

# Market building by strategic interactions: The role of powerful private actors and the state

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## Abstract

We analyse the building of markets, the central institutions in modern societies. We base our analysis on a game-theoretic approach that formalises how markets are built in a decentralised manner by the strategic interactions of actors whose expectations have to be aligned. Markets organise economic exchange among many participants whose action choices may be anonymous and simultaneous but are always interdependent. Private and state actors invest in the building of markets to reduce transaction costs and enable growth. Those who invest in market building critically influence which of the many possible market solutions evolve. In three case studies, we describe how private investment in information management, as well as standardisation and the development of products, creates and stabilises markets. We discuss how the state uses regulation, market participation, information management, and public investment to ensure that private initiatives can take place and that what evolves out of private initiatives remains in accordance with societal goals.

**Keywords:** strategic interactions; market building; private investment; state intervention.

**JEL:** E02; L10; P51.

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# 1 Introduction

After several decades in which the state was advised to withdraw from markets and practice deregulation and liberalisation, we have recently seen a series of market interventions in liberal Western societies: Since the 2007 Great Recession and beginning with the financial sector, various kinds of state actions have been carried out in several markets. The heaviest occurred during the COVID-19 pandemic. Severe restrictions on particular transactions were altering and destroying the established business models of firms and industries. The war in Ukraine required major adjustments in the European energy markets, which have mostly been state-led. Export controls and foreign investment screening mechanisms were implemented based on the idea of the need to secure ‘critical infrastructure’ from foreign (Chinese) control and industrial espionage.

The state invested in changing markets when outcomes came into conflict or threatened to come into conflict with political goals. Moreover, the state invested in creating markets that could hardly emerge from private initiatives alone or with the desired outcomes. Again, the pandemic resulted in the most direct measures when states and the EU organised the market for vaccines. Environmental policy, increasingly intertwined with industrial policy, became a tool of state intervention for market building. Large amounts of taxpayers’ money go into industrial policy initiatives such as the ‘Green Deal’, the ‘Global Gateway’, the ‘Build Back Better World’, or the ‘Inflation Reduction Act’.

This article aims to comprehend the role of powerful private actors and the state in the creation and changing of markets through the application of a theory of market building by strategic interactions. It is thereby important to distinguish the institution ‘market’ from the various structures and outcomes markets can produce. We make use of progress in and discussion about a theory of institutions and apply this theory to the building of markets in modern market economies. We consider a new line of the literature that combines the formerly separated equilibrium account and regulative rules account to create a ‘rules-in-equilibrium’ account of institutions (Hindriks & Guala 2015).

Equilibrium is important because institutions are human-made structures that need acceptance to become effective. *‘For rules to be followed, they must be regarded as legitimate, enforceable, reasonable, agreeable, or else by all the actors’* (Aoki 2015):486. Binmore (2015):494 agrees that *‘... an institution needs to be in some kind of equilibrium to survive, and survival is fundamental. Rules are necessary but subsidiary.’* This account is not undisputed. Searle (2015) opposes the idea of equilibrium being fundamental. For him, institutions are systems that enable the creation and maintenance of status functions (Searle 2015):507. Equilibrium is not needed. In spite of this controversy, Hindriks & Guala (2015) and their prominent commentators agree on the importance of institutions and their various tasks, as well as their material and non-material manifestations.

We build on a game-theoretic approach by Aoki (2001) that constitutes an early version of the rules-in-equilibrium approach. However, we take the critiques by Searle (2015), Hodgson (2015), and Sugden (2015) seriously. For our task, the study of markets, equilibrium is crucial. Markets are not declared or commanded; they are created by some actor's initiative and many actors' coordination. Most actors are private. Markets require more than tacit acceptance; active participation is needed. Power and outside options may be asymmetrically distributed, which gives some actors more influence on rule-setting than others. This certainly affects the outcomes but participation remains voluntary. When Loasy (1999) states that 'markets are goods', he stresses the point that markets are produced and resources are used to produce them. The resources are used tactically by those who provide them. It is not guaranteed that market outcomes are according to the plans of the investing parties, but it is naive to expect the market to be neutral or innocent to the investor: Markets are created to facilitate economic exchange in a way that generates the best expected outcome for those who invest in market building.

Often it is private investors who build markets in the pursuit of profits, but it does not have to be. The state, ideally as an actor on behalf of the interests of society, can interfere or even take the initiative. At times, private investment does not suffice and the state has to participate or change incentives by using various means. Rodrik (2011):xviii makes this point forcefully: '*... [M]arkets and governments are complements, not substitutes. If you want more and better markets, you have to have more (and better) governance.*' The feasible action set that the state can use to affect markets varies across time and space with economic and political situations and ideas. This article makes the following important and consequential points: Markets are contingent and their outcomes can be affected but not foreseen. Powerful private actors and the state take the lead but the market is established, sustained, and changed by the acceptance and coordination of many actors. Studying market building by strategic interactions makes it possible to better understand the evolution of markets, about which the economics literature still has little to say.

The article is structured as follows: In Section 2, we present the game-theoretic framework that gives a generic representation of a market as an institution that is endogenously created by strategic interactions. In Section 3, we discuss information compression as a central function and multiplicity as a central feature of markets. We further discuss how markets provide a system of rules that creates regularity of behaviour but allows change and coevolves with environmental factors and market participants in the long run. In Section 4, we illustrate functions and features in three examples from private market creation: We show in the case studies of the Cotton Broker Association, Standard Oil, and Amazon how private initiatives affect the finding of and the choice among alternative market solutions. In Section 5, we discuss four instruments the state uses to support finding or changing a market solution. In Section 6, we summarise and conclude.

## 2 Market building by strategic interactions

Aoki (2001) delivers a game-theoretic approach to institution building. We adopt this approach to analyse markets as outcomes of strategic interactions and means to structure beliefs and coordinate actions. In the frame of an economic exchange game, actors choose actions based on expectations about present and future payoffs, considering the observed consequences of the combined actions in previous periods. The consequences are summarised in the market and the environment, including the institutional environment, that the market is embedded in. Markets themselves are institutions that stabilise when actors succeed in aligning expectations and action choices become mutually best responses.

In the game-theoretic approach, institutions are defined as *‘the common beliefs about the rules of the game that are endogenously created through the strategic interactions of actors, held in the minds of actors, and are thus self-sustaining as equilibrium of the game’* (Aoki 2001):10.<sup>1</sup> How well this definition fits for every institution is hotly debated, but it certainly fits for markets: Markets result from the interplay of many actors. Once established, they guide actors in making action choices, generating regularity of behaviour and causing strong path dependencies in market states. Ex-ante, many alternative market solutions may emerge as an outcome for the same kind of economic exchange. In strategic interactions, actors coordinate on one of these solutions.

### 2.1 Game-theoretic foundations

Consider a set  $N = \{1, 2, \dots, n\}$  of a finite number of actors engaged in the economic exchange of a specific good, service, or factor and a set  $\mathcal{A}_i = \{a_i\}$  of technologically feasible actions, one for each actor  $i$ . The combination of actions by all actors is called an *action profile*  $\mathbf{a}$ .  $\mathcal{A} = \times_i \mathcal{A}_i$  is the set of action profiles with a generic element  $\mathbf{a} = (a_1, a_2, \dots, a_n)$ . Time is denoted by  $t$ .  $\mathbf{a}(t)$  is the realised action profile at  $t$ . It constitutes the state of the economic exchange, which we call the *market state*.  $\Omega$  denotes the set of consequences of action profile  $\mathbf{a}$ . A *consequence function*  $\phi$  assigns a consequence  $\omega$  in  $\Omega$  for each possible action profile  $\mathbf{a}$  in  $\mathcal{A}$ , such that  $\omega = \phi(\mathbf{a})$ .

The consequence function depends on a vast set of parameters  $\mathcal{E} = \{e\}$  that determine the state of the environment  $e$  in which the economic exchange takes place. Environmental parameters include initial endowments of resources, the state of production technologies, and the state of social arrangements in different domains of the society that form the institutional environment relevant for the economic exchange: laws, regulations, and policies

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<sup>1</sup>This notion of institutions as equilibrium outcomes is also close to Greif (2006):382’s definition of institutions as systems of social factors that conjointly generate regularity of behaviour. The factors are social in that they are human-made. Institutions are human-made non-physical factors. They are exogenous to each actor whose behaviour they influence. However, they are endogenous to the interplay of many actors.

(political domain); norms, values, conventions, social roles, and networks (sociocultural domain); and firms and other markets (economic domain). The consequence function incorporates the *exogenous rules* of the game á la North (1990).

Actors' action choices may not necessarily be observable by others but their consequences are. In each period, each actor chooses one action according to a *private action choice rule*  $s_i : \Omega \rightarrow \mathcal{A}_i (i \in N)$  that is based on the observable consequences of the action profile realised in the previous period:  $a_i(t+1) = s_i(\omega(t)) = s_i(\phi(\mathbf{a}(t)))$ . For assessment, each actor uses a payoff function  $u_i$  defined on the consequence space. We assume that actors intend to maximise their payoffs from their action choices, even if they are bounded in their abilities to do so. Action choice rules and the consequence function define the transition of the market over time as  $\mathbf{a}(t+1) = \mathbf{s}(\phi(\mathbf{a}(t))) = F(\mathbf{a}(t))$  for all  $t$ , where  $F : \mathcal{A}(t) \rightarrow \mathcal{A}(t+1)$  denotes the *transition function* that defines the new market state. A market stabilises, i.e. a steady-state equilibrium is reached, if  $\mathbf{a}(t) = \mathbf{a}(t+1) = \mathbf{a}(t+2) = \dots = \mathbf{a}^*$ , where all actors stay with their action choice from  $t$  on in every period.

It is not trivial that the market state can be stabilised. Since the payoff of each actor  $i$  depends not only on  $i$ 's own action choice but also on the realised combination of all action choices, each actor needs to form expectations about other actors' action choice rules. The transition function is then given by  $\mathbf{s}(\phi(\mathbf{a}(t))) = \{s_1(\phi(\mathbf{a}(t))), s_2(\phi(\mathbf{a}(t))), \dots, s_n(\phi(\mathbf{a}(t)))\}$ , the combination of all actors' private action choice rules, which we call a *strategy profile*  $\mathbf{s}$ . We use  $\sigma_{-i} : \mathcal{A} \rightarrow \mathcal{A}_{-i}$  to represent each actor's expectation of the other actors' action choice rules. If expectation  $\sigma_{-i}$  is consistent with the other actors' actual action choices and if  $i$ 's action choice is the best response to  $\sigma_{-i}$  given the market state  $\mathbf{a}(t)$ , then there exists a strategy profile  $\mathbf{s}^*(\phi(\mathbf{a}))$  that maximises  $i$ 's payoff such that

$$\begin{aligned} \sigma_{-i}(\phi(\mathbf{a}(t))) &= \mathbf{s}_{-i}^*(\phi(\mathbf{a}(t))), \\ \mathbf{s}_i^* &\in \underset{s_i}{\operatorname{argmax}} u_i(s_i(\phi(\mathbf{a}(t))), \sigma_{-i}(\phi(\mathbf{a}(t))), \end{aligned}$$

for all  $\mathbf{a}(t) \in \mathcal{A}, \omega(t) \in \Omega, t \geq 0$ , and all  $i$ . If every actor  $i \in N$  follows the private action choice rule that is expected by others, then the realised strategy profile is an equilibrium. The *equilibrium strategy profile*  $\mathbf{s}^*$  constitutes *rules-in-equilibrium* in the vein of Aoki (2001) and Hindriks & Guala (2015).  $\mathbf{s}^*$  is *self-sustaining* because no actor has an incentive to unilaterally deviate from his/her strategy. Its steady-state equilibrium trajectory is  $\mathbf{a}(t) = \mathbf{a}(t+1) = \dots = \mathbf{a}(t+n) = \mathbf{a}^* = \mathbf{s}^*(\phi(\mathbf{a}^*))$ , which results in an equilibrium with a stable market state. The consequences of the market-constituting action choices,  $\omega$ , are observed by all actors period after period as *market outcomes*.

## 2.2 Institutions as shared beliefs that feature multiplicity

Expectations about other actors' action choice rules that turn out to be mutually met seem impossible to find. In complex societies, we do not even know how many actors are involved, let alone can we form accurate expectations about every actor's action choice in every situation. Fortunately, for  $\sigma_{-i}$ , actors need not form expectations regarding every detail of every other actor's action choice rules. Actors do not even need to observe all actions chosen in the past, i.e. they do not require full information about previous market states. To successfully coordinate action choices, it is enough that actors have a *summary representation of the equilibrium path*, that is, compressed information about the way the economic exchange is organised, which allows actors to form 'correct beliefs' about others' action choice rules and therefore the current or evolving equilibrium.

We use  $\Sigma_i^*(\mathbf{s}^*)$  to represent the individual belief held in the mind of actor  $i$ . It consists of two parts: shared beliefs  $\Sigma^*(\mathbf{s}^*)$  and private residual information  $I_i^*(\mathbf{s}^*)$  about the equilibrium.  $\Sigma^*(\mathbf{s}^*)$  is the intersection of individual beliefs and captures *beliefs about the equilibrium held by all actors*, that is, their *common understandings or distributed cognition of the 'rules of the game'*.  $\Sigma^*(\mathbf{s}^*)$  is the *institution* that summarily represents the equilibrium strategy profile  $\mathbf{s}^*$ .  $\Sigma^*(\mathbf{s}^*)$  is consistent not only with one unchanged market state  $\mathbf{a}^*$  but with a bound of market states  $\mathbf{a} \in \hat{\mathcal{A}}$  within a bound of states of the environment  $e \in \hat{\mathcal{E}}$ . In equilibrium,  $\Sigma^*(\mathbf{s}^*)$  is confirmed by the consequences of the evolving market states period after period. Incorporating shared beliefs provided in the environment,  $\Sigma^*(\mathbf{s}^*)$  may precede an equilibrium strategy profile and guide actors in finding it. We call the equilibrium strategy profile  $\mathbf{s}^*$  and corresponding shared beliefs alias institution  $\Sigma^*(\mathbf{s}^*)$  a *market solution*.

$\Sigma^*(\mathbf{s}^*)$  is characterised by five features: endogeneity, information compression, robustness, universality, and multiplicity (Aoki 2001):197. Institutions are endogenous because they arise as outcomes of strategic interactions. Institutions compress enough information to guide actors towards mutually met expectations and a self-sustaining strategy profile. Institutions are robust to changes within a certain bound of states of the market and the environment and robust to minor mistakes, experiments, and deviance by actors from rules implied by the institutions. Institutions are universal in so far as they are relevant to all participants in the game, providing them with common knowledge and distributed cognition about the ways in which 'the game is played', although actors may attach different meanings and normative evaluations to them.<sup>2</sup> Multiplicity entails that a number of alternative institutions may evolve within  $\hat{\mathcal{E}}$ .

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<sup>2</sup>The variety of meanings and evaluations attached to an institution by actors can be identified as ideologies (Aoki 2001):202. Their support hinges on the power distribution among different groups of actors (governments, entrepreneurs, workers) and relates to social roles and network positions (Beckert 2010).

Alternative institutions guide actors towards alternative paths of equilibrium strategy profiles. For our analysis, this means that along the alternative paths, markets may stabilise at different time points, in different states, and with different outcomes, including prices, volumes, and the distribution of income. In this conceptualisation of markets, variety of ways to organise economic exchange is not a consequence of failure, inefficiency, or imperfection but of coordinating on one of many alternative equilibria. Alternative market solutions may not always be easily ranked. There may not exist one single best solution within  $\hat{\mathcal{E}}$ . Different social groups may favour different solutions for the different outcomes that are achieved. Consequently, there is social conflict over which market solution should be established, sustained, or replaced.

### 2.3 The institutional features of markets

There are many definitions for markets; most are overlapping or at least compatible in the sense that they put emphasis on different functions and features of markets. We focus on the institutional features of markets that include a behavioural dimension and a cognitive dimension and require the distribution and shared interpretation of information. We analyse markets as social arrangements that serve as cognitive media between strategic interactions and individual beliefs. This follows Aoki (2001, 2011), who aims to deliver a unified theory of institutions that incorporates insights and approaches from behavioural economics, neuroeconomics, and economic sociology.

Aoki's theory of institutions solves the tension between seeing institutions as exogenous rules (North 1990, Searle 2005) versus seeing them as self-sustaining equilibrium outcomes (Schotter 1981, Greif 2006) in a similar manner as the rules-in-equilibrium approach proposed by Hindriks & Guala (2015), which is extensively discussed in a series of comments by contemporary scholars working on theories of institutions (Aoki 2015, Binmore 2015, Hodgson 2015, Searle 2015, Sugden 2015, Herrmann-Pillath 2017). Building on Aoki (2011) and going beyond Hindriks & Guala (2015), we stress the importance of the representation of the equilibrium in the market and in the institutional environment of the market. Every participant who enters the market will find the information needed to form correct beliefs and make optimal action choices summarised in material and non-material representations of the equilibrium strategy profile.<sup>3</sup>

The presented game-theoretic approach is in accordance with Herrmann-Pillath (2017), who sees the market as an institutionalised circular causal loop between individual-level belief formation and population-level behavioural patterns. Institutionalisation requires

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<sup>3</sup>This offers a reconciliation of the mentalist view versus the materialist view of institutions. While the former focuses on the internal states of individuals, such as shared beliefs (Aoki 2001), collective intentionality (Searle 2005), or group-mind (Douglas 1986), the latter focuses on external societal artefacts such as organisations, money, prices, and symbols, which carry some social meanings and induce certain expectations in the minds of actors (Sarasvathy & Dew 2005, Çalışkan & Callon 2009).

the generation, standardisation, communication, and processing of information relevant for the economic exchange. We argue that this takes place within strategic interactions and with the help of societal artefacts and cues that provide summary information about the equilibrium strategy profile, which is commonly observable and, importantly, commonly cognisable by the actors.<sup>4</sup> Published reference prices are an example of such artefacts, which structure beliefs and action choices, but there are more: Marketplaces, product features, more variable sales prices, and the market volume also carry equilibrium information. They serve as salient public indicators that, taken together and in support of further structure provided by the institutional environment, are able to guide actors in forming correct beliefs and coordinating action choices, approaching a regularity of behaviour and a stabilisation of the market state. We discuss information compression as a central institutional feature of the market in more detail in subsection 3.1.

## 2.4 The institutional environment of markets

In our game-theoretic approach, the institutional environment affects the shape of the consequence function  $\phi$ . Recall that  $\phi$  gives the relationship between the market state and the market outcomes,  $\omega = \phi(\mathbf{a})$  which depends on the state of the environment. The institutional environment comprises a vast set of factors from the sociocultural, political, and economic domains of societies that together shape the consequence function and determine the payoff of each feasible action choice and therefore also the prices, quantities, and distribution of income that result from the realised market state  $\mathbf{a}(t)$  at  $e_t$ .

Markets enter the institutional environment of other markets. The institutional environment therefore includes a conglomerate of shared beliefs and material and non-material summary representations of equilibria that guide actors in coordinating the economic exchange of many goods, services, and factors. The existing market solutions provide a basis and serve as templates for exploiting novel opportunities for economic exchange, i.e. for creating new markets. The result is complementarities and path dependencies in institutional and economic development (Milgrom, Qian & Roberts 1991, Hall & Soskice 2001). In a similar manner, markets affect other social arrangements; firms in particular but also public entities at different levels. We make this point in Section 4 using the establishments of the Cotton Broker Association, Standard Oil, and Amazon as examples.<sup>5</sup>

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<sup>4</sup>Institutionalisation requires that actors are able to derive similar inferences from public information and turn them into shared beliefs that correspond with Lewis (1969)'s notion of *common knowledge*. Imitation, learning, societal artefacts, and cues support a transmission of the cognitive processes that take place in the minds of actors (Sugden 2011). The outcomes of this transmission are what the cognitive science literature terms *shared mental models*, *cognitive frames*, and *distributed cognition*, which refer to a standardised selection and interpretation of information, the formulation of expectations, and the translation of expectations into action choices across all actors (Cisek 2012, Greif & Mokyry 2017).

<sup>5</sup>While transaction cost theories building on Coase (1937) focus on make-or-buy-decisions, which induces one to see markets and firms as substitutes, markets and firms are also complements. En-



The state can serve as an innovator, risk-taker, signalling actor, and regulator of and investor in market building (Mazzucato 2013). Although the state may become an economic actor, its primary field of operation is the polity that constitutes a crucial part of the institutional environment of markets. Two important roles of the state are (i) setting and enforcing legal rules that organise the relationship between ordinary citizens and state authorities and (ii) providing public goods. In both roles, the state's actions have significant effects on market organisation. The rules determined in the political realm and the provided public infrastructure build the basic framework in which economic exchange takes place. State rules and state investment constrain and incentivise private action choices and thereby restrict the set of possible market solutions as exogenous factors (North 1990). Demsetz (2013) argues that the role of the state in directing market building increases with the degree of economic specialisation and, more generally, with the complexity of a society.

North (1994) and Aoki (2011) argue that preferences and cognition are subject to deep social influences. The sociocultural domain is a rich source of common understandings and distributed cognition in society. People use cultural mental models, including categories, identities, narratives, and worldviews, to process information (Hoff & Stiglitz 2016). The mental models are diffused and changed in social networks (Granovetter 2005). In different social contexts, actors, for example, evolve different levels of trust and degrees of risk aversion, which affects the feasibility of coordination and cooperation for economic exchange. Consequently, the set of possible market solutions, as well as the boundaries of the firm, vary with the cultural mental models to which actors are exposed or accustomed. North (2005) understands cultural beliefs as a common prior in the framework in which behavioural beliefs are formed. Aoki (2010, 2011) agrees by stating that economic actors are bound to use mental models and incorporate beliefs originating from the sociocultural realm of a society when they form their individual and shared beliefs about the way a specific kind of economic exchange is organised.

### **3 The functions, features, and evolution of markets**

In the previous section, we suggested understanding and analysing markets as outcomes of the strategic interactions of actors who coordinate to organise economic exchange. Actors include buyers and sellers but also intermediaries for exchange such as traders or banks. Usually, there are many actors involved and there are a number of alternative ways to coordinate action choices. Which mode of coordination is chosen and therefore which

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entrepreneurs and firms play a key role in building, stabilising, and changing markets. Entrepreneurial firms serve as innovators and risk-takers, while incumbent firms serve as relatively stable vehicles of routines (Schumpeter 1911). Simon (1991) provides an interesting view on the relationship between firms and markets. For an evolutionary view, see Herrmann-Pillath & Hederer (2022).

market solution is established depends on a number of factors, including the number of actors, size and power distribution among the actors, characteristics of goods and services, transaction cost of the exchange, experiences from other markets, resource endowments, state of the technology, and regulations imposed by the state. These factors are exogenous to the individual actors at time point  $t$  when they make the action choices that, in combination, establish the market state. However, these factors are strongly influenced by past combinations of chosen actions.

Coordinating action choices in a complex society is not easy, considering the many actors who participate in economic exchange and the many actions that each actor may choose at each time point. The multiplicity of optimal ways to organise the economic exchange makes an alignment of expectations and action choices even more complicated. To succeed in coordination, the information requirement on beneficial transactions must be reduced. Loasby (2000):299 explains the following: *‘[I]t is by preventing the exploration of many possibilities that institutions [here markets] economize each individual’s scarce resource of cognition and focus the attention of that individual on a particular range of options.’* The standardisation of goods and services (Swann 2010) and homogenisation of organisations and organisational practices (DiMaggio & Powell 1983), as well as reference prices (Eichenbaum, Jaimovich & Rebelo 2011), are means of information compression used to reduce informational complexity. Competition in markets also induces actors to reveal trade-relevant private information (Makowski & Ostroy 2001):480. In a world of imperfect information, costly information acquisition and processing, and costly decision-making, reduction of complexity enables to take any action at all (Loasby 1999):124.

The information that is compressed in the market and made available to all participants makes it possible to increase the number of transactions and decrease the costs per transaction. This allows to expand the exchange relationship from 1 : 1, i.e. one buyer and one seller, to an  $n : m$  relationship with many buyers and many sellers. Once established, the market solution is self-enforcing and robust enough to survive smaller mistakes, shocks, product innovation, the entry and exit of firms, and growth.

### **3.1 Markets compress information**

Modern markets and their environment provide enough information for actors to set up compatible strategy plans in simultaneous and anonymous decision-making settings. Options of bilateral trade are restricted through the standardisation of weights, measures, and qualities, transaction procedures, and accounting, by clarifying the rules of interaction and the settlement of conflict, and very often by providing a reference price. Unlike the sales price, which adjusts to changes in demand and supply on short notice, the reference price provides information on the long-run value of the traded good, service, or asset and the long-run profitability of engaging in its economic exchange. The weighted

average of actual transaction prices is often used. It is particularly inertial and compresses information on the established conduct of exchange, which guides actors in making the best action choices under these conducts. Berka, Devereux & Rudolph (2011) and the pricing literature cited therein demonstrate the coordinating role of the price. Berka et al. (2011) are interested in price-setting behaviour at the micro-level and study the prices of different products in a Swiss online supermarket to find frequent price changes that are quickly reversed. They conceptually differentiate between a rather unchanged reference price (sticky for 37 months on average) and sales prices, which change more often. The reference price changes slowly with market conditions. It is the price that producers, wholesalers, and consumers coordinate with.

The findings of Berka et al. (2011) are supported by Eichenbaum et al. (2011), who assess the importance of nominal rigidities and the usefulness of reference prices as statistics in macroeconomic analyses. While Berka et al. (2011):1 *'find that the characteristics of price adjustments seem to be substantial at odds with standard theory'* and Eichenbaum et al. (2011):235 *'argue that [their] evidence is inconsistent with the three most widely used pricing models in macroeconomics'*, a theory of market building by strategic interactions fits their empirical findings well: Coordination in the market requires a reference point to align the individual beliefs on both market sides. Price information helps. Reference prices provide public information on the prospects of economic exchange in the long run. Sales prices, in contrast, indicate short-run profit opportunities that guide actors in adjusting their plans to temporary changes in demand and supply. The short-run adjustments make the long-run equilibrium robust.

Aldous & Coyle (2021) describe the many activities related to the distribution of price information and the standardisation of qualities and measures that went hand in hand with the emergence of the world market for cotton and cotton products in Liverpool. The price information of raw cotton in Liverpool was first made available in 1787 by the *Prices Current* – a monthly published sheet collecting the most important import prices. After 1805, a *Weekly Circular* of cotton prices was published first only by one broker (Ewart and Ruston) and later as a *General Circular* involving almost the whole cotton market. The establishment of a clearing house for futures and the Liverpool cotton exchange made prices observable on a daily basis.<sup>6</sup> Providing product and price information was the most important reason for the success of Liverpool's Cotton Broker Association (CBA) over its competitors in Manchester and Lancashire. We will discuss the undertakings of the CBA to establish the Liverpool cotton market in more detail in subsection 4.1.

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<sup>6</sup>The comprehensive information on the cotton market was sent to the spinners inland, who could then make better-informed purchasing decisions (International Cotton Association 2022).

The important role of widely available price information is also characteristic for other commodity markets: The Libor (London Interbank Offered Rate) serves as a reference price in the credit business. Platts' benchmark prices structure the oil market. If markets are supposed to function as microeconomic theory assumes, price information needs to precede optimisation. Prices, however, convey information other than scarcity (Stiglitz 2000):1449. Prices carry institutional information and so do product qualities, sold quantities, and other market outcomes. Aoki (2017) underlines the role of 'external cognitive sources' shared by all actors that help each actor to economise the information-processing necessary for the action choice. Accordingly, Kjellberg & Helgesson (2006) emphasise the market's role as a sign system and representation of the rules governing the exchange that generates and distributes information. Common knowledge about product measures, qualities, and prices reduces information requirements and supports the formation of shared beliefs about the rules of the game. This enables strong growth since market entrants instantly find the relevant data to coordinate their actions with. Market participants' choices of measures, quality, and prices are restricted and coordination is enabled by making at least one alternative known to everyone.

### 3.2 Markets feature multiplicity

Multiplicity entails that of a set of alternative institutions  $\Sigma^{\mathbf{E}} = \{\Sigma^*, \Sigma^{**}, \dots, \Sigma^{k^*}\}$ , one element will be realised. Alternative institutions compress different information and guide actors in finding and sustaining one of the different equilibrium paths  $\{\mathbf{s}^*\}$ ,  $\{\mathbf{s}^{**}\}$ ,  $\dots$ ,  $\{\mathbf{s}^{k^*}\}$  that might also have been achieved at  $e \in \hat{\mathcal{E}}$ . Given that the set of alternative market solutions is potentially vast, it is hard to think of any two realised markets with the corresponding institutions as being identical.

Roth (2018):1610 discusses how the shapes and functions of marketplaces vary across time and space: *'marketplaces—which consist of infrastructure, rules, and customs through which information is exchanged and transactions are made—can be relatively small parts of large markets. Participants may have large strategy sets, i.e., many options available to them, beyond those available in any particular marketplace.'* Roth (2018) makes the point that without any imposed restrictions, the set of technologically feasible strategies of market participants is huge. However, at each marketplace, only a small subset of strategies becomes applicable. These subsets may or may not overlap across the different marketplaces. Consequently, different methods of exchange may be established at different marketplaces for the same kind of exchange. This holds especially for exchanges that need to be organised at a local scale due to the specificity of the good, service, or factor and due to limitations of trade. Different market solutions may not be easily ranked but some may be supported more than others at the individual, group, or societal levels.

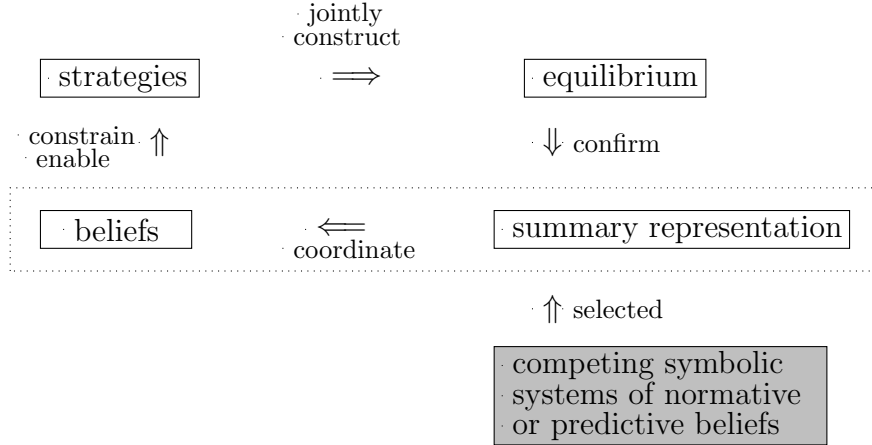
Kirman (2011) presents research on the organisation of fish markets to show that price finding differs strongly between different locations. In some fish markets, prices for fish are found in English auctions; in others, they are found via Dutch auctions; in still others, prices are negotiated bilaterally; and in yet other fish markets, take-it-or-leave-it offers are proposed. In some places, several of the price-finding mechanisms work at the same time. There are different time windows for different ways to trade fish. However, in every place and at any time, the rules are clear for participants and conduct is determined. The outcomes differ. Since it is the same good, fish, the systematic difference stems from market organisation only. Each mode of organisation fulfils its task, which is to match suppliers and customers who agree when trading a particular unit of fish for a particular price. Each of the analysed fish markets has a long tradition. They were established centuries ago. The rules according to which they function have not changed much. They survived the introduction of the supermarket, department stores, the refrigerator, and other innovations. Fish markets have reopened after wars, occupations, floods, and earthquakes. They proved to be durable without losing multiplicity in the sense that fish markets did not converge to one method of price finding; the variety of organisation is persistent.

For local marketplaces, alternative solutions for organising economic exchange can be directly compared. For marketplaces with a worldwide scope, comparisons may have to be made over time if alternatives are missing. The commercialisation of the internet and the invention of online marketplaces has created whole new worlds of possibilities for organising economic exchange, which required a redefinition of the marketplace. The virtual space became a new meeting and coordination point for the exchange of information, goods, services, and factors. It altered the meaning of physical space, as well as the limitations that were implemented with respect to how much information, goods, services, and factors can be exchanged at one marketplace. The omnipresence of some market solutions in the globalised world may give market participants the impression of their ‘natural existence’ or ‘superiority’ and conceal that the established mode of organising exchange is only *one possible solution* that is human-made and requires the support of an institutional environment.

### **3.3 Markets provide regularity but allow change**

Aoki illustrates his understanding of institution building in a figure that shows how markets are built and sustained based on the shared beliefs of an (envisioned) equilibrium strategy profile. Figure 1 reproduces Aoki (2001)’s Figure 1.1. It visualises the feedback loop between behavioural and cognitive processes, i.e. strategies and beliefs, at the individual level and at the collective level. Institutions work at the cognitive individual and collective levels, as indicated by the broken-line box.

Figure 1: Reaffirmation of the equilibrium over time.



The authors' own representation of Figure 1.1 in Aoki (2001):12.

The causal mechanism is as follows: Observing past market outcomes  $\omega(t-1)$  and deriving individual payoffs with the help of the payoff function  $u_i$ , actor  $i$  reconsiders his/her private strategy  $s_i$ .  $i$  then chooses an action based on individual beliefs about the present and future period action choices of the other actors induced by their strategies  $s_{-i}$  and contingent on a potential change in the state of the environment  $e$ . Recall that individual beliefs comprise shared beliefs  $\Sigma^*(\mathbf{s}^*)$  and private information  $I_i^*(\mathbf{s}^*)$ ; the former depends on tacit and symbolic summary representations of the (envisioned) equilibrium strategy profile. Institutions are held in the minds of actors, but they also exist in externalised substantive forms, such as symbols and cues, that inform all actors about the state of the market and environment.  $\Sigma^*(\mathbf{s}^*)$  enables  $i$ 's expectations  $\sigma_{-i}$  to match others' action choice rules  $s_{-i}$ . Reassured that  $\sigma_{-i} \approx s_{-i}$ ,  $i$ 's equilibrium strategy becomes  $\mathbf{s}_i^*$ , with the corresponding equilibrium action choices. If this applies to many actors and no big player deviates from the mutually expected action choices, the jointly constructed strategy profile  $\mathbf{s}^*(\phi(\mathbf{a}))$  is confirmed and the market state stabilises over time. On the equilibrium path, the summary representation, beliefs, and strategies are reaffirmed period after period.<sup>7</sup>

Despite the strong force of reaffirmation, there is no reason to assume that every actor's strategy will remain unchanged forever once an equilibrium is reached. Given the multiplicity of market solutions and the information-revealing feature of the market, there are opportunities and incentives for market participants and the government to improve efficiency, increase the number of actors or transactions per actor, and change the distribution of income. Suppose, for instance, that new private information alters  $I_i^*(\mathbf{s}^*)$

<sup>7</sup>Note that the reproduction of the strategy profile and stabilisation of the market state does not mean that the observed market outcomes are unchanged. Some market outcomes can change significantly over time under stable action choice rules. Changing outcomes may be the individual and aggregate production volumes: The equilibrium strategy may accommodate, e.g. an annual increase in output of  $x$  percent.

and induces a change in  $i$ 's strategy. Since private information is not available to others, only  $i$  may change their strategy. If this does not change the payoffs of the chosen actions of others, there is no reason for the other actors to adapt beliefs in spite of  $i$ 's deviation.<sup>8</sup> The market solution, i.e. the equilibrium strategy profile  $\mathbf{s}^*(\phi(\mathbf{a}))$  and corresponding shared beliefs  $\Sigma^*(\mathbf{s}^*)$ , remain unchanged. Actor  $i$  may realise an (additional) payoff and stick to the new strategy or return to the old one if the payoff was unsatisfactory.

The market solution may even survive if  $i$ 's new strategy induces changes in the strategies of other actors in a way that others' strategy updates compensate for  $i$ 's strategy change. After the strategy adjustments, individual payoffs may have changed for some actors but aggregate market outcomes remain roughly the same. The equilibrium strategy profile  $\mathbf{s}^*(\phi(\mathbf{a}))$  and shared beliefs  $\Sigma^*(\mathbf{s}^*)$  can be sustained. Such a behaviour has a flavour of firm reactions in a Cournot model, where the expansion of one firm's output is compensated by other firms' output reductions. The Cournot model presumes a roughly unchanged market volume, which may not be needed for sustaining a market solution. With growing demand, some firms may expand production without requiring a reduction in production and the strategy updates of others. The rules governing economic exchange remain stable despite market growth. Reaffirmation based on the last period's market outcomes stabilises the market state as long as the transition  $F : \mathcal{A}(t) \rightarrow \mathcal{A}(t+1)$  does not require major strategy changes from others. This even makes it possible to accommodate expected and unexpected market entry and exit. The market solution will survive as long as the equilibrium strategies of actors with sufficient accumulated market power remain unchanged.  $\sigma_{-i}(\phi(\mathbf{a}(t))) \approx \mathbf{s}_{-i}^*(\phi(\mathbf{a}(t)))$  is confirmed or refuted only ex-post.

Regularity given by the established market solution allows small and continuous changes in market outcomes, strategies, and participants over time. These adjustments keep established equilibria and institutions robust. However, large changes that can arise from accumulated internal dynamics or shocks in the environment may require large changes in actors' strategies. If, after strategy adjustments, individual strategies are no longer best responses such that  $\sigma_{-i}(\phi(\mathbf{a}(t))) \neq \mathbf{s}_{-i}^*(\phi(\mathbf{a}(t)))$ , shared beliefs dissolve and actors are left with private information  $I_i^*(\mathbf{s}^*)$ , which they use to form expectations  $\sigma_{-i}$  and choose their individual strategy  $s_i$ . Some actors may leave the market, some may enter, and others may increase or reduce their engagement. The market states converge again only after beliefs and strategies are realigned, i.e. the old market solution is reestablished or a new solution is found.

Schumpeter (1911) and the *Austrian School* study the role of entrepreneurs who, in the pursuit of business opportunities, constantly either support or challenge the sustainability of market solutions depending on their aspirations. Entrepreneurs orient their

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<sup>8</sup>As long as the others' ranking of possible strategies with respect to expected payoffs remains unchanged, their realised strategies remain unchanged.

expectations and behaviour towards imagined future market states (Beckert 2016). Innovative strategies are risky and their outcome is uncertain. An innovative strategy may induce no noticeable changes in the economy but may result in major financial losses for the investor. However, it can also drive dynamics in belief formation and require strategy updates from other market participants. This can change the distribution of resources and agents' power in existing markets and lead to the opening of a new market niche without threatening the established action choice rules (Kirzner 1997). Under conducive environmental conditions, innovative strategies can lead to the break-up of existing market solutions and the finding of new ones that organise economic exchange under entirely new action choice rules and with significantly different market outcomes.

Even the most future-oriented entrepreneur needs information about the established action choice rules before starting an attempt to change them purposefully. The decision of whether to innovate or not has to be based on a calculation of the expected outcome of a revolutionary idea for the unchanged strategies of others and present-day payoffs (Schumpeter 1939). Certainly, the market will change when the innovation is successful, and the calculation will have to be made again and based on the achieved market outcomes in the future. However, since the distribution of future payoffs is unknown before the new market state is realised and market outcomes can be observed, the entrepreneur has to base his/her expectations on data from the present and the past. When no market solution has yet been established to organise the economic exchange, the relevant data are derived from the broader institutional environment, which provides actors with basic rules for strategic interactions.

### **3.4 Markets coevolve with the environment and the number of actors in the long run**

In the model presented in subsection 2.1, the shape of the consequence function  $\phi$  and the number of actors  $N$  constitute exogenous constraints on actors' action choices. The set of technologically feasible actions  $\mathcal{A}$  is also given, such that the triplet  $\ll \phi, N, \mathcal{A} \gg$  determines the game form in which the strategic interactions take place, the market states evolve, and the market outcomes are achieved. Operating within this predetermined framework makes it possible for actors to align their beliefs and action choices at  $t$ . However, if we move from analysing market building at single time points towards the evolution of markets over time, we can no longer consider the state of the environment, the number of actors, and the set of feasible action choices as being exogenous to market states and outcomes. We then need to treat markets, environments, and the number and composition of actors as mutually adaptive and co-evolving in a complex system.



Over time, the number of actors adjusts to changes in prices and quantities set in the market. The composition of groups of actors not only affects the behavioural pattern in markets (De Grauwe & Ji 2019) but also adapts to changes in the behavioural patterns of the actors and changes in the state of the environment. The rules set and enforced by the government, which significantly affect the state of the environment in modern societies, are revised in response to changes in or aspirations for market states and outcomes. Legal property rights, contracting law, antitrust law, or trade policies were issued and revised to support or correct the rules for economic exchange that have emerged under the initiative of private actors and in their strategic interactions (Menger 1883). North (1994) argues that a convincing theory of the evolution of markets needs to take the complex interactions between markets, environments, and actors into account. We agree with North's claim and deliver this by studying the strategic interactions of actors, including state actors, in their struggle to organise economic exchange in modern societies.

For Metcalfe (1998):6, *'the joining together of uncoordinated striving for innovations with the subsequent market coordination of the resulting activities is the distinctive feature of the capitalist mode of change.'* We agree and add that innovations and their consequences can only be understood within the established market solution in which they evolve. Markets constitute the system of rules governing the economy. They are integrated into a larger system of rules governing society. Market building is an open-ended process in which innovators introduce new varieties of products, production processes, and strategies that may fit existing regularities of beliefs and behaviour but also induce profound changes.

Alami & Dixon (2020) discuss how globalisation requires governments to actively engage in market building in order to exploit the economic benefits of market integration while mitigating the pressures of competition. In the last quarter of the 20th century, the rise of market-oriented societies under a liberal social order asked states to provide a vast set of market-supporting rules favouring integration and competition but to refrain from market participation and intervention. The beginning of the 21st century heralds a new era: The rise of the Chinese economy under authoritarian rule, the financial crisis that weakened primarily Western economies, a pandemic that caused a contraction of the world economy, war within Europe, and rising nationalist sentiments have changed the perceived feasible action set of state actors. Within a short period of time, extensive market interventions, including bans on goods and service imports, restrictions on direct investment inflows, the renationalisation of private firms, and subsidy payments to domestic firms, were conducted by the governments of Western liberal democracies. Large amounts of taxpayers' money are being invested in new sectors by the EU (Green Deal), the US (Inflation Reduction Act), and the Chinese government (Belt and Road Initiative) to conquer future markets. Thirty years ago, such interventions were not discussable.

## 4 Private actors and market building

Before a market is established, the actors engaged in economic exchange are confronted with a series of 1 : 1 transactions; for each of these transactions, the rules must be negotiated. Finding trade partners and agreeing on the terms of trade is costly. Due to asymmetric information, high search costs, and opportunistic behaviour, many potential exchanges do not take place. An individual or organisation that is regularly searching for new trade partners has the incentive to invest in a platform of trade in order to reduce search and contracting costs (Coase 2012). Markets serve as these platforms. Private actors, usually from the supply side, are often the ones investing in the building of markets. The economic gains that can be achieved from the increased number of transactions that can take place in a market at reduced costs usually promise to more than compensate the private investment needed to build the market.

Market building requires investment in the organisation of information (compression, clearing, homogenisation), as well as the standardisation and development of products. The following three case studies illustrate this: The CBA's investment in data collection, processing, and distribution established the market for cotton trade in Liverpool, which became the centre of the global exchange of cotton in the 19th century. The refining technology and marketing investment of Standard Oil helped to establish the US oil market after many attempts to stabilise oil demand and supply by private and state actors had failed. For Amazon, it was investment in the building and management of a virtual marketplace that introduced a new mode of retailing and paved the way for digital product markets to emerge. In all the cases presented, private actors invested in market building to pursue their private goals. Although the exact structure and outcomes of markets could not be dictated by the private investors for the many actors participating in and shaping the market, the investing actors had a significant influence on which of the many possible market solutions was established.

### 4.1 The Cotton Broker Association

Aldous & Coyle (2021) see the evolution of Liverpool as the most important marketplace of cotton as a result of institutional innovations driven by the Liverpool cotton brokers who formed the CBA in 1841. Within half a century, the CBA created an institutional framework to govern the world's largest raw cotton market through the (i) enhancement of information flows, (ii) standardisation of quality, (iii) strengthening of contract enforcement mechanisms, and (iv) development of exchange platforms.

Aldous & Coyle (2021):681 state that *'[t]he CBA emerged from efforts to collect and disseminate accurate information on raw cotton. At the end of the 18th century, individual brokers had started to collate details on Liverpool commodity markets, which were*

*sent to their clients.*' Information spreading was a necessary condition for organising the commodity market. Price information was accompanied by the homogenisation of measures, units, and quality categories. Brokers who communicated with import merchants and buyers reduced the search costs of trading partners. Common knowledge of the most relevant information helped participants in the commodity markets to align expectations. The CBA's tremendous efforts homogenised not only the good but also the market participants on both sides of the trade. This made it possible to administer more transactions. The solution found by Manchester's dealers probably yielded higher returns per imported package for dealers but could handle fewer packages of cotton. Cotton imports and sales in Liverpool increased by about a factor of ten, while the price volatility and storage hold in the market fell. This shifted trade and redistributed surpluses from Manchester to Liverpool, which evolved into the largest and leading cotton market in the world.

There was a significant distance between planters and spinners in the 19th-century cotton industry. The cotton trade followed private-order contracting solutions, potentially backed by court-based solutions that were, however, time-consuming and badly informed in the early years. Brokers therefore first followed an unwritten code of conduct that was later conveyed to standardised pro forma contracts. Disputes were settled within the CBA. Because of family ties among the members, social norms, reputation effects, and the threat of expulsion from the association, misbehaviour was rare. The rules were remarkably self-enforcing. Information spreading and dispute settlement mechanisms within the association and later governance regulation helped to align the expectations of what actors involved in the cotton trade would do. Uncertainty and transaction costs were low. In the 1860s, a market for futures was established to reduce the risk of buyers during the American Civil War. Brokers gave loans to spinners and financed, insured, and processed the transport of cotton to Liverpool. Continuous organisational innovation in the platform of exchange reduced the transaction costs of cotton significantly over time.

The CBA's activities helped the formation of shared beliefs about the way the cotton trade was organised in the 19th century. The information compressed in the market allowed an increasing number of actors to participate in the exchange of cotton. Suppliers of raw materials and customers of fabricated textiles from all over the world could be included. Potentially, many different structures and outcomes of the cotton market were possible. However, the way that the CBA was managing information, standardising cotton measures and qualities, and setting and enforcing the rules for trade led to the evolution of a specific market solution that supported a specific market structure and distribution of income. The middlemen in Liverpool structured the industry over years and through incredible growth. The CBA's market solution even survived the relocation of the centre of production away from England.

## 4.2 Standard Oil

In a dynamic environment, prices, output levels, and the distribution of income can change rapidly. Finding and maintaining a market solution in a dynamic environment is not a matter of course: Lebergott (1984) provides an example from the early US oil industry, which went cyclically from boom to bust over the course of a decade. When prices were high, many small producers exploited their oil sources. With massive market entry, the supply rose and prices fell, but the produced quantity could not be adjusted (once an oil field is drilled, oil comes out until the well is exhausted). A stable organisation of the US oil market could not be found. A cartel was formed in an attempt to stabilise the market, but this mode of organisation failed. Cartels broke down repeatedly because it was too tempting for producers to deviate from the agreed-upon price. Information spreading, new state regulations, and dispute settlement mechanisms could not prevent these breakdowns. While oil wells popped up almost everywhere in Pennsylvania, where the first commercial oil-producing well in the US was installed in 1859, markets for refined products had to be developed and needed to be stabilised, which required several attempts.

The market was finally stabilised by Standard Oil, which was established in 1870 and evolved into a private ruling monopoly in the US oil market within the following two decades. With horizontal integration in the refining sector, Standard Oil began to structure the young oil industry. Standard Oil combined a large fraction of the supply within a single company and set prices centrally. It invested massively in refining technology, new oil products, distribution, and marketing. Oil consumption rose impressively. More components of refinery output were used and sold. Oil prices fell decade after decade, but the firm was highly profitable, following a low mark-up, large volume strategy (Lebergott 1984). Langlois (2007):8 elaborates on the market building role of Standard Oil with a reference to Schumpeter (1950), who acknowledges big firms for their potential to significantly reduce production and distribution costs such that efficiency benefits could massively outweigh the costs of supracompetitive pricing.

In 1899, Standard Oil was turned into a business trust, the first of its kind. Vertical integration strengthened the company's dominant position in the US oil market. The Standard Oil Trust was involved in oil production, transportation, refining, and marketing, which enabled the company to further lower costs and undercut competitors. By 1890, Standard Oil controlled 88% of the refined oil flows in the US (Jones 1921), had evolved into the largest petroleum company in the world, and had made its founder John D. Rockefeller into one of the richest persons in modern history. When Rockefeller was asked why he named the company 'Standard Oil', he gave the telling answer that with the name of the company, he aimed to *'symbolize the reliable standards of quality and service he envisioned for the nascent oil industry'* (Grayson 1987):213. Rockefeller reached his aims for the company and for the US oil market. Standard Oil standardised the prices and

qualities of oil products. Its investment, production, and distribution activities managed the expectations and actions of all participants in the oil industry. A stable market could form. The structure of the US oil market and its outcomes were set by and changed by Standard Oil's activities based on its corporate interests. Under Rockefeller's dominance, Standard Oil survived many, partly heavy shocks for decades until it was dissolved by the government for having become too costly for US society.

### 4.3 Amazon

The robber barons of the late 19th century have their analogue in the big tech firms of the 21st century. We confine ourselves to discussing one: Amazon. Jeff Bezos founded Amazon as an online marketplace for books in 1995, the same year in which eBay was launched. Only one year before, NetMarket ran the first secure retail transaction over the World Wide Web. This innovative way of retailing conducted by a handful of pioneering businesses set the stage for the emergence of many online retail markets and digital products within the last thirty years. By now, online retailing is widely used and has significantly changed the business environment for conventional brick-and-mortar retailers.

The invention of the internet and the consideration of its commercial usability were crucial prerequisites, but further investment and the coordination of many private and state actors were required to establish the online retailing mode. Investment was needed for the innovation of secure payment systems, the development of affordable computers, setting up the physical infrastructure that connects households and firms with the internet, the development and management of websites, logistics, and delivery infrastructure, educating households and workers in the use of computers, and familiarising households with online shopping. Investments in the development of the information and communication technology (ICT) industry paid off: The number of participants in online retailing and the range of goods traded online continue to grow. Profit margins are large and persistent for firms operating in the ICT industry. Profit differentials compared to more conventional sectors remain high (Bhangu 2020).

The success of online retail markets and further advancements in ICT gave way to the development of digital products (such as apps), new markets, and new market solutions. Some markets for physical products were displaced: e-tunes displaced the market for compact discs. For other markets, new niches were established: e-books were established as travel-friendly versions of physical books. The marketplace for digital and physical products is the same: the internet. Some well-established companies introduced online retailing possibilities to complement conservative distribution channels. Toys "R" Us, Nike, and IKEA, among others, entered into deals with Amazon to sell their products on Amazon platforms before they revised their decision some years later and set up their own online retailing infrastructures.

Smaller companies maintained their cooperation with Amazon. The company expanded into a multitude of product categories, a strategy that earned it the moniker ‘The Everything Store’. Amazon turned from seeking cooperation from other businesses to becoming a provider of various products and services. It gained a reputation as a ‘disruptor’ of well-established industries through the aggressive reinvestment of profits into the acquisition of start-ups. As of December 2023, Amazon owns over 100 subsidiaries. It is the world’s largest online retailer, a provider of smart speakers, cloud computing services, and live-streaming services, and the largest internet company measured by revenue and market share. In the US, Amazon is the second-largest private employer.

Dolata (2017) and Kirchner & Beyer (2016) discuss how big tech firms function as active creators and regulators of online markets. Platform companies have found new solutions to the fundamental coordination problems between market participants that meet their interests. Network effects shield early starters such as Microsoft, Google, and Amazon from competition (Gawer 2011). Amazon sets the conditions for the usage of Amazon platforms and software applications and determines the organisation of exchange for every individual and organisation that uses them. Beyond that, as the dominant provider of digital products and manager of online platforms for trade, Amazon sets the standards for product development and online retailing for every participant in these markets. Amazon’s standards and activities are the benchmark to coordinate with. This structures the online retailing and digital markets significantly and specifically for Amazon’s interests.

## 5 The state and market building

Monopolisation of supply, as well as tacit collusion among a few dominant suppliers, have been important institutional pillars used to establish and develop markets over centuries. Private initiatives in the pursuit of profits have often been the driving forces to build markets, but they had to be backed by a state or a ruler who provided a regulatory framework for private endeavours and very often also substantial finances. For ‘merchant-adventurers’ and the emerging chartered trading companies in the 17th century, such as the East India Company or the Hudson’s Bay Company, this even entailed that rulers transferred the right to rule to the trading companies, which set the rules in a way that allowed them to do profitable business abroad.<sup>9</sup> Rodrik (2011):9 deems the dichotomy between markets and states and between trade and rule false since market exchange cannot exist without rules imposed from somewhere. Strange (2015) agrees: In modern market economies, private and state actors together define the market rules.

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<sup>9</sup>This included defining and enforcing property rights, contracting rights, the right to collect taxes, and even the right to declare war and engage in military operations (Rodrik 2011):8.

The modern state provides a fast system of rules, among which those on property rights and contracting rights are discussed as most important for facilitating economic exchange (North 1990, Barzel & Allen 2023). State-imposed rules create a ‘stable world’ (Fligstein & McAdam 2011):7 in which economic activities take place. They structure and stabilise the beliefs of market participants in many respects, which makes it easier to coordinate actions and establish and develop markets of specific kinds. Changes in these rules, such as the introduction of antitrust laws or market-opening policies, affect belief formation, alter private strategy plans, and may lead to a break-up of existing market solutions. The acceptance of the state-imposed rules is a prerequisite.

We started this article with the observation that market interventions have recently been proposed and eventually also initiated in various markets with disappointing outcomes. The state has the ability and can take on the responsibility to change each and every market. Sometimes the state is made responsible by its citizens for regulating markets. At other times, the state itself assumes responsibility and takes the initiative to change market rules in the pursuit of political goals. However, despite its political and economic powers, the state cannot dictate or control private initiatives in complex market societies. It cannot preset the markets that are established, but it can undertake deliberate actions to influence private strategy plans, whether markets are established, how markets are structured, and which outcomes are achieved. It is the responsibility of the state in a modern market economy to ensure that private initiatives can take place and that what evolves out of private initiatives is in accordance with societal goals. We discuss four instruments that the state uses to change existing and create new markets:

1. The state sets the regulatory framework.
2. The state becomes a market player.
3. The state manages information.
4. The state undertakes investment.

The state has the authority to use legislative and executive power to set and enforce laws and regulations that tell people what they should and what they should not do. Misbehaviour can be formally sanctioned. If actors accept the rules and behave accordingly, formal rules are powerful means to align expectations and action choices and coordinate actors towards the establishment of markets with specific structures and outcomes. However, the state can use other means to direct institution building: It can become a market player and create a sizable demand for or supply of goods, services, and financial assets. The state can distribute information to help individuals align expectations in situations of uncertainty, as it is of special relevance in crisis situations. The state can undertake investment in the basic technology and infrastructure needed for the creation of new markets

that would not evolve from private initiatives alone. The state often uses a combination of these four instruments when carrying out economic policies.

## 5.1 The state and regulation

The state has a strong role, often a monopoly, in setting and enforcing formal rules, including laws and regulations. As a legislator, the state can guide people's behaviour to ensure that some unwanted behaviour does not occur or at least not in a dominant manner. Some types of legislation, such as property law and human rights laws, are pervasive. They clarify the rights and obligations of citizens and state actors and structure behaviour in all kinds of encounters and transactions. Other legislation is more specific: The law of tenancy organises the interaction between renter and rentee, employment law between employer and employee, and contract law between seller and buyer to rule out some unwanted outcomes in the housing, labour, products, and service markets. In the presented game-theoretic framework, legislation affects market building in the form of constraints that are exogenous to actors' strategic interactions. Changes in legislation can increase or reduce the number of players  $N$ , restrict the set of technologically feasible actions  $\mathcal{A}$ , and reshape the consequence function  $\phi$  to alter payoffs. Via restricting action choices, legislation can support finding, reinforcing, or changing a market solution.

The CBA issued a set of private-order regulations to establish the Liverpool cotton market. As the market grew in participants, volume, and geographical scope, formalised rules were introduced to complement informal ones: In January 1863, the CBA published a private constitution to provide a comprehensive set of regulations to govern the strongly growing business. Given the international character of the cotton industry, the CBA's regulations were discussed with the American Chamber of Commerce and the United Cotton Association. As trade became more anonymous and an increasing number of transactions took place between traders without CBA membership, the CBA's regulations alone became an increasingly insufficient institutional solution. Property rights and contracting rules formalised and enforced by the state were needed to govern the many standardised transactions in the growing cotton market.

Standard Oil's monopoly in the US oil market became increasingly costly for US society: In states in which competition was high, Standard Oil sold under market prices to drive competitors out of the markets. Where competition was low or non-existing, it charged above market prices to earn monopoly rents. Even in its early days, Standard Oil made secret transport deals that helped kerosene prices drop from 58 to 26 cents from 1865 to 1870 (Lebergott 1984). To end Standard Oil's unfavourable activities, the US government issued laws limiting the scale of companies. In response, Rockefeller split the company into many firms spread across dozens of federal states, only to combine the firms under a single group of trustees. De jure, market power was more dispersed. De facto,



power remained concentrated within Rockefeller’s trust. In 1890, the US Congress passed the Sherman Antitrust Act, which forbade every contract, scheme, deal, or conspiracy to restrain trade. In 1911, the US Supreme Court declared the Standard Oil group an ‘unreasonable monopoly’ under the Sherman Antitrust Act for using aggressive pricing to destroy competitors and ordered Standard Oil to break up into 34 independent companies with different boards of directors. The two largest companies were Standard Oil of New Jersey, which became Exxon, and Standard Oil of New York, which became Mobil (Manns 1998). This established a new market structure with more competition among smaller-sized suppliers. In 1999 and with the approval of the regulatory authorities, Exxon and Mobil were allowed to merge again and become ExxonMobil in order to enhance their competitiveness in the international oil and gas industry.

More recently, governments have increased efforts to regulate digital markets and restrict the market power of big tech firms, including Amazon, Google, and Facebook. In Europe, efforts are concentrated in two areas of action: First, the European Commission has pursued a series of infringements of EU antitrust laws and imposed heavy fines on big tech firms for abusing their dominant position in online advertising, internet search engines, and mobile operating systems. Second, ‘the right to be forgotten on the internet’ was formulated in the European General Data Protection Regulation and introduced by the European Court of Justice. The regulation aims at restricting the social regulatory sovereignty of platform operators. So far, the interventions have been rather ineffective. The big tech firms continue to structure digital markets and use data collected on platforms and software applications for their private corporate interests (Dolata 2022). The law seems to remain two steps behind the big tech firms, which were hurt only marginally by the imposed fines and were very innovative in working around the new regulations.

## 5.2 The state as a market player

We usually grant the state an active role in markets that experience some kind of failure. This includes the production, maintenance, and regulation of public goods, where free rider problems exist, and commons, where a ‘tragedy of commons’ may arise (Ostrom 1999). We also see a need for the state to participate in incomplete markets, where the excludability of goods cannot be guaranteed, and in the development of basic technologies or the provision of infrastructure. Free market mechanisms are inefficient in such markets. However, there is a tendency to overlook that *all markets and firms* are built and evolve in an environment that is critically influenced by an actively involved state.

In OECD countries, about 40% of the GDP is somehow reallocated by the state. This represents enormous economic power. Being the sovereign, the government can additionally raise huge amounts of debt. Keynesian fiscal policy rests on the state’s ability to create sizable demand for goods and services as a means of stabilisation. Public

demand can compensate for lower investment by private actors and prevent aggregate demand from falling too much. Ideally, for stabilisation, state activities should be spread over several markets. States have raised huge amounts of debt to lessen the effects of the COVID-19 pandemic on national economies. Furthermore, the state can redirect resources between markets or market segments to reach societal goals. If the state restricts itself to only demanding green energy, it will support a reallocation of the resources within the energy markets away from fossil-fuel-based segments to renewable energy segments.

A public push for carbon-free production could also be bolstered by the state's involvement in renewable energy production, which may replace or complement carbon dioxide regulations or taxes imposed on private firms. There are sectors and sector segments such as health, utilities, and public transport in which the state has historically evolved as the main supplier of goods and services. Sometimes the state acts as the monopoly supplier, sometimes it acts in cooperation with private suppliers (public private partnerships), and at other times it is in competition with private suppliers. In our game-theoretic framework, the state as a market player influences expectations  $\sigma_{-i}$  via its own action choices  $a_i$  as a market participant. The larger the market power of the state, the more state action choices influence private belief formation and strategies and, consequently, the evolution of a market, as shown in subsection 3.3.

Enacting and enforcing a new law was the way to break up Standard Oil's monopoly in the US oil market. Alternatively, the state could have nationalised oil production. Nationalisation is one solution to guarantee that the industry is run in accordance with national interests. Railways and electricity are prominent industry examples that can be considered as natural monopolies, which may be successfully run publicly if the government decides either to not exploit monopoly power or to broadly redistribute monopoly profits. Contrary to these considerations, there have been privatisation efforts, particularly in these industries, since the 1990s. The hope was that privatisation would reduce inefficiencies in the production process. Not all privatisation efforts were successful and some had to be reversed due to severe disruptions in operations. An example is the failure to privatise and renationalise the British railway (Holvad 2009).

The state management of demand and supply can be used not only to regulate the domestic economy but also to affect foreign economies. After Russia began war with Ukraine, the EU implemented export controls on arms, dual-use goods, and technology for equipment that could be used in Russia's military and energy sectors. It also restricted Russia's access to European financial markets, making it more difficult for Russian companies to raise capital in Europe. In response, Russia imposed a ban on the import of certain food products from countries that had sanctioned Russia and forbid oil and gas trade with 31 European companies. The sanctions hit the Russian economy as expected. In Europe, the war immediately shocked energy markets. Old equilibria broke up. First,

the prices of oil and oil products and later, the prices of groceries and housing rose significantly in EU countries that had large energy imports from Russia, such as Germany. Supply-side interventions followed: After Uniper, the German federal government nationalised the gas importer Securing Energy for Europe, formerly Gazprom Germania. The Economics Ministry justified this illiberal intervention by pointing to the impending insolvency of suppliers, which would endanger the security of the energy supply in Germany. Public ownership should first stabilise the big energy trading firms. Thereafter, and under state leadership, the firms should be managed in a way that guarantees the energy supply, drives down prices, and finds a new stable equilibrium for the energy markets.

### 5.3 The state and information management

Private actors need to invest a large amount of money to gain a dominant market position that allows them to manage the expectations of other market participants. Provided that it has enough capacity, the state usually finds it easier to do this. The state does not necessarily need to issue legislation or become an active market player; in many cases, it suffices that the state distributes information. Information management as an instrument of the state to direct market building is especially effective in situations of institutional uncertainty. If private actors have not found an equilibrium yet or if an existing equilibrium is destabilised, the state can bring the expectations of market participants into alignment by providing credible information about the state of the market and environment, the envisioned market solution, and planned state actions to reach that solution. A narrative, that is, according to Shiller (2017):968, *‘a simple story or easily expressed explanation of events that many people want to bring up in conversation or on news or social media’*, is a powerful tool that can be used to structure the beliefs of many, especially in modern societies in which advanced communication technologies allow such narratives to ‘go viral’ in an incredibly short time.

In our game-theoretic framework, expectations  $\sigma_{-i}$  need to be mutually met in such a way that no market participant wants to unilaterally deviate from the chosen strategy plan. Recall that  $\sigma_{-i}$  depends on individual beliefs  $\Sigma_i^*(\mathbf{s}^*)$  about the equilibrium. When shared beliefs  $\Sigma^*(\mathbf{s}^*)$  have not yet been established, individual beliefs build on private information  $I_i^*(\mathbf{s}^*)$ , which may vary greatly across actors depending on how asymmetric information is. Moreover, shared beliefs can be lost after a shock or change in environmental conditions. A change in  $\sigma_{-i}$  during time period  $t$  may cause a change in the optimal strategy, such that  $s_{i,t}^* \neq s_{i,t-1}^*$ . To find  $s_{i,t}^*$ , market participants collect private information on the state of the market and evolving market solution at each point in time. In a repeated game setting, actors may experiment with action choices and eventually succeed in aligning individual expectations by chance or by learning over time until a new market solution is found or a previous market solution is reestablished. The probability of success

can be considerably increased and the time needed to regain stability can be considerably reduced in the presence of what Calvert (1995) calls a ‘director’, that is, a clearinghouse of information.

In many cases, the state is most suited to take on the role of the director and collect, clean, and distribute information to guide market participants in (re)establishing a market solution. In addition to political and economic power, the state often concentrates media power. Market participants usually either have enough trust in or fear of the state to adjust their expectations and action choices according to state information. In situations in which market participants do not trust the information provided by state actors, as is the case with government announcements of planned monetary policy (Barro & Gordon 1983), the role of the director can be passed on to a more credible party, such as an independent central bank: On 26 July 2012, Mario Draghi promised that the European Central Bank (ECB) would do anything needed to save the euro. ‘Whatever it takes’ has since then been related to him. The promise of the ECB’s president to do whatever was needed to stabilise the euro’s value realigned expectations in the market for government bonds after uncertainties about the future of the euro arose in the aftermath of its 2009–2010 crisis. There were actions taken by the ECB as a big player in the market for government bonds that came with Draghi’s words. However, it was ‘whatever it takes’ that succeeded in calming down the nervous atmosphere. Market participants trusted Draghi that the ECB would undertake whatever interventions were needed to preserve the euro as a common currency.

‘Whatever it takes’ proved capable of influencing the decision-making of many. It became a reference phrase that was also used in other situations to regain stability. In a press conference on the COVID-19 pandemic on 12 March 2020, Olaf Scholz, at that time the Vice-Chancellor and Minister of Finance of Germany, announced that the German government would do ‘whatever it takes’ to contain the crisis. The UK’s Chancellor of the Exchequer Rishi Sunak, Italy’s Prime Minister Giuseppe Conte, and American immunologist Anthony Fauci all used Draghi’s ‘whatever it takes’ in the context of the pandemic in order to retain or regain stability in markets and elsewhere.

Taming the pandemic was a huge coordination task. There was great uncertainty about how to end it. State actors were as unprepared as the rest of the society and forced to experiment. It required the trust of the citizens that governments would find a way to guide societies out of the pandemic. More than that, it required the cooperation of a critical mass of citizens in following new rules (restrictions in personal encounters, curfews, shut-downs of stores and restaurants, mandatory mask-wearing, and vaccination) that were painful and interfered with private affairs. The new rules were announced and updated in regular speeches by public officials and in press releases. Their legitimacy was supported by specialist opinions on the current situation, as well as statistics on the

development of the number of infections and occupied beds in hospitals' intensive care units. Within a short period of time, peoples' expectations about what others will do in social encounters and their own behaviour changed dramatically but in a coordinated way. States that had the capacity and took on the responsibility of fighting the pandemic and could secure the cooperation of a large fraction of their citizens navigated their citizens out of the pandemic more quickly (Helliwell, Layard, Sachs, De Neve, Aknin & Wang 2022).

## 5.4 The state and investment

Establishing a market requires investment; we showed this in the case studies of the CBA, Standard Oil, and Amazon. If the gains of establishing a market cannot be internalised, private parties refrain from taking business opportunities. Public investment is then required for markets to come into being. Public investment plays a crucial role in the provision of physical infrastructure and the development of basic technology when non-excludability discourages private investment. However, the availability of infrastructure and technological advancements provide the foundation for private initiatives to expand existing and create new markets.

Amazon, Google, Apple, and the online retail and digital markets would not have been established if the internet had not been invented and made available for private commercial usage. However, the internet was not invented with the intention of creating new firms and markets. It was a product of the US government's investment in the development of ICT, which was intended to bring advancements in defense and space mission technologies; at that time a high-priority national interest due to US rivalry with the Soviet Union. Only after the internet had emerged did aspirations about its potential for commercial usage develop. The US government granted private initiatives access to ICT and the initiatives used this access to build new firms and markets (Mazzucato 2013). The ICT revolution and its long-lasting consequences for the way that we organise economic exchange today would not have occurred without the investment of the US government, which did not plan for the commercial internet and the significant changes that have been induced.

The far-reaching unintended changes that ICT caused in economies exemplify the power of the state to affect the evolution of not only one but many markets via public investment. The EU uses this leverage to intentionally guide European economies towards a green transition: In 2019, the European Commission proposed a *Green Deal* to convert EU economies into a climate-neutral economic area by 2050. The presented plan includes interventions in several markets through a mix of regulation, market participation, and public investment in sustainable finance, energy markets, transport, agriculture, and the manufacturing sector. International trade is affected by a *carbon border adjustment mechanism*. At least 30% of the budget of the EU between 2021 and 2027 must involve climate-relevant expenditures (summing to 600 billion euros). A *Just Transition*

*Mechanism* smooths adjustment. A sizable share of the 725-billion-euro fund called *Next Generation EU* shall be invested in green technologies. This is an incredible amount of money that has been put into transforming European economies, but needed to encourage coordinated changes in investment and consumption decisions. Mazzucato (2013) explains that private investment and strategy change will only come in combination with public investment since green technology is a highly capital-intensive, high-risk business sector that is unlikely to be led by venture capital or nudged by a green investment bank.

The European Commission feels rather than knows that the outcome of its efforts is uncertain. This is not only because the future is always uncertain but also because it perceives Europe as being in competition with the US and China in the attempt to control green markets that are expected to become crucial in the future. Some years ago, China's subsidy program destroyed the European solar panel industry. Now, with China also aiming at green markets, the European Commission is on alert. At the same time, the US is pushing for regaining market dominance in manufacturing industries. The *Inflation Reduction Act* includes several subsidies for promising green market investment. Seeing its industrial policy challenged, the EU Commission launched the *European Green Industrial Policy* in January 2023, which includes subsidies for green market investment as well. This investment is likely to help the green transformation of the economy but the result will surely differ from the outcome foreseen today. The many private actors that are necessarily involved and that have to *make* the transition cannot be fully controlled by the state; but they can be influenced in their belief formation and strategy choices.

## 6 Summary and concluding remarks

Although markets are the central subject of study in economics, we still know surprisingly little about how markets are created, how they are sustained, and when and in which direction they change. In economics textbooks and political debates, markets simply exist. This article has studied markets in order to understand how they come into being, why there exist a variety of market solutions to organise the same kind of economic exchange, and how market structures and outcomes can be changed. We treated markets as human-made instruments used to coordinate transactions of goods, services, and factors among many participants. We argued that markets are created in strategic interactions and are embedded in and supported by an institutional environment. Moreover, market outcomes can be affected but not perfectly foreseen or controlled.

To substantiate this, we built on a theory of institutions that we applied to markets. The approach retains the tradition of studying markets as sorts of equilibria. The starting point of our analysis was Aoki (2001), who offers a game-theoretic approach that we use to study markets as outcomes of and guides for strategic interactions. In this approach,

markets do not exist outside of the cognition and behaviour of market participants. Each market that is established is one specific of many possible solutions for organising economic activities. Since markets are outcomes of a strategic game, they are not neutral in their distributional consequences. Prices convey information other than scarcity; they provide information about the established market solution and support market participants in coordinating anonymous and simultaneous action choices successfully.

Markets rely on information compression to help participants align their expectations and action choices. Once they have been established, markets are self-sustaining and can be remarkably robust even in a changing environment. However, markets need to be established in the first place. We stressed the influence of powerful actors in finding the ‘shared beliefs about the rule of the game’ and elaborated on the role of powerful private actors in three examples: We first laid out the role of the CBA in the building of the 19th-century cotton market in Liverpool; second, we pointed to the role of Standard Oil in stabilising and structuring the US oil market in the 1870s; and third, we discussed the role of Amazon in the creation of online retail markets in the 1990s and digital markets more recently. We then turned to the role of the state, which can use regulation, market participation, information management, and public investment to guide private actors in creating and changing markets.

The state can use its centralised power to significantly influence the decentralised building of markets. Requests for changes in market outcomes are not just wishful thinking. It is, however, not possible to dictate the evolution of markets in modern market economies. This is due to the different interests of the many actors whose participation is voluntary and whose knowledge is severely incomplete and asymmetrically distributed. Market interactions are too complex, substitution alternatives are too manifold, and arbitrage opportunities are too tempting to have a market precisely planned, even if the planner is the state. Exogenous shocks and internal dynamics that accumulate over time regularly cause unintended changes in market outcomes. At each point in time, actors have to make decisions that are relevant for future states of the economy about which they have expectations but not knowledge. Consequently, there is plenty of room for unplanned innovation and failure at each point in time. However, uncertainty is a characteristic of the future that does not rule out investment as long as high risk is expected to be met with high profits. Initiatives such as the Green Deal, the Belt and Roads Initiative, and the Inflation Reduction Act are attempts to create and structure markets with high future potential. The success of these attempts is necessarily unforeseeable today. There will be failures, but the private and state actors who will prevail will set the rules for economic exchange in their favour.

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