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Department of Economics Working Paper Series

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by

Richard N. Langlois
University of Connecticut

Working Paper 2022-12
May 2022

365 Fairfield Way, Unit 1063
Storrs, CT 06269-1063
Phone: (860) 486-3022
Fax: (860) 486-4463
http://www.econ.uconn.edu/

Modularity, Identity, and the Constitutional Diagonal

Richard N. Langlois
Department of Economics
The University of Connecticut
Storrs, CT 06269-1063
richard.langlois@uconn.edu

Second Draft
Version of May 12, 2022

ABSTRACT

The framework of modular systems articulated in *Design Rules* can be applied in the larger setting of social institutions. The principles of encapsulation and information hiding operate in society as mechanisms to internalize externalities. This essay focuses on intangible externalities, or "moralisms," that involve the transmission across module boundaries of pure information rather than materials or energy. Such intangible externalities arise in the practice of identity, the affiliations through which individuals create and define their sense of self. Both formally and informally, individuals tend to modularize themselves into identity groups in order to minimize the costs of the intangible externalities that identities impose on one another. One important way to reduce conflict among identity groups is to create a governance structure in which some interactions are proscribed – the constitutional diagonal. In the end, because of the inherent incompatibilities – the non-modular interactions – between identities that arise inevitably from the very meaning and function of identity, genuine toleration is possible only through the increased standardization of identities. The essay applies these ideas to the problems facing large social networks like Facebook.

JEL classifications: D02, D23, D71, D74, K11, P14, P16

Paper for the special issue of *Industrial and Corporate Change*
The Power of Modularity Today: 20 Years of "Design Rules"

This paper benefited from many conversations with Metin Coşgel and Tom Miceli. Giampaolo Garzarelli, Alan MacCormack, and two anonymous referees provided helpful comments and suggestions.

We often think of the greatness of an academic work in terms of whether it deserves to be called the "last word" on its subject. But another mark of a truly great academic contribution is its ability to shape and catalyze new ideas. Most remarkable of all is to be both – the last word and the first word. *Design Rules* (2000) arguably flirts with that achievement. The book is a comprehensive and authoritative account of the organizational design of human artifacts. At the same time, its intellectual framework begs to be applied to a wide variety of social reality, even beyond the design of artifacts.

This essay celebrates *Design Rules* by moving afield from the construction of artifacts and attempts to apply the ideas of modular design to social institutions broadly understood. It goes without saying that *Design Rules* is concerned with social institutions, especially the institutions of valuation and governance that are inevitably part of any process of design (Baldwin and Clark 2000, chapter 4). This paper proposes to think about social institutions even more broadly.

In another sense, however, this paper is also in the end about designing artifacts – for some of today's most prominent and controversial artifacts are ultimately systems of social institutions. I have in mind Internet platforms like those of Amazon, Apple, Google, or Facebook. To the extent that these platforms operate multi-sided markets, they need to construct and implement strong institutions of governance – institutions that are not unlike political institutions – to regulate the interactions among what may well be billions of individuals. Without well-designed institutions of governance, multi-sided markets can easily deteriorate and collapse (Evans 2012). Recent newspaper headlines suggest that this is not an empty concern; and the governance institutions of the major Internet platforms are coming under increasing public and political scrutiny across the ideological spectrum (Hawley 2021; Klobuchar 2021).

Modularity.

First, a quick review. Modularity is an approach to the design of complex systems, whether consciously designed (which is what Baldwin and Clark are mostly interested in) or the emergent result of Darwinian or other spontaneous processes. The principal benefit of modularity in design is that it organizes complexity in a way that reduces the costs and the potential instability of systemic interconnections. Herbert Simon (1962) described modular systems as *decomposable*.

	a_1	a_2	a_3	a_4	a_5	a_6	a_7
a_1	x			x		x	x
a_2		x	x		x		
a_3			x	x		x	x
a_4	x			x			
a_5		x			x		x
a_6	x		x	x		x	
a_7		x		x		x	x

1.1. A non-decomposable system.

	a_1	a_2	a_3	a_4	a_5	a_6	a_7
a_1	x	x					
a_2	x	x					
a_3			x	x			
a_4			x	x			
a_5					x	x	
a_6					x	x	
a_7							x

1.2. A decomposable system.

	a_1	a_2	a_3	a_4	a_5	a_6	a_7
a_1	x	x	x	x	x	x	x
a_2	x	x	x				
a_3	x	x	x				
a_4	x			x	x		
a_5	x			x	x		
a_6	x					x	x
a_7	x					x	x

1.3. Modular system with common interface.

Figure 1.

Consider Figure 1. An entry of *x* in location a_{ij} means that element a_i communicates with element a_j. Matrix 1.1 is a fully non-decomposable system: every element communicates with every other element. That means that the behavior of every element potentially affects, and is potentially affected by, the behavior of every other element. That could be a real problem. It implies not only high costs of coordination but also the possibility of unforeseen and perhaps destabilizing interaction effects. By contrast, Matrix 1.2 is a decomposable system. Communication is encapsulated within clusters of elements – modules – that do not communicate with elements "far away."

Notice, however, that, although a decomposable system like Matrix 1.2 clearly solves the problem of coordination, it does so by creating autarkic clusters: it eliminates the costs of cooperation by the expedient of entirely eliminating cooperation between clusters (though not within clusters). The term *modular system* takes on many meanings in the literature; but one important candidate definition is that a modular system is a nearly decomposable system that preserves the possibility of universal cooperation by adopting a common interface. The common interface enables, but also governs and disciplines, the communication among subsystems. In terms of Figure 1, an interface would be a set of elements that communicates with most or all the other elements. In Matrix 1.3, element a_1 is the common interface: a_1 communicates with all the a_{ij} and all the a_{ij} communicate with a_1.[1] In other respects, however, Matrix 1.3 remains sparse off the diagonal. The modules communicate with each other only through the interface, never directly. Sparseness of the off-diagonal – what we might think of as the *leanness* of the system – is a crucial characteristic of a well-designed modular system.

Baldwin and Clark have their own useful language for talking about modularity. They distinguish between *visible design rules* and *hidden design parameters*. The visible design rules consist of three parts. (1) An *architecture* specifies the modules that will be part of the system and what their functions will be. (2) *Interfaces* describe in detail how the modules will interact, including how they fit together and communicate. And (3) *standards* test a module's conformity to design rules and measure the module's performance relative to other modules. Crucial to this schema are the ideas of *encapsulation* and *information hiding*. Not only do the parts not need to communicate extensively with one another, they are structurally *forbidden* from communicating

[1] We could also imagine the interface to be just the column a_1 not also the row a_1. That would mean that the interface communicates with the parts but the parts don't talk back. This seems to be how Baldwin and Clark (2000, e. g., p. 74) conceptualize design rules. I return to this point below.

with one another. The basic idea is that "system details that are likely to change independently should be the secrets of separate modules; the only assumptions that should appear in the interfaces between modules are those that are considered unlikely to change" (Parnas, Clemens and Weiss 1985, p. 260).

Rights and encapsulation.

It is easy to see how these principles might apply to an artifact, like, say, a Wintel personal computer, what those of us of a certain age still think of as an "IBM compatible" PC. A set of interface standards, associated with the microprocessor, the operating system, and the system bus, coordinate the interactions among the component modules in a way that obviates explicit coordination among the enterprises that fabricate the components and write the applications software (Langlois and Robertson 1992). It is my contention, however, that these very general principles of organizational design can give us insight into many other kinds of systems, including social institutions.

Thought of in terms of system design, a liberal market economy is a modular system, much like the one in Matrix 1.3 This is arguably the source its genius, the cause of what the economic historian Deirdre McCloskey (2016) calls the Great Enrichment of the last 250 years. As F. A. Hayek (1945) long ago pointed out, the price system – the market's interface – is a "marvel" because it allows incredibly complex interactions without a correspondingly complex flow of information. Beyond economizing on information flows, however, the market is also a marvel because it permits a wide variety of experiments among the modules, leading to rapid innovation through a process of trial-and-error learning. It is this process of decentralized experimentation that led to the "market-tested betterment," as McCloskey calls it, of the Great Enrichment.

Writing in opposition to the idea of socialist central planning, Hayek was primarily concerned with the ability of the market-as-modular-system to economize on information flows. But the concept of information hiding has two sides: yes, modules *need not* communicate with myriad other modules; but, more than that, along some dimensions modules *may not* communicate with those other modules, except through the interface. Economists are well aware of this: the price system functions less effectively when there are failures of encapsulation – when there are *externalities*. The terminology of "information" hiding (from software engineering) is perhaps a bit misleading here. The nodes in a network transfer among themselves not only information but also materials and energy (Baldwin 2008). And it is those flows of materials and energy that economists mostly have in mind when they analyze the problem of externality. If a manufacturer dumps noxious materials into an unowned stream, or if the noisy energy from a confectioner's machinery intrudes on the quiet of a neighboring physician's consulting room, encapsulation has failed; and, at least in a world of significant transaction costs, economic efficiency suffers. We can understand the entire Coasean program (Coase 1960) in terms of the architectural design of institutions: one wants to redesign the institutions – fix the property rights – in order to encapsulate the modules properly, thereby channeling interaction through the price system and internalizing the externality.

Can the transmission of pure information also create an externality? That is a more subtle question than may at first seem. Clearly, some goods are themselves *constructed* of information. For example, as designs became more valuable, it became economical to extend property rights to the designs themselves not just to the artifacts created from those designs (Baldwin and Clark 2000, p. 103). Patents have been around since at least the fifteenth century (Alfred 2012). To the extent that certain kinds of easily codifiable information, like some kinds of designs, can escape

the control of their owner, the result is famously a positive externality. But I will be concerned here primarily with a different kind of informational externality.

Armen Alchian defined a system of property rights as "a method of assigning to particular individuals the 'authority' to select, for specific goods, any use from a nonprohibited class of uses" (Alchian 1965, p. 130). The notion of "authority" here suggests encapsulation, that the potential uses of the owned objects are under the control of the owner alone and that others within the system may not interfere. Ownership is a negative right – a right to exclude. As Sir William Blackstone famously put it, a right to property is "that sole and despotic dominion which one man claims and exercises over the external things of the world, in total exclusion of the right of any other individual in the universe" (Blackstone 1775, Chapter 1). The legal theorist Henry Smith (2012) has argued that we should understand the law of property as a modular system. Giving owners despotic dominion over objects encapsulates those objects, thus economizing on information and facilitating social cooperation.

Echoing a well-known maxim of liberal social thought, Alchian recommends drawing the boundaries of the property modules so that each property owner has "the right to use goods (or transfer that right) in any way the owner wishes so long as the *physical attributes* or uses of all other people's private property is unaffected" (emphasis added). By Alchian's definition, it would seem, flows of information would not count as externalities – not count as violations of encapsulation – because they do not interfere *physically* with the attributes of the owner's sphere of control.

One of Coase's great insights was that harms are symmetric: if the confectioner has the right to make noise, then the physician is harmed; but if the doctor has a right to quiet, the

confectioner is harmed.[2] Coase pointed out that, if transaction costs are insignificant, the parties can bargain to an efficient solution, and so there is no externality. This is the so-called Coase Theorem, which Coase himself considered to be an obvious idea going back at least to Adam Smith and not to have been the point of his paper (McCloskey 1997). Coase was interested in the case in which there *were* transactions costs. Indeed, it is only when there are transaction costs that Coasean reasoning can say something about which of the parties ought to get the right. As between the confectioner and the physician, where there are presumably low transaction costs, Coase is agnostic. Alchian, though, is not: the person who is physically intruding by sending energy across a property boundary is the rights violator.[3]

Note what this means. In Alchian's account, if I send harmful energy across your property boundary without consent, you have the right to stop me.[4] But if I send a harmful *message* across your boundary without consent, you might *not* have the right to stop me. Yet a message can clearly be a harm. If I erect a giant sign on my own property that disparages you or your product, I have lowered your utility or your profit, even though nothing has crossed your property line.[5] From an economic point of view, such a harm is a real (technological) externality because it affects economic activity but is transmitted outside of the price system. Calabresi and Melamed (1972) call such intangible externalities *moralisms*.

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2 Not all harms are externalities. If I set up next door to the confectioner and make better and cheaper candy, I harm the confectioner through the price system not outside of it. The harm I inflict would technically be a "pecuniary" externality, which is not a real or "technological" externality.

3 I am putting aside the question of whether the confectioner was in place first and the physician voluntarily "came to the nuisance." This is almost certainly what happened in the case Coase cites. An industrial area of London was gentrifying, and the physician set up shop abutting an already established candy maker.

4 What it means precisely to have a property right is also a complex and controverted matter (Hodgson 2015).

5 Reflected photons may have crossed your property line. But it is not the energy of the photons that creates the harm in this case but rather the information content of their configuration. A billboard disparaging you constitutes a harm even if it isn't visible from your property and even if you have never personally seen it.

Moralisms are of course rampant in society. People routinely feel themselves annoyed, even aggrieved, by the aesthetic, political, religious, cultural, or philosophical messages that others broadcast. (We might be tempted to think of this as peculiarly characteristic of the present age; in fact, it has ever been thus.) Consider the problem of "repugnant" transactions. I may be harmed (offended, outraged) merely by the knowledge that someone has sold a kidney or has charged hurricane victims an exorbitant price for an electric generator – even though I was miles away, had nothing to do with these transactions, and learned about them only because a third party told me. Alchian's definition of rights would suggest that offended parties should have no recourse, since the repugnant transactions effected no change in the physical parameters of anything the aggrieved victim owned. By Alchian's definition, the *creators* of the intangible harms should get the right. Some philosophers agree (Brennan and Jaworski 2015). Others believe in essence that the *receivers* of the harmful information should get the right, which is to say in practice that the "repugnant" transactions should be prohibited by the state (Sandel 2012).

Coasean reasoning suggests why there is an economic, if not therefore necessarily a philosophical, argument for upholding Alchian's view. In general, we can expect the transaction costs of detecting physical intrusions to be relatively low; and the legal system can verify relatively cheaply the fact and extent of a physical intrusion. By contrast, in most instances of moralisms, including those emanating from repugnant transactions, the costs of measuring the effects of the immaterial intrusions and are high. There is no objective mechanism for determining the genuine existence let alone the cost of the harm (Calabresi and Melamed 1972). As such harms often implicate fundamental human values, this is not the kind of transaction-cost problem that artificial-intelligence or other modern technology could conceivably overcome. Moreover, compensating victims of intangible harm creates a widespread incentive to fabricate and allege intangible harm.

As Amartya Sen (1970) showed, however, assigning the rights to the emanators is not Pareto optimal: moralisms are real externalities, and giving the rights to the transmitters without forcing them to compensate their victims leaves those externalities uninternalized. But, for the reasons just mentioned, in a second-best world of high transactions costs, giving the rights to the emanators may well be optimal. And, as John Stuart Mill (1859) long ago argued, there are positive benefits, especially from a dynamic point of view, to a world in which messages of all sorts can flow freely. Mill's argument is closely related to the Baldwin and Clark proposition that a system generates rapid trial-and-error learning when it engages in many simultaneous independent experiments. I return to this point below.

But – and here again is the Coasean point – in an interconnected world some people will be unhappy no matter which way the rights are assigned. That unhappiness will influence the nature and volume of moralisms transmitted, and it will also motivate the participants to attempt to redesign the system to their advantage. When people consider themselves the victims of moralisms, even if they are the socially optimal victims of moralisms, they may expend resources to reduce their perceived victimization, including perhaps by attempting reciprocal attacks on their offenders or by using political mechanisms to change the rules of the game. These endogenous processes of system redesign take place in the wider civil society, and we can also see them operate within the artifactual societies of online social networks.

To focus the argument (and perhaps for other reasons), I want to concentrate on one particular set of moralisms: those arising in the exercise of *identity*. By all accounts, the harms transmitted within social networks are very much harms implicating identity.

Economists have recently, and perhaps belatedly, begun to think about how economic behavior is conditioned by the agent's identity – by the agent's sense of self.[6] Akerlof and Kranton (2000, 2010) model identity as an argument in the utility function. Each agent is a member of a category (perhaps by choice, perhaps not); and each category – each identity – specifies a set of ideal standards. The agent's utility then depends in part on how well the agent's own characteristics, including actions and behavior, comport with the ideal. But the agent's utility may also depend on the extent to which others comport with the standard.[7] The standards provided by the identity category give meaning to the individual's actions. At the same time, however, "identity underlies a new type of externality. One person's actions can have meaning for and evoke responses in others" (Akerlof and Kranton 2000, p. 717).

Agents may harbor multiple identities, of course, and may choose to emphasize different identities in different circumstances (to the extent that is possible). There may be complex interaction effects among the multiple identities. In order not to complicate the present analysis, however, I will subsume identity switching into the process of asserting or failing to assert a single salient identity that is the source of a negative externality. One can sometimes fail to assert the salient identity by emphasizing – switching to – a different existing identity. Modifying one's identity – a topic to which I return below – is often a matter of emphasizing a different identity that one already holds rather than of creating some new identity out of whole cloth.

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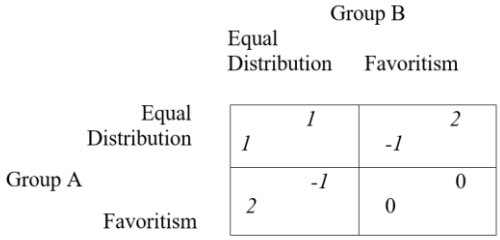
[6] More correctly, we might say that economist are becoming reacquainted with this idea, which was fundamental to Adam Smith (1976 [1759]).

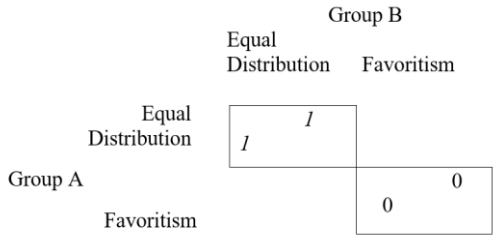
[7] The agent could be offended if others do not comport with the agent's own standards: for example, if others fail to adhere to the religious views the agent professes. Alternatively, the agent could be offended if others fail to comport with the standards of the category to which the agent believes the other has been or should have been assigned. In Akerlof and Kranton (2000), males may be offended if females do not comport with what they (the males) consider to be the standards of femininity (and, presumably, vice-versa).

The constitutional diagonal.

Political theorists, including practitioners of public-choice theory and constitutional political economy, have long thought about identity groups in the context of coalitional politics. Buchanan



2.1 Majoritarian voting.



2.2 The constitutional diagonal.

Figure 2: after Buchanan and Congleton (1998).

and Congleton (1998) model the issue in a simple and enlightening way. Consider two identity groups, A and B, which can affect the allocation of resources through some kind of majoritarian voting. The two groups could agree to allocate resources equally between them; or the group in the majority could choose to favor its own members and penalize the other group. For example, the majority could choose to provide public goods to its own members while taxing the members of the minority to pay for them. (Figure 2.) This looks like a prisoners's dilemma game, but that is not what the authors have in mind. In a prisoners's dilemma, the two players move independently at the same time. In majoritarian voting, only the winner moves. So if A is in the majority, it chooses favoritism, and the players end up in the southwest quadrant; if B is in majority, the players end up in the northeast quadrant. That is not socially optimal. Moreover, the majority might switch over time, as interests, ideology, or demography change, leading to cycling between the northeast and the southwest (Shepsle and Weingast 2012).

For Buchanan and Congleton, the solution, simple in concept though not in execution, is to create a constitutional rule that makes the off-diagonal choices unavailable. This is the essence

of a constitution: to remove some alternatives from the province of majoritarian control. The framers of the American Constitution arguably had exactly this problem in mind, as James Madison famously did in his discussion of the problem of "faction" – the problem of interest groups – in *Federalist 10* (Madison 1961 [1787]). Although it is far from perfect, the analogy with modular design is striking. Modularity is about restricting actions in the system space – about keeping the off-diagonal lean. One of the benefits of such a design is that it reduces the possibility of inefficient cycling by designers attempting to optimize the system (Baldwin and Clark 2000, p. 52). As with the majoritarian problem of Buchanan and Congleton, the design of a non-modular artifactual system may converge only very slowly, or not at all, to the optimum. The solution to the cycling problem lies in system design.

In the classic account of political economy, it is fairly narrow economic interests that motivate the groups – taxes and public goods. But there is no reason we can't frame the problem in terms of identity. Let V be the value of asserting one's own identity and e be the external cost of co-existing with someone of a different identity. Assume that the legal system follows Alchian's advice and assigns the right to the emitters: individuals may assert their own identity, and those with a different identity who feel themselves harmed have no cause of action. That gives us the prisoners's dilemma game in Figure 3.1. The unique Nash equilibrium is for both parties to assert

		Group B: Assert identity	Group B: Repress identity
Group A	Assert identity	$V-e$ / $V-e$	$-e$ / V
	Repress identity	V / $-e$	0 / 0

3.1 The tragedy of the identity commons.

		Group B: Block	Group B: Not block
Group A	Block	$\underline{0}$ / $\underline{0}$	$-e$ / V
	Not block	V / $-e$	$V-e$ / $V-e$

3.2 The tragedy of the identity anti-commons.

Figure 3

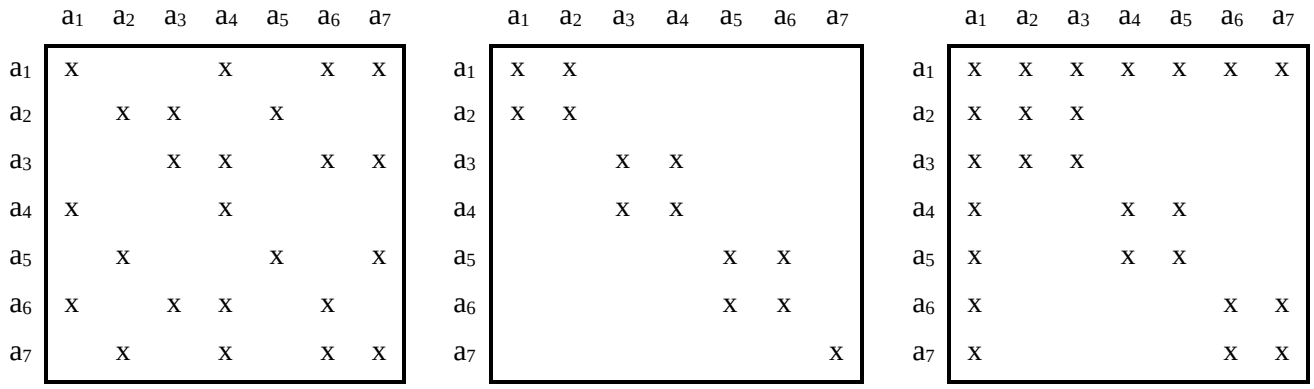
their identities and thus impose externalities on each other. We might call this the tragedy of the identity commons. Whether the equilibrium is efficient depends on whether *V-e* is greater than or less than zero, that is, on whether the benefits of expressing identity are greater than the external costs imposed. Alternatively, the legal system could assign the right in the opposite way, by giving veto power to all those who feel themselves offended. In that case we have the game of Figure 3.2, whose unique Nash equilibrium is for both sides to exercise veto power. This is the tragedy of the anti-commons (Buchanan and Yoon 2000). The anti-commons equilibrium is efficient only if the costs of the externalities outweigh the benefits of expressing identity.

As we did with Figure 2, we can also view Figure 3.1 not as a prisoners's dilemma game but in the framework of majoritarian voting. We can allow the two groups to have different costs and benefits, such that $V_A \neq V_B$ and $e_A \neq e_B$, either because one group is simply bigger than the other or because one group feels more intensely. Under majority voting, we might easily end up in an off-diagonal: one group is free to assert its identity while the other group must repress its identity. For some parameter values, that may even be optimal, as when a small group expressing its identity causes identarian harm to a large and sensitive group. This is, of course, Sen's result in another guise. The norm of equal treatment need not be the utilitarian optimum, at least in a narrow static sense, though one could argue that it is the alternative that reasonable people would choose behind a veil of ignorance.

Endogenous identity groups.

So far, we have talked about identity in terms of group categories of identity. In some cases, the parameters of those categories may be exogenous, or at least hard to change, like race, gender, language, or citizenship. Especially in a relatively liberal society, however, some aspects of identity are subject to change, including perhaps political ideology, cultural attitudes, or even

religion. In either case, identity groups might coalesce endogenously as individuals take steps to increase the benefits and reduce the costs of expressing identity. The theory of modularity gives



4.1. Unsorted individuals. 4.2. Tiebout-sorted identity groups. 4.3. Sorted groups with a media interface.

Figure 4.

us a way of thinking about this. Consider Figure 4. The a_i are individuals, and an x in location a_{ij} means that individual a_i and a_j are aware of each other's category and of each other's behavior, as either sender or receiver of identity messages.

Many have argued that there are *positive* externalities when a large variety of identities interact with one another. In the framework of Baldwin and Clark, we can think of each identity as a kind of option, an experiment trying out ways of being human; and a multiplicity of such experiments enriches all. This is the process underlying McCloskey's account of the Great Enrichment. It also underlies John Stuart Mill's argument in favor of free speech. Yet the possibility of high-level benefits of interaction among identities does not rule out – and history confirms – the likelihood that such interaction can at the same time lead to conflict. The externalities that are positive in the long run at a system-wide level are often perceived as negative by participants on the ground. Indeed, to the extent that conflict among identities leads to reduced system-wide interaction, it can threaten the positive learning externalities extolled by Mill and

McCloskey. If free speech is perceived as causing harms, political efforts will arise to limit speech. Thus it is worth thinking about how agents respond to the perceived negative effects of identity.

In Figure 4.1, individuals interact with a large number of others, including potentially those with a very different identity. As many have argued, going back at least to Gordon Allport (1954), interacting with people different from oneself could instill greater tolerance of differences, meaning in our framework a reduction in the individual cost parameters of the identity externalities.[8] For example, people might also modify their own behavior – sometimes disingenuously (Kuran 1995) – to reduce the friction with others. In the limit, people might even switch category to become more like those with whom they interact – assimilation. We can think of such changes of behavior or category, such movements in identity space, as movements within the matrix. Matrix 4.1 transforms into Matrix 4.2.

People will tend to move in physical space as well. Charles Tiebout (1956) long ago pointed out that people will sort themselves geographically – they will vote with their feet – in order to achieve their desired mix of local taxes and public goods. The theory of political federalism, inspired in part by Tiebout, is very much a theory of modular design. A federal system is a hierarchy of governments in which each sub-government possesses a delineated scope of authority and is autonomous within its own well-defined sphere (Riker 1964). The autonomy of each government is institutionalized by a constitution, written or implicit, that makes the structure of federalism self-enforcing (Weingast 1995). In principle at least, the sub-governments of

[8] The other side of the coin, as an equally large number of commentators have observed, is that significant identity differences in society can erode the necessary common understanding of society's "visible design rules." As Douglass North put it, "with growing specialization, common ideologies and norms of behavior break down as people have increasingly different experiences and hence different perceptions of the world around them" (North 1988, p. 18).

political federalism are encapsulated modules in a well-designed modular system. Note that the practice of zoning is usually justified as a mechanism for sorting groups according to their externalities – confectioners can be zoned industrial while physicians are zoned commercial. In the same way, people can also attempt to sort away identity externalities. Rather than adapt their behavior or change their identity category, people can vote with their feet in order to reduce the costs of the identity externalities in their daily lives.[9] Bill Bishop has argued that Americans are increasingly doing this, choosing, almost instinctively, to move to localities where the lawn signs and bumper stickers match their own. Over the period 1980 to 2000, while racial segregation in American counties declined slightly, segregation by political party increased 26 per cent (Bishop 2008, p. 6).

Moreover, sorting doesn't have to be entirely geographic. As the late Anthony Downs long ago observed, voters are confronted with innumerable complex questions of public policy on which it is irrational to become fully informed. People thus adopt an ideology as a mechanism to economize on the costs of becoming informed (Downs 1957, p. 99). Identities, of which ideologies are a part, serve a similar function. Denzau and North (1994) argued that competing clusters of shared "mental models" naturally emerge in society. In many cases, such clusters take on the form of organizations. Carliss Baldwin (2008) has described business firms as modules that communicate with other modules only at "thin crossing points," which frequently correspond roughly to Hayek's interface of the price system. The firms themselves are "transaction-free zones" in which rich information can be transmitted at low cost. Similarly, identity organizations – religions, political parties, even hobbyist groups – are *externality-free zones* in which members

[9] In the United States in the twentieth century, sorting for physical externalities was also a way of sorting for identity. Existing white areas tended to be zoned residential while existing minority areas were often zoned commercial or for mixed use (Shertzer, Twinam and Walsh 2021).

can practice their identities without imposing costs on those within the group. Like firms, identity groups are instances of horizontal and vertical integration deployed as a solution to the problem of externality (Demsetz 1964). Within the groups, identity externalities that are negative to outsiders can become positive to insiders. Thus identity organizations are more than just repositories of sorted individuals. They often behave like firms – some indeed *are* firms, and not always not-for-profit ones – that are in effect "producing" identity (Carvalho 2016). Many such organizations adopt rules and practices designed to reinforce identity, including not only indoctrination but sometimes onerous restrictions and behavioral requirements that serve to increase the member's commitment to the identity (Iannaccone 1992).

In Matrix 4.2, individuals communicate only within their own group. This kind of sorting minimizes externalities overall, though it might increase friction in the interaction among groups. If interacting with people different from oneself increases tolerance, interacting (only, mostly) with those of the same identity might have the opposite effect. In the view of Bishop, "like-minded, homogeneous groups squelch dissent, grow more extreme in their thinking, and ignore evidence that their positions are wrong. As a result, we now live in a giant feedback loop, hearing our own thoughts about what's right and wrong bounced back to us by the television shows we watch, the newspapers and books we read, the blogs we visit online, the sermons we hear, and the neighborhoods we live in" (Bishop 2008, p. 39).

Much of the blame for this has been laid at the feet of the Internet and cable television. For most of the twentieth century, radio and television broadcasting – but, strikingly, not print journalism – was heavily regulated by the Federal Communications Commission, arguably in flagrant violation of the First Amendment (Pool 1983). Content was restricted to inoffensive mainstream fare, and the so-called fairness doctrine raised the cost of expressing opinion by

requiring a station (in principle at least) to give free equal time to other views. "There is not room in the broadcast band for every school of thought, religious, political, social, and economic, each to have its separate broadcasting station, its mouthpiece in the ether," said the FCC mendaciously (McChesney 1993, p. 27). When Americans all heard the same news, in the comforting voice of Walter Cronkite, distinct identity groups in the society were connected by a common interface (Matrix 4.3), which had the effect of moderating communication between groups and providing sources of identity at a national level. By contrast, it is widely believed, the Internet has fractionated communication and thereby fractionated public opinion and cultural values, multiplying intangible externalities and creating a tragedy of the identity commons.

Here again we can think of the broadcast-era interface as only the column a_1 not the row a_1, since the big networks broadcast to all the a_{ij} but did not allow the elements to talk back. By contrast, Internet platforms allow two-way transmissions. Nonetheless, the networks, like today's internet platforms, were extremely sensitive to audience feedback through their advertisers, an effect that "moderated" content – that conformed content to the median or modal taste – quite apart from the dictates of government regulation. Although Section 230 of the Communications Decency Act of 1996 (47 U.S.C. §230) formally shields Internet platforms from liability for the opinions of their users, the large platforms like Facebook and Twitter today are coming under increasing political and commercial pressure to moderate content in much the way the broadcast networks once did. I return to this issue below.

Toleration and dignity.

Is toleration not the solution to the problem of identity externalities? Can't we all just learn to live together? In a world where e = 0 for everyone, there would be no externalities and no conflict. In the end, however, people demand of others not merely toleration but active affirmation. As Francis

Fukuyama (2018) has argued, individuals crave the recognition of dignity for themselves and their identity. People do not want to feel as though they are merely invisible to others. All demand at the very least equal dignity – that their identity be respected on an equal basis with that of other people; and some demand even more – that their identity be recognized as superior to that of others.

		B		
		Active promotion	General neglect	Affirm other's identity
A	Active promotion	*3* / *3*	*2* / *8*	*0* / *13*
	General neglect	*8* / *2*	*6* / *6*	*5* / *11*
	Affirm other's identity	*13* / *0*	*11* / *5*	*9* / *9*

Figure 5: Modified from Lomasky (1987, p. 66).

The philosopher Loren Lomasky (1987) has formalized something like this in the game of Figure 5, which I modify slightly to speak more clearly to identity.

There are now three choices. Individuals or groups can actively promote their own identity, perhaps in an imperialistic or evangelical way, at the expense of the other identity. Alternatively, individuals or groups can become invisible, denying or hiding their own identity but not actively affirming the identity of the other. And, finally, individuals or groups can actively affirm the identity of the other, which may not mean conversion so much as the (public, symbolic) acknowledgment of the superior dignity of the other identity. As before, if the process we envisage

is majority voting or some other coercive mechanism of collective choice, the dominant identity will insist on the strongest form of recognition and will in addition demand that the minority actively affirm the majority's identity (again, the northeast or southwest boxes). If we see this as a prisoners's dilemma game, the Nash equilibrium is for both players to actively promote their identities. That is not socially optimal. To reach the optimum (the southeast box) requires some kind of imposed constitutional rule of equal treatment. To put it another way, if a constitution were to enforce the norm of equal treatment by eliminating the off-diagonal possibilities, the southeast box would be a stable state that the players would not leave if they happened to land on it. Note that pure toleration – the middle box – is neither an equilibrium nor an optimum.

The philosopher Kwame Anthony Appiah (2010) has sketched a vision of an easy-going cosmopolitanism in which people retain their local identities but seamlessly take up aspects of other cultures from around the world, changing those elements and adapting them to local needs. For Appiah, a cosmopolitan is not someone with no identity but rather someone with an identity constructed from many far-flung pieces. Far more that we often realize, he argues, this cosmopolitan vision reflects the world we actually live in. Yet this formulation ignores a crucial difficulty: often by their very nature, identities are incompatible. Exclusion and difference are often fundamental to identity. If identities are strongly constituted and deeply felt, the words and deeds that are the active practice of identity A may at the same time be grievous sins in the eyes of identity B.

We can formalize this a bit with a simple model.[10] Let

$$U_i = \alpha_i I_i - \beta_i I_j,\ i \neq j$$

where $\alpha_i, \beta_i > 0$. Now define

$$I_i = \begin{cases} 1 & \text{if } i \text{ practices his own identity} \\ 0 & \text{if } i \text{ does not practice his own identity} \\ -\epsilon & \text{if } i \text{ must actively recognize another's identity} \end{cases}$$

where $\epsilon > 0$. Thus, if i has to recognize j's identity, i's payoff is $U_i = -\epsilon\alpha_i$, whereas if j has to recognize i's identity, i's payoff is $U_i = \alpha_i + \epsilon\beta_i$. The parameter ϵ therefore capture both the benefit and cost of active recognition. If $\alpha_i - \beta_i > 0$, then in Figure 6 as in Figure 5, the dominant strategy for both groups 1 and 2 is to actively practice their own identities. This time, however,

		1		
		Active promotion	General neglect	Affirm other's identity
2	Active promotion	$\alpha_1 - \beta_1$ $\alpha_2 - \beta_2$	0 α_2	$-\epsilon\alpha_1$ $\alpha_2 + \epsilon\beta_2$
	General neglect	α_1 0	0 0	$-\epsilon\alpha_1$ 0
	Affirm other's identity	$\alpha_1 + \epsilon\beta_1$ $-\epsilon\alpha_2$	0 $-\epsilon\alpha_2$	$-\epsilon\alpha_1$ $-\epsilon\alpha_2$

Figure 6

[10] Which I owe to Tom Miceli.

for some parameter values, including the cosmopolitan world in which $\beta_1 = \beta_2 = 0$, the northwest box is the social optimum. The mutual affirmation of one another's identities is no longer the optimum because the incompatibilities involved are too costly; and residence in the southeast box is no longer a stable state. Mutual affirmation would now be painful, and it would have to be enforced by some outside authority.

What this means is that the transition to an equilibrium of mutually recognized dignity – whether that be the middle box or the southeast box – will require a change in parameters. Moving from Figure 6 to Figure 5 will require that members of the identity groups abandon some of the features of their identity that are incompatible with the identities of others.

Consider the conflicts among religions in northern Europe in the medieval and early modern periods (Johnson and Koyama 2019). In the Middle Ages, Jews were not persecuted by the state. To the extent that secular authority existed, it generally protected the Jews, who provided financing for the landed aristocracy. By contrast, the Church demanded that Christianity be accorded superior dignity over Judaism; and rank-and-file Christians, who were the source of most of the persecution, were offended by and fearful of the distinctive appearance and practices of the Jews. To the extent there was toleration, it was what Johnson and Koyama call conditional toleration, which "worked by compartmentalizing religious communities into their own separate legal and often physical spheres" (Johnson and Koyama 2019, p. 2). Even with increased urbanization in the early modern period, Jews were restricted geographically. Beginning in the fifteenth century, the Jews of Frankfurt were confined to the *Judengasse*, a section of street a quarter mile long and a dozen feet wide. The Jews were subject to severe restrictions, including the requirement that they abase themselves before Christians; but within the ghetto they followed their own laws, customs, and practices, even punishing deviations from orthodoxy.

As state capacity increased in this period and central rulers gained ascendancy over local autocrats, princes and emperors attempted to unify their ethnically and religiously diverse dominions – the better to suppress revolt and collect taxes – by putting less-discriminatory rules in place. In 1782, Joseph II of Austria issued the Edict of Toleration, which granted civic rights to the Jews but also demanded that they abandon some distinctive features of their identity. Many taxes and restrictions were eliminated, but at the same time Jews were required to attend secular schools and speak German instead of Yiddish. Both Christians and Jews often resented these reforms – the Christians because the reforms undermined their higher status and reduced barriers to entry, the Jews because the reforms eroded cherished customs and practices. In fits and starts, policies like those of Joseph II evolved into the modern liberal regime of equal treatment. But that evolution required changes in the identities themselves; it was not driven by the peaceful coexistence of initially conflicting identities.

Social Networks.

In 2002, Jonathan Abrams started a website that allowed people to create personal profile pages and to connect with friends and friends of friends (Evans 2012, pp. 1226-1231; McCullough 2018, pp. 258-264). Friendster achieved moderate success, with some three million users by 2003; and it attracted capital from top venture-capital firms. But the company was not up to the engineering challenges of running a large social network, and the system was often slow and unresponsive. In part, this was the result of "fakesters," fake and often provocative users who tied up system resources and generally degraded the experience of serious users. Belatedly, Friendster began banning fake profiles and policing content. The combination of content enforcement and buggy technology sent users scurrying to a clone site called Myspace, which had been created by a shady outfit whose main business was peddling wrinkle cream on late-night television. Myspace took

off. It would be acquired by media mogul Rupert Murdoch for $580 million in 2005 and would negotiate a $900 million advertising deal with Google the next year.

But as Myspace was getting big fast and acquiring users, its product was deteriorating under an onslaught of fake profiles and dubious content. In part, this was a classic lemons problem (Akerlof 1970). Myspace users couldn't tell the real identities and intentions of other users. This created an incentive for the most serious users to exit, lowering the average quality of users, which in turn caused even more of the higher-quality users to leave. Of course, many users enjoyed the risqué content and vibe of Myspace. The real problem was that a social network is (at least) a three-sided market, involving not just sending and receiving users but also advertisers. And mainstream advertisers wanted nothing to do with what Myspace was becoming.

The solution to this kind of problem is to create institutions to enforce quality and police violations. In effect, a social network needs to set up a governance structure – a constitution – not unlike that of a political state. To prevent instability, a social network will be forced to forbid some interactions, perhaps including violence, pornography, "hate speech," and "fake news." Because a social network is a voluntary contractual organization not a state, its principal enforcement tool is ostracism. The medieval Champagne Fairs, an early example of a two-sided market, operated exactly this way (Milgrom, North and Weingast 1990). This is why Apple carefully vets app developers – the video-game industry had experienced a lemons crash in 1983 when Steve Jobs's onetime employer Atari and other console makers failed to vet game developers – and why Google's algorithms prioritize the quality of search results and ads (Evans, Hagiu and Schmalensee 2008, pp. 124-125).

When he started what became Facebook in 2004, Mark Zuckerberg understood this principle implicitly (McCullough 2018, pp. 265-293). The site was originally designed as an exclusive platform for Harvard students to network; and it expanded judiciously, initially limiting membership to patrons at other elite universities. Only with this high-quality network in place did Facebook open up to the world, in September 2006. Users were required to employ their true identities; those who didn't were deleted and banned. And from the start, Facebook policed a wide variety of content that it believed most of its serious users might find offensive. Already in April 2009, 18 per cent of Facebook's 850 employees were patrolling the website for violations (Evans 2012, p. 1230). All of this made Facebook attractive to advertisers. The high-quality strategy quickly toppled Myspace, and Facebook began to benefit from network effects of its own. Membership exploded almost overnight, from six million in 2006 to 350 million in 2009 to 1.55 billion in 2015.

From the point of view of a platform, "quality" is defined by the preferences of the community of users. The objective is to manage content to make the system function as effectively, and as profitably, as possible. But when users come to number in the billions, representing a vast array of points of view, it becomes increasingly difficult – and perhaps impossible – to define the criteria of quality in a way that will not elicit dissatisfaction from large segments of the user community. Facebook's decisions about content moderation are frequently understood in terms of the politics of identity: one person's expression of identity is another person's sinful act. In forbidding some expressions of identity, a social network is foreclosing some off-diagonal exchanges. And the political battle is over which off-diagonal – or neither – will win.

Calls have gone up to amend or repeal Section 230, which, as we saw, shields Internet providers from liability for the content that flows through their platforms. If they were to become liable for content, Internet providers would be forced to exclude a wide variety of content that significant numbers of users might potentially find offensive. Some voices have even argued that the Internet platforms should be regulated in precisely the heavy-handed ways in which broadcasting was regulated for most of the twentieth century (Carr 2021). By contrast, other voices have suggested going beyond Section 230 to treat platforms as common carriers, thereby forbidding them from discriminating among viewpoints (Volokh 2021). Advocates of free speech point out that a social network as large as Facebook serves much the same function as the larger political institutions it must to some extent emulate. Nadine Strossen (2018), a former president of the American Civil Liberties Union, has argued that Facebook and other social networks should adopt the same rules the U. S. federal government must follow under the First Amendment, even though, like private universities, social networks are voluntary organizations not directly subject the Amendment. This would be the constitutional-diagonal solution, which – as with free speech in the larger society – would not please those who would have benefited from being in one of the off-diagonals.

The problem for Facebook is that a neutral and inclusive policy may not be stable let alone profit maximizing. The company's original strategy was to maintain high quality; but with almost three billion users, that problem has quite possibly become unmanageable. In 2018, fearing that external content from news feeds was increasing social anger and political polarization, Facebook tweaked its algorithms to encourage more active interaction among users themselves, which Mark

Zuckerberg felt would be better for everyone's mental health.[11] Instead, for reasons we have analyzed, users became angrier and more polarized. During the Covid-19 pandemic, Zuckerberg made it his personal goal to use Facebook to increase vaccination rates.[12] The network was quickly flooded with vaccine-hesitant posts. The threat of popular protest of and government intervention in Facebook's policing policies is arguably making its problems fully intractable. It is thus perhaps no surprise that Zuckerberg has called for government regulation to remove from his shoulders the burdens of content regulation.[13]

Conclusion.

I have argued that the framework of modular systems articulated in *Design Rules* can be applied in the larger setting of social institutions. The principles of encapsulation and information hiding operate in society as mechanisms to internalize externalities. In this essay I have focused on intangible externalities, or moralisms, that involve the transmission across module boundaries of pure information rather than materials or energy. An important manifestation of such intangible externalities arises in the practice of identity, the affiliations through which individuals create and define their sense of self. Both formally and informally, individuals tend to modularize themselves into identity groups in order to minimize the costs of the intangible externalities that identities impose on one another. One important way to manage conflict among identity groups is to create a constitutional governance structure in which some interactions are proscribed – the constitutional diagonal. In the end, however, because of the inherent incompatibilities – the non-modular

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11 Keach Hagey and Jeff Horwitz, "Facebook Tried to Make Its Platform a Healthier Place. It Got Angrier Instead," *The Wall Street Journal*, September 15, 2021.

12 Sam Schechner, Jeff Horwitz, and Emily Glazer, "How Facebook Hobbled Mark Zuckerberg's Bid to Get America Vaccinated," *The Wall Street Journal*, September 17, 2021.

13 Mark Zuckerberg, "The Internet Needs New Rules. Let's Start in These Four Areas," *The Washington Post*, March 30, 2019.

interactions – between identities that arise inevitably from the very meaning and function of identity, genuine toleration is possible only through the increased standardization of identities. I illustrate these issues by considering the problems of content moderation in present-day social networks like Facebook.

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