ANTI-HERDING REGULATION

Ian Ayres*
Joshua Mitts**

Abstract

In some contexts, an individual's choice to mimic the behavior of others, to join the herd, can increase systemic risk and retard the production of information. Herding can thus produce negative externalities. And in such situations, individuals by definition have insufficient incentives to separate from the herd. But the traditional regulatory response to externality problems is to impose across-the-board mandates. Command-and-control regulation tends to displace one pooling equilibrium by moving behavior to a new, mandated pool. Mortgage regulators, for example, might respond to an unregulated equilibrium where most homeowners start with 2% down by imposing a requirement that causes most homeowners instead to place 10% down. But this Article shows that society can at times be better off if regulation induces separating behaviors by regulated entities. We evaluate a variety of mechanisms including licenses, subsidies, and regulatory variances as well as regulatory menus and heterogeneous altering rules that can incentivize a limited number of regulated entities to take the path less chosen. Anti-herding regulation provides a new means to attend to ways that mimicry can both suppress the production of information and exacerbate systemic risk.

I. INTRODUCTION

There is a strong regulatory pull toward uniformity. It makes a bureaucrat's life easier if all firms fill out the same licensing form, and it is easier for bureaucrats to monitor compliance if all licenses convey the same privileges and obligations. One-size-fits-all regulation also comports with a naïve equal-protection norm of treating the public fairly. To be sure, the equal protection principle calls upon government actors to treat dissimilar individuals differently.[1] But in this Article we will explore circumstances where the government should treat similar people differently to discourage inefficient pooling by private actors. Anti-herding regulation can produce two kinds of benefits. First, anti-herding regulation can reduce the kinds of systemic risk that occur when there is excessive behavioral uniformity. For example, if virtually all homeowners (through low-downpayment first mortgages or equity-stripping second mortgages) have less than 5% equity in their homes, then a 10% reduction in housing prices can lead to a destabilizing wave of defaults. Second, anti-herding regulation can produce socially beneficial information. Inducing separating equilibria among the regulated can, for example, avoid the inefficiency of informational cascades and help steer both private and public actors toward better evidence-based outcomes. More broadly, we argue that regulators should be attuned to systemic impacts of regulatory pooling on the production of information and on the production of systemic risk. Pooling is normally a good thing. Competitive markets pool

---

[1] *See generally* Paul Brest, *Foreword: In Defense of the Antidiscrimination Principle*, 90 HARV. L. REV. 1 (1976).

on a single price. Highways are safer if drivers choose to drive at the same speed.[2] But this Article delineates circumstances where regulation should actively strive to induce behavioral diversity.

It is easy to see that mandatory rules induce pooling. Public health laws force every child to receive the same vaccines prior to entering school. But pooling equilibria is often a frequent byproduct of even regulatory regimes that grant more autonomy to the regulated entities. Thus, for example, the minimum reserve requirements give banks the option of retaining higher cash reserves, but in the ordinary course of business many banks find it most profitable to pool at the regulatory minimum. Indeed, the minimum reserve likely induces more pooling than would occur in a world where banks individually choose the percentage of deposits to keep on hand.[3] Regulation can thus not only mandate pooling, regulation can also subsidize pooling in the sense of incentivizing regulated entities to opt for similar action.

But even seemingly neutral default rules may lead to socially inefficient pooling. If you run a bank and you are deciding whether to herd with other banks and invest a substantial proportion of your assets in mortgage-backed CDOs, you are not incentivized to fully consider how your investment choice will impact the default risk of other banks.[4] To be sure, moving from mandatory to default regulation will often induce more separation. Homeschooling produces more educational diversity than the lock-step uniformity of the Soviet regime. And regulators should be attuned to whether their default regulations are producing sufficient diversity. Home mortgagors were free to make larger downpayments, but in the early 2000s the majority of borrowers chose to put down less than 5% heedless of how their individual choices impacted the fragility of their neighbors' investments. Whenever there are positive externalities from separating equilibria, regulators should be concerned that a laissez-faire market will underproduce separation.

Regulation is of course a natural response to the problem of negative externalities. When my pollution hurts you, regulation naturally restricts my right to omit effluents. But the standard regulatory response to externalities is to impose mandated uniformity. The standard response moves behavior from one pooling equilibrium (say, of pollution) to another pooling equilibrium (of non-pollution). But in some contexts, it is the pooling of behavior that is itself the problem. A regulatory mandate that moves homeowners from a pooling equilibrium of 1% downpayments to a pooling equilibrium of 5% does not solve the pooling problem. There is nothing socially deleterious about a few homeowners having highly leveraged mortgages. Indeed, having

---

[2] Highways are not, however, safer if all drivers choose to drive at the same time.

[3] A similar kind of pooling at a regulatory minimum can be seen in how New York City tenement design responded to the minimum light shaft requirements of the Tenement Housing Act of 1879. *See* Alan S. Oser, *Making Tenements Modern*, N.Y. TIMES, Apr. 4, 1999, *available at* http://www.nytimes.com/1999/04/04/realestate/making-tenements-modern.html.

[4] Analogously, in choosing whether to follow the herd or to deviate, you are unlikely to fully internalize the information benefits to society of being a maverick.

a few low-equity mortgages might provide an early warning of problems in the housing market. The problem is when a substantial proportion of home-owners simultaneously choose to take out mortgages with high leverage.[5]

The challenge then for anti-herding regulation is to craft regulatory regimes that proactively induce separation. The goal of this Article is not only to theorize *when* anti-herding regulation is appropriate, but to suggest *how* it might be feasibly implemented. A first step is to grant regulated entities greater autonomy. Moving from mandatory rules to laissez-faire defaults at times will be sufficient to diversify the behavior of regulated entities. Regulatory defaults, or default rules in regulatory regimes, can let a thousand flowers bloom. This form of laissez-faire diversity can at times be enhanced by non-transparency. Transparency that allows regulated entities to see how other entities behave facilitates mimicry and leads to disabling informational cascades. In such cases, Bayesian decision makers find it individually more rational to mimic the tried-and-seemingly-true behavior of others rather than to take the road less traveled. We will show that at times even mandated non-transparency might produce better information or more diverse risk-taking.[6]

Policies that expand autonomy promote separation by exploiting pre-existing differences among the regulated—differences that lead them to make different choices. But for reasons already discussed, the differences among the regulated may not be sufficient to produce socially desirable separation. Anti-herding regulation must be ready to confront the harder problem of inducing *similar* entities to behave differently. To this end, we suggest ways that government can incentivize limited amounts of deviation from a pool by using combinations of carrots and sticks. Accordingly, we develop the idea of limited licenses and regulatory variances that lift a regulatory burden for a subset of regulated entities. For example, the Treasury might supplement the recent Dodd-Frank risk-retention rules for securitized mortgages[7] by auctioning a limited number of licenses freeing license-holding lenders from securitizing prohibitions. A limited number of tradable licenses can preserve ex ante equal protection while insuring ex post diversity in regulatory burdens. Regulatory menus and heterogeneous altering rules can produce analogous separating effects. Something as simple as putting progressive surcharges on certain mortgage terms that tend to exacerbate

---

[5] Indeed, a hallmark of many of the pooling problems described here is non-linearity of the externality. The externality is exacerbated as the size of the pool increases. The first and second derivatives of the externality with respect to the size of the pool are likely to be positive—at least for some policy-relevant levels of pooling.

[6] Banks that do not know the portfolio decisions of their rivals will be unable to merely mimic others' investment decisions.

[7] *See* Credit Risk Retention Final Rule (Oct. 23, 2014) (to be codified at 12 C.F.R. pt. 43), *available at* http://www.federalreserve.gov/aboutthefed/boardmeetings/bcreg20141022a1.pdf.

systemic risk[8] can constrain excessive pooling on those terms without completely eliminating activity.

The remainder of this Article is divided into three parts. The next Part sets out our theory of why anti-herding regulation can help constrain negative externalities with regard to both systemic risk and information production. Part III explores anti-herding regulatory mechanisms (including licensure and menus) to better promote separating equilibria. Part IV then sketches how anti-herding regulation might be usefully applied in a variety of contexts.

II.   WHY INDUCE SEPARATING EQUILIBRIA? STABILITY AND INFORMATION RATIONALES FOR ANTI-HERDING REGULATION

A.   *Pooling v. Separation in Contract Law*

The concepts of "pooling" and "separating" equilibria describe the degree of similarity and difference, respectively, between transaction terms or outcomes across contracts.[9] Terms include price, type of transaction, and other non-price terms such as delivery requirements and payment structures. Outcomes refer to the economic implications of an agreement, which may be similar across agreements even if their terms differ in a technical sense.

To take a simple contracting example, if A buys wheat from B at two dollars per bushel with a thirty-day delivery period, we would say that C and D are "pooling" with A and B when C buys wheat from D at the same price and delivery duration. Conversely, C and D are "separating" from A and B when C agrees to buy wheat at five dollars per bushel with a fifteen-day delivery period. However, even if C and D separate from A and B, other contractors may pool with either or both of the pairs, resulting in multiple "pools."[10] To obtain further separation, it is necessary for subsequent contractors to transact at different combinations of price and delivery lengths. Accordingly, the degree of pooling and separation depends on the distribution of terms across contracts. This can easily be visualized on the two dimensions of price and delivery length:

---

[8] *See generally* Ian Ayres & Joshua Mitts, *Three Proposals for Regulating the Distribution of Home Equity*, 31 YALE J. ON REG. 77 (2014) (noting that interest-only, low-downpayment, interest-reset terms exacerbate system risk relative to traditional fixed-rate amortizing loans).

[9] As we discuss below, in the context of partial industry regulation, one can easily extend the analysis of private contracting in this Article to decisions by administrative agencies to enforce policy according to certain criteria. Indeed, individual decisions more generally can be analyzed along a spectrum of cross-sectional similarity in terms of pooling and separation.

[10] Contractors may also pool in response to government regulation by engaging in the same type of transaction. For example, housing subsidies led to the popularity of subprime mortgages.

Figure 1: Pooling v. Separating Equilibria

Pooling Equilibria   **Separating Equilibria**
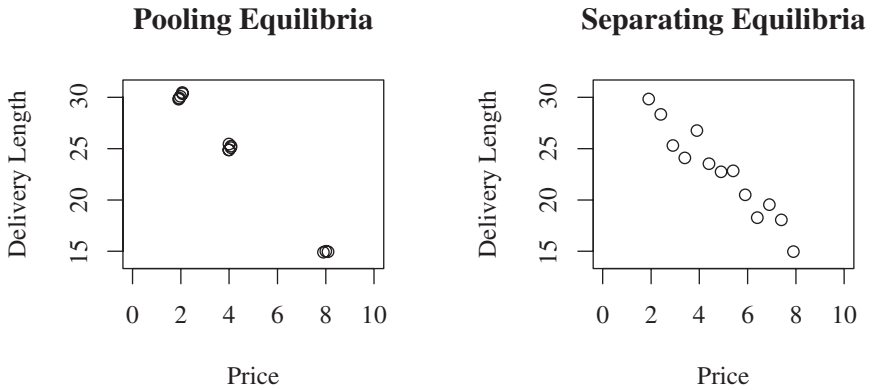
It is difficult to visualize additional dimensions, but the principle is the same: separating equilibria reflect a dispersion of contracts across the spectrum of terms.

In a competitive market, it may not be possible to obtain a price lower (or higher) than the competitive level. Even with perfect competition, however, contractors can often negotiate price in exchange for changes to other terms—such as conditions of payment or delivery—and thereby separate. Of course, each party obtains some subjective utility from a given combination of terms. Presumably this utility exceeds the cost of contracting and performance, or else the party would not have entered into the agreement. But pooling and separation are defined with respect to contract terms in an external, objective sense, considering the empirical distribution of contracting terms across a sector, geographic region, or society as a whole. The focus of our discussion is essentially *regulatory*: how should the law respond to the collective effect of similarity in private contracting?

This question matters because the emergence of pooling and separating equilibria can have profound implications for efficiency and, as we show below, systemic stability and information acquisition. Indeed, the importance of this topic has been noted in the legal and economics literature. As far back as 1973, Michael Spence showed that workers may signal competencies by choosing either to pool at the same level of education as other workers or to separate by adopting different levels of education, depending on the payoffs involved.[11] Thereafter, the distinction between pooling and separating equilibria played a significant role in game theory and the analysis of strategic behavior.[12]

---

[11] Michael Spence, *Job Market Signaling*, 87 Q. J. Econ. 355, 362–63 (1973); *see also* Martin J. Osborne & Ariel Rubinstein, A Course in Game Theory 238 (1994) (describing Spence's signaling game and the resulting pooling and separating equilibria).

[12] *See, e.g.*, Osborne & Rubinstein, *supra* note 11, at 238.

Law-and-economics scholars have since shown that "[r]estrictions on freedom of contract" can "move the contractual equilibrium to more efficient forms of contractual separation."[13] There are clear benefits to treating different types of contractors differently, or getting different types to separate, but in this Article we focus on getting similar types to separate. A key insight is that inducing separation among otherwise similar contractors can sometimes be more efficient than pooling.[14]

As we show in this Article, much of regulation actually produces pooling. It is easy to see how mandatory rules produce pooling, but even default rules can induce inefficient pooling if similar contractors ignore the social benefits of separation or if the cost of altering the default is sufficiently high.[15] The importance of separation seems to contradict the premise of much of the regulation of private economic activity. For example, much of consumer protection law mandates disclosure of specific terms. Regulation Z, which implements the Truth in Lending Act, prescribes in meticulous detail a comprehensive list of terms that must be disclosed to borrowers.[16] The notion that different types of disclosure might apply to some borrowers and not to others is foreign to the Truth-in-Lending regime. Or consider insider trading. Rather than considering whether only certain actors should be subject to the prohibition on insider trading, the U.S. securities laws impose a blanket prohibition on any trading on material, nonpublic information.[17] Indeed, the entire body of criminal law reflects a paradigm of inducing pooling equilibria at non-commission of the prohibited conduct.[18]

We are not suggesting the lawmakers abandon prohibitory rules entirely. Pooling is often socially beneficial. For example, scholars have noted that mandatory rules in contract law—which necessarily induce pooling equilibria—can prevent an "inefficient splintering of precedent that might

---

[13] Ian Ayres & Robert Gertner, *Strategic Contractual Inefficiency and the Optimal Choice of Legal Rules*, 101 YALE L.J. 729, 744 (1992).

[14] Ian Ayres and John Braithwaite have argued that "partial-industry regulation"—where government regulates only a subset of an industry—can reduce monopoly power. Ian Ayres & John Braithwaite, *Partial Industry Regulation: A Monopsony Standard for Consumer Protection*, 80 CALIF. L. REV. 13, 1516 (1992) (finding that "purposefully treat[ing] firms in an industry differently" can promote competition and suggesting benefits of separation in the enforcement of regulatory policy); *see also* Ian Ayres, *Responsive Regulation: A Co-Author's Appreciation,* 7 REG. & GOV. 145, 146 (2013) ("In some contexts, regulators should intentionally strive for a separating equilibrium in which the regulated entities behave differently. A regulatory goal to avoid pooling can naturally lead to new forms of partial-industry regulation.").

[15] Penalty defaults might induce more separation than would majoritarian defaults. *See* Ian Ayres & Robert Gertner, *Filling Gaps in Incomplete Contracts: An Economic Theory of Default Rules*, 99 YALE L.J. 87, 111–12 (1989).

[16] *See* 12 C.F.R. § 226.1–226.59 (2012).

[17] *See, e.g.*, United States v. O'Hagan, 521 U.S. 642 (1997); 17 C.F.R. § 240. 10b5-1 (2012).

[18] In practice, of course, individuals still separate by committing crimes and paying the price that the law imposes for their conduct if they are caught.

take place under an enabling rule."[19] Pooling equilibria lead to greater pre-
dictability because contractors can rely on the prior experience of others who
have transacted on a given combination of price and non-price terms. The
prevalence of contracts of adhesion in the consumer setting likely reflects
the benefits of reducing variation in non-price terms and pooling contractors
at the competitive price level.

     Nonetheless, too little separation can be costly. Commenting on *Hadley
v. Baxendale*,[20] scholars have shown that a liability ceiling can induce "a
more efficient separating equilibrium (in which both high-value and low-
value shippers are served)" by "eliminat[ing] the carrier's incentive to ig-
nore low-value shippers."[21] Similarly, a government policy of awarding con-
tracts to the lowest bidder can perpetuate racial discrimination by pooling
with non-minority contractors when "private suppliers (of, say, credit or
steel) systematically charge higher prices to minority firms."[22] Neutralizing
such discrimination requires inducing separation in awarding government
contracts, for example, by "estimat[ing] which firms would be available to
place winning bids in the absence of private discrimination and then . . .
award[ing] such firms bidding credits to recreate their ability to compete."[23]

     More recently, Ian Ayres and Joshua Mitts discussed the detrimental
effects of excessive pooling equilibria in the home mortgage market.[24] They
showed that clustering of low levels of equity among homeowners in geo-
graphic areas can dramatically exacerbate the effect of natural downturns in
housing prices, leading to a feedback cycle of foreclosures and further fall-
ing prices.[25] However, incentives to obtain a *single* level of minimum home
equity—even if higher than the 0% downpayments that characterized pre-
financial crisis mortgages—would also be detrimental.[26] For example, a drop
of 10% in housing prices would push the same group of homeowners into
negative equity whether they were pooled at 2% or 8% equity. While pool-
ing all homeowners at high levels of equity (say, 20%) would reduce the
overall likelihood of foreclosure, this would have harmful distributive ef-
fects.[27] A narrowly tailored approach to reducing systemic risk in the hous-

---

[19] Ian Ayres, *Making a Difference: The Contractual Contributions of Easterbrook and Fischel*, 59 U. Chi. L. Rev. 1391, 1405 n.30 (1992) (book review) (citing Jeffrey N. Gordon, *The Mandatory Structure of Corporate Law*, 89 Colum. L. Rev. 1549, 1565–66 (1989)).

[20] 156 Eng. Rep. 145 (1854). *Hadley* involved a suit for consequential damages over lost profits while a mill could not operate due to the delayed delivery of a crankshaft.

[21] Ayres & Gertner, *supra* note 13, at 744.

[22] Ian Ayres & Fredrick E. Vars, *When Does Private Discrimination Justify Affirmative Action?*, 98 Colum. L. Rev. 1577, 1640 (1998).

[23] *Id.*

[24] Ian Ayres & Joshua Mitts, *Three Proposals for Regulating the Distribution of Home Equity*, 31 Yale J. on Reg. 77, 142 (2014).

[25] *Id.* at 105.

[26] *Id.* at 125–26.

[27] *See id.* at 119–120.

ing market requires moving from pooling to separating equilibria—altering not only the average level of equity but also its *distribution*.[28]

In the following two sections, we expand on this principle of inducing beneficial diversity in the distribution of contracting terms by discussing two fundamental rationales for inducing separating equilibria: stability and information. When discussing each, we show how regulatory intervention is justified to prevent social externalities.[29] When private contractors choose to pool with others, they impose costs on society that justify a regulatory response.[30]

B.   *Economic Stability and Survival*

In a recent article, Ayres and Mitts argued that low-equity clustering contributes to systemic risk by exposing proportionately more contractors to negative equity as a result of downturns in housing prices.[31] In this section, we show more generally how "herding," that is, excessive contractual pooling equilibria, endangers economic stability, justifying regulation for the sake of society as a whole.

1.   *Proportionate Exposure to a Fixed Shock*

At a fundamental level, the existence of physical assets that permit human survival implies that nearly every shock will necessarily be limited to some subgroup of the population. Other than events that would lead to the utter destruction of human civilization (for example, an asteroid impact or climate change), the negative impact of any shock—no matter how severe—will eventually be absorbed by humanity, leaving survivors to consume the resources that remain. Of course, most economic crises have an impact that is far less severe for wealthy societies—indeed, while the United States emerged from the recent financial crisis with a reduced standard of living, there were no large-scale famines or waves of disease that characterized prior eras following financial crises.

Accordingly, from the standpoint of promoting stability, the key question is *where* precisely the dividing line between the affected subgroup and the remainder of society will fall. To take a concrete example from Ayres and Mitts's discussion of the recent financial crisis, the unknown variable was the precise percentage that home prices would fall, such that all homeowners below that level would be pushed into negative equity. More generally, we can define some cutoff *c* that represents this dividing line between the affected and unaffected as a result of a crisis. Critically, the value of *c* is

---

[28] *See id.* at 142.

[29] *See* Ayres & Gertner, *supra* note 15, at 88–89 ("[I]mmutable rules are justifiable if society wants to protect (1) parties within the contract, or (2) parties outside the contract.").

[30] They may also impose costs on themselves, which may not be fully internalized because of psychological biases that encourage pooling even to one's own detriment.

[31] *See* Ayres & Mitts, *supra* note 24, at 90.

unknown prior to a crisis. Plotting two potential values of this cutoff on the two prior graphs demonstrates the general danger that excessive pooling equilibria pose:

FIGURE 2: THE EFFECT OF POTENTIAL SHOCKS ON POOLING
v. SEPARATING EQUILIBRIA

Pooling Equilibria   **Separating Equilibria**
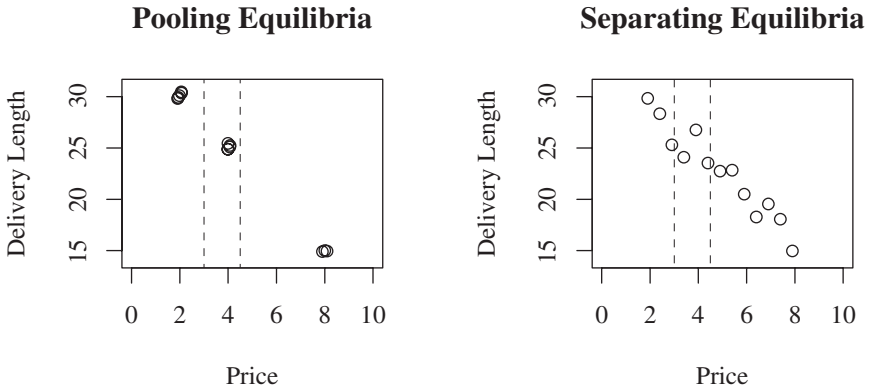
These graphs plot $c = \$3.00$ and $c = \$4.50$ as vertical lines, which can be interpreted as a shock to buyers at that price level—for example, a sudden post-acquisition drop in the price of wheat of $3.00 or $4.50, respectively. While a shock at $3.00 seems to affect roughly the same number of buyers whether pooled or separated, a drop of $4.50 subjects the *entire* group pooled at $4.00 to the shock but only affects a smaller proportion of the separated buyers. This is identical to the argument advanced recently by Ayres and Mitts: pooling at low levels of equity exposes proportionately more homeowners to the risk of a sudden drop in home prices than if they were more broadly dispersed among equity levels.

The notion that separating equilibria enhance systemic stability is not limited to the idiosyncratic example we just gave. While we do not give a rigorous mathematical proof in this paper, a few intuitions suggest the universal applicability of this principle. Modern portfolio theory holds that diversification of investments reduces idiosyncratic risk by spreading it across assets that are less than perfectly positively correlated.[32] The benefits of diversity derive from the fact that the potential outcomes of a given set of contractual terms are unknown ex ante, which implies that each set of terms has a probability distribution with a nonzero variance. As long as the returns of different sets of terms are not perfectly positively correlated, diversity reduces risk.

---

[32] *See generally* EDWIN J. ELTON ET AL., MODERN PORTFOLIO THEORY AND INVESTMENT ANALYSIS (Jennifer Manias et al. eds., 8th ed. 2009) (surveying the development of portfolio theory).

Indeed, there is a deep connection between the risk-reducing properties of asset diversification and separating equilibria among contract terms. From a societal perspective, the "returns" from a given set of contract terms reflect the externality of a transaction. Many types of failed transactions are not merely zero-sum propositions where one party's loss is the other's gain but rather impose costs on society as a whole. Indeed, the recent financial crisis has shown that mass failure and economic instability are costly for society. By distributing contracts across risk portfolios that are not perfectly positively correlated (for example, identical contract terms), society gains the benefit of diversification just like an individual who invests in uncorrelated assets. Some terms might fail but others will succeed, reducing the overall variance of outcomes.

The importance of diversity and separation is not limited to financial investments. In the following two subsections, we demonstrate how the benefits of diversity are evident across a wide range of natural phenomena, from agricultural ecosystems to genetic profiles. Separating equilibria can facilitate the emergence of stronger economic institutions that can withstand unexpected shocks—and possibly even reverse the trend of increasing social fragility that has facilitated repeated economic crises.

2. *Biodiversity and Ecosystem Stability*

A key tenant of our argument is that separating equilibria promote stability by spreading risk across a greater proportion of contract terms. In our view, the benefits of diversity reflect a fundamental property of risk-readiness that is evident across a number of fields, not only finance theory. Understanding the stability-enhancing properties of variation as they appear in natural contexts can shed light on the importance of inducing separating equilibria among contract terms. One prominent example is ecology, where the benefits of diversity in the composition of biological ecosystems are well known.

In 2005, a prominent ecological literature review summed up the stability-enhancing aspects of variation in biological ecosystems:

> If an ecosystem is subject to a variety of natural and human-caused environmental stresses or disturbances, then having a diversity of species that encompass a variety of functional response types ought to reduce the likelihood of loss of all species capable of performing particular ecological processes . . . In such cases, unstable individual populations stabilize properties of the ecosystem as a whole.[33]

---

[33] David U. Hooper et al., *Effects of Biodiversity on Ecosystem Functioning: A Consensus of Current Knowledge*, 75 ECOL. MONOGRAPHS 3, 15 (2005) (citations omitted).

Of particular interest for our claim regarding the benefit of diversity in the contractual setting, the authors explicitly link the benefits of biodiversity to financial portfolio theory: "[i]f species abundances are negatively correlated or vary randomly and independently from one another, then overall ecosystem properties are likely to vary less in more diverse communities than in species-poor communities," providing a "statistical averaging [which] is similar to diversified stock portfolios."[34]

The authors provide the following graphical depiction of the "simulated stability of individual populations and a resulting community property (summed abundances of individual species) illustrating the portfolio effect:"[35]

FIGURE 3: THE STABILITY-ENHANCING EFFECT OF BIODIVERSITY

---
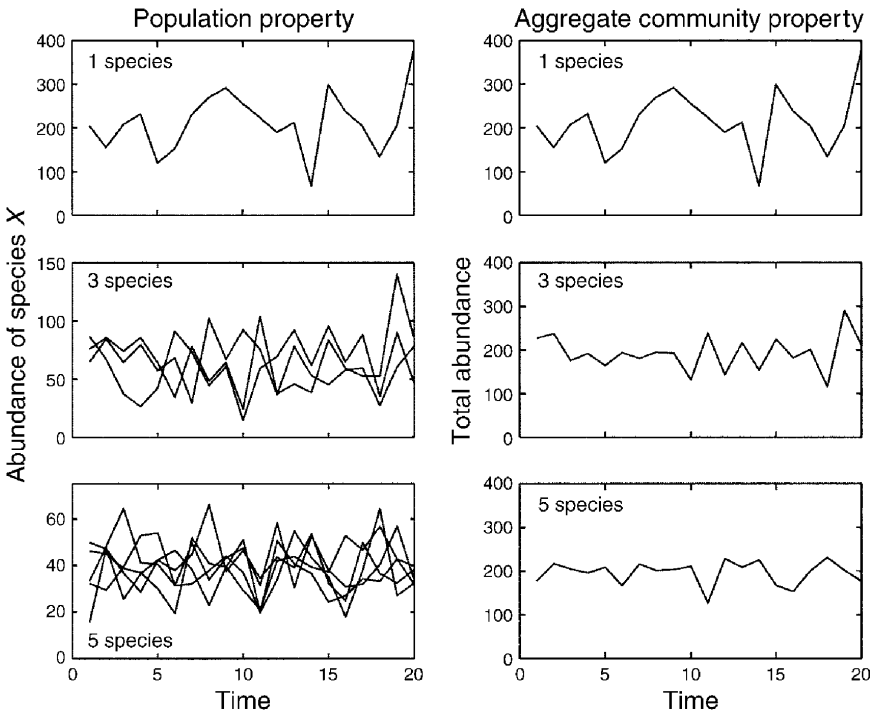
[34] *Id.*

[35] *Id.* at 16 (citing D.F. Doak et al., *The Statistical Inevitability of Stability-Diversity Relationships in Community Ecology*, 151 AM. NATURALIST 264 (1998); G. D. Tilman, *Biodiversity: Population Versus Ecosystem Stability*, 77 ECOLOGY 350 (1996); K.C. Cottingham et al., *Biodiversity May Regulate the Temporal Variability of Ecological Systems*, 4 ECOL. LETTERS 72 (2001)). The authors emphasize that the "decrease in aggregate variability with increasing numbers of species results from the random fluctuations of the individual species. Underlying assumptions that contribute to the degree of dampening include equal abundance of all species and no correlation ($r = 0$) among species' temporal dynamics." *Id.*

The figure demonstrates that as the number of different types of species increases, the random variation of each species reduces the instability of the overall community. This is precisely the theoretical justification for inducing separating equilibria among contractual terms: society as a whole benefits from reduced economic instability.

The benefits of biodiversity are not merely theoretical, however. Field experiments have provided tentative empirical support for the proposition that diversity enhances ecological stability.[36] For example, "studies of ecosystem recovery after disturbance have often found that ecosystems with more rapid recovery (i.e., greater resilience) were those with a higher diversity of response types[,] e.g., a mix of seeders and sprouters in the case of fire."[37] Similarly, "[e]xperiments in microcosms and grasslands suggest that increased species richness, either in terms of numbers of different functional groups, or numbers of species within trophic functional groups, can lead to decreased temporal variability in ecosystem properties."[38] In short, the notion that separation promotes stability is supported by ample empirical research in the ecological setting.

The importance of preserving biodiversity has served as the motivation behind the worldwide effort to establish and maintain seed banks over the last forty years. In 1972, the National Academy of Sciences issued a report in response to the Southern corn leaf blight epidemic of 1970, warning that "a decrease in genetic diversity [in agriculture] has accelerated since the adoption of hybrid corn" from 1920–1970.[39] The report led to the establishment of the institution now known as Bioversity International, which initially coordinated efforts to promote the storage of crop diversity in seed banks in the 1970s and now conducts research to preserve agricultural biodiversity across the globe.[40]

The need to maintain sufficient separation has been widely acknowledged in ecological and agricultural research but remains largely absent from the economic paradigm underlying contract law and financial regulation. The risk-readiness justification is identical across the two contexts, however. Like biological systems, markets are subject to unexpected shocks, which would have a lesser impact if spread across a variety of contractual equilibria. Indeed, as we explain in the next subsection, the benefits of separating equilibria derive from more fundamental properties such as the essen-

---

[36] *Id.* at 17–19.

[37] *Id.* at 17–18 (citing Sandra Lavorel, *Ecological Diversity and Resilience of Mediterranean Vegetation to Disturbance*, 5 DIVERSITY & DISTRIBUTIONS 3 (1999)).

[38] *Id.* at 19 (citing Jill McGrady-Steed et al., *Biodiversity Regulates Ecosystem Predictability*, 390 NATURE 162 (1997); Shahid Naeem & Shibin Li, *Biodiversity Enhances Ecosystem Reliability*, 390 NATURE 507 (1997); Mark C. Emmerson et al., *Consistent Patterns and the Idiosyncratic Effects of Biodiversity in Marine Ecosystems*, 411 NATURE 73 (2001)).

[39] NAT'L ACADEMY OF SCIENCES, GENETIC VULNERABILITY OF MAJOR CROPS 100 (1972).

[40] *History*, BIOVERSITY INTERNATIONAL, http://www.bioversityinternational.org/about-us/who-we-are/history/ (last visited Nov. 24, 2014).

tial role of genetic variation in population survival. These principles apply with equal force to social and economic institutions.

3. *Genetic Variation, Population Survival, and Fragility*

In this subsection, we discuss the stability-enhancing properties of separating equilibria in two more settings. We begin with the genetics literature, which provides insights into the importance of variation for the survival of living organisms. We then discuss the connection between diversity and preparedness in light of mathematical literature on risk, uncertainty, and fragility.

At the biological level, the importance of diversity reaches far beyond agricultural ecosystems. An extensive body of genetics literature has shown that "[p]reservation of genetic diversity for disease resistance genes can be of great importance for population survival,"[41] particularly in natural animal populations.[42] Genetic diversity is essential for *adaptability*, the ability of living organisms to respond to unexpected shocks and changes in environmental conditions. The mechanism by which genetic variation enhances adaptability is insightful for regulating separating equilibria in the contractual setting:

> The adaptability of each individual to different environmental conditions is restricted by the fact that its genetic variation cannot be unlimited. This means that a population can only achieve its adaptability by *distribution* of the *variation across individuals. . . .* [T]he formation of a resistant but genetically uniform population can imply increased susceptibility for new disturbances in the environment.[43]

---

[41] G. Booy et al., *Genetic Diversity and the Survival of Populations*, 2 Plant Biology 379, 384 (2000) (citing Stephen J. O'Brien & James F. Evermann, *Interactive Influence of Infectious Disease and Genetic Diversity In Natural Populations*, 3 Trends Ecology & Evolution 254 (1988); Laura F. Hünneke, *Ecological Implications of Genetic Variation In Plant Populations*, in Genetics and Conservation of Rare Plants 31 (Donald A. Falk & Kent E. Holsinger, eds., 1991)).

[42] *Id.* at 385 (citing David W. Coltman et al., *Parasite-Mediated Selection Against Inbred Soay Sheep in a Free-Living, Island Population*, 53 Evolution 1259 (1999); Stephen J. O'Brien et al., *Genetic Basis for Species Vulnerability in the Cheetah*, 227 Science 1428 (1985); Stephen J. O'Brien, *A Role for Molecular Genetics in Biological Conservation*, 91 Proc. Nat'l Acad. Sci. 5748 (1994)).

[43] *Id.* at 385 (emphasis added) (citing Hans R. Gregorius, *The Importance of Genetic Multiplicity for Tolerance of Atmospheric Pollution*, in Genetic Effects of Air Pollutants in Forest Tree Populations 163 (Florian Scholz et al. eds., 1989); Piet J. Den Boer et al., *Spreading the Risk of Extinction by Genetic Diversity in Populations of the Carabid Beetle* Pterostichus Oblongopunctatus F., 43 Neth. J. Zoology 242 (1993); Sheldon I. Guttman, *Population Genetic Structure and Ecotoxicology*, 102 Envtl. Health Persp. 97 (1994); Glen A. Fox, *Tinkering With the Tinkerer: Pollution Versus Evolution*, 103 Envtl. Health. Persp. 93 (1995)).

The italicized quoted text is of great importance for the regulation of con-
tractual equilibria. The need for genetic diversity derives from the inherently
limited nature of a single organism's genetic variation. The ability of a popu-
lation to adapt to unexpected shocks depends on distribution of this variation
across different genetic profiles. This fundamental principle of variation *in
the variation* is essential to systemic stability and demonstrates why it is
paramount to ensure a sufficient level of separating equilibria. No matter
how robust a given contractual regime is to unexpected shocks, the profile of
risks to which a single regime may effectively respond is necessarily finite.
Enhancing systemic stability beyond the bounds of a single risk profile ne-
cessitates the distribution of varying terms across equilibria.

The importance of the distribution of variation is stated in terms of
probability theory by risk-management scholar Nassim Nicholas Taleb in his
writings on uncertainty and fragility.[44] The technical term for the variation of
the variance of a probability distribution is *kurtosis*, also known as its fourth
moment.[45] Kurtosis essentially refers to the degree of "fatness" of the tails
of a probability distribution—the extent to which overall returns are derived
from extreme rather than ordinary events. For example, a high-kurtosis dis-
tribution might have a negative expected value (the weighted average of all
payoffs is less than zero) but nonetheless is characterized by positive returns
ninety-nine percent of the time. This could occur if the rare outcome has
such a large negative payoff that it outweighs the positive outcomes exper-
ienced most of the time.

4. *Diversity as Insurance for Unknown Conditional Probability*

In the prior Part, we discussed the stability-enhancing benefits of sepa-
rating equilibria in the statistical terms of preparing for a high-kurtosis, un-
expected shock. But behavioral diversity can also produce an insurance
advantage that makes systems more resilient.

To take a stylized example, consider the battle of Stalingrad in World
War II. The Soviets succeeded in repelling the Nazi invasion, in part because
Stalin was able to quickly draft and mobilize over one million Russian
men.[46] It seems likely that the totalitarian nature of his dictatorial regime was
at least partially responsible for his success in amassing his forces with such
speed. As this battle proved to be a turning point in the war against Hitler,[47]
it seems that the dictatorial ideology of communism was at least partially

---

[44] *See generally* Nassim Nicholas Taleb, The Black Swan: The Impact of the
Highly Improbable (2010); Nassim Nicholas Taleb, Antifragile: Things That Gain
from Disorder (2012).

[45] *See generally* Nassim Nicholas Taleb, *Fat Tails and (Anti)fragility: Lectures on
Probability, Risk, and Decisions in The Real World* (2013), *available at* https://docs.google
.com/file/d/0B_31K_MP92hURjZxTkxUTFZnMVk/edit?pli=1.

[46] *See* John Simkin, *Stalingrad*, Spartacus Educational, http://www.spartacus.school
net.co.uk/RUSstalingrad.htm (last visited June 20, 2013) (collecting primary sources).

[47] *Cf. id.*

responsible for halting the momentum of Hitler's genocidal regime. The world was potentially more resilient because Nazi invaders were forced to confront a diversity of economic systems—liberal capitalistic systems which are more productive but slow to mobilize, as well as totalitarian systems which are less productive but faster to mobilize. If we stylistically denote the world's payoffs by f(y), it might be true:

$$f_{\text{Mixed}}(y \mid X = Hitler) > f_{\text{Liberalism}}(y \mid X = Hitler)$$

but

$$f_{\text{Mixed}}(y \mid X \neq Hitler) < f_{\text{Liberalism}}(y \mid X \neq Hitler)$$

Even though the payoffs to the world are generally better in non-mixed economic systems where all countries are capitalistic democracies,[48] when confronted with a Nazi threat, the payoffs are higher when countries are governed by mixed liberal and totalitarian regimes.[49]

Crucially, we are *not* suggesting that the *unconditional* payoffs of mixed liberal-totalitarian regimes exceed those of liberalism, i.e., $f_{\text{Mixed}}(y) > f_{\text{Liberalism}}(y)$. Our point is merely that in some states of the world, mixed regimes may produce higher payoffs than in a world with only liberal democracies. To use another analogy, we do not know which will ensure the survival of the human race if the Martians land one day. The future of civilization may hinge on retaining sufficient diversity of economic and political systems so as to ensure that a high enough conditional payoff remains.

The subject of this Article is the legal regulation of private behavior, not existential threats to humankind. But the principle is equally applicable to transaction terms. A particular form of economic activity may have little benefit today but have a substantial payoff to society in the future. Consider, for example, greenhouse gas emissions. Even though the current level of emissions is highly detrimental to society by contributing to climate change,[50] gasoline cars may provide great utility at some point in the future. The key insight of our argument is that *some* level of seemingly detrimental activity today might be highly valuable under conditions that are presently unknown.

A similar diversity-as-insurance idea underlies proposals for "partial industry regulation."[51] Industries with regulated prices can face the risk of

---

[48] *See* IMMANUEL KANT, PERPETUAL PEACE: A PHILOSOPHICAL SKETCH (1795).

[49] The presence of Stalin's totalitarian regime, however, may have facilitated the Nazi threat (for example with the signing of the Nazi-Soviet Non-Aggression Pact), but conditional on World War II having begun, the rest of the world might have been safer with mixed regimes.

[50] *See, e.g.*, David Biello, *How Much Is Too Much?: Estimating Greenhouse Gas Emissions*, SCIENTIFIC AMERICAN, http://www.scientificamerican.com/article/limits-on-greenhouse-gas-emissions/ (Apr. 29, 2009).

[51] *See supra* note 13.

regulatory capture—where the regulator induces supra-compensatory pricing. Industries without price regulation may be more susceptible to collusion. But an industry that applies price regulation to only a subset of producers might more resiliently avoid the risk of the worst outcomes that might be produced by either pure system. The regulated portion might provide competitive pressure against private collusion, and the unregulated firms might ameliorate the risk of deadweight loss when regulators become captured by the interests of the regulated.[52]

C.   *Information and Experimentation*

The second fundamental justification for separating equilibria is informational in nature: diversity permits learning of better outcomes in alternative states of the world. In the following subsections, we explore the informational benefits of separating equilibria through the theoretical lenses of informational cascades. Depriving society of these informational benefits is a type of externality that justifies regulatory intervention. We conclude with a few examples of this informational rationale in law and practice today.

We previously emphasized the stability-enhancing benefits of preparedness for such unexpected shocks, but there is an informational payoff as well. Society not only obtains the benefit of the better-performing behavior in the conditional state, but is also enriched by *learning* that such a payoff exists. In the Stalingrad example, retaining some level of a totalitarian ideology might have not only prevented Hitler from conquering Europe, but also might have given humanity more information about the relative performance of different political and economic systems in the face of an unusual type of stress. This process of learning and discovery reflects a form of comparative experimentation, whereby the conditional payoffs of differing behaviors are allowed to unfold in parallel.

This experimentalist rationale is similar to the argument scholars have advanced in advocating for explicit randomized testing of law and regulation.[53] Experiments that randomly assign different regulatory regimes to different entities can produce causal information about the impact of different rules.[54] Randomized assignment is indeed a kind of anti-herding regulation, because exposing otherwise similar entities to different regulations can promote separating private behaviors. Separating equilibria in private behaviors can analogously provide regulators and lawmakers with the variation that

---

[52] *See* Ian Ayres, *Responsive Regulation: A Co-Author's Appreciation,* 7 REG. & GOV. 145, 146 (2013) ("In some contexts, regulators should intentionally strive for a separating equilibrium in which the regulated entities behave differently. A regulatory goal to avoid pooling can naturally lead to new forms of partial-industry regulation.").

[53] *See* Michael Abramowicz, Ian Ayres & Yair Listokin, *Randomizing Law*, 159 U. PA. L. REV. 929 (2011).

[54] *See id.* at 939.

can help support evidence-based inferences about legal impacts. In this sense, separating equilibria complement randomization: the latter facilitates causal inference while the former expands society's knowledge regarding the covariance of potential outcomes with varying types of contractual equilibria.

1. Informational Cascades

In two well-known articles, Sushil Bikhchandani, David Hirshleifer, and Ivo Welch demonstrated the threat to the accumulation of knowledge resulting from an "informational cascade."[55] The key insight behind an informational cascade is to distinguish between the ability to observe the *signals* of other individuals as opposed to merely their *actions* in a setting of sequential decision-making.[56] A signal is an individual's subjective probability regarding the payoff of a particular action, transaction, or contractual term. Observing predecessors' signals (not merely their actions) leads to the accumulation of more accurate information regarding the payoff over time.

To take a simple example, imagine that B is unsure how beneficial a zero-downpayment mortgage actually is, because she is unsure whether the upfront cash savings will outweigh the greater monthly payment. She knows, however, that A has just taken a zero-downpayment mortgage for his home. If B can observe not only A's *action* of taking the zero-downpayment mortgage, but also A's *signal*—whether A subjectively believes it was a good idea—B can update her own belief based on A's signal and thereby make a decision with greater information.

This insight can be shown formally by using the rule of probability known as *Bayes' Rule*, which utilizes the concept of "posterior" probability: a probability that is more informative or "updated" in light of observed data. This rule states that posterior probability is proportional to the prior probability without observing the data multiplied by the likelihood that the observed data would occur under the prior belief. In algebraic terms, $P(B|A) \propto P(B)P(A|B)$.[57] If this formula looks familiar, it is because Bayes' Rule utilizes the concept of conditional probability we discussed in the prior section—which in this case is interpreted as subjective belief conditional upon observing certain information.

In the prior example, this means that B's updated belief regarding the desirability of a zero-downpayment mortgage ($P(B|A)$) is proportional to

---

[55] Sushil Bikhchandani, David Hirshleifer & Ivo Welch, *A Theory of Fads, Fashion, Custom, and Cultural Change as Informational Cascades*, 100 J. Pol. Econ. 992 (1992); Sushil Bikhchandani, David Hirshleifer & Ivo Welch, *Learning from the Behavior of Others: Conformity, Fads, and Informational Cascades*, 12 J. Econ. Persp. 151 (1998).

[56] *See* Bikhchandani, David Hirshleifer & Ivo Welch, *Learning from the Behavior of Others: Conformity, Fads, and Informational Cascades*, 12 J. Econ. Persp. 151, 153 (1998).

[57] This is presented in terms of proportionality rather than equality because we have omitted the normalization term P(A) in the denominator.

her prior belief (P(B)) multiplied by the likelihood that A's experience would occur given her prior belief (P(A│B)). The key insight for the theory of informational cascades is that P(A│B) is only known when B can observe A's *signals*, that is, his subjective probability P(A) regarding the payoff of the activity. Put differently, the notion of information acquisition through Bayesian updating depends on knowing the likelihood function. Updating subjective beliefs in light of another's beliefs necessarily implies observing those beliefs.

However, if B can only observe A's *actions* rather than his signal, Bikhchandani et al. show that B will rationally update her beliefs in light of A's actions, but this quickly leads to no additional accumulation of information regarding the underlying payoff.[58] To take a simple example, if B observes that A takes the mortgage, B will either take the mortgage if her prior belief is that the mortgage is beneficial—because A's action implies similarly—or remain indifferent between taking the mortgage if her prior belief is that it is not—because she knows only her negative prior belief and A's positive action. If she is indifferent, she flips a coin.

The key insight is that an informational cascade begins with the next actor, C.[59] If C observes that A and B took the zero-downpayment mortgage, C will do so *regardless* of his prior belief. This is because even if he thinks the mortgage is a bad idea, he infers from A and B's conduct that it is more likely than not to be beneficial. A's action implies a positive payoff and B's action either implies a positive payoff or indifference. As long as C ascribes some nonzero probability to the positive payoff possibility, A and B's combined actions imply that a positive payoff is more likely than not.

In short, while C was indifferent between taking the mortgage when he had a negative prior belief and only observed A, observing B makes it wholly rational to take the mortgage by tilting the probability that the mortgage is a good decision slightly above fifty percent. The same rationale applies to subsequent actors, all of whom are "stuck" in an informational cascade whereby it is entirely rational to infer the value of an unknown event from the *actions* of predecessors when their signals are unobservable.[60]

An informational cascade is essentially a series of pooling equilibria. Rather than transacting on different terms—even terms which may have a higher payoff—subsequent contractors end up pooling on the same terms because of the informational disparity resulting from the inability to observe predecessors' private signals. Crucially, pooling within an informational cascade is wholly rational: subsequent parties are simply maximizing utility under significant informational constraints by rationally relying on others'

---

[58] *See id.* at 153.

[59] Bikhchandani et al., *Learning from the Behavior of Others*, *supra* note 56, at 154.

[60] If B's coin flip led her not to take the mortgage, A and B's probabilities offset each other, leading C to make his decision solely on the basis of private information. C would thus take A's place in the cascade, and the sequence would begin again. *See id.* at 155.

prior experience. Yet they are doing so ignoring the expected social benefit of providing information on out-of-equilibrium behavior.[61]

In this sense, regulatory intervention to "break up" informational cascades by inducing separating equilibria reduces the externality of an informational market failure. By forcing separation, regulators compel subsequent contractors to make a decision based on information other than probabilistic inference from similar transaction terms, bringing society the benefit of better-informed decisions. This intervention might counteract the precedential benefits of pooling equilibria,[62] but it is difficult to know when relying on precedent will lead to efficient cost reduction as opposed to ignorance-promoting informational cascades. Our argument is not that regulators should prohibit pooling equilibria entirely, but that some separating is desirable to prevent the dangers of excessive pooling equilibria, of which informational cascades are but one example. In this case, separation benefits society as a whole by increasing information regarding more socially efficient alternatives in the present and future.[63]

2. Examples

We are not the first to notice the informational benefits of separating equilibria. Indeed, there are several examples in law and practice today. Perhaps the most well-known is the justification for federalism given by Justice Brandeis in 1932:

> It is one of the happy incidents of the federal system that a single courageous State may, if its citizens choose, serve as a laboratory; and try novel social and economic experiments without risk to the rest of the country.[64]

Similarly, Roberta Romano has referred to federalism as the "genius of American corporate law,"[65] which has led to much literature considering whether such experimentation and competition among states in fact produces a "race to the top" in corporate governance.[66]

---

[61] In addition to depriving society of information regarding the unknown future payoffs of certain contractual equilibria, informational cascades prevent contractors from learning of better alternatives that might be *presently* available.

[62] *See* Ayres & Gertner, *supra* note 18, at 1405 n.30 (discussing the potential for an "inefficient splintering of precedent that might take place under an enabling rule").

[63] This may also benefit parties to the contract by forcing them to take a risk and possibly discover an alternative set of transaction terms that are more beneficial.

[64] New State Ice Co. v. Liebmann, 285 U.S. 262, 311 (1932) (Brandeis, J., dissenting).

[65] ROBERTA ROMANO, THE GENIUS OF AMERICAN CORPORATE LAW 1 (1993).

[66] *See, e.g.*, Lucian Ayre Bebchuk, Alma Cohen & Allen Ferrell, *Does the Evidence Favor State Competition in Corporate Law?,* 90 CAL. L. REV. 1775 (2002); Michael Abramowicz, *Speeding Up the Crawl to the Top,* 20 YALE J. ON REG. 139 (2003); Lucian Arye Bebchuk & Assaf Hamdani, *Vigorous Race or Leisurely Walk: Reconsidering the Competition Over Corporate Charters,* 112 YALE L.J. 553 (2002); William W. Bratton, *Corporate Law's Race to Nowhere in Particular,* 44 U. TORONTO L.J. 401 (1994).

We return to this topic in our discussion of inducing separating equilibria in corporate law in Part IV.C below, but in our view, experimentation can provide much more information than whether, in a binary manner, one type of contractual equilibria has a higher payoff on average than another. The parallel execution of differing contractual terms permits discovering not only which terms are more effective on average, but also whether some (for example, unknown conditional future payoffs) are more effective under different conditions such as locations and even time.

A practical example of the benefits of retaining separation despite evidence as to the average superiority of one method over another is Google AdWords' Quality Score positioning system. As Google explains, the Quality Score is based on the relevance of your keywords, the quality of your landing page, your ad's clickthrough rate (CTR), adjusted for its position on the page, and a few other factors "expected clickthrough rate, ad relevance, and landing page experience."[67] The clickthrough rate is "[a] ratio showing how often people who see your ad end up clicking it."[68]

The use of the clickthrough rate in Google's Quality Score algorithm implies that ads that are more popular are more likely to be clicked. However, the clickthrough rate is just one of several factors, and even those ads that have a relatively low clickthrough rate are still likely to appear from time to time. Google retains separation in its Quality Score algorithm; the purpose is not to determine, as a binary matter, which ads are better than others so that these may be retained and all others eliminated. Rather, Google's algorithm implicitly recognizes that the effectiveness of ads may change over time, different users are likely to be affected by ads dissimilarly, and the popularity of an ad is just one measure that is relevant to the ad's placement determination. This thinking reflects an understanding of the informational benefits of separation: were Google to exclusively prefer those that are highest-performing, advertisers would be deprived of knowledge regarding the conditional effectiveness of other ads.

Indeed, we suggest that the informational benefits of favoring separation have profound ethical implications as well. Consider, for example, the practice of halting pharmaceutical drug trials when it becomes apparent that one drug is more effective than another. A prostate cancer drug trial was recently halted "to give all patients a chance to receive the life-extending medication."[69] The problem with such an approach, in our view, is that it deprives society of conditional knowledge that might be of great importance. What if the medication that seems highly effective today kills all of its users

---

[67] *How Adwords Works*, GOOGLE ADWORDS, http://support.google.com/adwords/answer/2497976?hl=en&ref_topic=2642398 (last visited Oct. 5, 2014)

[68] *Clickthrough Rate (CTR),* GOOGLE ADWORDS, https://support.google.com/adwords/answer/2615875?hl=en (last visited Oct. 5, 2014)

[69] Victoria Colliver, *Prostate Cancer Drug So Effective Trial Stopped*, S.F. CHRONICLE, June 2, 2012, *available at* http://www.sfgate.com/health/article/Prostate-cancer-drug-so-effective-trial-stopped-3603973.php.

one year from now? The paradigm of pooling at what seems effective to-day—reducing diversity in favor of binary choices—deprives society of the knowledge regarding payoffs conditional on the future or even differing circumstances in the present.

In the following Part, we show how regulators may intervene to induce separation to preserve both the stability-enhancing and informational benefits of diversity in contractual equilibria.

III.   Three Ways to Induce Separation

In this Part, we discuss three mechanisms by which regulators may induce separating equilibria in private contracting: direct manipulation of incentives through licensing and subsidies, menus, and heterogeneously impeding altering rules.

A.   *Carrots and Sticks: Direct Manipulation of Incentives Through Licensing and Subsidies*

In a recent article, Ian Ayres and Joshua Mitts proposed a system of leverage licenses to induce separation in the distribution of home equity.[70] Licenses have been widely favored as the instrument of choice to regulate environmental externalities such as carbon emissions,[71] and scholars have proposed licensing regimes for fields as diverse as patent rights,[72] energy credits,[73] and hunting rights.[74] The advantages of licensing over traditional "command-and-control" regulation (i.e., simply prohibiting certain conduct) are closely related to the rationales for inducing separating equilibria that we have outlined: there are substantial advantages to allowing *some* quantity of a beneficial phenomenon with undesirable side effects rather than outlawing it entirely.

Such "partial" regulation typically has been justified under the theory that the socially efficient level of an activity is less than would otherwise result without regulation but nonetheless nonzero. Initially, economists proposed intervention in the form of a *Pigouvian* tax, a simple surcharge on transactions that reduced output to the socially efficient level.[75] Subsequent

---

[70] Ayres & Mitts, *supra* note 24, at 7.

[71] *See, e.g.*, T. H. Titenberg, *Economic Instruments for Environmental Regulation*, 6 Oxford Rev. Econ. Pol'y 17, 30 (1990).

[72] Ian Ayres & Gideon Parchomovsky, *Tradable Patent Rights*, 60 Stanford L. Rev. 863, 883 (2007).

[73] David Berry, *The Market for Tradable Renewable Energy Credits*, 42 Ecological Econ. 369, 370 (2002).

[74] Douglas MacMillan, *Tradeable Hunting Obligations—A New Approach to Regulating Red Deer Numbers in the Scottish Highlands?*, 71 J. Envtl. Mgmt. 261, 266 (2004).

[75] *See, e.g.*, Arthur Pigou, The Economics of Welfare (1932); William J. Baumol & Wallace E. Oates, *The Use of Standards and Prices for Protection of the Environment*, 73 Swedish J. Econ. 42, 42 (1971).

research demonstrated, however, that tradable permits—restrictions on the permissible *quantity* of an activity—were often superior to price mechanisms.[76] Yet they are functionally identical: in economist Marty Weitzmann's words, "in principle exactly the same information is needed to correctly specify either."[77] Building on this principle, Ian Ayres has suggested an intermediate approach consisting of Pigouvian taxes that increase with quantity.[78]

However, while licenses and Pigouvian taxes are equally effective at reducing output to a socially efficient level, they are not equally certain to lead to separating equilibria and the resulting stability and informational benefits that we described in Part II of this Article. As Ayres and Mitts explain, Pigouvian taxes expose regulators to the risk that the quantity of takers will be unexpectedly high. If regulators set the Pigouvian price of borrowing with zero equity at $2000, there would be some risk that millions of borrowers would pay the price, and that the economy would again be exposed to the needless systemic risk caused by low-equity bunching.[79]

More generally, taxes lead to separating equilibria only under certain assumptions regarding contractors' demand curves. Licensing, on the other hand, directly permits or prohibits the emergence of specified quantity levels of different sets of transaction terms. This property of a licensing system leads Ayres and Mitts to propose a system of leverage licensing whereby lenders must have a license to originate or service mortgages at given equity levels.[80] For example, by permitting only a certain quantity of loans at less than 5% equity and 5–10% equity, regulators can directly facilitate separation in the leverage terms of mortgage transactions.[81]

We suggest that licensing regimes can similarly facilitate the emergence of separating equilibria more generally. We discuss applications of this principle in detail in Part IV below, but in general, it is conceptually straightforward to extend the principle of licensing a limited number of transactions with a different set of contractual terms to other contexts such as banking and securities regulation. Just as with Ayres and Mitts's proposal for mortgage equity regulation, these licenses could be tradable, ensuring that they gravitate to their highest-valued use.[82]

---

[76] *E.g.*, J. H. DALES, POLLUTION, PROPERTY AND PRICES (1968); Martin L. Weitzman, *Prices vs. Quantities*, 41 REV. ECON. STUD. 477 (1974). *But see* Robert N. Stavins, *Transaction Costs and Tradeable Permits*, 29 J. ENVIRON. ECON. & MGMT. 133 (1995) (emphasizing transaction costs of tradable permits).

[77] Weitzman, *supra* note 76, at 478. *But see* Robert Cooter, *Prices and Sanctions*, 84 COLUM. L. REV. 1523, 1531 (1984) ("[B]ehavior is more elastic with respect to prices than sanctions.").

[78] Ian Ayres, *Narrow Tailoring*, 43 UCLA L. REV. 1781, 1808–09 (1996) (proposing a declining-credit schedule for minority bidders on procurement contracts that trades off quantity for the size of the subsidy).

[79] Ayres & Mitts, *supra* note 23, at 127–28.

[80] *See id.* at 82.

[81] *Id.* at 91.

[82] *See id.* at 122.

Licensing, however, is not the only way to directly manipulate incentives to achieve separating equilibria. Sometimes it is helpful to pair the "stick" of regulatory prohibitions with the "carrot" of subsidies and payments for the desired conduct.[83] A complementary approach to requiring licenses to limit pooling equilibria, therefore, would be to subsidize the emergence of diversity in contracting terms. For example, regulators could issue variances to encourage transactions on terms other than those that are common in the marketplace. In the context of mortgage equity, regulators might, for example, offer a substantial tax incentive for mortgages with 5–10% equity, were they to observe significant pooling at the 0–5% level.

An example of targeted subsidies is Ayres and Mitts's proposal to institute variation in the "conforming mortgage" definition utilized by Fannie Mae and Freddie Mac.[84] They suggest permitting the government-sponsored enterprise (GSE) to "incentivize beneficially varying conformity by simply setting the price they are willing to offer for mortgage products at each level."[85] By offering different prices for mortgages at different equity levels, the GSEs would induce beneficial separation in the distribution of equity. Varying subsidies can effectively complement the direct quantity restrictions that are imposed by a licensing scheme.

Under current law, regulatory variances are sometimes proposed to accomplish public policy goals—for example, with kidney transplantation.[86] Differentiating regulatory treatment through the use of targeted variances could induce separation. A similar idea is that of discretionary enforcement—regulators could choose to enforce laws differentially for otherwise similarly situated contractors. In Part IV, we discuss how regulators could induce separation in the composition of bank balance sheets by imposing differential *transparency* requirements, reducing systemic risk by preventing financial institutions from mimicking each other's asset holdings.

More generally, one can imagine incorporating a "pro-diversity" policy into every form of economic regulation. As we explained in Part II, diversity in the distribution of contractual terms provides stability-enhancing and informational benefits. These benefits are often substantial in magnitude but nonetheless conditional in various ways that may not be readily apparent in an expected-value comparison of different terms. Accordingly, regulators might adopt policies that subsidize diversity for its own sake. For example, regulators might provide for special grants or loan guarantees for types of businesses, private market structures, or ideologies that are *different*, regardless of an agency's estimation of their respective likelihoods of success. As

---

[83] *See generally* Ian Ayres, Carrots and Sticks: Unlock the Power of Incentives to Get Things Done (2010) (discussing incentives and anti-incentives).

[84] Ayres & Mitts, *supra* note 23, at 139.

[85] *Id.* at 139.

[86] *See, e.g.*, Kidney Transplantation Committee, Proposal to Substantially Revise the National Kidney Allocation System (2012), *available at* http://optn.transplant.hrsa.gov/PublicComment/pubcommentPropSub_311.pdf.

we have repeatedly emphasized, any estimation of future success is always conditional on today's information. Accordingly, a policy of inducing diversity serves society (and parties to the contract) by increasing the likelihood that some particular set of contract terms will have a very high conditional payoff that cannot be anticipated today. We return to this point when discussing concrete applications in Part IV.

B.   Menus

Legal menus are another way to reduce externalities by inducing separation.[87] The core of our anti-herding proposal is the notion that similar actors should be treated differently or induced to behave differently. As with licenses and subsidies, menus can reduce the externalities of excessive pooling by inducing more separation than would exist with merely the option of contracting around a traditional default.

A menu is the communication of at least two simultaneous offers.[88] An example of a contractual menu from everyday life is the document communicating the food offerings at a restaurant, where a customer may choose one or more of the enumerated meal choices or nothing at all.[89] If the offeree does not accept one of the listed options, no contract is formed. Yair Listokin has shown empirically that statutory menus matter in state corporate law: Georgia has expressly provided by statute for fair price protection in business combinations, whereas Delaware has done so only by judicial precedent; specifically, Listokin found that 57% of Georgia corporations opted in to fair price protection compared to 20% in states lacking a statutory menu.[90] Listokin has also shown that there is variation more generally in the "menu" of antitakeover protections that state corporate law offers to firms.[91]

Menus that simultaneously offer a higher-price, lower-regulation alternative and a lower-price, higher-regulation alternative can induce regulated entities to separate themselves based on whether the lower regulation is worth the cost of the higher price. Thus, some incorporating entities in Delaware choose the lower-price close corporation form while others opt for the higher-price, more responsive standard corporate form.[92] Varying the qual-

---

[87] *See generally* Ian Ayres, *Menus Matter*, 73 U. Chi. L. Rev. 3, 3–4 (2006) (calling for scholars and lawmakers to "move beyond the bad old days, when market interventionists only had the simplistic tools of a 'tort head'—who, like linguistically challenged parrots, could only ritualistically repeat 'prohibit it' or 'mandate it'"). We wish to thank Patrick Hayden for stimulating our thinking in this area.

[88] *Id.* at 3.

[89] *See id.*

[90] Yair Listokin, *What Do Corporate Default Rules and Menus Do? An Empirical Examination*, 6 J. Emp. L. Stud. 279, 295 (2009).

[91] *See* Yair Listokin, *If You Give Shareholders Power, Do They Use It? An Empirical Analysis*, 166 J. Institutional & Theoretical Econ. 38, 39 (2010).

[92] *See* Ian Ayres, *Judging Close Corporations in the Age of Statutes*, 70 Wash. U. L. Q. 365, 376–77 (1992) (discussing substantial differences in cost between close and public incorporation in Delaware).

ity-price mixture (or varying two quality dimensions of a regulation) can deter herding behavior. Indeed, the self-separating effect of menus is quite analogous to the mortgage license regime described above, except in this case the government rather than the market would choose the menu prices—simultaneously offering the option to issue mortgages with less leverage for lower license prices.

Menus combined with clearly communicated altering rules can facilitate separation by reducing the cost of contracting around the default to a privately higher-valued alternative.[93] More generally, menus can induce separating equilibria whenever the cost of individualized negotiations for an alternative set of terms exceeds the cost of contracting under the menu. A survey by Kelley Blue Book found, for example, that fifty-nine percent of American consumers "hate" negotiating over the price of a new car.[94] Such a strong dislike for haggling is likely to lead to pooling at the suggested retail price or a non-negotiated discount from it. One could imagine giving consumers a menu of three to five combinations of price and financing terms. Choosing from this menu would likely have a much lower psychological cost than conducting open-ended negotiations, as is presently the case.

In short, a regulatory mandate for a lower-cost "opt-out" procedure, such as a menu, encourages contractors, for whom negotiation is costly, to separate rather than pool at the default rule or terms offered by the offeror. We discuss specific examples in which regulators might induce efficient separation by offering a menu of choices in Part IV. But first, it is worth considering how the cost-reducing properties of menus extend to procedural rules of contracting more generally, which we explain in the following section.

C. *Heterogeneous Impeding Altering Rules*

A third way to induce separation is a generalization of the insights we developed with regard to menus, and consists of employing heterogeneously impeding altering rules. As Ian Ayres has explained, "Altering rules are the necessary and sufficient conditions for displacing a default legal treatment with some particular other legal treatment."[95] Ayres describes one particular type known as an "impeding" altering rule, which imposes a cost on con-

---

[93] Scholars have shown how separating menus can promote efficiency by reducing altering costs for offerors, using the facts of *Hadley v. Baxendale* as an example: "When high-type valuations are intermediate [compared to low-type ones], carriers will offer separating menus—because the gains from discriminating between the high and low types is now greater than are the costs of contracting." Ayres & Gertner, *supra* note 13, at 751. In this example, menus induce separation by giving offerors a low-cost mechanism to contract with offerees with a lower valuation that is private information, eliminating the dilemma between excluding these offerees entirely or engaging in prohibitively costly individualized negotiations.

[94] *Graphic: Do Americans Like Buying Cars?*, KELLEY BLUE BOOK: THE TRUSTED RESOURCE (Aug. 3, 2011), http://www.kbb.com/car-news/all-the-latest/graphic-do-americans-like-buying-cars/.

[95] Ian Ayres, *Regulating Opt-Out: An Economic Theory of Altering Rules*, 121 YALE L.J. 2032, 2036 (2012).

tractors who wish to opt-out of the default rule (for example, by charging a fee for opt-out or mandating the performance of a time-consuming procedure to effectuate the opt-out):

> Concerns with negative externalities or (hard) paternalism can also at times motivate lawmakers to implement altering rules that seek to impede some contractors from opting out . . . . They are quasi-mandatory rules that attempt to produce a constrained separating equilibrium, allowing a reduced number of contractors to opt for legal consequences that lawmakers disfavor. . . . Heterogeneity . . . can produce contexts where it is efficient to erect impeding barriers that disproportionately allow default displacement where there are higher private benefits, lower negative externalities, or lower paternalism concerns.[96]

Ayres shows that an impeding altering rule can promote efficiency when it "deter[s] *some* contractors from contracting around the default."[97] This result is driven by heterogeneity in the gains and negative externalities from altering; given a sufficiently large difference in gains between different types of contractors and a sufficiently small difference in the negative externalities, an impeding altering rule is more efficient than a default or mandatory rule when it encourages some contractors, who have large gains, to opt-out and others, who have only small gains, to remain with the default.[98] This could occur, for example, if lawmakers set the cost of opt-out above the gains from altering for the latter group but below that of the former.

In this straightforward example, an impeding altering rule can induce separation given a certain distribution of gains and costs of opting out. We suggest that this intuition can be extended to situations that deviate from this assumed distribution among contractors. The key insight is that impeding altering rules can be more efficient than simple default or mandatory rules, even among homogeneously distributed contractors, as long as the *rules* are *heterogeneously impeding*. Ayres's model does not require that the gains and costs of opt-out be solely a function of contractors' private valuations. Through a sufficiently sophisticated altering rule, it is possible to render the mechanism of opt-out more or less costly or beneficial for parties regardless of heterogeneity in the payoffs from the underlying substantive "opted-into" rule.

Why differentially impose costs or gains on parties who would otherwise benefit equally from a uniform rule (whether default or mandatory)? As we showed in Part II, there are strong externality justifications for inducing separating equilibria by regulation. As a hypothetical example of cost impo-

---

[96] *Id.* at 2086–88.
[97] *Id.* at 2089 (emphasis added).
[98] *See id.* at 2089–90.

sition through heterogeneously impeding altering rules, consider Ayres and Mitts's proposal to regulate the distribution of equity in the mortgage market.[99] Instead of a licensing scheme, one could imagine regulators requiring a significantly more burdensome application procedure for loans at levels of equity that were experiencing bunching. Potential homeowners wishing to obtain a mortgage at 5% equity might be required to undergo a lengthy on-line training course, whereas only a simple signature would be required for 8% equity. Such a heterogeneously impeding altering rule could effectively induce separation in the distribution of equity even if the gains and losses from opting out were identically distributed, for example, if all homeowners prefer a lower downpayment over a higher one.[100]

The capacity of heterogeneously impeding altering rules to induce separating equilibria is not limited to the differential imposition of additional costs on similarly situated contractors. It is also possible to induce separation by heterogeneously *reducing* the costs of contracting for specific terms. Such an approach would be particularly effective if there were a baseline cost inherent in the negotiation setting. This often occurs in situations of bilateral monopoly, "thin markets" where the presence of asymmetric information renders unstructured negotiations costly and protracted.[101] In these settings, scholars have typically advocated for liability rules, such as by forcing judicial sales to cash out the entitlement rather than compel costly bilateral negotiations.[102]

Recently, Steven Brams and Joshua Mitts demonstrated that the principle of mechanism design can guide regulatory intervention to reduce transaction costs in bilateral monopolies with asymmetric information.[103] They

---

[99] Ayres & Mitts, *supra* note 23, at 122.

[100] However, this particular altering rule might *require* homogeneity to obtain an optimal result. If the gains and costs from engaging in the opt-out procedure are heterogeneously distributed, such an altering rule might not have the desired effect. Regulators could apply the procedure at random to try to neutralize selection effects, but if the distribution of costs and benefits correlates with the undesirable equity level, then a homogeneously impeding altering rule (for example, one that simply imposes a fixed cost of altering on every contractor, along the lines of Ayres's example) might be preferred to one that is heterogeneously impeding.

[101] *See* IAN AYRES, OPTIONAL LAW: THE STRUCTURE OF LEGAL ENTITLEMENTS 20 (2005) ("[W]hile contracts may serve as a fine paradigmatic example, the option approach is a powerful way to analyze any bilateral monopoly situation—that is any situation where there are two (or a small number of) people who 'are stuck with each other.'") (quoting Carol M. Rose, *The Shadow of the Cathedral*, 106 YALE L.J. 2175, 2183 (1997) ("Ayres and Talley are interested in situations in which two parties are stuck with each other, thin markets instead of 'thick' ones. Neighboring landowners seem to fit that bill.")).

[102] *See, e.g.*, Ian Ayres & Eric Talley, *Solomonic Bargaining: Dividing a Legal Entitlement to Facilitate Coasean Trade*, 104 YALE L.J. 1027, 1032 (1995); Louis Kaplow & Steven Shavell, *Do Liability Rules Facilitate Bargaining? A Reply to Ayres and Talley*, 105 YALE L.J. 221, 223–24 (1995); Ian Ayres & Eric Talley, *Distinguishing Between Consensual and Non-consensual Advantages of Liability Rules*, 105 YALE L.J. 235, 249 (1995); Louis Kaplow & Steven Shavell, *Property Rules Versus Liability Rules: An Economic Analysis*, 109 HARV. L. REV. 713, 735 (1996).

[103] *See* Steven J. Brams & Joshua R. Mitts, *Law and Mechanism Design: Procedures to Induce Honest Bargaining*, 68 NYU ANN. SURV. AM. L. 729, 743,789 (2013) (quoting Royal Swedish Academy of Sciences, *Press Release: The Sveriges Riksbank Prize in Economic Sci-*

propose altering rules consisting of algorithmic procedures that restructure incentives in the negotiation process to facilitate agreement instead of engaging in protracted and costly unstructured negotiation. Specifically, Brams and Mitts discuss two procedures—the Bonus Procedure and Two-Stage Procedure—that render the honest disclosure of reservation prices a weakly dominant strategy.[104] In the former, a third party (for example, a regulatory agency) grants the parties a bonus equal to half the difference between their offers, which renders it impossible for each party to do better than bidding its reservation price.[105] In the latter, negotiations are conducted in two stages, where parties first submit reservation prices to determine if a transaction is possible and then submit binding offers thereafter. When specific algorithmic procedures are followed, it can be proven that honest disclosure of reservation prices in the first stage is a weakly dominant strategy.[106]

The presence of high-cost unstructured negotiations in the absence of a bargaining procedure renders bilateral monopoly scenarios well suited for algorithmic altering rules. These rules heterogeneously reduce the cost of contracting in order to induce separating equilibria. There is no reason why algorithmic altering rules should be universally applied to all types of contractors in every situation. Indeed, regulators can utilize these procedures selectively to induce separating equilibria that provide the stability-enhancing and informational benefits we discussed in Part II.

IV. APPLICATIONS

In this Part, we apply our theory of inducing separating equilibria to three regulatory settings: banking, consumer finance, and corporate and securities law. We show how a regulatory policy of encouraging separation can provide specific informational and stability-enhancing benefits in each of these fields.

A. *Banking & Financial Institutions*

1. *Herding as Source of Systemic Risk*

Our discussion of the stability-enhancing properties of separating equilibria has focused on the risk posed by a high number of individuals pooling at the same contractual terms. Ayres and Mitts, for example, emphasize the

---

ences in Memory of Alfred Nobel (Oct. 15, 2007), http://www.nobelprize.org/nobel_prizes/ economics/laureates/2007/press.html (awarding the Nobel Prize in Economics to three scholars for "having laid the foundations of mechanism design theory," which addresses "the optimal mechanism to reach a certain goal, such as social welfare or private profit" in "transactions [that] do not take place in open markets but within firms, in bargaining between individuals or interest groups and under a host of other institutional arrangements")).

[104] *Id.* at 750, 753.

[105] The proof is given in *id.* at 761–62 .

[106] *See id.* at 753, 756–57.

potential for low-equity clustering to transform a slight downturn in housing prices in a geographic region into a cascade of negative equity, foreclosure, and further falling prices.[107] But a similar vulnerability is present when there is excessive clustering among the balance sheets of a relatively small number of banks and financial institutions.

In a recent paper, Joshua Mitts described this phenomenon as a type of systemic risk to the financial system that was effectively exploited in the crisis of 2008 to 2009.[108] Building on work by Viral Acharya[109] and Richard Squire,[110] Mitts identified three forms of systemic risk as (1) mutual exposure of financial institutions to an asset class with correlated returns conditional on an unexpected shock, (2) direct counterparty exposure by firms to each other, such that the insolvency of one can induce the insolvency of the other, and (3) short-term illiquidity resulting from a crisis of confidence among creditors—for example, a classic "run on the bank."[111] Mitts argued that the statutory limitation on government recapitalization of failed firms renders the Federal Deposit Insurance Corporation's (FDIC) resolution powers under the Dodd-Frank Orderly Liquidation Authority (OLA) effective at responding to the third type of systemic risk—short-term illiquidity—but not the first two types, in which conditional synchronization of asset returns leads to balance-sheet insolvency.[112] The presence of such correlation enables firms to strategically compel a government bailout.

To see how this vulnerability operates, compare a sequence of financial institution failures caused by liquidity shortfalls to one caused by insolvency. In the former case, the failure of a financial institution due to depositors or other creditors rushing to withdraw assets or demand repayment may be halted or contained as long as there is a lender of last resort.[113] As long as the institution is fundamentally solvent, it would be rational for a lender to supply emergency, short-term credit collateralized or otherwise indirectly guaranteed by these assets. In practice this often occurs through debtor-in-possession financing in bankruptcy proceedings for nonbank financial firms.[114]

---

[107] *See* Ayres & Mitts, *supra* note 23, at 77.

[108] Joshua Mitts, *Systemic Risk and Managerial Incentives in the Dodd-Frank Orderly Liquidation Authority* (Feb. 18, 2013) (unpublished manuscript), *available at* http://ssrn.com/abstract=2220208.

[109] Viral V. Acharya, *A Theory Of Systemic Risk and Design of Prudential Bank Regulation*, 5 J. Fin. Stability 224 (2009) (finding systemic risk is "the endogenously chosen correlation of returns on assets held by banks").

[110] Richard Squire, *Clearinghouses as Liquidity Partitioning*, 99 Cornell L. Rev. 857 (2014).

[111] Mitts, *supra* note 104, at 11.

[112] *Id.* at 12.

[113] *See generally* Mark A. Carlson and David C. Wheelock, *The Lender of Last Resort: Lessons from the Fed's First 100 Years* (Federal Reserve Bank of St. Louis, Working Paper No. 2012-056B, 2013) (discussing the Federal Reserve's traditional role as lender of last resort).

[114] Banks were traditionally subject to a unique FDIC resolution scheme because the failure to repay depositors often leads to a crippling crisis of confidence that leads to irreversible reputational damage.

Of course, when conditions in the credit markets render a market solution impracticable, it is essential to empower a regulatory agency to step in and prevent a firm from inefficiently closing its doors due to mere illiquidity. Under the OLA, the FDIC has broad authority to extend emergency credit to firms it places in resolution.[115] This regime is well suited to prevent the next crisis of creditor confidence; as long as the proximate cause of an institution's troubles is illiquidity, the FDIC has the tools to intervene and serve as a lender of last resort.

However, if the cause of an institution's failure is insolvency resulting from common bets on poorly performing assets or interconnected exposures in the financial sector, an effective resolution is much more complex. Often, the value of the underlying assets held by these firms is depressed due to broader macroeconomic conditions or substantial uncertainty regarding expected future returns in a particular economic sector (for example, housing). When depressed asset prices are unlikely to recover in the short term, it would be foolish for the private market to extend credit, since a new creditor would only be diluting its pro rata recovery in any insolvency proceeding.[116]

The ordinary approach to an insolvent firm is to compel it to enter bankruptcy, where creditors will recover cents on the dollar. But if a firm is systemically important, by definition forcing creditors to take a loss would undermine the stability of the financial system. With the "common bets" type of systemic risk, a forced sale would signal a valuation to the market that would likely push other financial institutions holding the common assets into insolvency as well. And in the "interconnected exposure" case, forcing other financial institutions to take cents on the dollar would significantly reduce the asset side of their balance sheets.

Accordingly, when conditionally correlated firms are facing insolvency-driven failure, the only solution is a bailout, in other words, recapitalization in one form or another. Either private investors or government regulators must infuse failing firms with equity capital directly or remove the problematic assets off their balance sheets. This is precisely what the highly unpopular Troubled Asset Relief Program (TARP) did in 2008.[117] De-

---

[115] *See supra* note 104, at 24 (citing 12 U.S.C. § 5390(n), (o) (2013) (providing for the orderly liquidation fund and assessments on financial companies with over $50 billion in assets)).

[116] Admittedly, it is sometimes difficult to distinguish between illiquidity and insolvency because liquidity crises can spiral into insolvency crises as a result of fire sales that depress asset prices. In these cases, the lender of last resort may be improperly used, for instance, if the lender does not realize that the assets of the institution to which it is extending credit have declined in value. But liquidity shortages can be prevented effectively with the existing regulatory scheme established by the OLA, which facilitates the supply of emergency credit to troubled firms. The OLA, therefore, eliminates the need to conduct fire sales and needlessly depress asset prices. Accordingly, balance-sheet synchronization, which has not been addressed by the OLA or the Dodd-Frank regulatory response more generally, remains as a potent threat to systemic stability.

[117] *See generally* Lissa Lamkin Broome, *The Dodd-Frank Act: TARP Bailout Backlash and Too Big To Fail*, 15 N.C. BANK. INST. 69 (2011) (describing the backlash against the

spite its unpopularity among the public, policymakers recognized that the subprime crisis was fundamentally one of insolvency: the value of so-called "toxic" assets such as subprime mortgage-backed securities was significantly depressed. Indeed, Lehman Brothers was found to have been over $30 billion insolvent as of September 8, 2008, one week before its bankruptcy filing.[118]

In short, when financial institutions interlock their destinies by holding assets with a high degree of correlation conditional on a crisis occurring or otherwise serving as creditor counterparties to each other, the financial system is exposed to the risk that a decline in one firm's assets will prompt a cascading wave of insolvency in the sector. In the 2008 crisis, the TARP bailout saved the sector from a wave of cascading insolvency that would have brought global economic ruin. But bailouts are not inevitable: it is possible to prevent correlated insolvency through anti-herding prudential regulation that prevents financial institutions from pooling well before the point of collective failure.

We suggest that an anti-herding policy of inducing separating equilibria should inform the development of macroprudential regulatory policy for financial institutions. Balance-sheet correlation is a case of pooling equilibria, albeit one that is more difficult to detect than in the consumer setting because of the conditional nature of the similarity. Unlike consumers, banks and financial institutions invest in a wide variety of assets, implying that at least nominally, no bank is pooling all of its assets in one type of investment. But assets that are seemingly unconditionally unrelated (that is, on average) can suddenly move in lockstep when a crisis occurs. Holding such assets leads essentially to the inverse of the conditional probability benefit of separating equilibria we discussed previously: instead of diversity functioning as stability-enhancing "insurance" for an unexpected shock, institutions can exploit conditional correlation to synchronize the effects of an unexpected shock, ensuring that a crisis collectively and simultaneously plunges an entire sector into balance-sheet insolvency.

Indeed, reducing insolvency-derived systemic risk necessitates prudential regulation aimed specifically at preventing conditional synchronization in financial institutions' outcomes. Since the 2008 to 2009 crisis, there has been a wealth of economic and financial literature specifically addressing this challenge. In the following subsection, we draw on this literature and outline a proposal for prudential regulators to induce separation in the four "L"s of financial crises: leverage, liquidity, losses, and linkages.

Troubled Asset Relief Program and the development of the orderly liquidation authority in response).

[118] Report of Examiner Anton R. Valukas at 1579–80, *In re* Lehman Brothers Holdings Inc., No. 08–13555 (Bankr. S.D.N.Y. Mar. 11, 2010).

2. *Inducing Separation in the "L"s of Financial Crises*

In a leading article on systemic risk in the financial sector, Monica Billio et al. define the "four 'L's of financial crises" as "leverage, liquidity, losses, and linkages."[119] While each of these has been the subject of extensive literature in economics and finance, little attention has been paid to the implications of a legal regulatory paradigm that permits the emergence of excessive pooling equilibria.

A particularly simple, straightforward application of inducing separation in the financial regulatory setting is leverage. The intuition is straightforward: just as Ayres and Mitts argued with respect to homeowners and the housing market, excessive clustering of banks with high levels of leverage exposes proportionately more institutions to insolvency in the event of a fixed shock than if their leverage levels were distributed over a wider spectrum. Surprisingly, this aspect of balance sheet regulation has been largely omitted by the regulatory response to the financial crisis of 2008 to 2009.

In the wake of the crisis, the Basel Committee on Banking Supervision developed the Basel III capital standards, which impose uniform leverage requirements for banks at the international level.[120] The Basel III capital standards are complex but essentially can be distilled down to two central requirements. First, a financial institution's total capital may not fall below eight percent of its risk-weighted assets.[121] Second, banks are subject to an overall non-risk-based leverage ratio which serves as a "backstop" to the risk-weighted capital framework.[122] The bulk of the Basel III rules supply a detailed definition of what qualifies as capital to satisfy the risk-weighted and leverage ratio buffer requirements.[123]

But the Basel III capital standards dedicate comparatively little discussion to the risk of correlated failure and cascading default from proportionately greater exposure to a given shock. The rules impose an "asset-value correlation multiplier for large financial institutions," but this consists solely of a capital surcharge computed from a "probability of default" estimated by a simulated downturn.[124] We support requiring higher capital for a higher estimated overall probability of default, but this capital surcharge does not directly address the risk of correlated failure among financial institutions.

In our view, macroprudential regulation of bank capital should incorporate a policy of inducing separation in bank leverage levels. Similar to Ayres

---

[119] Monica Billio et al., *Econometric Measures Of Connectedness and Systemic Risk in the Finance and Insurance Sectors*, 104 J. Fin. Econ. 535, 537 (2012).

[120] Basel Committee on Banking Supervision, Basel III: A Global Regulatory Framework For More Resilient Banks and Banking Systems, Dec. 2010 (rev. June 2011), *available at* http://www.bis.org/publ/bcbs189.pdf.

[121] *Id.* § 50.

[122] *Id.* § 152.

[123] *See, e.g., id.* § 52 (defining "Common Equity Tier 1 capital").

[124] *See id.* § 272 (adding multiplier of 1.25 to a "correlation parameter" which is solely a function of a firm's estimated "probability of default").

and Mitts's proposal to regulate the distribution of home equity among homeowners,[125] we propose that prudential regulators cap the proportion of financial institutions at specified leverage levels so as to reduce the likelihood of simultaneous default under a given shock. Much like the licenses they propose for the mortgage setting, these "leverage licenses" could be tradable to maximize efficiency. Some institutions could purchase the opportunity to lever up and make a high-stakes bet, but this would necessarily imply a corresponding reduction in the amount of leverage elsewhere in the system.

More generally, such an approach reflects the key intuition that Ayres and Mitts emphasize in the mortgage setting: what matters is not the binary existence of excessive risk but the distribution of that risk across contracts. Some level of risk-taking—even beyond the Basel III minimum capital ratios—may spur economic growth. A binary, one-size-fits-all regulatory mandate induces a type of excessive pooling, depriving society of the benefits from a small quantity of risky contracting. The failure of a single highly leveraged bank—even a large one—would not necessarily endanger stability of the financial system were it the only one to fail. Similarly, if all banks respond to the current Basel III proposal by pooling at the 8% risk-weighted capital level, the entire banking system would be exposed to the possibility that 8% may not be enough. As we have emphasized throughout this Article, inducing separating equilibria insures against the possibility that today's regulatory response may be insufficient for tomorrow's crisis.

These principles apply similarly to the regulation of liquidity levels among financial institutions. In January 2013, the Basel Committee issued a revised rule on liquidity, which mandates that financial institutions hold a minimum Liquidity Coverage Ratio (LCR), increasing gradually from 60% to 100% over the years 2015 to 2019.[126] The LCR consists of the value of so-called "high-quality liquid assets" as a percentage of monthly net cash outflows.[127] These minimum liquidity levels are intended to ensure that banks will not face a systemic liquidity shortfall in the next crisis.

However, just as with bank capital, the liquidity provisions are binary, one-size-fits-all standards, applying identically to all financial institutions. It is hardly certain that the 100% LCR will be sufficient for the next crisis, which might require 200% of net cash outflows in liquid assets. The Basel Committee was rightly concerned with balancing bank profitability against systemic stability—indeed, it emphasized that the incremental approach is "designed to ensure that the LCR can be introduced without material disruption to the orderly strengthening of banking systems or the ongoing financ-

---

[125] *See* Ayres & Mitts, *supra* note 24, at 11.

[126] Basel Committee on Banking Supervision, BASEL III: THE LIQUIDITY COVERAGE RATIO AND LIQUIDITY RISK MONITORING TOOLS § 10 (2013), *available at* http://www.bis.org/publ/bcbs238.pdf.

[127] *Id.* § 17.

ing of economic activity."[128] But a uniform rule is inevitably over- and under-inclusive, likely slowing economic growth in exchange for a false sense of security that a 100% LCR is a guarantee against future liquidity shortages.

We suggest that financial regulators induce separating equilibria in the distribution of liquidity rather than rely on a single minimum liquidity ratio. A combination of menus and direct economic incentives might be well suited for this setting. For example, every month regulators could let firms choose from a set of minimum LCRs such as 50%, 100%, and 200%, with higher levels costing more than lower ones. Using data on a firm's net cash outflows, regulators could track the overall distribution of illiquidity among financial institutions and modify the menu choices as well as the cost of each choice each month. Diversity in the distribution of LCRs would bring society the benefit of lower liquidity requirements for some financial institutions while ensuring that others are subject to even higher levels so as to insure against the possibility that a specific level—such as 100%—is insufficient for the next crisis. Finally, a similar approach would be effective for the last two "L"s of financial crises: losses and linkages, as we explain in the following section.

3.   *Reducing Conditional Asset Correlations with CoVaR*

We suggest licensing the distribution of bank *assets*, not merely capital levels, using the "CoVaR" measure developed by Tobias Adrian and Markus K. Brunnermeier.[129] Adrian and Brunnermeier define CoVaR as "marginal contribution of a particular institution (in a non-causal sense) to the overall systemic risk."[130] This can be stated in algebraic terms as the value-at-risk "of institution *j* (or the financial system) conditional on some event $\mathbb{C}(X^i)$ of institution *i*," so that CoVaR is "implicitly defined by the q-quantile of the conditional probability distribution:"[131]

$$\Pr\left(X^j \leq \text{CoVaR}_q^{j|\mathbb{C}(X^i)}|\mathbb{C}(X^i)\right) = q$$

In other words, CoVaR is the maximum amount that institution *j* (which could also be the financial system as a whole) may lose with probability *q* conditional on event $\mathbb{C}$ happening to institution *i*.[132]

---

[128] *Id.* § 10.

[129] Tobias Adrian & Markus K. Brunnermeier, *CoVaR* 2 (Nat'l Bureau of Econ. Research, Working Paper No. 17454, 2011), http://www.nber.org/papers/w17454.

[130] *Id.* They also explain that "under many distributional assumptions . . . the CoVaR of an institution is proportional to the covariance of the financial system and the individual institution." *Id.*
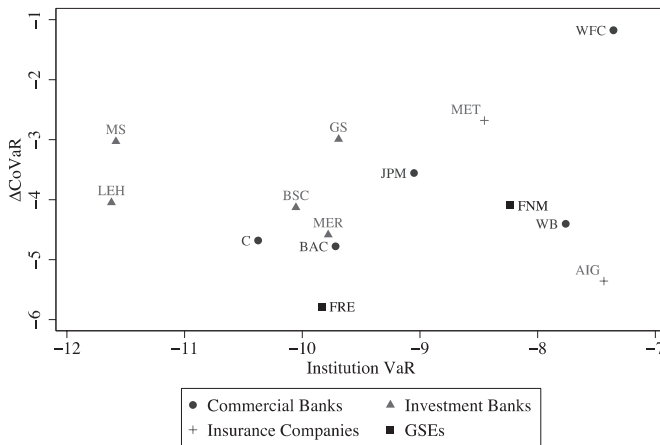
[131] *Id.* at 7.

[132] To measure CoVaR, prudential regulators could utilize the measure developed by Monica Billio et al., who use principal component analysis of financial returns and Granger-causality tests to "gauge the degree of connectedness of the financial system." Bilio et al.,

To understand how CoVaR operates, imagine that event $\mathbb{C}(X^i)$ is an unexpected decline in the value of an asset held by institution *i*. This definition implies that the financial system will lose at most a certain amount, given by CoVaR, with probability *q*. Imagine, for example, that the event is an unexpected decline in the value of home mortgage securities held by institution *i*. CoVaR supplies an "upper bound" for the financial system's probabilistic loss upon this event occurring to institution *i* (for example, a loss of $100 million with 50% probability, $200 million with 25% probability, and so forth). Accordingly, CoVaR indicates the degree to which a specific institution's fate is interlinked with that of the financial system as a whole: if the system is largely unaffected by events occurring to institution *i*, CoVaR is minimal. CoVaR thus supplies a formal definition of systemic risk as the conditional correlation of asset returns of the financial system in response to events affecting individual firms within it.

Adrian and Brunnermeier provide two useful examples of estimating and applying CoVaR. The first is a plot of CoVaR against VaR (value-at-risk) for fourteen leading financial institutions. VaR measures the *unconditional* risk of a particular firm, specifically the 1% quantile of a firm's return distribution, in other words, a "worst case" tail event. The ΔCoVaR measure therefore represents "the percentage point change in the financial system's 1% VaR when a particular institution realizes its own 1% VaR."[133]

FIGURE 4: COVAR VS. VAR

Consider an example: AIG was among the least risky firms in terms of unconditional risk. It stood to lose only about 7.5% in the "worst case" scenario as represented by the 1% quantile, but had the second highest CoVaR in this group. The 1% quantile of the financial system's return distribution would have dropped 5% when AIG alone lost relatively little. On the other hand, Wells Fargo & Company ("WFC"), which emerged relatively unscathed from the financial crisis even after acquiring Wachovia,[134] had approximately the same VaR as AIG but the lowest CoVaR of the group.

As a second example, Adrian and Brunnermeier show how CoVaR in the *future* may be estimated as a countercyclical measure that can detect systemic risk as it accumulates, which is the focus of this Article. They develop a two-year "forward ΔCoVaR" measure using data from all publicly traded financial institutions and show how it was a better predictor of the financial crisis than a contemporaneous alternative.[135]

In our view, forward CoVaR is a particularly useful measure for regulatory policy because it provides a predictive quantitative measure for the conditional correlation that can result from herding. For example, prudential regulators could directly utilize forward CoVaR to reduce asset herding on bank balance sheets. The Federal Reserve could issue 1000 forward CoVaR licenses with each license corresponding to the permissible holding of $1 million in assets at 1.0 forward CoVaR. An institution would thus require one license for every $10 million in assets at a forward CoVaR of 0.10. The initial 1000 allocation would be auctioned to institutions and tradable on a secondary market. This causes licenses to gravitate towards firms that highly value holding a higher proportion of assets with performance correlated with that of other firms while forcing other firms to diversify, thereby restricting the overall level of CoVaR within the market. By setting a hard cap on firms' correlation with the financial system as a whole, a licensing scheme would directly prevent correlated declines in asset values across financial institutions.[136]

Alternatively, regulators could impose a corrective CoVaR tax. A comprehensive evaluation of how to compute such a tax would require identifying the precise social cost of conditional synchronization, which is beyond the scope of this Article. But we suggest a few intuitions. Some level of CoVaR is undoubtedly desirable, because completely uncorrelated asset

---

[134] *See, e.g.*, *Wells Fargo: 2 Upside Catalysts*, Seeking Alpha (Mar. 4, 2013), http://seekingalpha.com/article/1242871-wells-fargo-2-huge-upside-catalysts ("Wells Fargo (WFC) has enjoyed a well-deserved reputation on Wall Street as a very strong, conservative bank that came through the financial crisis virtually unscathed and stronger than ever.").

[135] Adrian & Brunnermeier, *supra* note 125, at 23–24.

[136] For a discussion of the implementation issues that may arise with this licensing system, see our detailed proposal to license mortgage equity in Ayres & Mitts, *supra* note 8, at 130–31. Many of the principles that we articulated in the mortgage context (for example, licensing based on geographic area, instituting monitoring systems to keep regulators up to date, and tailoring licenses to underserved communities to promote distributional policy goals) would apply in these settings as well.

portfolios would likely lead to suboptimal underinvestment. However, the social cost of synchronization is likely greater at higher levels of CoVaR. Accordingly, we suggest that any such tax be nonlinear in nature: at small levels of CoVaR, no tax would be imposed, but at greater levels, the tax would increase significantly. This would reduce the likelihood of synchronized failure en masse while still allowing firms to maintain basic investment portfolios that have some level of interconnectedness.

A third alternative to licensing or taxation is to indirectly reduce CoVaR by issuing regulatory variances for differential disclosure and transparency. For example, regulators could randomly allocate "opacity privileges" that would grant financial institutions one-time exemptions from public reporting requirements. Reducing transparency in a controlled and targeted manner would permit banks to peruse idiosyncratic investment strategies that are harder for counterparties to mimic. The selective concealment of asset portfolios gives regulators the ability to indirectly induce greater variation in conditional asset returns and thereby reduce CoVaR across the financial system as a whole.

CoVaR is a powerful measure to induce separation and reduce herding among financial institution asset portfolios. But the intuitions behind CoVaR are not limited to bank balance sheets. CoVaR can be utilized in additional areas of regulatory policy such as consumer finance and corporate and securities law to combat the emergence of herding and induce beneficial separation. In the following sections, we discuss these applications of reducing conditional correlation in other settings.

B.   Consumer Finance

1.   Enhancing Systemic Stability: CoVaR for Consumer Debt

Just as with financial institutions, CoVaR can be employed to counteract the externality of excessive herding on *consumer* balance sheets. Such pooling arises when consumers find it individually rational to engage in economic activity that is conditionally correlated, making it more likely that an unexpected adverse event will impose external costs on society. The most straightforward example is debt-to-income (DTI) ratios. When consumers pool at the same debt level as a proportion of income, a given decline in income levels (for example, due to rising unemployment) exposes more consumers to the risk of being unable to service their debt. The externality in this case is the effect of deleveraging on the broader economy: consumers' inability to service debt can lead to the imposition of losses on creditors, as well as on other sectors of the economy that depend on consumer spending.

In other words, DTI herding implies greater correlation of detrimental outcomes conditional on a given proportional decline in income. This correlation can be stated, in terms of the definition of CoVaR, as an increased amount that other consumers, creditors, and the financial system j will

probabilistically lose in response to an adverse event occurring to consumer *i*. And, just as in the banking context, the quantitative nature of CoVaR permits regulatory intervention to cap this conditional correlation.

To be sure, licensing or taxing CoVaR in the consumer setting is more difficult than in the banking context because unlike financial institutions, consumers are not subject to continuous prudential regulation and oversight. However, tracking consumer DTI levels is not technically infeasible. The information is already available in income tax filings and credit reports. The federal government already has access to income tax returns, and with appropriate statutory authority, regulators could simply use the prior year's adjusted gross income (AGI) as a rough proxy for current income. AGI would be an imperfect measure, as some individuals have access to income that is not reported under AGI (for example, adult children living with their parents), but it would likely capture the vast majority of the population. We are not suggesting that any individually identifying information would be utilized; CoVaR could be calculated using data aggregated by geographic region, age, or occupation.[137]

Credit reporting would function in a similar manner. Congress might simply mandate that the major credit-reporting bureaus report aggregate debt data to a financial regulator such as the Consumer Financial Protection Bureau (CFPB), which would compute approximate DTI levels from the prior year's income. While linking individual debt levels to AGI would likely prove problematic for privacy reasons, it is only necessary to have sufficient granularity in the reporting level. For example, if the CFPB were to compute that consumer debt is herding at a DTI of 30% among 18 to 25 year olds in the construction industry, it might mandate that credit-card issuers charge higher interest levels for customers aged 18 to 25 in the construction industry with a DTI in excess of 25%.

2. *Informational Benefits of Separation in Consumer Finance*

In addition to enhancing stability, inducing separating equilibria in consumer finance would provide substantial informational benefits. Extensive literature on behavioral biases in consumer contracting has shown that consumers systematically fail to fully maximize utility as predicted by rational actor theory.[138] Writing on the prevalence of industry exploitation of con-

---

[137] Occupational data might be the most useful for anticipating the propensity of individuals to be exposed to a common shock to the labor markets.

[138] The literature on this topic is vast. For leading examples of general scholarship, *see, e.g.*, RICHARD L. OLIVER, SATISFACTION: A BEHAVIORAL PERSPECTIVE ON THE CONSUMER (2nd ed. 2010); BEHAVIORAL LAW AND ECONOMICS (Cass R. Sunstein, ed., 2000); Christine Jolls, Cass R. Sunstein & Richard Thaler, *A Behavioral Approach to Law and Economics*, 50 STANFORD L. REV. 1471 (1998); Daniel Kahneman, *Maps of Bounded Rationality: Psychology for Behavioral Economics*, 5 AM. ECON. REV. 1449 (2003); Russell B. Korobkin & Thomas S. Ulen, *Law and Behavioral Science: Removing the Rationality Assumption from Law and Economics*, 88 CALIF. L. REV. 1051 (2000).

sumer biases in the credit-card market, Oren Bar-Gill notes that "competitive forces compel sellers to take advantage of consumer weaknesses."[139] Bar-Gill suggests various consumer-protection policy proposals such as better ex ante regulation with warnings, disclosures, and default rules, as well as active judicial review under the doctrines of unconscionability, penalty, and bankruptcy law.[140]

However, a primary critique of behavioral economics is that the distribution of biases in the population is unknown. Richard Epstein, for example, has emphasized that "no consumer wears a black or white hat that indicates his or her [type of bias] . . . the behavioral critique loses much of its bite, because it can no longer predict any systematic direction to the market errors."[141] But it is precisely this problem of obtaining information as to the distribution of biases in the population that separating equilibria can solve. Variation in the types of consumer contracts permits regulators to make comparative inferences regarding the likelihood of behavioral biases.

As a concrete example, consider the regulation of warnings and disclosure in consumer financial transactions. It is unclear what type of disclosure is most effective at reducing consumer biases. In 1968, the Truth in Lending Act was enacted under a paradigm of "more is better"—greater quantity of disclosure was assumed to lead to more informed and ultimately more rational decision-making.[142] Writing one decade later, two law professors noted that this approach had led to numerous problems: "[C]onsumers and creditors alike claim[ ] that disclosure statements are unnecessarily complex, and a steady stream of litigation [is] flowing."[143]

Ever since, scholars have debated simplification in credit-disclosure statements to consumers.[144] The CFPB recently proposed a vastly simpler disclosure form for home mortgage transactions consisting of basic terms such as the loan amount, interest rate, estimated monthly payment for different groups of years, and cash required to close.[145] But simplification alone is hardly a panacea: the portions omitted may be critical for an adequate under-

---

[139] Oren Bar-Gill, *Seduction by Plastic*, 98 Nw. U. L. Rev. 1373 (2004).

[140] *Id.* at 1373–1427.

[141] Richard A. Epstein, *Behavioral Economics: Human Errors and Market Corrections*, 73 U. Chi. L. Rev. 111, 121 (2006).

[142] *See, e.g.*, Truth in Lending Act, 15 U.S.C. § 1601(a) (2009) ("It is the purpose of this subchapter to assure a meaningful disclosure of credit terms so that the consumer will be able to compare more readily the various credit terms available to him and avoid the uninformed use of credit, and to protect the consumer against inaccurate and unfair credit billing and credit card practices.").

[143] Jonathan M. Landers & Ralph J. Rohner, *A Functional Analysis of Truth in Lending*, 26 UCLA L. Rev. 711, 712 (1978).

[144] *See, e.g.*, Jeffrey Davis, *Protecting Consumers from Overdisclosure and Gobbledygook: An Empirical Look at the Simplification of Consumer-Credit Contracts*, 63 Va. L. Rev. 841 (1977); David M. Grether, Alan Schwartz & Louis L. Wilde, *Irrelevance of Information Overload: An Analysis of Search and Disclosure*, 59 S. Cal. L. Rev. 277 (1986).

[145] Integrated Mortgage Disclosures under the Real Estate Settlement Procedures Act (Regulation X) and the Truth In Lending Act (Regulation Z), 77 Fed. Reg. 51116 (Aug. 23, 2012). For a visual example of the CFPB's proposed form, *see Know Before You Owe*, Con-

standing of the risks of the transaction. It is difficult to believe that the CFPB just happened to discover the optimal mix of disclosure that will provide the maximum amount of bias reduction.

More fundamentally, the optimal level of disclosure may be heterogeneous among the borrower population. It likely varies with borrowers' education levels, socioeconomic conditions, and other unobservable characteristics. The optimal regulatory policy for disclosure may likewise be heterogeneous: different forms for different types of borrowers or borrowing situations. Indeed, Ian Ayres and Alan Schwartz recently argued that consumer protection law should focus on unexpected, unfavorable terms and that "sellers could enforce unexpected, unfavorable terms only if they are disclosed in a 'warning box' that has a government-provided standard border."[146] The idea is that to be effective, consumer protection law may need to be heterogeneous in nature, applying differentially to different types of terms. In a similar vein, Ariel Porat and Lior Jacob Strahilevitz recently argued that the emergence of "big data" should render legal rules "personalized," meaning heterogeneously adapted to individual traits and characteristics.[147] They specifically identify consumer protection law as a natural candidate for personalized default rules, such as where an efficient minoritarian default rule of "delivery at the buyer's residence" might apply to medical equipment stores with a large number of disabled customers.[148]

We build on these insights and suggest that inducing separation in the regulation of consumer financial transactions is the key to empirical discovery of which forms of disclosure are more effective than others under varying conditions. When combined with random assignment, the experimental nature of this approach would permit causal inference as to the long-term effectiveness of varying types of disclosure. For example, regulators could randomly assign varying types of disclosure forms and compare default rates several years later to determine which is more effective.

But variation can also facilitate the implementation of heterogeneous policy as an end unto itself. Similar to Ayres and Schwartz's proposal to limit unenforceability to a subset of terms—those which are unexpected and unfavorable—we suggest that in addition to searching for the "best" form of disclosure, variation in disclosure requirements would facilitate learning of the *conditional* payoffs, which are often unknown yet of great importance. These conditions include types of borrowers and circumstances of the transaction at the time of borrowing—for example, certain forms of disclosure may be effective with borrowers of different socioeconomic or educational

---

SUMER FINANCIAL PROTECTION BUREAU, http://www.consumerfinance.gov/knowbeforeyou owe/ (last visited May 11, 2013).

[146] Ian Ayres & Alan Schwartz, *The No-Reading Problem in Consumer Contract Law*, 66 STAN. L. REV. 545, 545 (2014).

[147] Ariel Porat & Lior Jacob Strahilevitz, *Personalizing Default Rules and Disclosure with Big Data*, 112 MICH. L. REV. 1417 (2014).

[148] *Id.* at 1442.

backgrounds, or for interest-only as opposed to variable-rate loans—as well as unknown *future* events such as macroeconomic downturns. The latter is especially important because the next crisis may impact borrowers differently in ways that we cannot foresee today. A regulatory policy of inducing variation to preserve knowledge as to the conditional payoffs of various forms of regulation provides society with the informational benefit of inference as to the *conditional* effectiveness of different types of disclosure.

C.   Securities Regulation

A third area that would benefit from a regulatory policy of inducing separating equilibria is securities regulation. Since their inception, securities laws have been characterized by mandatory rules that apply equally to all issuers, despite the inefficiencies inherent in a one-size-fits-all regime. Scholars have repeatedly criticized this approach in contexts ranging from mandatory disclosure under the Williams Act to the prohibition on trading on material nonpublic information. In 1987, Jonathan R. Macey and Jeffrey M. Netter argued that "no one has ever explained why target firms could not themselves provide incentives for bidders to disclose the information required by the Williams Act if such disclosure would benefit shareholders."[149]

Roberta Romano has penned an extensive critique of the mandatory, "one-size-fits-all" system of federal securities regulation.[150] She shows that there is little empirical evidence that the mandatory disclosure imposed by the federal securities laws produces net benefits that exceed costs or that adequate information would not be produced for investors in the absence of such compulsory disclosure.[151] Moreover, Romano emphasizes, there is ample evidence that state competition for corporate charters has led to legal regimes that are efficient and maximize shareholder value. Accordingly, Romano calls for a market approach to securities regulation whereby firms may choose the state to register their securities and thereby "opt in" to that state's disclosure laws.[152] Alternatively, Romano advocates making the federal securities laws a "default" regime, giving firms the option to choose whether to comply. Such an approach would lack the benefits of state competition

---

[149] Jonathan R. Macey & Jeffry M. Netter, *Regulation 13D and the Regulatory Process*, 65 WASH. U. L.Q. 131, 154 (1987). Ian Ayres and Steven Choi have similarly argued that firms should be able to permit so-called "outsider trading" by informed outsiders such as market analysts through an opt-out mechanism consisting of the approval of "both a majority of a firm's board and a majority of a firm's shareholders." Ian Ayres & Stephen Choi, *Internalizing Outsider Trading*, 101 MICH. L. REV. 313, 389 (2002).

[150] Roberta Romano, *Empowering Investors: A Market Approach to Securities Regulation*, 107 YALE L.J. 2359 (1998).

[151] *Id.* at 2373.

[152] *Id.* at 2362.

but still allow firms and investors to decide whether the securities laws are value maximizing.[153]

Romano's market-based proposal for securities regulation reflects the anti-herding regulatory paradigm we have advocated throughout this Article. Permitting states to compete for firms' securities registration would provide the informational benefit of diversity, for example, by learning which set of disclosure rules promotes efficiency and greater shareholder value creation on average.[154] Even a federal default rule with firm-specific opt-out would facilitate comparative inference as to whether compliance with the federal securities laws is associated with higher shareholder value. Unfortunately, the Securities & Exchange Commission (SEC) has not utilized its exemptive authority to enable any sort of experimentation regarding which disclosure laws would be most value maximizing.

Scholars have also criticized the mandatory nature of the securities laws in light of the recent controversy over reforming the ten-day filing window for the acquisition of beneficial ownership under Section 13(d) of the Securities Exchange Act of 1934.[155] Joshua Mitts has argued that the SEC should permit firms to balance the costs and benefits of shareholder activism and the stealth acquisition of shares by opting for a firm-specific disclosure window through a shareholder amendment to the corporate bylaws.[156] This is similar to an approach advocated by Luca Enriques, Matteo Gargantini & Valerio Novembre, who suggest that the European Commission permit shareholder disclosure opt -out of varying durations both by member states and specific firms.[157] Alternatively, Steven Brams and Joshua Mitts have suggested a more radical but more efficient case-by-case transactional mechanism whereby stealth acquirers purchase specific-disclosure delays through an asynchronous bargaining mechanism.[158]

---

[153] *Id.* at 2396. This argument has been echoed by Alan Palmiter, who dedicated an entire article to issuer choice in securities offerings. Alan R. Palmiter, *Toward Disclosure Choice in Securities Offerings*, 1999 COLUM. BUS. L. REV. 1 (1999).

[154] In a similar vein, Roberta Romano more recently called for greater diversity in the regulatory regimes applying to financial institutions. Roberta Romano, *For Diversity in the International Regulation of Financial Institutions: Critiquing and Recalibrating the Basel Architecture* 3 (Yale Law & Econ. Research, Working Paper No. 452, 2013), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2127749 (calling for "a more flexible financial architecture that provides greater room for regulatory diversity and experimentation, given the uncertain and dynamic environment in which financial institutions operate"). This differs from our discussion of balance-sheet herding in the banking setting but is an important complementary application of anti-herding principles to financial regulation more generally.

[155] *See, e.g.*, Lucian A. Bebchuk & Robert J. Jackson Jr., *The Law and Economics of Blockholder Disclosure*, 2 HARV. BUS. L. REV. 39, 46 (2012); Letter from Wachtell, Lipton, Rosen & Katz to Elizabeth M. Murphy, Sec'y, U.S. Sec. & Exch. Comm'n, 3 (Mar. 7, 2011), *available at* http://www.sec.gov/rules/petitions/2011/petn4-624.pdf.

[156] Joshua Mitts, *A Private Ordering Solution to Blockholder Disclosure*, 35 N.C. CENT. L. REV 203, 239 (2013).

[157] Luca Enriques, Matteo Gargantini & Valerio Novembre, *Mandatory and Contract-Based Shareholding Disclosure*, 25 UNIF. L. REV. 713, 736 (2010).

[158] Steven Brams & Joshua Mitts, *Law and Mechanism Design: Procedures to Induce Honest Bargaining*, 68 N.Y.U. ANN. SURV. AM. L. 729, 783 (2013).

We echo these calls for a more efficient, nonmandatory securities regulation regime, but in our view, separation is desirable for the additional reasons we have outlined in this Article. In particular, inducing diversity in the distribution of rules under the securities laws would have substantial informational benefits. For example, the SEC could subsidize the adoption of varying beneficial ownership disclosure windows under Section 13(d) to obtain empirical data regarding which durations are value maximizing for different types and sizes of firms. A similar approach could be taken with insider and outsider trading: the SEC could issue a limited quantity of variances to empirically experiment with the tradeoff between adverse-selection effects and for allowing informed trading as a form of compensation.[159] In short, securities regulation seems well suited for the informational benefits of a regulatory policy of inducing separating equilibria.

V. Conclusion: The Parable of the Bridges

On April 16, 1850, the Angers Bridge collapsed while a battalion of French soldiers was marching across it.[160] The collapse occurred during a powerful storm with high winds, but even though the soldiers had been ordered to break step during the crossing, a commission found that a contributing cause for the collapse was that the soldiers unconsciously matched the cadence of their step to the initial oscillations induced by the wind.[161] A similar unconscious parallelism was found in England 150 years later:

> Soon after the crowd streamed on to London's Millennium Bridge on the day it opened, the bridge started to sway from side to side: many pedestrians fell spontaneously into step with the bridge's vibrations, inadvertently amplifying them.[162]

Synchronous marching can thus deleteriously amplify the natural oscillations of a bridge. Viewed through the lens of herding, the soldiers' marching is a kind of pooling that amplifies systemic risk. The standard regulatory remedy of ordering soldiers to break step rests on the idea that, given autonomy, the soldiers will march proverbially to different drummers. But the

---

[159] *Compare, e.g.*, Stanislav Dolgopolov, *Insider Trading and the Bid-Ask Spread: A Critical Evaluation of Adverse Selection in Market Making*, 33 Cap. U. L. Rev. 83, 180 (2004), *and* Kimberly D. Krawiec, *Fairness, Efficiency, and Insider Trading: Deconstructing the Coin of the Realm in the Information Age,* 95 Nw. U. L. Rev. 443, 469–70 (2001) (arguing that insider trading should be prohibited), *with* David D. Haddock & Jonathan R. Macey, *A Coasian Model of Insider Trading*, 80 Nw. U. L. Rev. 1449, 1457 (1986) (advocating for the legalization of insider trading).

[160] *See* John Surtees & Bill Wolmuth, *Crowd-Related Failure of Bridges*, 156 Proc. ICE-Civil Engineering 116, 118 (2003).

[161] A. Dumas, Annales Des Ponts Et Chaussées: Partie Technique 404 (1850) ("le passage d'un grand nombre de soldats dont la marche devait involontairement devenir cadencée par l'effet des oscillations du plancher").

[162] Steven H. Strogatz, et al., *Crowd Synchrony on the Millennium Bridge*, 438 Nature 43, 43 (2005).

lesson of the Angers and Millennium bridge histories is that laissez-faire regulation may not be sufficient to avoid deleterious herding. The unconscious choices of pedestrians and soldiers to match their cadence to the oscillations of the bridge can exacerbate the impact of a natural shock.

The parable of the bridges can help us see that "too-big-to-fail" (TBTF) provisions are laudable but do not go far enough. A large bank can be thought of (literally) as a large pool of assets—which might imprudently be overexposed to a particular kind of financial shock. Seen in this light, the prohibition against TBTF banks can be seen as a kind of anti-pooling regulation—because the regulation sought to stop unhealthy pooling of risk that could occur inside the portfolio of a single financial behemoth. But critics of TBTF have correctly pointed out that after breaking up or shrinking the size of the large banks, there is nothing in current regulation to stop smaller banks from herding and replicating any aggregate position of the larger banks. The hope of TBTF is that smaller banks will naturally make diverse investment decisions and consequently produce less pooling equilibria But the parable of the bridges illustrates that laissez-faire regulation may not be sufficient to deter deleterious herding. Merely not mandating uniformity may be sufficient. At times it may be appropriate to mandate (or actively encourage) nonuniformity.

As we have shown, a particularly effective means of inducing separation is the CoVaR measure of conditional correlation of asset returns. From regulating bank balance sheets to debt levels and incorporation, regulators can utilize the CoVaR measure to cap the synchronized failure that renders a financial system vulnerable to an unexpected shock. Anti-herding policies can be extended to other regulatory settings as well. There has been an extensive debate recently over whether the minimum length of law school should be two years instead of three.[163] But why not a menu of different durations to encourage experimentation with which duration is optimal for different socioeconomic groups in various geographical regions? More broadly, the informational benefits of diversity imply that an effective policy solution might involve a basket of options rather than a single choice that is "better" than the others. We could imagine any number of contexts—governance systems, treaty regimes, educational systems—where a one-size-fits-all paradigm prevents society from discovering better alternatives.[164]

---

[163] *See, e.g.*, Debra Cassens Weiss, *Two-Year Law School Was a Good Idea in 1970, and It's a Good Idea Now, Prof Tells ABA Task Force*, ABA JOURNAL (Feb. 10, 2013), *available at* http://www.abajournal.com/news/article/two-year_law_school_was_a_good_idea_in_1970_and_its_a_good_idea_now/.

[164] Indeed, one more reason to institute anti-herding regulation is that a regulatory policy may unexpectedly fail when tomorrow's society differs from today's. Government subsidies for homeownership were essential for debt-averse post-Depression America but far from optimal in the mid-2000s housing bubble when flipping houses became in vogue. *Compare* Robert E. Lang & Rebecca R. Sohmer, *Legacy of the Housing Act of 1949: The Past, Present, and Future of Federal Housing and Urban Policy*, 11 HOUSING POLICY DEBATE 291, 295 (2000) ("Title II dramatically increased the availability of FHA mortgage insurance and fueled a

In short, we suggest that the lesson of the Angers Bridge is not only that the aggregation of individually beneficial activities can lead to socially detrimental outcomes. The deeper point is that excessive *synchronization* itself can be dangerous—without the cacophony of diversity we just might find an otherwise safe bridge collapsing beneath us. But there is also an independent benefit to anti-herding regulation: policies that induce separation can give society insights into not only the world we live in today, but also the world we might unexpectedly encounter tomorrow.

---

postwar boom in housing construction and homeownership.") (citing Sylvia C. Martinez, *The Housing Act of 1949: Its Place in the Realization of the American Dream of Homeownership*, 11 Housing Policy Debate 467, 471–76 (2000)), *with* Andrew Haughwout et al., *Real Estate Investors, the Leverage Cycle, and the Housing Market Crisis*, Fed. Res. Bank. N.Y. Staff Report No. 514 (Sept. 2011), at 10, *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1926858 (discussing the dramatic increase in the 2000s of so-called buy-and-flip investors who are "portrayed in the popular television show 'Flip This House'"). In a recent empirical project, Joshua Mitts demonstrates a predictive approach to regulation using large-scale textual data on social trends. Joshua Mitts, *Predictive Regulation* (June 27, 2014) (unpublished manuscript), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2411816. However, the key to adaptable regulation is ensuring sufficient diversity in the distribution of policy so that government can nimbly respond to social changes without the "ratchet effect" of being locked in to a one-size-fits-all approach.