same rule from Figure 1 now disallows satisfaction of those needs on multiple dimensions (shown as three dimensions here).

Now fast-forward again ten years into the future. Legislators and/or regulators have negotiated amendments to the rule, increasing its length by 20%. The rule has become an irregular, complicated surface between what is allowed and disallowed (Figure 3). This surface takes time and money to explore and comprehend and as we have seen, imparts more advantage to the well funded and well connected.

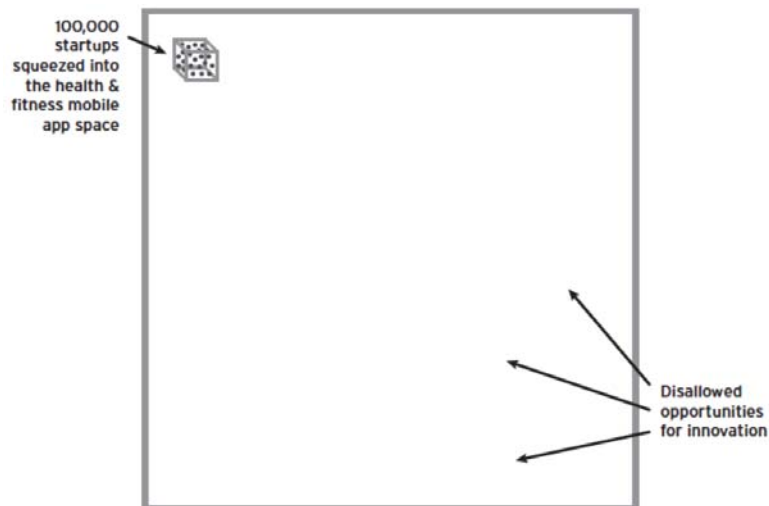
Figure 3 Ten years later (from today) (see online version for colours)



Note: The rule has become an irregular, complicated surface between what is allowed and disallowed that takes time and money to explore and comprehend.

In less regulated industries, changing customer needs, demand, technologies and competition are the biggest risks and uncertainties a business faces. But in industries with heavier imposed regulations like financial services and health care and increasingly in all industries, business people not only have to become knowledgeable of the current regulatory regime but also have to make guesses about its probable momentum and direction. The biggest risks and uncertainties they face are the regulations themselves (i.e., regime uncertainty).

Figure 4 Imposed regulations turn expansive, positive-sum market spaces into tight, zero- or negative-sum spaces for market participants



Over 100,000 publishers crowd into the health and fitness segment of the mobile app market (Figure 4) (Boxall, 2014). Few of these crowded apps will survive. In contrast, there are relatively few startups in aviation, construction, consumer banking, education, medical devices, pharmaceuticals and postal services. Why? In part because regulations are more heavily imposed on these areas. Imposed regulations raise barriers to entry, further entrench the positions of existing players and increase the capital required of new market entrants. Kritikos (2014) cites 2012 World Bank data to show how (imposed) regulation and innovation are inversely related by country. If even a fraction of the mobile app entrepreneurs could be freed to address these other opportunities, those fields would see much more rapid advances and humanity would be far ahead of where it is today.

11 Impact on economic growth

Multiple studies have correlated countries' economic growth and development with greater use of common law, either as a result of more developed financial markets or greater security of contracts and property rights (Mahoney, 2001). Looking at economic growth rates around the globe, Paul G. Mahoney states, "Over the period 1960–1992, common law countries experienced, on average, a bit more than half a percent greater real per capita GDP growth per year than did civil law countries, controlling for starting per capita GDP, secondary school enrolment, population growth, investment and other factors".

In 'The Economic Consequences of Legal Origins', Porta et al. (2008, p.298) catalog other institutional and economic benefits of a common law system:

"Compared to French civil law, common law is associated with

- Better investor protection, which in turn is associated with improved financial development, better access to finance and higher ownership dispersion
- Lighter government ownership and regulation, which are in turn associated with less corruption, better functioning labour markets and smaller unofficial economies; and
- Less formalised and more independent judicial systems, which are in turn associated with more secure property rights and better contract enforcement".

When Botswana gained its independence in 1966, it inherited two forms of common law. First was its long-established 'customary' tribal law. Second, after 1885, the British introduced common law but ruled Botswana only lightly as a protectorate, giving stature to its tribal law (Acemoglu et. al., 2003). From 1965 to 1995, Botswana was the fastest growing country in the world, with an average annual rate of growth of 7.7%. During that time, Botswana moved from third-poorest nation in the world to upper-middle income nation. New York University economist Easterly (2006) advises developing nations to adopt common-law systems as tools for development.

12 Case study

12.1 *Self-driving cars and unmanned aerial vehicles*

Self-driving cars and commercial unmanned aerial vehicles (UAVs or drones) have the potential to greatly improve safety, access and quality of life for consumers; efficiency and logistics for businesses; and public transportation for municipalities and civil defence for nations. Self-driving cars don't get tired, distracted, intoxicated, or fall asleep and as a result have amassed far superior driving records to humans. Drones serve people in remote locations; victims of earthquakes and other natural disasters; and those with limited mobility. The many commercial and consumer applications of drones include farming, construction, filmmaking and extreme sports. Let's compare imposed and organic approaches to self-driving cars' and drones' regulation.

12.1.1 *Imposed approaches*

Self-driving cars and UAVs are today illegal in the United States except under very restricted circumstances. As of this writing, self-driving cars are disallowed in all but eight states and the District of Columbia and even those jurisdictions require a human 'driver' present. As recently as August 2016, new Federal Aviation Administration (2016) regulations restricted drones to flying only:

- well away from airports
- up to 400 feet in altitude
- if they weigh less than 55 lbs (25 kg)
- within visual sight of a certified operator who may operate only one drone at a time
- during daylight hours
- not over people.

FAA waivers are required to depart from these restrictions. Consider just one of these restrictions, limiting UAVs to within sight of their operators and during daylight hours. This restriction discourages innovators from developing drone capabilities such as:

- sensing airborne objects like birds, kites and other drones
- computing the positions of those objects and moving quickly to avoid them
- communicating with other drones to avoid collision
- 24/7 deliveries of pharmaceuticals, spare parts and electrical components.

Given these constraints, it is hardly surprising that the top worldwide manufacturer of non-military UAVs today is not US-based but Chinese: Shenzhen-based DJI Technology Company. DJI's drones are used for farming, construction, finding earthquake victims and all of the other applications listed above.

12.1.2 Organic approaches

In contrast, organic regulation of self-driving cars and UAVs might look to precedents such as the liability and responsibility of the owners of dangerous animals (Froomkin and Colangelo, 2014) and to ‘Peeping Tom’ laws. Common laws have long held owners responsible for controlling or restraining dangerous animals to protect other people. Owners of self-driving cars and UAVs that destroyed others’ property or hurt or killed another person would be similarly responsible. Peeping Tom laws make it a crime to secretly peep into a room occupied by another person or to secretly photograph or video that person or room. Judges could naturally extend such laws to drones as well. To address negligence, wilful misconduct, or strict liability (harming someone through a defective product) in the use of self-driving cars and UAVs, common law would likely provide for or facilitate

- fines or imprisonment of the owners of irresponsible, invasive, or malicious self-driving cars or UAVs
- owners being able to hold irresponsible manufacturers responsible
- the use of interceptor UAVs to defend life, property and privacy from invasive or malicious UAVs.

For self-driving cars, the Rand Corporation concluded in a recent report that, “aggressive policymaker intervention is premature and would probably do more harm than good” [Anderson et al., (2014), p.149]. For drones, use of common law, while protecting life, property and privacy, would likely hasten development of the sensing, computation and communication innovations and applications bulleted above.

13 Recommendations for designing regulations

Despite its many advantages, organic regulation is widely overlooked by regulators, lawmakers and policy makers. So the first task is to make them aware of organic regulation as a viable option. Going further, we recommend that they adopt organic approaches first, giving the approaches ample opportunity to work and superseding them with imposed regulations only with a full appreciation for the costs of doing so. If regulations must be imposed for public good, political, or other reasons, here are specific recommendations for designing and implementing them so they most closely emulate, evolve like, and offer benefits of organic regulation. We again use drones as examples:

1 Codify objectives and outcomes, not specifications

‘Drones will operate safely and not harm people or property’ assigns broad responsibility to drone owners/operators without dictating how to achieve that outcome. Entrepreneurs experiment with and test many technologies that improve safety in drone design and operation. Even industry insiders are often surprised by improvements. For regulators to specify *means* rather than *outcomes* limits

experimentation, learning and ultimately public safety. ‘Aircraft have the right of way over drones’ holds drones or their owners/operators responsible for getting out of the way of aircraft (without dictating how). Contrast this approach with ‘drones will operate within visual sight of their operators during daylight hours only’, which strictly limits use of and deters innovation in drones.

2 Enable industrial and societal learning

Good regulations provide large spaces for learning. To achieve and retain global competitiveness, a country’s industries need to be able to learn rapidly, ideally more rapidly than those of other countries; and to best enjoy the benefits of new technologies, societies need to be able to discover how best to apply them. An enabling regulation such as ‘drones may freely operate up to 400 feet’ (while operating safely, or not harming people or property, or staying far enough away from people or objects to avoid collision) provides manufacturers, entrepreneurs and consumers wide latitude to experiment with, market and try out new technologies, while protecting people and property.

3 Extend definitions of private property

People are naturally incentivised to protect, preserve, invest in and improve what they own, either for their own use or for sale or exchange. Shale natural gas and drilling likely developed first in the US because individual property rights in the form of mineral rights (unlike in many other countries) apply to the ground underneath one’s land as well as that on earth’s surface.⁸ Even the UK, traditionally a common law jurisdiction, nationalised its onshore oil and gas reserves in 1934. The transfer of ownership of these reserves from individuals to the Crown reduced innovation in and development of these natural resources (Lowther, 2014). To avoid similar outcomes with UAVs, property owners should retain rights to some amount of airspace surrounding their property. This is not only for privacy as in the Peeping Tom case, but to encourage development of and investment in drones that improve and complement physical property (e.g., wash windows, paint, repair external walls and roofs, photograph/video events and provide security).

14 Recommendations for lawmakers and policy makers

Here are broader recommendations for lawmakers and policy makers imposing regulations, so that those regulations most closely emulate organic regulation and avoid public-choice concerns and unintended consequences:

1 Devolve regulatory authority

Transferring or delegating authority from more central to more local jurisdictions:

- empowers legislators and regulators who are closest to and most informed of local conditions and can best tailor regulations to those conditions
- makes it easier to hold local legislators and regulators accountable
- enables jurisdictions to learn from one another’s experiences and experiments.

Shale gas and drilling are regulated mostly by the states, who are sensitive to intrastate variations in geology and hydrology of shale formations. Such local oversight has helped enable the shale gas revolution, which has driven major reductions in natural gas costs (Brooks, 2011).

Online technologies today let decentralised networks of private citizens coordinate joint efforts and adapt to dynamic circumstances better than central authorities can. For example, the Harvard Kennedy School's Center for International Development finds that volunteers with cell phones can crowdsource and disseminate more timely and actionable earthquake and hurricane geographical and weather data than can official emergency response systems that gather and disseminate information centrally (Khwaja, 2012)⁹.

More-local jurisdictions learn from and copy each other. For example, cities adopt best practices from each other for such services as parks and recreation, road maintenance, public transportation and police and fire protection. Beyond greater accountability, adaptability and productivity, multiple decentralised authorities exploring different paths in parallel mean greater and faster learning, benefiting everyone.

2 Cap the number of words and pages of each law or regulation and of total regulations

A brief regulation is not necessarily good, but a long, complicated regulation is almost certainly harmful. If the number of pages of a law exceeds about a hundred, neither legislators nor private citizens will readily absorb their contents, comprehend their probable consequences, or even read them. Having many words and pages makes it easy to hide special-interest provisions and invites lobbying and horse-trading to pass the legislation. Complicated regulations at once empower agencies and disempower the people that the agencies serve. Cap both the number of words and pages of each regulation and the total number of words and pages of the code of federal regulations. For every new number of words and pages added, eliminate equal numbers.

3 Create special economic zones

Starting in 1978, China recognised six locally autonomous special economic zones (SEZs). The first of these, Shenzhen, has been among the fastest growing economies in the world. In the 1970s, Shenzhen was a fishing village; today it is a sprawling metropolis of approximately 15 million people. A growing percentage of the world's newest technologies come from China and Shenzhen in particular, thanks to SEZs. Focusing specifically on automation, the Japanese city of Fukuoka has piloted Tokku, special deregulation zones that create low-risk, living laboratories for testing robots and drones (Weng et al., 2015).

Such zones may determine their own regulations and taxes and be partially or fully exempt from being taxed for or receiving state and federal funds. For example, the autonomous Basque Country of Spain collects all of its own taxes and pays to the Spanish federal government a fixed 7% to 8% of those taxes, generally lower than the rest of Spain. This arrangement promotes accountability and efficiency and has helped the Basque region achieve and maintain the highest per capita income in Spain.

Eight of the most economically depressed cities in the United States are Akron, Ohio; Cleveland, Ohio; Detroit, Michigan; Flint, Michigan; Gary, Indiana; Lansing, Michigan; Stockton, California; and Toledo, Ohio. To revitalise these and other depressed areas, turn them into SEZs. Government commitments to SEZs must be genuine and long term – on the order of decades, not merely years – to persuade entrepreneurs that they are not bait-and-switch gimmicks to get them to move and start businesses there. But if the commitments are genuine and long term, expect entrepreneurs and investors to be attracted to and transform these blighted areas. As these pockets of economic freedom and growth make the advantages of SEZs visible, further expect other cities and regions of the USA to clamour for similar treatment.

4 Use innovation impact assessments

Make innovation impact assessments (IIAs) part of the vetting of proposed regulations. IIAs are similar to environmental impact assessments, assessing how wildlife will coevolve over years with real estate developments and landscaping. Both innovation and the environment are complex systems with aspects that are nonlinear or chaotic that simply cannot be predicted. But where a regulation's impact on innovation can be documented or reasonably predicted, it should be included in regulatory review and approval.

At the Neurogaming 2013 conference, panellists openly shared tips with entrepreneurs on how to avoid the Food and Drug Administration. If your game measures heart rate, don't advertise that fact; otherwise, the game may be considered a medical device and subject to FDA scrutiny. The detrimental impact of FDA regulations on such promising new industries would be highlighted in IIAs and cause regulators to either narrow the scope of regulations or exempt the industries.

5 Test regulation on small scales first

If unexpected costs and consequences overwhelm a regulation's benefits in a smaller jurisdiction, they will likely do so as well in a larger jurisdiction where the regulation's overall fit with history, practices and economic conditions is necessarily worse. Enacting the exact provisions of the US ACA in a state or region first would likely have revealed its perverse economic incentives before and thus informed its nationwide roll out.

6 Include sunset clauses in statutes

Technology is changing life and society at an ever-increasing rate, so the period of time a rule goes unreviewed should systematically decline. Consider letting every statute expire in no more than ten years, with the limit declining continuously by 10% every decade starting today. For any statute enacted in 2017, its limit would be ten years. For one enacted or re-enacted in 2027, the limit would be nine years. If one enacted or re-enacted in 2027 still made sense in 2036, it could then be re-enacted for eight years.

7 Measure and manage performance by jurisdiction

The World Bank annually reports its ease of doing business index for approximately 189 countries and regions around the globe. The index measures how easy or hard it is for a local entrepreneur to open and run a small to medium-sized business when

complying with relevant regulations. It measures and tracks changes in regulations affecting 11 areas in the life cycle of a business. A favourable ease of doing business overall ranking (i.e., a low rank, starting with #1) means the regulatory environment is conducive to starting and operating a business in that country or region (World Bank Group, 2015).

Wherever a country ranks on the index, a worthwhile and aggressive five-year goal for its political leadership is to *cut its ranking in half*. If a country currently ranks #100, make it a goal to be #50 by 2022. If a country currently ranks #20, make it a goal to be #10 by 2022. This very tangible, measureable goal will benefit all citizens of that country.

The United States has declined in the World Bank's overall ranking from #3 in 2005 to #7 in 2015, when it was surpassed by Singapore, New Zealand, Hong Kong, Denmark, South Korea and Norway (World Bank Group, 2015). A great and worthy goal for the USA to regain its freedom and leadership in innovation and global competitiveness, would be to return to the #3 or #4 rank by the year 2022. And then to #1 by 2027.

15 Summary and conclusions

We have compared organic and imposed regulatory regimes of societies and economies and seen how they interact and co-evolve. Organic regulation – social customs, markets, private agreements and common law – more closely reflects the complex systems nature of and closely evolves with economies and societies.

Imposed regulations – federal, state and local statutes, regulatory agency promulgations and executive orders – introduce public choice concerns, unintended consequences and greater risk of error and corruption. Imposed regulations are also less predictable long term than common law. Empirical and other evidence shows that use of organic regulation is associated with greater entrepreneurship, innovation and economic development and growth. Greater use of case-based law, a form of organic regulation, is especially important in heterogeneous environments where technological change is rapid. In case studies of self-driving vehicles and drones, we directly compare use of imposed and organic regimes. We recommend that regulators, lawmakers and policymakers adopt organic approaches first, giving them ample opportunity to work and superseding them with imposed regulations only with a full appreciation for the costs of doing so. When statutes are necessary, we recommend designing and implementing them, to the extent possible, to emulate common law.

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Notes

- 1 See 'exceptional fossils reveal the earliest evidence of social behavior in mammals', <http://phys.org/news/2011-05-exceptional-fossils-reveal-earliest-evidence.html>, 9 May 2011.
- 2 Zywicki (2003) notes that from the 17th to 19th centuries, thanks to such innovations as the printing press that made historical case records more widely available, the common-law principle of stare decisis gradually evolved from merely illustrative to more binding in both England and North America. As it did so, the principle strengthened the continuity, comprehensibility and predictability of law, but also invited manipulation of judicial precedent and 'rent-seeking' since later cases would more likely comply with prior ones. As a result, Hasnas (2008) distinguishes between 'old' (or 'early') and 'modern' common law.

- 3 Smith (2008) also tested outside mechanisms that secured property rights, for example, by changing the environment to remove the possibility of stealing from other ‘players’ entirely. Interestingly, in some cases these outside mechanisms lowered overall efficiency in the economy. The most important factor for efficiency was not the existence of an external mechanism, but “the extent to which subjects endogenously form cooperative as opposed to adversarial groups” (Kimbrough et al., 2010).
- 4 Hasnas (2008) categorises law as politicised (what I call imposed regulation), depoliticised (what I call organic without design) and consent-based (what I call organic with design).
- 5 In ‘Are we Rome?’, Reed (2015) speculates that heavy-handed, imposed regulations led to the decline and fall of the Roman Empire.
- 6 Worker status has become more onerous since 1992 due to both changes to the regulation and also stricter enforcement. IRS Form SS-8 was revised 13 times between 1985 and 2014, both responding to and contributing to the uncertainty of the regulatory environment.
- 7 Conversation with Bob Luddy, founder and CEO of CaptiveAire.
- 8 In legal terms, ‘mineral’ rights or interests commonly include rights to natural resources which a geologist would not classify as minerals, such as oil, gas and coal.
- 9 In *Complexity and the Art of Public Policy*, David Colander and Roland Kupers make the case that a central role (possibly the central role) of government is to facilitate self-organization among its citizens (Colander, 2014).