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Economic Governance and Institutional Design

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Economic Governance and Institutional Design *

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Abstract

What are institutions, and how should they be designed to achieve compliance with behavioral rules, including laws, social norms, religious rules, or cultural traditions? This conceptual paper introduces a typology of economic governance institutions and explains how it can be used both by policy makers, administrators, and researchers in law and economics to improve rule compliance. It explains how effective and efficient institutions can be identified for a given economic governance problem. The concepts are applied to two cases: how to create trust in cloud computing technologies, and how to implement data sharing of user-generated information on data-driven markets?

JEL classification: D02, D71, D78, K23, K42, L33, P48

Keywords: Economic governance, institutional design, private ordering, public ordering, institutions, trust in cloud computing, mandatory data sharing.

*This project grew out of joint work with Scott Masten many years ago, which has inspired me until today. I also learned a lot from repeated discussions with Gillian Hadfield and Vatsalya Srivastava, co-authors on other projects, about the fundamentals of institutions and economic governance. I am indebted to their insights and wisdom. Moreover, this paper has benefited from discussions with many graduate students at Tilburg University, who have seen some of the material in this paper in class, colleagues at TILEC and at CCP (especially Cédric Argenton, Panos Delimatsis, Sean Ennis, and Wieland Müller), and several seminar audiences providing feedback on the two application cases. All errors are my own.

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1 Introduction

How can we organize society? How should we organize society? These questions arise because *homo sapiens* is not only a *zoon politikon*, a political animal,[1] but because the underlying reason for the ubiquity of social connections is that many activities we engage in directly or indirectly affect others: we jointly participate in traffic; we decide to smoke or litter (or to take care of the young or the old); we work hard, keep our promises and are "good citizens" (or we look for an easy life at the expense of the absent ones); we belong to the same communities or states and elect politicians or decide (not) to revolt against an autocrat.

In the language of economics: players' actions generate externalities that are not internalized by the individual's payoff-maximizing choice of action, which may differ with players' preferences. Consequently, the affected others may want some say in their companions' actions. This creates the need for behavioral rules. Determination of the contents of those rules and a social structure that supports everybody's rule compliance are necessary and build the foundation of society.

Notably, this says nothing about *how* rules should be enforced, *who* should enforce them, what *enforcement technologies* are available or socially accepted, let alone what the *contents of the rules* should be. Because of specialization advantages and economies of scale, often rule enforcement is delegated from a group, be that a small family or an entire country, to individual enforcers. Assume, for the sake of the example, that we are looking at rule enforcement at the national level and that you are a policy maker, a legislator, or a bureaucrat with some discretion how to enforce the rule.

For instance, the rule says: *Everybody should pay their taxes.* What can you do to increase rule compliance? Available options include the following policies:

1. Passing a new *law* that punishes not paying taxes with a hefty fine.

2. Launching an information campaign conveying the message that it is *ethical* to pay your taxes and that only asocial free-riders do not pay.

3. Publicize the actual tax payments of every citizen last year, and ask everybody to *stop social interactions* with people they expect to evade taxes.

Option 1 has the major disadvantage that law enforcement of such a complex rule for mil-

[1] See Aristotle (1984).

lions of people is very costly. Therefore, in many cases it may not be worthwhile to use scarce bureaucratic resources to hunt down the last potential tax evader. Option 2 may trigger compliance by some altruists, but many people will trade a bit of bad conscience for less (effectively voluntary) tax payments. Option 3 is fundamentally different than option 2 because the purported reason for tax payments does not depend on an individual's ethical values but on the social fabric surrounding the individual. If that social fabric, also called social capital, works well, as is often given in smaller or closer-knit communities, in villages, clubs, or organizations with a limited amount of members, option 3 has good potential to be effective, especially if combined with option 2.[2]

Now, assume the rule you need to implement is: "*Firms active in the innovation of healthcare equipment should develop more devices that can be economically used for poorer citizens and focus less on higher quality for the rich.*"

The difficulty for any policy maker in a democratic, capitalist state based on the rule of law arises that private firms have no formal obligation to serve specific patient groups, such as "poorer citizens". Hence, passing a new *law (or universal service obligation)* would be hard to rationalize and to enforce legitimately. However, the government could informally suggest an *industry association* of healthcare equipment manufacturers to support certain developments among their members. If they do not cooperate, there may be less governmental support for the industry's wishes in the future. Conversely, if the industry association's call to its members to invest in certain areas, such as economical devices, is rejected, the rejecting firms risk being *excluded from important future information or coordinated activities at the industry level*, which are organized by the association in the future.

As a final example, assume you are a decision maker at the center of some federal structure, such as the US Government or the European Commission, and it is your task to implement the rule: "*(Member) State X should contribute its fair share to fighting climate change.*"

Similar to the second example above, the policy maker's problem is that it is no viable option to use *coercion* against a non-cooperating US/EU state. Related, using new *law* to force compliance is costly and lengthy and may backfire politically, because the regulated states have voting power within the federal organizations. Consequently, the only enforcement technology available to the policy maker is to use some way of *ostracism* or *boycott*, based on a clearly

[2]See Fukuyama (1995) or Putnam (2000) for classical works studying social capital. The "effectiveness" of policies depends on a variety of reasons, which will be discussed below.

specified trigger strategy.[3] For instance, the policy maker could specify that the state can only get certain *funds or other support in the future* if it complies with recommendations about climate-protective policies and their institutional implementation now.

In more general terms, the ad hoc approach to such problems in countries with high economic and political development levels usually is: we have laws, courts and police to solve them. In short, we have a government with its legislative, judicial, and executive branch that are tasked to define, adjudicate and enforce rules on behalf of citizens. Next to that, we have markets, where producers and consumers exchange and bargain about goods and services and where competitive forces (by and large) make sure that market powers are not overwhelming and that after completed transactions all parties are better off than before.

However, many transactions take place outside of markets, e.g., in families, firms or other close-knit communities (Gibbons and Henderson, 2011). Even in the most capitalist countries, commercial transactors often prefer to avoid use of the legal system and court ordering even if the court system is fairly effective (Macaulay, 1963, Williamson, 2005, Hadfield and Bozovic, 2016). Many conflicts throughout history and around the world are solved not by invoking formal laws, suing other parties, or calling the police, even if those laws can be well enforced and there is hope that neither corrupt nor absent or ill-qualified governmental agents stand in the way of effective law enforcement. Instead, there are a myriad of alternative institutions, from community norms to religious commandments, from standards set by trade associations to arbitration rules within standard-setting organizations or between countries at the World Trade Organization, from social media shit storms to criminal gangs with strong muscles, which define, adjudicate, and enforce these rules. This paper is about such alternative economic governance institutions.

The three introductory examples above share the characteristic that the enforcement regime for each policy is endogenized, i.e., it is not taken as fixed ("pass a new law!") as is often assumed in the literature. Instead, various channels and levels of governance are considered and compared. The effective ones, and the efficient one, have to be identified and then implemented.

In the remainder of the paper, in section 2 several key concepts, such as economic governance, institutions, organizations, and transactions will be defined. Then, based on Dixit (2009),

[3]Trigger strategy is a game-theoretic concept that is based on some form of "if you do (a), I will reply by (A). If you do (b)≠(a), I will reply by (B), which is worse for you than (A)." Therefore, playing (B) would resemble "pulling the trigger," which only happens after a specific (here: non-compliant) action of the regulated player. Details follow in the next section.

three fundamental economic governance problems will be introduced, explained, and modeled: property rights protection, collective action, and contract enforcement. Section 3 contains the main theoretical contribution of the paper: a typology of institutions that can be used to solve economic governance problems. Eight archetypical economic governance institutions will be delineated from each other, and it will be explained how to use the typology, both for research and for policy purposes. Section 4 briefly presents two applications of the economic governance framework: one on how to increase trust in cloud computing technologies, and one on how to implement data sharing of user-generated data on data-driven markets. Section 5 concludes.

2 Economic Governance and Institutions

2.1 Definitions and key concepts

What is *economic governance*? Dixit (2009:5) defines economic governance as "the structure and functioning of the legal and social institutions that support economic activity and economic transactions by protecting property rights, enforcing contracts, and taking collective action to provide physical and organizational infrastructure." This definition deserves to be read several times.[4] Hence, if we talk about economic governance, we refer to legal and social institutions (different from political institutions) that aim to tackle three fundamental problems: property rights protection, contract enforcement, and collective action. More generally, it can be understood as the study of how rules (including laws, ethical rules, social norms, and policies) can be implemented such that compliance is increased. This is fundamentally different from corporate governance (or more general, but less used: organizational governance), which refers to the contractually agreed on allocation of control rights and income rights within one organization.

These definitions lead to the next question: what is an *institution*, and what is an *organization*? An excellent approach, which is easy to keep in mind, is North's (1990) classical description: *institutions are the rules of the game; organizations are the players.*

Based on this definition, Acemoglu et al. (2005) distinguish economic institutions and political institutions.[5] Importantly, their view takes a *macroeconomic* approach, which aims

[4]Dixit (2009) starts this presidential address to the American Economic Association: "The concept of "governance" has risen from obscurity to buzzword status in just three decades. EconLit shows only 5 mentions of the word governance in the 1970s; by the end of 2008, it was mentioned 33,177 times. The much more specific phrase "economic governance" has appeared 192 times; its more popular cousin, "corporate governance," 9,717 times." As of May 2024, these numbers are 138,595 for "governance", 3,874 for "economic governance," and 99,928 for "corporate governance." Hence, whereas economic governance has gained traction over the past 16 years, it is still the very small sibling of corporate governance.

[5]Acemoglu et al. (2005) describe "economic institutions ... such as the structure of property rights and

at explaining the role of economic and political institutions for economic growth. It is very helpful for that purpose, but it does not inform us how the practical challenges put up in front of decision makers in politics, society, businesses, or families can use institutional design to improve rule implementation and compliance.

Therefore, by contrast to Acemoglu et al. (2005), the current paper assumes a *microeconomic* perspective: we start from fundamental economic governance problems and show how institutions can be designed to solve them. To understand this better, we make use of Greif's (2006, ch.2) discussion of institutions. Greif focuses on one single *transaction*, i.e., an exchange relationship between two parties (product vs price, labor vs wage, gift vs status, etc.), and distinguishes so-called *central transactions* from *auxiliary transactions*.[6]

In a *central transaction*, at least two players interact with each other. Here, value is created. For instance, if a seller values a good at \$10 and a buyer values it at \$20, if the transaction is completed for a price of \$15, both the seller and the buyer get a surplus of \$5: the total surplus is \$10 as compared to the transaction not taking place. Notably, many central transactions contain the opportunity for one or both parties to behave opportunistically. For instance, a buyer might be willing to pay a high price for a high-quality product, but producing high quality may be very costly for the seller. If quality cannot be checked easily and if the buyer does not trust the seller to actually deliver high quality, the transaction possibly breaks down and its value is foregone. Reversely, the buyer in this example could pay late or could only pay less than the agreed price, mentioning made-up, hard to verify reasons like sick workers or raised input prices as an excuse. The field of economic governance studies how the resulting value losses, which can lead to a total breakdown of the transaction, can be avoided.[7]

As an institution is a rule, let us assume that both players agree that each of them shall forego opportunities to maximize their individual payoff at the expense of the other player. Henceforth, if a player acts according to this rule, I will write that they *cooperate*. Otherwise, they *defect* from the agreement. Using this terminology, the rule can be expressed in general:

the presence and perfection of markets" (p.389) and "[p]olitical institutions, similarly to economic institutions, determine the constraints on and the incentives of the key actors, but this time in the political sphere. Examples of political institutions include the form of government, for example, democracy vs. dictatorship or autocracy, and the extent of constraints on politicians and political elites" (p.390).

[6]Transaction Cost Economics is an entire field in itself, which I can do no justice here. See Tadelis and Williamson (2012) and Masten (2016) for entry points into this literature.

[7]The specific problem sketched here, moral hazard, has been studied and theoretically solved in many environments (see Holmstrom, 1979, for an early example). Mostly, however, in such work only one solution, for instance an "optimal contract," is considered. Enforcement of the contract by perfect law enforcement agencies is usually assumed and alternative (potentially superior) enforcement mechanisms are neglected.

all players should cooperate.

The next — and crucial — question is whether and, if so, why players will comply with the rule. To formalize the incentives to do so, or not, Greif (2006) introduces the notion of an *auxiliary transaction*. An auxiliary transaction does not create value in itself, it only serves to increase incentives for cooperation in the central transaction. For this purpose, it defines which player(s) should take which action if, and only if, one of the players in the central transaction defects. Hence, the auxiliary transaction is a behavioral rule that gets triggered by defective behavior in the central transaction.[8] The exact content of the auxiliary transaction depends on the specific economic governance institution, which is the topic of section 3.

Now, we have all ingredients in place to define an institution, in line with Greif (2006). *An institution identifies (a) the players & behavioral rules in a central transaction, (b) the players & behavioral rules in an auxiliary transaction; (c) it must be self-enforcing.*

Greif (2006) underlines the importance of part (c): if the incentives for would-be punishers in an auxiliary transaction to actually punish defectors in a central transaction are not strong enough, adhering to the set of rules is no equilibrium, i.e., it will not be followed for long. Then, this institution will break down and cannot support cooperative behavior in the central transaction.

2.2 Three fundamental economic governance problems

Historically, the expansion of *impersonal exchange*, i.e., cooperative trade beyond an individual's immediate circle of acquaintances, such as one's village or community, played a crucial role for the substantial economic development throughout the last millennium (Mokyr, 1990, Grossman/Helpman, 1991). The reason is that cooperative *personal* trade is restricted to the number of individuals known to a person, which inhibits gains from specialization and scale economies and limits the exploitation of new opportunities. The problem of impersonal exchange is that it is inherently risky: if meeting unknown people in one-shot interactions without further governance institutions in place, transactors have no incentives to honor deals, to respect others' property rights, or to support collective action.[9] As a consequence: without institutions that can fix the incentive problem, the scope of impersonal exchange (and corresponding benefits)

[8] This definition suggests that well-working auxiliary transactions are hard to detect empirically. For instance, if the deterrence effect of a punishment for a crime is immense, there will be few crimes and fewer punishments to observe.

[9] For example, think of unregulated consumer-to-consumer trade via the internet or trade with illegal goods.

will be reduced.[10] What is needed is *good economic governance.*

Dixit (2009) lists three fundamental economic governance problems: property rights protection, contract enforcement, and collective action. There can be more, such as coordination problems, but by understanding these three categories the scope and methodology of economic governance as a field can be explained well.

Property rights protection: Property rights are legal rights of a natural or legal person over a tangible or intangible good. They include not only the right to exclude others from its use, to sell or to destroy it but also a right to their fruits. Therefore, without secure property rights, rational players may fear that others appropriate the fruits of one's efforts. If those fruits do not grow by themselves but require investments (money, care, work, etc.), then the incentives to invest will be limited.

For readers appreciating formal clarity (which is not needed to understand the problem), this situation can be modeled as a *one-sided prisoner's dilemma* with an investor i and a potential thief x. The first number/character in the following matrix denotes the payoff of i, the second one the payoff of x, depending on the played strategy combination.

i / x	Not steal	Steal
Invest	$h, 0$	l, w
Not invest	$0, 0$	$0, 0$

Figure 1: A one-sided Prisoner's Dilemma.

Assume that $h, w > 0 > l$ and $h > w + l$.[11] Then, it would be efficient to play (Invest, Not Steal).[12] However, the unique pure-strategy Nash equilibrium of the game is (Not invest, Steal). Consequently, the game predicts that the investor (farmer, worker, ...) does not invest and that, consequently, there is nothing to steal for the thief. Both go hungry.

Contract Enforcement: In the economy, some transactions occur at arm's length, i.e., the exchange of a good against money is taking place simultaneously. Most transactions, however, involve some kind of staged delivery of the parties' obligations. Think of internet or credit card shopping, payments in installments for expensive goods, booking a flight, or the services of a

[10] See Dixit (2003a) for a model visualizing this reduction.

[11] This makes sure the game is actually a one-sided prisoner's dilemma.

[12] "Efficiency" here refers to both Pareto-efficiency, i.e., a situation where it is impossible to improve the payoff of at least one player without reducing the other player's payoff, as well as to total surplus, i.e., a standard where the payoffs of both players are simply added up.

gardener, a lawyer, or a tax advisor. In all of these cases, the party delivering its obligations second is tempted to renege on its obligations (fully or partly): to pay late or not in full, to deliver a worse service than agreed on, or to disappear at all. If such reneging of contractual obligations occurs or is even just expected or feared, however, the incentives of the first party to deliver its obligations are also reduced.

From these initial considerations, we can immediately predict that without effective contract enforcement, promises of others to produce/buy/pay something in the future are not credible. Therefore, opportunities for efficient trade get lost.

In formal terms (again, not needed for intuitive understanding), the situation can be modeled as a *two-sided prisoner's dilemma* game with traders i and x, where cooperate (defect) means to honor (renege on) one's contractual obligations:

i / x	Cooperate	Defect
Cooperate	h, h	l, w
Defect	w, l	d, d

Figure 2: A two-sided Prisoner's Dilemma.

Assume that $w > h > 0 > d > l$ and $2h > w + l$. Then, the efficient strategy combination is (Cooperate, Cooperate), but the unique Nash equilibrium is (Defect, Defect).[13] In sum, absent any economic governance institution, these two players will both miss out on efficient trading opportunities and thereby reduce welfare, consumption possibilities, and a thriving economy.

Collective Action: Collective action, i.e., coordinated behavior aiming to improve everybody's payoff in the long term, is important in various walks of life, including in the production of public goods (which benefit many but are costly only for some). Think of organizing a party, preparing for unemployment or climate change, or paying for police or military forces.

To study this formally, we can construct a *multilateral prisoner's dilemma* game with citizens $1, ..., n$, each of whom has to decide simultaneously whether to cooperate or to defect.[14] Cooperation refers to contributing to the public good (e.g., to paying a monthly premium to unemployment insurance) and defection means to free-ride. Assume further that each player is hit by a negative shock (say, unemployment) with a certain probability, which only materializes

[13] Here, (Defect, Defect) is even an *equilibrium in strictly dominant strategies*, which implies that the prediction is even stronger and more robust than a prediction only based on Nash equilibrium.

[14] Due to the difficulty of visualizing $n > 3$ dimensions, I refrain from producing a complex graph with little added value.

after the decisions have been made, and that everybody knows that, even in case of unemployment, the rest of society would not want to let an unemployed person starve in the streets but rather pay a bit for the person's food and shelter.

In such a game, given appropriate parameters, it is efficient to have mutual cooperation. However, the unique Nash equilibrium is that everybody free-rides. Hence, absent additional institutional and organizational infrastructure, the public goods, such as social safety nets, will not be provided in equilibrium.

2.3 Some final clarifications

Before we approach the next section, where I will present, explain, and discuss alternative economic governance institutions, a few frequent misunderstandings have to be clarified.

Governance vs. Government: Despite their semantic similarity, these are two very different concepts. *Government* refers to the set of organizations in public ownership that rule a certain territory, often but not always on behalf of the people who live there. *Governance*, by contrast, comes in two shapes: economic governance, as defined above by Dixit (2009), and organizational or corporate governance. The latter concept refers to the allocation of control rights and income rights in organizations: who can do what and who benefits from it in which way?[15]

Therefore, the concept of governance is significantly broader than government: as will be clear in the next section, achieving rule compliance by public ordering, i.e., using the state's coercive powers to enforce rules, is only one of the options that economic governance offers — and organizational governance increases the breadth of the term governance even more.

Adjudication vs. Enforcement: As the distinction between central transactions and auxiliary transactions suggests, the trick about institutions is not only to define what behavioral rules are but also what is supposed to happen if some player breaks a rule. For that purpose, we need somebody to adjudicate whether a rule was broken, or not, and somebody to enforce the rule, e.g., by credibly punishing a defector such that breaking the rule is not incentive-compatible. These two tasks can rest in the hands of the same person or organization, or be separated. For

[15]For this purpose, it is important to distinguish between contracted and residual control rights and between contracted and residual income rights. "Residual" refers to all those rights that have not been contracted out to any other party and, hence, define ownership of an organization. Residual control rights tell us who can decide about how the organization's assets are used (Grossman and Hart, 1986), whereas residual income rights tell us who gets the profits, potentially negative, that the organization produces after all other costs have been paid and all obligations have been honored.

instance, laws are usually adjudicated by judges and enforced by the police. In many countries, the combined institution of law + police obtains its legitimacy from representing the will of the people, which is expressed by democratic elections delegating decision-making power to parliamentary legislators, who instruct the government (police) to enforce the laws. Judges check whether enforcement is in line with the law.

In medieval Iceland, by contrast, adjudication of rules relied on the memory of the case law by so-called *jarls* and was determined by regularly held assemblies of citizens (*things*). Enforcement of the *thing*'s decisions, however, was decentralized: in absence of a general police force, every citizen who saw a sentenced wrongdoer had the obligation to punish them individually.[16]

Reversely, some authors underline the difference in information structures rather than the difference in enforcement modalities between economic governance institutions. Argenton and Wang (2022) argue that the key difference is not about the enforcement technology, which is the same in their models of legal and social norms, but about the information about which behavior (in the central transaction) is punishable and which is at the disposal of the contracting parties. In their framework, law differs from a pure social reprobation mechanism because it does not leave it to victims to complain ex post but announces ex ante what is and what is not permitted.

The conceptual distinction between adjudication and enforcement underlines an important function of rule-making and adjudication of the rules: they must make enforcement *credible*, such that everybody *believes* that others respect the rule, too.[17] Thereby, even if enforcement is never needed in equilibrium, rules and their adjudication serve as a coordination device.

The Credibility Problem vs. the Clarity Problem: A relatively recent development within the economic governance literature is to distinguish between two categories of problems: The credibility problem and the clarity problem. The large majority of the existing work studies the *credibility problem*. Think of a Prisoner's Dilemma as captured in Figure 2. The key question that the institutional designer faces is, how can we incentivize the players to move from (Defect, Defect) to (Cooperate, Cooperate)? More generally, the credibility problem of economic governance institutions is to credibly move players from mutual *defection* to mutual *cooperation* in social dilemmas.

What this notion implicitly assumes is that the players know which real-world actions refer

[16] See Hadfield and Weingast (2012) for details of this system.

[17] Basu (2018) comprehensively analyses the role of shared beliefs among the citizens in a jurisdiction for law compliance.

to "cooperation" and "defection", respectively, and to have a common understanding of this mapping. For instance, if two players agree to meet at 12 o'clock noon, solving the credibility problem implies to incentivize the players, by carrots and/or sticks, to be "on time." It ignores that in some cultures arriving at 12.15 p.m. is still considered to be perfectly on time (and hence mapped to "cooperate"), whereas in other cultures arriving at 12.05 p.m. is already an impoliteness and is interpreted as being "too late" (i.e., it is mapped to "defect"). Obviously, such different mapping of real-world actions can lead to severe misunderstandings and to the inability to create honest and durable transactions.

This problem is called the *clarity problem* (Gibbons and Henderson, 2011). It is anterior to the credibility problem because, as long as the players have no common understanding of cooperation and defection, they cannot even progress to the stage where it can be checked objectively who cooperated and who defected (Hadfield et al., 2024a).

To tackle the clarity problem, a class of institutions coined *classification institutions* are used: social norms, ethics, laws, directives, religious rules, cultural traditions, and other institutions assign a normative label, *acceptable* or *wrongful*, to human behavior.[18] They clarify, what the terms of an agreement mean. For instance, two cotton traders may turn to an association of cotton traders to obtain a verifiable and neutral definition of what "high-quality cloth" means (Bernstein, 2001). Here, the association and its rules take over the function of the classification institution.[19]

Practically, the distinction between central and auxiliary transactions introduced in Section 2 helps us categorizing these two problems: both the clarity problem and the credibility problem affect the central transaction. While classification institutions solve the clarity problem in the central transaction, enforcement institutions are designed in the auxiliary transaction to solve the credibility problem.

[18] Hadfield and Weingast (2012) refer to classification institutions as the process by which classifications are generated and adapted. The "institution" could be a purely emergent process: the classifications are stable equilibria of a decentralized enforcement system; as societies grow more complex, an identifiable entity takes on deliberate classification responsibility (so-called "authoritative stewardship"): the elders, a chief, a court, legal doctrine, etc. See Hadfield et al. (2024a,b) for details and modeling.

[19] MacLeod (2007:596) wrote that the "evolution of successful informal agreements depends upon a number of interlocking elements, including *a mutual understanding of the events that determine contract breach*" (italics added). Hadfield and Weingast (2012) show how the capacity of legal orders can serve as coordination device distinguishing acceptable from unacceptable behavior.

3 Alternative Governance Institutions: How to Implement Good Governance?

3.1 Principles

This section contains the core contribution of this paper: a typology of institutions that can be used to solve or mitigate economic governance problems. It can be used to identify *effective* and *efficient* economic governance institutions for a specific problem and, hence, should be helpful for policy makers, legislators, managers, and other decision makers.[20]

As explained in the previous section, Avinash Dixit (2009) identified three fundamental economic governance problems. Here, I will focus on one of them, contract enforcement, and delineate theoretically available contract enforcement institutions.[21] Once it is clear how to work with the typology, it will be straightforward for the reader to apply the same methodology to other economic governance problems.

Have a look back at the two-sided prisoner's dilemma in Figure 2. The archetypical contract-enforcement situation is a seller-buyer relationship: in the central transaction, either side can *cooperate* by fulfilling their contractual agreements (e.g., to produce high quality and to pay on time, respectively) or *defect* by behaving in a way that myopically and opportunistically maximizes their own payoff at the expense of their trading partner (e.g., to produce low quality or to pay late).

The auxiliary transaction then depends on the specific contract enforcement institution used. The task of the policy maker is now to design the auxiliary transaction such that it is incentive compatible for both players to cooperate in the central transaction. For this purpose, we rely

[20]The methodology suggested here shares some characteristics with Ayres and Braithwaite (1992), who argue that effective regulation requires adaptability and that the use of both state and non-state actors can foster a more holistic regulatory environment. Thereby, they also endogenize regulatory technologies, where the base of a regulatory pyramid starts from the least coercive technology (*persuasion and cooperation*) and advances to the most coercive one (*punishment and severe enforcement*) at the pyramid's peak.
A key difference is that even at the bottom level of Ayres and Braithwaite's pyramid, where regulators aim to encourage compliance through persuasion, negotiation, and education, the shadow of the law (coercive enforcement) looms in the back: if you cannot be persuaded to act in a certain way, the regulator can (and will) escalate their enforcement technology, which gets more painful for the regulated entity. This approach is reminiscent of the paternalistic regulation found in autocratic countries, such as China, where the regulator does not have to use force because everybody knows they could — and fighting the state is meaningless. By contrast, the methodology introduced below also reflects situations where state coercion is either unavailable or too expensive to use.
In the past years, Braithwaite has extended the concept of responsive regulation and constructed regulatory pyramids for various use cases. See `https://johnbraithwaite.com/responsive-regulation/`.

[21]Notably, the term "contract" here will refer to agreements in general, including written, verbal and implicit agreements. It is therefore used differently than by legal scholars, where the term is usually reserved for agreements that would be legally binding in a public court of law, which mostly requires some form of written contract.

on Figure 3, which is the key figure of this paper.[22] At the top row, there are eight boxes, each of which represent one available contract enforcement institution. Beneath the top row, between every pair of institutions, there is a vertical demarcation line, which informs us about a characteristic of all institutions on the left of that line and a different characteristic of all institutions on the right of that line. Thereby, each institution is uniquely characterized.

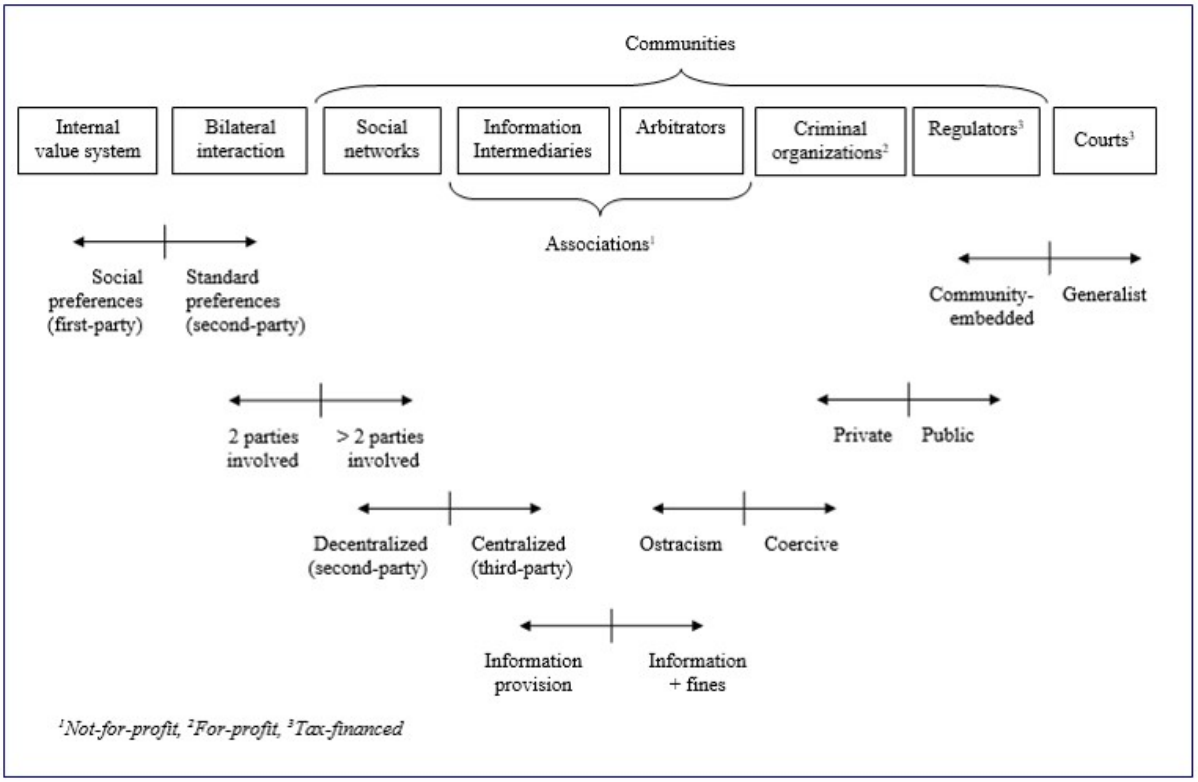

Figure 3: A Typology of Contract Enforcement Institutions (adapted from Masten and Prüfer, 2011).

Importantly, the exact titles of each enforcement institution (box in the figure) are less relevant. The delineations below the boxes are leading. E.g., if your understanding of "Regulators" is different than described in Figure 3, start with the characterization below the boxes and identify which description of the institution you have in mind fits best.

3.2 Finding effective institutions and the efficient institution

In order to find effective and efficient institutions to solve a contract enforcement problem, we start on the *very left* of the typology, i.e., with *Internal Value Systems*. The description below the box tells us that Internal Value Systems refers to a situation where the players have (pro-)social preferences, i.e., where they enjoy if the other player has a higher payoff. Practically,

[22]Figure 3 builds on a precursor one introduced in Masten and Prüfer (2011), which was never published.

this captures situations where the players just like each other very much (e.g., within families) or where a player's utility increases in the payoff of the other player because they have certain ethical norms or strongly believe in religious values about compassion, for instance.

Now, we have to ask ourselves whether *Internal Value Systems* typically can solve the problem of contract enforcement, that is, whether they can change the game-theoretic prediction in the prisoner's dilemma situation, that both players will defect, and construct an equilibrium where both players cooperate instead. If the answer is *yes*, we found an *effective institution*. If the answer is *no*, we move one box/institution to the right and ask ourselves whether *Bilateral Interaction* can solve the contract enforcement problem, and so on.[23]

Every institution that is deemed to be able to achieve mutual cooperation is called an *effective* contract enforcement institution. Among all effective institutions, the one located farthest to the left of the figure is the *efficient* institution for this economic governance problem. Economic efficiency is defined by an allocation of goods that maximizes total surplus while not decreasing any single player's payoff (Pareto efficiency). Alternatively, it can be defined as achieving higher output per input unit.

Using the latter definition, here all effective institutions solve the economic governance problem and, thereby, produce the same economic outcome: a central transaction where both players cooperate. One characteristic of Figure 3 we have not mentioned, yet, is that the eight institutions are ordered from left to right by increasing *instantaneous cost of using them*.[24] Naturally, an institution that leads to cooperation without the need to involve any other person, is cheapest. Consequently, if the institution on the very left, *Internal Value Systems*, is effective, it is also the cheapest one to use and therefore efficient. If people cooperate because they want to (it benefits them personally), we can save all other institutions listed in the figure. Some call this utopia.

Moving to the right in the figure, institutions relying on coordinated punishment behavior

[23]Such analyses, whether a specific institution might solve a given economic governance problem in a particular setting under certain circumstances, in theory can be very elaborate, which depends on available time and resources. My experience in working with the typology has shown, however, that is is quite straightforward to rule out several institutions as ineffective without too much effort. For instance, by looking at the world it is clear that ethics, aka *Internal Value Systems*, or *Bilateral (Repeated) Interaction* cannot solve contract enforcement problems on anonymous markets with many participants and outside options for future transactions.

[24]Notably, there may be indirect or set-up costs necessary to build certain institutions, which are ignored here. For instance, instilling certain moral values in young people can be a long and expensive investment by parents and society at large. Building a culture of professional and uncorrupted judiciary, where judges stick to the spirit of the law because they are convinced this is the right thing to do, is difficult. Once installed, however, the instantaneous cost of using *Internal Value Systems* to obtain mutual cooperation are smaller than the alternatives'.

by less other people are cheaper to use than those relying on more other people. Private ordering institutions are cheaper than public ordering institutions, which come with significantly more administration, checks, and balances, and so on.[25] In the extreme case, if an economic governance problem is so hard to solve that only general public courts, aided by law enforcement agencies, can achieve cooperation, then *Courts* are the uniquely effective and efficient institution — but the entire system is very expensive, as compared to the case where *Internal Value Systems* can solve the problem.

3.3 Eight contract enforcement institutions

The previous subsection equipped us with a methodology how to use the typology of contract enforcement institutions. Now, we will fill it with life by describing more specifically how any existing institution in the real world can be categorized as one of the eight archetypical institutions. The delineations below the eight boxes in Figure 3 serve us well for this purpose.

Internal Value Systems: This institution directly refers to the objectives of individuals. An individual i driven by an *Internal Value System* could either cooperate with another person j because i likes j a lot and hence benefits psychologically if j is better off (e.g., within families or partnerships). Or i could benefit from the self-image of being a moral person, whose task or duty it is to help others or who thinks that it is very important to keep one's promises even if it comes at a (material) cost. More help to any other person or a person with certain characteristics then creates higher utility to i. Because for such cooperative behavior no other party needs to act — not even the other player in the Prisoner's Dilemma game — Dixit (2009) calls this a "first-party system." The decision to cooperate occurs in the head of player i and without further interaction. Therefore, the created utility is completely psychological (or spiritual).

Such prosocial behavior is widely observed in practice, as many studies in experimental and behavioral economics have shown (see, e.g., Camerer, 2003). Theoretically, the merits of and restrictions to prosocial behavior can be explained by an evolutionary idea: social preferences are restricted to interactions within a certain group that competes with other groups. Therefore, if individual i knows that they can only survive if i's group survives, it is rational to support group fitness by cooperating within the group. There is a lot of experimental evidence for such prosocial behavior (see overview in Henrich, 2001) and an increasing body of theoretical papers

[25] See the symposium on "Private Orderings" introduced by Bernstein et al. (2015) for details and great applications.

(e.g., Tabellini, 2008, Baron, 2010, Tilman et al., 2018).

Notably, this evolutionary interpretation of within-group prosociality has a counterpart in the business world: mergers & corporate governance. The simple idea is that cooperation between competing firms can be achieved by merging them: if they belong to the same owner, it is efficient, at the merged firm's level, to shift tasks and profits to the unit that has a comparative advantage.[26] However, Dixit (2009:12) noted: "The merger of two firms does not eliminate the problem of contract enforcement; it merely transforms the contract into a principal-agent problem within one firm. *Economic governance between distinct economic units becomes corporate governance within one unit.* The costs of contract enforcement are part of transaction costs broadly defined; therefore, the choice between external and internal enforcement depends on the comparison of the two costs" (italics added).

Bilateral Repeated Interaction: If *Internal Value Systems* are not sufficient to establish mutual cooperation as an equilibrium, we do not consider prosocial preferences, anymore, but enter the realm of standard preferences. From now on, all institutions are modeled with a utility function of players in mind that narrowly maximizes their own payoff, and nobody else's. This also involves a move from a first-party system to a "second-party system" (Dixit, 2009), implying that the actions of a second player—the other person in the central transaction—are necessary to incentivize player i's cooperation.

Crucially, without further institutional context, cooperation between rational players with standard preferences will break down in a one-shot Prisoner's Dilemma. A potential solution is given by repeating the bilateral interaction and interacting again, and again, with the same partner. Players can rely on a trigger strategy that makes cooperation in period t dependent on cooperation in earlier periods. If any player defects only once, they will "pull the trigger" by defecting for the rest of times (as a punishment strategy). Confronted with such a threat, each player has to trade off the net present value from eternal (cooperate, cooperate)-play with the net present value from one-time unilateral defection and eternal (defect, defect)-payoffs thereafter. The Folk Theorem (Friedman, 1971) formalizes this trade-off and shows that it is in the interest of both players to cooperate under a few conditions, especially if they are patient enough (i.e., if they do not discount future payoffs too much) and if they interact frequently enough with each other.

[26] Recall Williamson's (1985) list of reasons explaining why vertical integration is often a beneficial transaction for the involved firms.

Research has shown that *Bilateral Repeated Interaction* works well in very small communities with few outside options for trading, where the dependence of two players on each other is high (see Baker et al., 2002, or MacLeod, 2007). However, as soon as the community size grows—and with it the number of potential trading partners after a first partnership broke down because of defection—this institution will not be effective, anymore. In this case, we are entering the domain of "Collective Enforcement Institutions": institutions for the enforcement of agreements involving others than just the parties to the transaction themselves. In Figure 3, this includes all institutions right of *Bilateral Interaction*.

Social Networks: Social Networks are the logical extension of the Folk Theorem to third parties. If the bilateral frequency of interaction between two traders is too low to sustain cooperation, they can leverage the trigger-strategy threat by involving other players. The fundamental idea is: if player i defects against their partner j, j will inform their friends (or professional contacts or other acquaintances) $k, l, m, ...$ about the defection. These friends are then supposed not to interact with i in the future (or to interact but to defect, depending on the game), thereby ruining i's expected payoff from future transactions. Consequently, if i believes that they will lose the value from cooperative interaction with j's friends in the future if i defects against j, then i will be more incentivized to cooperate with j today. Therefore, such social networks, where each player is characterized by the size (and potentially by the identity) of their contacts, have also been referred to as *multilateral second-party institutions* (see Landa, 1983, Kandori, 1992, Greif, 1993, Ellison, 1994, Dixit, 2003b, or Masten and Prüfer, 2014).

Social networks are the most frequent institution to enforce social norms or other cultural norms. They are *decentralized* and are based on dyadic information transmission. This means that every player i is connected to n_i other players and can send messages about the behavior of former partner j to these contacts. It is possible that someone makes sure the communications infrastructure of the network is maintained but that person or entity is not involved in the communication itself. Applications of social networks include many online social networks and $1 : n$-messaging apps, but also offline networks like those used to sustain social norms, in traditional village communities or friendship networks, or in microcredit lending.[27]

The benefit of social networks as an enforcement institution is that they are relatively cheap

[27]In microcredits, a group of people takes out a loan and is jointly liable for paying it back. Consequently, if one person defects and does not pay back, the other group members are incentivized to check with and convince the defector to pay indeed—or to face group punishment. See Armendariz and Morduch (2010) for details.

to manage. The flip side of this is that without a central player managing and standardizing communication, information transmission (and storage) can be hard to sustain, especially if the network size or complexity of transmitted messages grows (see Ostrom, 1990). Moreover, social networks, which often enforce social norms, depend on the precise compliance of various players with their required actions both in the central and in the auxiliary transactions. This complexity makes social norms relatively inflexible, which is ineffective if the world changes (see Hadfield et al., 2024b).

Information Intermediaries: A natural solution to this problem is to have one player who serves as the central node of a network. This party collects and disseminates information about the behavior of the matched partners of those players connected to the central player and runs a repository about such past information. Thereby, the institution is changed from a two-party to a three-party system, in Dixit's (2009) words. Because the central player takes over institutionalized responsibility, such information intermediary services often come at a fee for the connected individual players, who can benefit from better information, better spread of information, and better coordinated individual (punishment) actions following a defection in any central transaction.

This gives rise to *organizations* as new players in the auxiliary transaction, next to individuals, where the central player serves as manager of the organization and the individuals connected to the organization become members. Rating agencies, credit bureaus, industry associations or the secretary of a local sports club are real-world representations of such information intermediaries. Often membership in such a club comes with certain obligations, apart from payment of the membership fee, which is used to pay the manager and to sustain the organizational infrastructure: especially the duty to report about one's own experiences with other individuals, both members and non-members, in central transactions is a valuable resource for other members and, thereby, increases value of membership in the club.

Because the resulting economies of scale in data assembly and dissemination among members come together with higher costs for maintaining the club's infrastructure, as compared to decentralized social networks, centralized associations of the information intermediary type are more suitable for situations with higher numbers of involved individuals.

The associations can be member-owned, e.g., trade associations or standard-setting organizations, where the members themselves are usually for-profit firms but the association is a

nonprofit organization only maximizing service quality for their members. Alternatively, an information intermediary can be owned by a third party, e.g., Standard & Poor's. For formal studies of information intermediaries, see Greif et al. (1994), Kali (1999), Baron (2010), Larrain and Prüfer (2015) or Prüfer (2016).

The main problem of information intermediaries, with respect to their role in auxiliary transactions supporting contract enforcement, is their limitation to use ostracism as enforcement technology: to incentivize both members and non-members to cooperate, the club manager can only threaten everybody with the dissemination of information about a defection, combined with the call to all members not to interact with a transgressor in the future (and the second-order call not to interact with members who have not followed such a call for boycotting a transgressor). Of course, such a call could be made stronger by threatening transgressors or non-punishers with expulsion from the club (and, therefore, from exclusion of valuable information about other wrongdoers). If would-be transgressors have good trading options outside of the club, however, this threat may not be enough to prevent defection.

Arbitrators: Figure 3 distinguishes two types of associations: *Information Intermediaries* and *Arbitrators*. It shows that there is a fine line of distinction between both. The only difference is that Arbitrators not only distribute information from their members and about members' and their (business/private) partners' behavior and then call for boycotts of transgressors. On top, arbitrators would investigate cases of accused defections themselves, make a judgment, and determine a fine for which the identified defector can prevent exclusion from the group, which is the ultimate punishment of arbitration tribunals.[28] Thereby, they support contract enforcement by ordering the members of their association not to trade with a defecting party that does not respect their judgment and does not pay the fine to the victim.

In sum, where *Information Intermediaries* often resemble lightly-organized facilitators of social-network information transmission, *Arbitration* tribunals more resemble private courts. Naturally, their effectiveness is strongest if exclusion from the group of members would be disastrous for one member, for instance, in the case of tightly-knit trade associations, where a convicted defector would be excluded from all future business. The same model applies in international relations, where the players are states but the stakes are not high enough to resort

[28] In practice, some arbitration tribunals do have access to the coercive powers of public courts/the police to enforce their judgments, but those are de facto a mixed institution between a private arbitration tribunal and a public court and come with specific problems, as arbitration tribunals are subject to less scrutiny, including the existence of appeals courts, than public courts. See Leeson (2008).

to coercion (read: war) in case one state does not comply with its contractual obligations. Think about the World Trade Organization or environmental agreements such as the Kyoto protocol.

Arbitration tribunals are also the institutions (cum organization) that makes the distinction between adjudication and enforcement, discussed in Section 2.3, most salient: arbitrators adjudicate cases and, as long as this adjudication is effective, they create value, even if they do not have the coercive enforcement powers of public courts.

Consequently, compared to *Information Intermediaries*, *Arbitrators* have more and harsher punishment options but are more expensive because investigating a case is costly. Compared to public courts, however, arbitrators are more flexible and often more knowledgeable about industry and trade customs and, therefore, can potentially make better decisions on a case-by-case basis. They also do not have to sustain a coercive law enforcement apparatus, which makes them cheaper than public courts. Both formal and conceptual models of arbitrators are constructed and studied by Milgrom et al. (1990), Bernstein (1992, 2001), Dixit (2003a), or Prüfer (2016). Arbitration tribunals' main problem, as with all institutions discussed by now, is that association membership is voluntary and that arbitration tribunals do not have statutory access to coercion. The damage payment an arbitrator can award from the defector to the victim of defection in equilibrium is restricted to the net present value of the defector's membership and ongoing interaction with other members, which is below the maximum damage payment a public court could enforce.

Criminal Organizations: Because of the weaknesses of all enforcement institutions relying on ostracism, Figure 3 lists a potentially surprising institution: criminal organizations. As Dixit (2003a), based on Diego Gambetta's (1993) work about the Sicilian Mafia, explains, the Mafia's business model is to offer players protection from the opportunism (defection) of their partners—and to charge a fee for it. They do so by threatening the partner with harsh coercive punishment, which can deter defection even in cases where the partners may never see each other again. Thereby, originally the Mafia would *increase* numbers and types of transactions in which individual players could expect cooperative behavior (the *scope of cooperation*). This suggests that if state governance is absent or very weak, criminal organizations can take over governance and thereby substitute the state — alas with a different objective function.

Criminal organizations work very similar to private arbitration tribunals, with two exceptions: first, criminal organizations reserve the right to punish defection by coercion, which makes

their threats more terrible and, hence, more effective. Second, where associations are usually nonprofit organizations whose potential excesses in punishment are contained both by the wish to retain the legal nonprofit status and by the economic oversight of the association's manager by the membership assembly, criminal organizations are profit-maximizers.

Profit-maximization combined with coercive enforcement is what ruins the effectiveness of these institutions as enforcers of general rules. They can be very effective in doing so but, as any dictator, over time their temptation to use their coercion to increase their fees in exchange of guaranteeing cooperation in the central transaction just grows and grows (see Olson, 2000). Such "stationary bandits" have better incentives to support production and not appropriate all revenues in the country they control than a "roving bandit," who does not have long-term goals, but both criminal organizations and dictators have incentives to steal a lot from all people and businesses in their realm. Therefore, unless constrained by external forces, they will exploit their powers, neglect externalities onto others and only keep a fragile peace (read: honor agreements) with the most powerful players, who they rely on for their profit-maximization objectives (Greif et al., 1994).

Blattman et al. (forthcoming) support this view by offering evidence on drug gangs in Medellin, Colombia: "we see no evidence that state proximity crowded out criminal rule. On the contrary," (p.3) "state and gang rule are sometimes complements" (p.1). Underscoring the importance of criminal organizations' profit motive, they find that "gangs were most likely to compete with the state [for governing a neighborhood] in the neighborhoods close to profitable drug markets. In less profitable neighborhoods, they do not appear to respond to state proximity at all" (p.3).

Regulators: Interestingly, *Criminal Organizations* and *Regulators* share several characteristics. They both are organizations put at the center of an enforcement institution, investigating and adjudicating cases between other parties. They both have access to coercive punishment. They are both community-embedded, in the sense that they know a lot about the trade going on in the central transaction and have informal connections to other players, which allows them to rely on the wisdom and knowledge of those contacts.

The one major distinction between them is their objective function and mandate, but this one is huge. Where *Criminal Organizations*, as discussed above, only maximize their own profits (or net present value over time), *Regulators* are public organizations and, therefore, act

on behalf of the state. At least nominally, this defines their objective as welfare-maximization or consumer surplus-maximization, or any other goal positively correlated with the happiness of many citizens.[29]

Real-world "regulators" comprise many governmental authorities, including actual industry regulators, e.g., for finance, health care, electricity or telecommunications, but also competition authorities, and other public agencies. They include specialized courts such as trade courts or family courts, where experts from the trade at hand judge over other traders and decide on behalf of the state whether the behavior of other players in that trade is in line with public laws and directives. If they find against one player, they all have access to coercive law enforcers of the state, thereby being highly effective.

The flip-side of these very powerful, knowledgeable, and nominally well-meaning organizations also comes from their community-embeddedness: listening to other players may give them more insights about specific players and nuanced judgment capabilities—but these can be biased. Being part of a community implies that others in the community have expectations and that others may share information with regulators strategically. The more regulators are embedded in the community of traders, the higher the probability of being captured. Once this threat is overarching, we only have the final enforcement institution left.

(General) Courts: Both *Regulators* and *General Courts* act on behalf of the state. Therefore, we speak of *public ordering*, in contrast to *private ordering*, where the institution is organized by private parties without mandate from the state.[30] Courts investigate cases, judge who cooperated and who defected, and (for private law cases) determine the damage payment that a defector has to pay to their victim. Because public courts can access the coercive enforcement powers of the state, in theory, they can enforce any damage payment and, thereby, be most effective. In practice, however, due to problems of asymmetric information, limited funds of convicted defectors, and human rights (slavery or worse, as ultimate punishment threat, is illegal), courts often resort to "expectation damages," where the value of the damage payment

[29]I acknowledge that corruption and nepotism do exist in public organizations, which will be briefly discussed below. Nevertheless, as compared to general social goals, such as total welfare-maximization, these forces seem to be secondary in democratic countries. For a more nuanced account of the relationship between corruption and democracy, see `https://www.unodc.org/e4j/en/anti-corruption/module-3/key-issues/corruption-and-democracy.html`.

[30]Because many people immediately think of the state as necessary actor if economic governance problems, externalities, asymmetric (market) power or public goods provision have to be tackled, a main purpose of explaining this typology of economic governance institutions is to point at all the private ordering institutions available to solve many problems.

is a multiple of the value lost to the victim in the central transaction (Hermalin et al., 2007). Consequently, if traders believe that courts are effective, defection is not worthwhile.

The key difference between *Regulators*, including specialized courts, and *General Courts* is that the former are community embedded, with all pros and cons discussed above, whereas the latter operate fully rule-based. This implies that a judge at a general court only has to know the law but not any specialized trade. Clearly, this comes at the cost of neglecting potentially useful information about a specific central transaction or the players in it. On the upside, this methodology guarantees the highest degree of institutionalized independence from any influence, including lobbying and capture. Therefore, powerful players in society will never have as much power in front of a *General Court* as they would have in front of a specialized court or when dealing with another *Regulator*.

The difficulty that comes with rule-based decision making is that a judge requires *verifiability* of the parties' claims (a certain burden of proof). In contrast, private-ordering institutions can make decisions based on *observability* of the claims, which is significantly easier to satisfy in many cases.[31] Therefore, to make decisions on behalf of victims of infractions that are difficult to prove, courts are sometimes not effective but private ordering institutions can be.[32]

Apart from difficulties with the burden of proof, the main problem of general courts is that they are very expensive to use, where the disutility associated with using courts includes both financial costs for lawyers and fees, the relatively long time to get a decision due to strict procedures, psychological costs of the litigants, the potential loss of business secrets of privacy, and many more. Parts of these costs stem from the courts' big advantage: to be neutral, general, and based on abstract laws—and thereby relatively hard to capture by community-based interest groups.

3.4 Property Rights Protections and Collective Action

The typology of contract enforcement institutions introduced above can also be applied to other economic governance problems. Here, I just briefly comment on the other two mentioned by

[31] *Verifiability* is a characteristic of a transaction, where a third party, such as a court, could verify ex post who cooperated and who defected. Verifiability is required to get *contractibility*, i.e., a situation where the players can write a meaningful contract about everybody's rights and obligations ex ante because they know that a victim would be able to show to a court that they cooperated and the other player defected ex post. By contrast, *observability* is a characteristic of a transaction, where it is sufficient that the players know who played what, without the necessity of being able to prove it to a third party.

[32] See Masten and Prüfer (2014) for a model that shows that and why courts are also not used in equilibrium, even if available, for damages of low value.

Dixit (2009).

Protection of Property Rights: The one-sided Prisoner's Dilemma depicted in Figure 1 captures various real-world situations where one player is in the hands of another one: hold up, lock in, or property rights protection. With perfect law enforcement, the government could make sure that everybody's property rights are protected, which, in turn, increases the incentives to invest and innovate because the low (Not invest, Steal)-payoffs in Figure 1 can be avoided. In many countries, historical periods, or situations where not many people are present, however, the police cannot ensure such protection.

In these cases, often private ordering-institutions may solve the problem, e.g., by establishing neighborhood watch groups with social media warnings (resembling *social networks* or maybe even *information intermediaries*), gating communities and hiring private guards (sharing characteristics with *arbitrators* or *criminal organizations*) or even actually hiring a *criminal organization* for severe cases (e.g. mercenaries in territories of civil war). In all of these case, the economic goal is to reduce the potential thief's payoff from stealing and, therefore, to deter any attacks on one's property rights. This transaction transforms the stochastic marginal cost of being robbed into a deterministic fixed cost of paying the guards.

Thinking the same situation one step further, an interesting question is to which extent private ordering institutions could guard against predatory or corrupt (autocratic) governments. The first insight is that, due to the imbalance of coercive powers between the government and the individual citizen, any single individual is nearly helpless.[33] However, this does not imply that nothing can be done to tame the arbitrary or strategic exploitation of citizens in autocratic countries. Two requirements are necessary to mitigate such excesses.

First, (would-be) victims of an autocrat's power must flock together and form an organization that protects their interests by communicating to the autocrat that they will only continue to do business in the autocratic country in the future if none of them is harmed or expropriated. In Figure 3, this organization is an *arbitration association*.[34] The trick is that, absent access to coercion, the association can make use of the mighty autocrat's wish for profitable future

[33] A recent example showing this truth perfectly is the recent case of Jack Ma, the founder of China's big tech firm Alibaba, who criticized Chinese authorities in public on October 2, 2020, being one of the richest individuals in the country. He quickly disappeared, only to apologize several weeks later for his earlier statements at his next public appearance. In January 2023, Ant Group, which Ma had founded, reported that he would relinquish control and see his voting rights shrink from above 50% to 6.2% (Financial Times, "Jack Ma cedes control of Ant Group," January 7, 2023.)

[34] See Greif et al. (1994) and Larrain and Prüfer (2015) for models showing in detail how, when and why such protection can be effective.

interactions (business, trade, luxury goods, etc.)—and threaten to boycott the autocrat in case any harm is inflicted on their members. This is the power of ostracism as enforcement technology.

Second, the traders/association members threatening the autocrat to withhold profitable future interactions must reside outside of the autocrat's territory. Otherwise, they could be raided and put to prison, or worse, in case of non-cooperation with the autocratic regime.

While the second requirement is relatively straightforward, the first one is difficult. As Greif et al. (1994) show in detail, it is not easy to design the *corporate/organizational* governance of the association such that it can effectively deter single players from trading (very profitably) with the autocrat—and thereby free-riding on their fellow members' self-inflicted non-trade strategy after the autocrats transgression. This coordination problem becomes more severe in a global world with many, not only one, "associations" or other players.[35] As shown by Larrain and Prüfer (2015), the general situation regarding property rights protection may be a major driver for the net effects of trade associations onto total welfare. They show that such associations (or guilds) are generally positive for everybody in environments of weakly protected property rights because association members will invest their own resources and for their own self interest and lobby politicians/rulers for better property rights protection, thereby creating positive externalities for the rest of the economy. However, their net effects turn negative for non-members with increasing property rights protection because then the marginal returns of additional property rights protection are decreasing but the rent-seeking motive of associations becomes dominant.

Ensuring Collective Action: Collective action problems are akin to coordination problems, where positive externalities lead to underinvestment if players only act on their own (see subsection 2.2). The main protagonist of the field was Nobel Laureate Elinor Ostrom, whose 1990 book summarizes several case studies and extracts the gist of how people in the real world solve collective action problems by designing good economic governance. In particular, Ostrom (1990) points at several empirical key findings, which are often just assumed in theoretical work but which, apparently, need to be implemented explicitly. These characteristics of good economic governance (all based on private ordering and ostracism, not coercion, as main enforcement technology) include:

- *Stability of group composition*: as is easily understandable from a game-theoretic perspec-

[35] We get new evidence about this difficulty every day when inspecting the effectiveness of trade sanctions and boycotts against states like Russia or Iran.

tive, if players often enter or exit a group, it is difficult to threaten them with the stop of future interactions—they may already be gone independently because of bankruptcy, retirement, moving, or death.

- *Good local information* about (1) the identity of group members, (2) members' rights and duties, (3) consequences of misbehavior, and (4) a history of individual members' behavior: these findings are also intuitive (yet still valuable because we need to know what we cannot assume in models).
  - Without (1), we cannot structure any relational contract (in a repeated game context). Thereby, any punishment strategy is meaningless if we do not know who should behave in which way, who should adjudicate behavior in the central transaction, and who should inflict which punishment. This is reminiscent of the first part of the definition of institutions à la Greif (2006); see Section 2.1.
  - (2) and (3) also reflect Greif's definition of institutions: if we do not know who should take which action in the central and/or auxiliary transactions and if, hence, any player in the central transaction does not know what punishment (or foregone benefits) may follow defection, incentives are not properly defined and it is meaningless to speak about economic governance solving the credibility problem.
  - (4) is needed in all ostracism-based governance institutions, i.e., typically in private ordering, because here behavior in period t against player j depends on j's behavior in periods up to $t-1$. This then underlines the value added of a formal information intermediary helping purely decentralized social network information provision.[36]

- Rules specifying unacceptable behavior must be *compatible with available information* about the relevant actions. For instance, if the goal of a managed fishery is to avoid overfishing, it does not make sense to make punishment conditional on the quantity of fish caught, which is often unverifiable or even unobservable. Instead, punishment should only depend on observables that serve as proxy for the main variable of interest, e.g., boat or net size.

- So-called grim trigger strategies, which exclude a defector from cooperative trade forever

[36] See Prüfer (2016) showing this value added and the conditions it depends on explicitly. See Hadfield et al. (2024b) to understand the elaborative and detailed prescriptions of social norm enforcement (a form of social networks) for all involved players.

and, hence, are the worst possible ostracism-based punishment, are popular among economic theorists (because they are relatively easy to model). By contrast, Ostrom's case studies have revealed that *graduated punishments* are more successful in the long term. They trade off the deterrence effect of long punishments/exclusion periods and the opportunity for one-time defectors to return as contributing members of the community after a limited period of exclusion. See the discussion in Greif (2006, Appendix C) and Watson (1999, 2002).

4 Applying Institutional Design Principles

Here, I will show how the typology of economic governance institutions explained in Section 3 can be applied in practice, both by researchers trying to narrow down the set of effective institutions that can solve an economic governance problem in theory and by policy makers or regulators who have to implement a given rule and are considering what the possible and the most efficient ways are to achieve compliance.[37] This will be done by means of two applications: (i) how to increase users' trust in cloud computing technologies, and (ii) how to implement the provision on data-driven markets (think: search engines), that dominant firms should share their data about users' preferences and characteristics with competing providers? The first problem is relevant for cloud service providers failing to convince some potential users of their services to actually use them—and, in turn, to those users missing out on access to efficient cloud services. The second question is highly practically relevant for several digital markets because the EU's Digital Markets Act, Art. 6(10,11) establishes such a data-sharing obligation for so-called "gatekeepers" but does not detail how it should be implemented.

Importantly, this part of the paper only reports the gist of already published work that tackles these problems. The problem of too little trust in cloud computing technologies was addressed in Prüfer (2013, 2018). A proposal for the governance of mandatory data sharing was designed in Graef and Prüfer (2021). Henceforth, I will draw on these articles. Here, the purpose is only to exemplify how to apply the typology of economic governance institutions to any specific problem.

The methodology in either case is the same: first, the *economic governance problem* is addressed, i.e., the abstract problem and the relevant players are defined and the typology is

[37] More generally, any decision maker who wants to implement a rule can make use of the typology. This includes company executives, sports club managers, and parents seeking rule compliance from their children.

used to identify the efficient type of institution in each case. Second, we go into depth and solve the *organizational governance* problem by designing an incentive scheme for all players that fits Greif's (2006) definition of an institution (see Section 2.1) and improves a reasonable societal objective such as total welfare or consumer surplus maximization.

4.1 Trusting Privacy in the Cloud

This subsection draws on Prüfer (2013), where the efficient type of economic governance institution to increase users' trust in the privacy- and data security-promises of Cloud Service Providers (CSPs) are derived. It also touches on Prüfer (2018), which is a more formal, game theoretic treatise that starts from the results of the 2013-article, and then designs an organizational governance scheme that improves on the previous situation.[38]

The economic governance problem in cloud computing: "Cloud computing is a model for enabling convenient, on demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction" (US National Institute of Standards and Technology, 2009).[39] At the end of 2024, worldwide public cloud end-user spending is expected to surpass $675 billion, a 20 percent increase on 2023—and an average 20% annual increase for the past ten years.[40]

At the same time, many end users are concerned about privacy risks when putting private pictures or personal data to the cloud. Many businesses, especially small and medium-sized enterprises, worry about data security if they let their crucial services run in the cloud (Pearson et al., 2012). Additionally, cloud computing is a global industry, and it is easy for CSPs to move or copy from a cloud server in country 1 with high security level to country 2 with low security (and save costs on the way), without the user noticing it. Therefore, a multitude of legal and regulatory regimes applies, which increases the costs of doing business or consuming services in the cloud. Both of these problems are amplified further because cloud computing is a complex and highly dynamic, fast changing industry. As a consequence, both individual and business users underutilize the opportunities inherent in cloud computing technologies, which mitigates

[38] Here, many explanations and references are omitted. For details, please consult the original articles.

[39] Technological details are explained in a generally accessible way at `http://www.dummies.com/how-to/content/what-is-cloud-computing.html`.

[40] `https://www.gartner.com/en/newsroom/press-releases/2024-05-20-gartner-forecasts-worldwide-public-cloud-end-user-spending-to-surpass-675-billion-in-2024`

innovation and economic growth.

Let us formulate this situation as an economic governance problem. Assume that a Cloud Service Provider promises in a contract with a user to protect the privacy and data security needs of the user at a specific level. In turn, the user pays a price for secure cloud services. This situation resembles a classic economic governance problem: contract enforcement. Notably, as payment of the price can be required in periodic installments, e.g., in a subscription model, moral hazard on the user's side is very limited. The best model would therefore be a one-sided Prisoner's Dilemma, as in Figure 1, where the CSP "cooperates" if they keep the contract and where they "defect" if they produce lower privacy protection than promised.

Key questions to be solved are then as follows: How can the CSP be incentivized to keep their contractual obligations and to install procedures that protect the privacy needs of users? How, in turn, can we make sure that users trust the promise of providers to implement certain levels of privacy protection and to be willing to pay a premium for it?

Applying the economic governance typology: As suggested in Section 3.2, we start on the very left of the typology of economic governance institutions (Figure 3). Can *Internal Value Systems* solve the contract enforcement problem? Cloud computing is a global industry, where players interact via digital environments with many people they do not know and who, most likely, have a different cultural background and are not members of their community. Taken together, it is almost certain that internal value systems cannot solve the global contract enforcement problem.

Thus, we must move towards the right in Figure 3 and look for a potential solution there. It is often said that *reputation mechanisms* are very powerful on the internet. Social (online) networks are one of the most prolific success stories of the internet, not only because they connect people but also because they offer powerful opportunities to let individuals find like-minded allies, for instance, to organize collective action against wrongdoers. Unfortunately, theoretical research has shown that *social networks* only support contract enforcement if the importance of traders rather symmetric and if the total total number of traders is small (Greif et al., 1994, Dixit, 2003b). These constraints are confirmed empirically in many industries (Ostrom, 1990, Christmann and Taylor, 2006). There are just too many unknown users out there, who consider to buy cloud computing services and who we would have to reach for a joint boycott in case a CSP was defecting, such that we could hope to constrain a CSP from

breaking their contract with us. Consequently, *social networks* also do not offer the solution to our economic governance problem. For the same reasons, *bilateral interaction* is even less effective.

On the other side, *information intermediaries* offer a better organized version of social networks. Many of them exist online, for instance, in the form of online feedback systems, but empirical evidence has shown that they are largely unreliable, can be easily gamed, and never reach all users needed (Dellarocas and Wood, 2008, Cabral and Hortacsu, 2010). Hence, also no solution in sight here.

Let us briefly jump over the next institution and consider the right three boxes in Figure 3. It seems straightforward that *criminal organizations* are not effective in keeping shirking CSPs in check because the global character of the cloud computing industry leads, in particular, to information problems and only secondarily to enforcement problems, which criminal organizations may solve more effectively.

Public ordering institutions, namely *regulators* and *courts*, have similar problems: Multinational cloud providers can escape any single national or regional legislator or regulator quickly. The highly dynamic and innovative cloud computing industry is a challenge for any public authority, which would have to create and constantly adjust appropriate rules that reflect the state of the technological development. Moreover, in many countries there is a specific administrative problem: ministries of the interior are responsible for data protection *and* public safety. This double function makes "compromises" likely, where the bureaucrats could be tempted to put public safety ("protection from terrorist threats") first and put privacy concerns only second. This expectation would not increase users' trust in privacy-protective promises of CSPs if public authorities were in charge of investigating infringements. We conclude that public ordering does not offer an effective solution to the contract enforcement problem.

Candidate solution: arbitration associations: This leaves one contract enforcement institution, *arbitration associations*, which combines private information collection and investigation of cases with a centralized organization that relies on its members' coordinated boycott of convicted defectors. More specifically, in the cloud computing industry, this can offer a solution in the form of a *certification agency* that offers providers to certify them with a label that can be shown to prospective users as credible proof of a certain privacy-protection standard.[41]

[41] There is extensive empirical support for the disciplining effects of certification standards (Bühler and Schütt 2014).

A certification agency is a privately managed organization with an own legal entity that is staffed by industry experts, who audit and monitor cloud service providers and award certificates (about high privacy-protection standards) only to those providers whose standards meet certain criteria.

Unfortunately, this description is wishful thinking. Edelman (2011) presents evidence that web sites with "trust" labels are *more* likely to behave untrustworthy than uncertified sites. Thus, by introducing a classical certification agency the CSP's credibility problem would be replaced by the certification agency's credibility problem: How to ensure that the certifier is not captured themselves and that they do not have any incentive to misreport the findings of a CSP's audit (e.g., because of bribes or to save monitoring effort)?

Economic theory has studied this question. Strausz (2005) and Mathis et al. (2009) show that reputation concerns of profit-maximizing certification agencies can mitigate their incentives to shirk. The idea is, if a certifier is caught once handing out a false certificate, they lose all future business. As long as the certification business offers higher profits than alternative occupations, the certifier is incentivized to behave well and "cooperate" by truthfully awarding certificates only to those CSPs who produce sufficiently high levels of data security.

The problem with this governance scheme in the practice of cloud computing is that it depends on the quick, cheap, and reliable transmission of information about certifiers' behavior (and reputation) to all industry participants. Otherwise, the threat to be excluded from future business has little bite. However, these requirements are not fulfilled in a global industry with many heterogenous, decentralized users from all over the world, often without expert IT-knowledge, which would allow them to judge which certificates are reliable. Hence, classical certification agencies also offer no solution to the economic governance problem.

Fortunately, there is hope, inspired by practically existing certification schemes. All theory papers model *one-layered* certification schemes, where users and providers would play a central transaction and a profit-maximizing certifier would run the auxiliary transaction and be supposed to withdraw certificates of defecting CSPs. In practice, however, *two layers of certifiers* are frequent, where a certifier is checked themselves by a certifier of certifiers.[42]

This insight is the starting point of the model constructed in Prüfer (2018). It shows that, in theory, a two-layered certification scheme can indeed solve the problem of underutilized cloud

[42]See the impressive list of examples reported by ENISA (2013) including certification schemes managed by ISO 27001, Online Trust Services, German Federal Office for Information Security (BSI), UK Communications Electronics Security Group (CESG), US Federal Information Security Management Act (FISMA).

services by understanding it as an economic governance problem (contract enforcement), where the central transaction is played between a CSP selling cloud services of a certain privacy-protection level to users, who are willing, in equilibrium, to pay a premium for the high service quality. This is achieved by designing an appropriate auxiliary transaction around a so-called *cloud association*: a private, international, nonprofit club of cloud service providers, who share control over the certification protocol with user representatives and source certification of CSPs out to for-profit certifiers who, in turn, depend on a license of the cloud association for future business.

The key is to incentivize users who received low-quality services from a certified CSP (who should deliver high-quality services, as claimed by the certificate) to complain directly to the user representatives on the board of the cloud association. This is achieved by implementing an easy-to-use complaints mechanism and the promise to supply high-quality substitute services for free to cheated users (followed by a case-by-case investigation by the cloud association). If such a mechanism is in place, licensed auditors know that it will be revealed if they falsely hand out certificates, which would cost them profits in the future. Knowing that auditors will not shirk, CSPs also have no incentive to apply for a certificate if they produce low-quality services. Consequently, because every player fears to lose benefits when defecting, there is no incentive to defect (i.e., to implement low privacy protection).

The results of the model show that in a dynamic, globally operating industry a private ordering institution can avoid market breakdown (in theory) and thereby support market growth (in practice). The effectiveness of this institution depends on the careful composition of organizational and institutional features.[43]

4.2 Implementing Regulation of Big Tech: Data Sharing

The theory of harm on data-driven markets: The background of this section is Graef and Prüfer (2021), who study how the legal provision to share certain data on so-called data-driven markets can be implemented effectively and efficiently, as is prescribed in the EU's Digital Markets Act, Art. 6(10,11). The economic rationale for mandatory data sharing is developed by Prüfer and Schottmüller (2021). They focus on so-called *user information*: data about the preferences and characteristics of individual users, which can be stored automatically and

[43]Section 6 of Prüfer (2018) compares the theoretical cloud association with the actually existing *Cloud Security Alliance* and shows that theory is close to practice and sometimes trumps it.

virtually for free on all digital markets. A *data-driven market* is then defined as a market where a firm's marginal costs of innovation decrease in the amount of user information, that is, if it is subject to specific feedback effects (*data-driven indirect network effects*). Prüfer and Schottmüller (2021) show in a dynamic model of innovation competition that, in data-driven markets, user information almost surely leads to market tipping (monopolization).

The problem is that such a tipped market with one dominant firm and, potentially, a few very small niche players, is characterized by low incentives to innovate both for the dominant firm and for (potential) challengers. The intuition of this tipping tendency is that the smaller firms, even if they are equipped with a superior idea/production technology, face higher marginal costs of innovation because they lack access to the large pile of user information to which the dominant firm has access due to its significantly larger user base. Consequently, if a smaller firm were to heavily invest in innovation and roll out its high-quality product, the dominant firm could imitate it quickly — at lower cost of innovation — and regain its quality lead. The smaller firm would find itself again in the runners-up spot, which implies few users and low revenues — but it still has to pay the large cost for the attempted leap in innovation. Foreseeing this situation, entrepreneurs and private financiers would not invest in innovation of a smaller firm. In turn, because the dominant firm knows about the deterring disincentive to innovate for its would-be competitors, it is protected by its large (and constantly renewed) stream of user information and can rest on a lower level of innovative efforts, too. These low innovation rates, both by the dominant firm and by (would-be) competitors, as compared to a situation with lively competition, constitute the theory of harm of Prüfer and Schottmüller.

What to do about market tipping and low innovation rates? To remedy these problems, Prüfer and Schottmüller (2021) studied, based on the earlier idea of Argenton and Prüfer (2012), the consequences of a regulatory intervention in data-driven markets: to require the sharing of (anonymized) data on user preferences and characteristics amongst competitors. They showed that, even in a dynamic model where competitors know that their innovation investments today affect their market shares and hence their innovation costs tomorrow, such a policy intervention could mitigate market tipping and would have positive net effects on innovation and welfare if data-driven indirect network effects are sufficiently strong.[44]

[44] Graef and Prüfer (2021) place this suggestion in the literature and show how it was taken up by the European Union when legislating the Digital Markets Act—yet, without clear instructions how to implement it.

The economic governance problem on data-driven markets: Graef and Prüfer (2021) elaborate on all kinds of important details, such as, which data should be shared, who should have to share and who should get access to the shared data, how should it be shared and for which price, etc. All of these considerations are only of secondary importance for the purpose here, though, which is to show how the framework explained in Section 3 can be applied to identify the efficient economic governance institution to implement mandatory data sharing on data-driven markets.

The first question we have to answer is, what the economic governance problem is. Assume a data-sharing obligation for user information is in place. Then, the two credibility problems in the central transaction are: (i) whether the parties subject to the obligation (data senders) comply with it; (ii) whether the receiving parties (data receivers) use the incoming data in a way that is in line with the spirit of the data-sharing obligation, namely to offer and improve services for end users while respecting several side constraints, especially privacy protection of the end users whose information is shared. If a party complies with their obligation, we say they *cooperate*. Otherwise, they *defect*.

For each transaction, an economic governance institution must identify in the auxiliary transaction (i) whether a player cooperated or defected (adjudication) and, in case of defection, (ii) who is supposed to take which action in order to punish the defector (enforcement). Again, we start on the very left of Figure 3. Akin to cloud computing, on data-driven markets (or digital markets, more generally) transactions are rarely made between players who belong to the same close-knit community or family. Most interactions occur via computers and are often supported by bots and other software programs, which make the transaction impersonal. These characteristics rule out that morality (*internal value systems*), will be effective here in general.

Moving right in the typology, the reliance on ostracism that connects *bilateral interaction*, *social networks*, and *associations*, strongly deteriorates the usefulness of these governance institutions for mandatory data sharing of user information on data-driven markets. There, a dominant firm would prefer, rather sooner than later, to cease sharing data with its competitors, simply because data sharing diminishes the dominant firm's lead (and lower marginal costs of innovation) and makes the market more competitive (Prüfer and Schottmüller, 2021). In turn, the dominant firm has no interest in a long-term relationship with data receivers (its competitors). Hence, there is no substantive incentive to enforce cooperation on the data receivers' side by threatening them to stop delivering data if they breach end users' privacy because this would

imply that the dominant firm has to monitor the operations of receivers, which is costly (and may furthermore infringe competition law). Hence, all institutions that rely on ostracism offer no solution to our problems here.

The remaining three institutions all enforce rules (cooperation) via the threat of coercion. *Criminal organizations* are not suitable for our purpose because, by definition, they maximize someone's private objectives (usually profit or power maximization), whereas the goal of our entire exercise is to identify a solution to the economic governance problems that maximizes (consumer) welfare and innovation. These considerations suggest that the solution to our problems lies in the realm of *public ordering*. Specifically, the combination of a presumed objective of consumer-welfare maximization with the enforcement powers of the state is critical. Only then, players can be expected to adhere to the desired rules such that firms with a data-sharing obligation share their relevant data completely and in a manner that is useful to receivers, and receivers respect users' privacy rights.

This leaves two possible institutions on the very right of Figure 3: regulators and generalist courts. *Generalist courts* are bound by strict rules (laws) and staffed by judges who have extensive knowledge of those laws. Their main advantage is that they are as independent and impartial as is possible, from the institutional setup. Their disadvantage is, apart from being very costly to use, that they have little knowledge of specific trades, for instance data-driven markets, and are not embedded in communities.

Candidate solution: *Regulators* improve on these shortcomings of generalist courts. They operate with more flexible decision-making rules and are often staffed by experts in the subject from different disciplines (e.g. lawyers, economists, data scientists). Regulators are also embedded in (expert) communities, which implies that they not only understand a specific industry better than generalist judges, they also receive more information via informal channels and from a greater variety of sources about the relevant parameters of a given case. Consequently, the probability to err about a decision that requires expert knowledge is lower among regulators than in generalist courts.

As explained in the previous subsection, the main disadvantage of regulators is that their community-embedding comes along with a higher likelihood of being influenced or "captured." This problem, however, can be minimized via a specific *organizational governance* structure, which is detailed in Graef and Prüfer (2021, section 3.3). That structure specifies which player

should take over which of the three key tasks necessary to enforce mandatory data sharing: investigation, decision making, and enforcement.[45] Evaluating all trade-offs, we conclude that *regulators* are the best available institution to solve the economic governance problems stemming from mandatory data sharing on data-driven markets.[46] Importantly, this insight is not an assumption, as in many other legal and economic papers that immediately assign the role of market intervenor to regulators or competition authorities. It is a result.

5 Conclusion

The typology of contract enforcement institutions explained in Section 3 offers a comprehensive and consistent toolkit with which many economic governance problems can be addressed. This includes rules that policy makers or other officials from the public or business spheres wish to implement, as well as private rules, starting from within-family behavior via conduct in online environments to the organization of clubs and international political treaties. Thereby, it offers a unified framework to address governance issues in society, politics, and the economy.

The procedure is simple. First, identify the central transaction, including the players and which real-world behavior constitutes *cooperation* or *defection*, respectively. Second, apply the economic governance typology as explained in Section 3 to structure the auxiliary transaction and identify effective institutions and the efficient institution. Third, design an organizational governance structure, potentially but not necessarily by means of a game-theoretic model, which makes sure all players identified in both transactions are incentivised to cooperate.

This procedure should be helpful both for policy makers and public administrators (just as many researchers in law, economics, and political science), who all too often narrowly consider the tools of public ordering and dismiss private ordering's enforcement capabilities (and that several types of private ordering exist). Endogenizing enforcement institutions and, beforehand, classification institutions can significantly broaden the available governance toolkit that decision makers have to solve diverse social dilemmas. Thereby, looking forward, it could contribute to rethinking and structuring the most pressing societal problems, including climate change, in-

[45] *Investigation*: Who collects and analyzes information about markets that could be data driven? *Decision making:* Who decides whether a market is found to be data driven and, if so, who has to share which data and who can access those data? *Enforcement:* Who sets up and manages the technological infrastructure necessary to share data and thereby monitors that mandatory data sharing is enforced properly

[46] Notably, this result does not rule out potential opportunism on the part of the regulating organization, for example, by extracting rents from dominant firms. To minimize this risk, as all state actors regulators are subject to regular parliamentary checks and decision makers of regulating agencies are accountable for their deeds.

equalities within and between countries, and the wicked alliance of both populist and autocratic policy makers with the latest technologies, including artificial intelligence.

References

Acemoglu, Daron, Johnson, Simon, and James A. Robinson. 2005. "Institutions as a Fundamental Cause of Long-run Growth," in: Aghion, Philippe, and Steven N. Durlauf (eds.), *Handbook of Economic Growth*, Vol. IA. Elsevier.

Argenton, Cédric, and Jens Prüfer 2012. "Search engine competition with network externalities," *Journal of Competition Law & Economics*, 8(1), 73-105.

Argenton, Cédric, and Xiaoyu Wang. 2022. "Information, coordination and legal ordering," mimeo.

Aristotle. 1984. "Nicomachean Ethics," in: *The Complete Works of Aristotle, vol. one and two: the Revised Oxford Translation*, J. Barnes (ed.), Princeton, NJ: Princeton University Press, 1984.

Armendáriz, Beatriz, and Jonathan Morduch. 2010. *The Economics of Microfinance*. Cambridge, MA: MIT Press.

Ayres, Ian, and John Braithwaite. 1992. *Responsive Regulation. Transcending the Deregulation Debate*. New York, Oxford: Oxford University Press.

Baker, George, Gibbons, Robert, and Kevin J. Murphy. 2002. "Relational Contracts and the Theory of the Firm," *Quarterly Journal of Economics*, 117: 39–84.

Baron, Daniel P. 2010. "Morally Motivated Self-Regulation," *American Economic Review*, 100: 1299–329.

Basu, Kaushik. 2018. *The republic of beliefs: A new approach to law and economics*. Princeton University Press.

Bernstein, Lisa. 1992. "Opting Out of the Legal System: Extralegal Contractual Relations in the Diamond Industry," *Journal of Legal Studies,* 11: 115–57.

Bernstein, Lisa. 2001. "Private Commercial Law in the Cotton Industry: Creating Cooperation Through Rules, Norms, and Institutions," *Michigan Law Review*, 99: 1724–90.

Bernstein, Lisa, Morrison, Alan, and J. Mark Ramseyer. 2015. "Private Orderings," *Journal of Legal Analysis*, 7(2): 247-250.

Blattman, Chris, Duncan, Gustavo, Lessing, Benjamin and Santiago Tobon. Forthcoming. "Gang Rule: Understanding and Countering Criminal Governance," *The Review of Economic Studies*.

Bühler, B., and F. Schütt. 2014. "Certification and minimum quality standards when

consumers are uninformed." European Economic Review, 70: 493–511.

Cabral, L.M.B., and A. Hortacsu. 2010. "The dynamics of seller reputation: theory and evidence from ebay," *Journal of Industrial Economics*, 58(1): 54–78 .

Camerer, Colin F. 2003. *Behavioral game theory: Experiments in strategic interaction.* Russell Sage Foundation.

Christmann, P., and G. Taylor. 2006. "Firm self-regulation through international certifiable standards: determinants of symbolic versus substantive implementation," *Journal of International Business Studies*, 37: 863–878.

Dellarocas, C., Wood, C.A. 2008. "The sound of silence in online feedback: estimating trading risks in the presence of reporting bias," *Management Science*, 54(3): 460–476 .

Dixit, Avinash. 2003a. "On Modes of Economic Governance," *Econometrica* 71: 449–81.

Dixit, Avinash. 2003b. "Trade Expansion and Contract Enforcement," *Journal of Political Economy* 111: 1293–317.

Dixit, Avinash. 2004. *Lawlessness and Economics: Alternative Modes of Governance.* Princeton, NJ: Princeton University Press.

Dixit, Avinash. 2009. "Governance Institutions and Economic Activity," *American Economic Review* 99: 5–24.

Edelman, Ben. 2011. "Adverse selection in online 'trust' certifications and search results," *Electronic Commerce Research and Applications*, 10: 17–25.

Ellison, Glenn. 1994. "Cooperation in the Prisoner's Dilemma with Anonymous Random Matching," *Review of Economic Studies,* 61: 567–88.

ENISA. 2013. "Schemes for Auditing Security Measures: An Overview," European Union Agency for Network and Information Security.

Friedman, J. 1971. "A Noncooperative Eqyuilibrium for Supergames," *Review of Economic Studies*, 38: 1-12.

Fukuyama, Francis. 1995. *Trust: The Social Virtues and the Creation of Prosperity.* Free Press.

Gambetta, Diego. 1993. *The Sicilian Mafia: The Business of Protection.* Cambridge: Harvard University Press.

Gibbons, Robert, and Rebecca Henderson. 2011. "Relational Contracts and Organizational Capabilities," *Organization Science*, 23: 1350-64.

Graef, Inge and Jens Prüfer. 2021. "Governance of Data Sharing: a Law & Economics

Proposal," *Research Policy*, 50: 104330.

Greif, Avner. 1993. "Contract Enforceability and Economic Institutions in Early Trade: The Maghribi Traders' Coalition," *American Economic Review*, 83: 525–48.

Greif, Avner. 2006. *Institutions and the Path to the Modern Economy: Lessons from Medieval Trade*. New York: Cambridge University Press.

Greif, Avner, Paul. R. Milgrom, and Barry. R. Weingast. 1994. "Coordination, Commitment, and Enforcement: The Case of the Merchant Guild," *Journal of Political Economy*, 102: 745–76.

Grossman, Sanford, and Oliver Hart. 1986. "The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Ownership," *Journal of Political Economy,* 94: 691–719.

Grossman, Gene M., and Elhanan Helpman. 1991. "Trade, knowledge spillovers, and growth," *European Economic Review*, 35, 2–3: 517-526.

Hadfield, Gillian K., and Iva Bozovic. 2016. "Scaffolding: Using Formal Contracts to Support Informal Relations in Support of Innovation," Wisconsin Law Review, 5: `wlr.law.wisc.edu/volume-2016-no-5/`

Hadfield, Gillian, and Barry Weingast. 2012. "What Is Law? A Coordination Model of the Characteristics of Legal Order," *Journal of Legal Analysis*, 4: 471–514.

Hadfield, Gillian, Prüfer, Jens, and Vatsalya Srivastava. 2024a. "Classification Through Thick and Thin: Permissive Norms and Strict Laws," mimeo, Tilburg University.

Hadfield, Gillian, Prüfer, Jens, and Vatsalya Srivastava. 2024b. "Clash of Classification Institutions," mimeo, Tilburg University.

Henrich, J., R. Boyd, S. Bowles, C. Camerer, E. Fehr, H. Gintis, and R. McElreath. 2001. "In search of homo economicus: Behavioral experiments in 15 small-scale societies," *American Economic Review*, 91: 73-78.

Hermalin, B.E., A. W. Katz, and R. Craswell. 2007. "Contract Law," in A. M. Polinsky and S. Shavell, eds., *Handbook of Law and Economics*, 3–138. Amsterdam: Elsevier.

Holmström, Bengt. 1979. "Moral Hazard and Observability," *The Bell Journal of Economics*, 10(1): 74-91.

Kali, R. 1999. "Endogenous Business Networks," *Journal of Law, Economics & Organization*, 15: 615–36.

Kandori, M. 1992. "Social norms and community enforcement," *The Review of Economic Studies*, 59(1): 63-80.

Landa, Janet T. 1983. *Political Economy of the Ethnically Homogeneous Chinese Middleman Group in Southeast Asia: Ethnicity and Entrepreneurship in a Plural Society.* Maruzen Asia.

Larrain, Maria, and Jens Prüfer. 2015. "Business Associations, Lobbying, and Endogenous Institutions," *Journal of Legal Analysis*, 7(2): 467-516.

Leeson, Peter.T. 2008. "How Important is State Enforcement for Trade?" *American Law & Economics Review*, 10: 61–89.

Macaulay, S. 1963. "Non-Contractual Relations in Business: A Preliminary Study, *American Sociological Review*", 28: 55-67.

MacLeod, Bentley. 2007. "Reputations, Relationships, and Contract Enforcement," *Journal of Economic Literature,* XLV: 595628.

Masten, Scott E. 2016. "Transaction Cost Economics," *Elgar Research Reviews in Economics.* Cheltenham, UK: Edward Elgar Publishing.

Masten, Scott E., and Jens Prüfer. 2011. "On the Evolution of Collective Enforcement Institutions: Communities and Courts," CentER Discussion Paper 2011–074, Tilburg University.

Masten, Scott E., and Jens Prüfer. 2014. "On the Evolution of Collective Enforcement Institutions: Communities and Courts," *Journal of Legal Studies,* 43: 359-400.

Mathis, J., McAndrews, J., and J.-C. Rochet. 2009. "Rating the raters: are reputation concerns powerful enough to discipline rating agencies?" *Journal of Monetary Economics*, 56: 657–674 .

Milgrom, Paul. R., Douglass. C. North, and Barry. R. Weingast. 1990. "The Role of Institutions in the Revival of Trade: The Law Merchant, Private Judges, and the Champagne Fairs," *Economics and Politics*, 2: 1–23.

Mokyr, Joel. 1990. *The Lever of Riches: Technological Creativity and Economic Progress.* Oxford University Press.

North, Douglass C. 1990. *Institutions, institutional change, and economic performance.* New York: Cambridge University Press.

Pearson, S. 2011. "Toward accountability in the cloud," *IEEE Internet Comput*, 15(4): 64–69.

Prüfer, Jens. "How to Govern the Cloud?" *IEEE CloudCom 2013*, DOI 10.1109/CloudCom.2013.100: 33-38.

Prüfer, Jens. 2016. "Business Associations and Private Ordering," *Journal of Law, Economics, & Organization*, 32(2): 306-358.

Prüfer, Jens. 2018. "Trusting Privacy in the Cloud," *Information Economics and Policy*, 45: 52-67.

Prüfer, Jens, and Christoph Schottmüller. 2021. "Competing with Big Data," *Journal of Industrial Economics*, 69: 967-1008.

Olson, Mancur. 2000. *Power and prosperity.* New York: Basic Books.

Ostrom, Elinor. 1990. *Governing the Commons: The Evolution of Institutions for Collective Action.* Cambridge, UK: Cambridge University Press.

Putnam, Robert D. 2000. *Bowling Alone: The Collapse and Revival of American Community.* Simon & Schuster.

Strausz, R. 2005. "Honest certification and the threat of capture." *International Journal of Industrial Organization*, 23: 45–62.

Tabellini, Guido. 2008. "The scope of cooperation: Values and incentives," *The Quarterly Journal of Economics*, 123(3): 905-950.

Tadelis, Steven and Oliver E. Williamson. 2012. "Transaction Cost Economics," in: Robert S. Gibbons and John Roberts (eds.), *Handbook of Organizational Economics*, Princeton University Press: 159-192.

Tilman, Andrew R., Dixit, Avinash K., and Simon A. Levin. 2018. "Localized prosocial preferences, public goods, and common-pool resources," *Proceedings of the National Academy of Sciences*, 116(12): 5305-5310.

Watson, Joel. 1999. "Starting Small and Renegotiation," *Journal of Economic Theory*, 85: 52-90.

Watson, Joel. 2002. "Starting Small and Commitment," *Games and Economic Behavior*, 38: 176-199.

Williamson, Oliver E. 1985. *The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting.* New York: Free Press.

Williamson, Oliver E. 2005. "The economics of governance," *American Economic Review*: 1-18.

Williamson, Oliver E. 2010. "Transaction Cost Economics: The Natural Progression," *American Economic Review*, 100 (3): 673-690.