

LACHMANN AND SHACKLE: ON THE JOINT PRODUCTION OF INTERPRETATION INSTRUMENTS

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ABSTRACT

In this chapter, we present fragments of previously unpublished correspondence between Ludwig Lachmann and G. L. S. Shackle on the nature of institutions. This correspondence allows us to rationally reconstruct a theory of institutions, which extends Lachmann's theoretical work. Shackle pointed out to Lachmann that institutions might be inputs into economic activities and that they themselves may be reproduced and transformed by these activities. Lachmann in turn contended that institutions consist of "instruments of interpretation." We develop the concept of "instruments of interpretation" as a subset of institutions. These instruments are mental models and cognitive tools which are (1) inputs complementary to capital goods (2) jointly produced, reproduced, and transformed through economic activity. We suggest that in contrast to privately produced capital goods, parts of the institutional infrastructure are produced jointly as shared goods because the use of certain institutional elements is non-exclusive and non-subtractable; these elements – instruments of interpretation – are produced and reproduced by sharing and contributions through a process of joint production. This chapter explicitly connects two different but essential themes in Lachmann's work: capital, and institutions. By combining these two strands of Lachmann's work, we are able to demonstrate that there is a cross-complementarity between institutional orders and capital structures. This connection in turn provides a thicker understanding of the workings of markets.

Keywords: Institutions; capital goods; economic theory; entrepreneurship; capital structure; institutional orders; shared goods; joint production

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INTRODUCTION

Perhaps the most important contribution of Ludwig Lachmann to economic theory was his treatment of capital and its structure. But besides the analysis of the capital structure, Lachmann was also greatly interested in institutional orders. In this chapter, we demonstrate that there are important connections between the capital structure and the institutional order, and we show how the analysis of these knowledge structures can be fruitfully integrated into a thicker understanding of the market process. We argue that while we may often tend to think of capital in terms of private goods (rival and excludable), seeing knowledge (often non-subtractable and hardly excludable) as a kind of capital should help us recognize that different kinds of capital, being heterogeneous, may be produced in different ways.¹

In 1985, Lachmann exchanged a series of letters with G. L. S. Shackle discussing the importance of institutions for our understanding of markets. We present relevant parts of this correspondence here. In a letter from May 2, 1985, Lachmann wrote:

We have to show what makes stock exchanges and (in our world) foreign exchange markets function in the peculiar way they do. Volatility of expectations is not the whole answer. We have to show why here expectations should be more volatile than elsewhere.

We also must have something to say about institutions. To be sure there are the “organic” ones (as Menger called them) which the market evolves in order to cope with the problems of exchanges but there are others which the social order imposes on the market. At any moment the market is constrained by such institutions.²

While Lachmann tried to convince Shackle of the need to focus on the analysis of institutions so as to better understand the legitimacy of certain arrangements, Shackle remained unconvinced. In a letter from September 1985, Shackle replied:

I am a little puzzled in these days by what seems to be an attempt to get round the difficulties posed for analysis by uncertainty, volatility of expectations, and the manifest impossibility of co-ordinating plans which are continuously evolving products of thought, by discussing side-issues: property rights, institutions and other distractions. “Institutions” do not seem to me to affect the basic scheme of things except perhaps by gathering individuals into gangs, so that they march together without a visible road or map, instead of going each on his own.

In this chapter, we will show how Lachmann convinced Shackle of the importance of institutions and their focal role in the coordination of plans. Consequently, we will rationally reconstruct Lachmann’s analysis by combining the two different but essential themes in his work – capital and institutions – to better understand the functioning of markets as governance structures that allocate resources and create wealth.

While, in his work on institutions, Lachmann would emphasize the coherence between different institutions, in his work on capital, he would highlight the complementarity of heterogeneous capital goods. Both coherence and complementarity are elements of stability. We will use these parallels to connect Lachmann’s account of institutions with his theory of capital goods. By

combining these two strands of his work, we are able to demonstrate that there is an interdependence between institutional orders and capital structures. We argue that a particular type of “institutional elements” (Greif, 2006),³ which Lachmann called “instruments of interpretation,” is best thought of as heterogeneous shared goods.

The key point is that while the institutional infrastructure, and the interpretation instruments in particular, are complementary to physical and human forms of capital goods, unlike them, the infrastructure consists of shared goods. Because the use of instruments of interpretation is often non-exclusive and non-subtractable, parts of the institutional infrastructure are being produced and reproduced by sharing and contributions through a process of joint production. This shared infrastructure is essential for the proper functioning of the economy, but existing accounts of the market process tend to neglect it. Through such neglect, we fail to appreciate the rich texture which structures market interactions, a theme dear to Ludwig Lachmann, who was closely associated with the hermeneutical turn within Austrian economics. The chapter concludes with suggestions as to how this rational reconstruction can spark new research on institutions and their relation to economic activity.

LACHMANN AND THE CAPITAL STRUCTURE

Lachmann’s work has contributed to the theory of capital formation and its effects on production, on the one hand, and to the theory of institutional order on the other hand. In capital theory, his major contribution was to point to the heterogeneity and specificity of capital. He argues that capital could not be added up as a homogenous aggregate but is best thought of as a capital structure. Underneath this capital structure, there is an intricate web of individual plans; these plans give a purpose to the current use of capital goods. Within an individual plan, there is a complementarity of different capital goods, but it is only through the market process that the complementarity of different plans and hence of different uses of capital goods is achieved or at least improved.

It is not always the case, contends Lachmann, that investment on the margin pushes the yield of capital down. This would be true if all capital goods were completely interchangeable but capital goods are heterogeneous and what counts as capital is subjective. In other words, what counts as a capital good depends on individual plans; what is a capital good depends on the purposes of economic subjects and the substitutability or complementarity of capital goods emerges from a set of marginal adjustments that entrepreneurs might (be willing to) make to their plans.

If a plan is successfully carried out, the entrepreneur will consider all the goods that make up the plan to be complements. If, however, a plan fails at some point of its effectuation, the goods that were considered to be complementary by the entrepreneur are discarded and become potential substitutes in other production plans with relationship to the existing capital structure. The key consequence of introducing both the relationships of complementarity and the substitution of investment goods with regard to the existing capital structure is a

phenomenon that Lachmann called “investment repercussion” (Lachmann, 1948) which can help us understand why an additional investment does not necessarily need to push returns on capital down.

Let us look at this problem in some more detail. In a hypothetical state of equilibrium where no plans are ever revised, all capital goods are perfectly interchangeable and over time, “the effect of investment on further investment decisions is bound to be depressing” (Lachmann, 1948, p. 699). Lachmann contended that unless there were unforeseen changes the marginal efficiency of capital would decline. If unforeseen changes take place, as they usually do, entrepreneurs change their plans, and some capital goods become substitutes for other capital goods to which they were previously complementary in other, by now discarded, plans. Lachmann offers an example of an investment in railway infrastructure in the nineteenth-century US which created investment repercussions in terms of the formation of new capital goods and investment opportunities.⁴

Because capital is fundamentally a subjective concept, Lachmann is skeptical as to our ability to systematically measure capital stocks (Lachmann, 1941; see also Garzarelli & KucharŤ, 2018). But even if we cannot meaningfully measure the total quantity of capital in real terms, “some proportion of it, as also the flow of services emerging from it, is germane to essential propositions of economic theory” (Lachmann, 1941, pp. 368–369). These propositions rest on the fact that while physical properties of capital goods cannot help us determine how to classify and measure heterogeneous capital goods, it is the case that “all measurement must necessarily proceed in terms of value relationships, and all economic values are ultimately derived from subjective estimates” (Lachmann, 1941, p. 376). Capital, as Walter Grinder reiterated, is therefore “not a homogeneous aggregate, but rather a complex interdependent *structure* of heterogeneous producer’s goods” (Grinder, 1977, p. 15, emphasis added). These goods when applied “for the same end, or a group of consistent ends” (Lachmann, 1947, p. 110) will be complementary capital goods, rather than perfectly interchangeable substitutes.

As we will see below, for linking Lachmann’s analysis of the capital structure and institutional order, it is important to understand that Lachmann sees capital goods as instruments which are “designed for a purpose” (Lachmann, 1947, p. 112). Sometimes, these purposes may be highly specific but sometimes they will be quite general; an instrument designed for a general purpose is a highly versatile capital good and it may easily serve as a substitute for a number of other capital goods that figure in other plans.⁵ The coefficients of complementarity and substitutability are in a constant flux as entrepreneurs change and reconsider their plans using certain artifacts in new ways to achieve new ends and discarding other artifacts that can be easily substituted in existing plans. A capital structure is thus in a continuous state of transformation (Lachmann, 1947, p. 113).

In his review of *Human Action* (Mises, 1949), Lachmann explains that while entrepreneurs typically try to buy low and sell high, that is, invest, produce, and sell, this is not all there is to entrepreneurial action. The entrepreneur also has

another function: the “regrouping of capital assets”; Lachmann argues that by buying and selling these capital assets, the entrepreneur generates “the incessant reshuffling of the combinations of complementary capital goods with which he works and which in their complexity form the ever-changing basis of the capital structure” (Lachmann, 1951, p. 422). The structure of capital instruments (which goods are capital goods and how do they fit together in an economy) is thus an emergent phenomenon resulting from entrepreneurial action.

LACHMANN AND SHACKLE ON INSTITUTIONS

In developing his institutional theory, Lachmann was primarily interested in extending the legacy of Max Weber (Lachmann, 1971). Lachmann emphasizes that institutions serve as guideposts for individual plans; they provide points of mutual coordination among individual plans in a world that is otherwise highly uncertain and rapidly changing. In this view, he was influenced by Shackle who emphasizes the unknowability of the future and the depth of the coordination problem in what Shackle called the “kaleidic society” (Lachmann, 1976; Shackle, 1972).

Despite this convergence in their work, we saw in the introduction that Shackle was, initially, not convinced that the economic analysis of price fluctuations should center its focus on institutions. Lachmann would nevertheless persist in attempting to convince his friend of the importance of institutions: “‘Subjectivists’ like us,” he wrote in a letter from September 15, 1985, “cannot afford to neglect them, even if some others might.”⁶ Further on in the letter, he went on giving Shackle a couple of reasons in support of his contention:

(1) The market economy rests upon a framework of institutions, of which property and contract are basic. Are there also others complementary to them, or still others incompatible with them? You may feel we should refer such questions to a “cognate discipline” such as “economic sociology.” Perhaps, but even if we do and these sociologist [are] then successful, could we ignore their findings?

(2) You and I believe that uncertainty and divergent expectations are [of] paramount importance for our understanding of what happens in a market economy. If so, how can we fail to take an interest in EVERYTHING THAT MAY REDUCE UNCERTAINTY? The existence of an institution means that the range of action of certain agents is (mostly voluntarily, though not necessarily so) reduced so that others can take their orientation from the reduced range. The time-table of British Rail is the classic example of such an institution. Banks, department stores and the National Health Service cannot of course remove uncertainty from [the market economy]. But they enable us to know what to do when we need them. We know how certain agents (mostly anonymous to us) will act. I conclude: How we assert that Uncertainty matters, but its (however partial) diminution does not? (Capitalization in original.)

There are a couple of points that we should take note of. First, Lachmann considers institutions (such as property and contract law) to form a framework on which market economies rest.⁷ Secondly, Lachmann recognizes the importance of complementarity among institutions (such as property rights, contract law, and

others). Thirdly, Lachmann metaphorically likens institutions to signposts. Institutions – like signposts – have to be read and interpreted; like signposts, we can make use of institutions to reduce uncertainty as to our expectations of other people’s strivings.⁸ Finally, for Lachmann, institutions do not merely constrain our actions but also enable them; they suggest “what to do.”

And indeed, Lachmann’s reasoning seems to have convinced Shackle. In a reply to Lachmann from September 21, 1985, he wrote:

Your argument is overwhelmingly decisive, but even this power and efficiency of conviction is over-matched by its sheer elegance of design and reason.

I recognize, of course, that institutions, in the encompassing sense that you give to this word, are the skeletal traces of the long human tale, preserved by their indispensable usefulness and the integral frame that provide for society. They are, indeed, the chambers in which civilized and social life is housed. The individual, of course, is constrained by them, and finds in them vital resources. But he is still their architect, he shapes and reforms them continually. I should have been more conscious of the massive burden of meaning that the word “institutions” carries, if I had experienced the formative influences of a Law Department which have played so great a part in continental Europe. But my scholarly background, as you know, has been chancy and in a sense unsystematic.

Two years later in a letter from August 8, 1987, Shackle would still remind Lachmann about the influence of his reasoning reaffirming the constraining and enabling (directing) nature of the institutional infrastructure:

You have rightly reproved me in the past for not grasping the nature and dominant role of institutions. But I think I have gained that insight. Institutions are the contours which constrain and direct the stream of affairs, helping indispensably to make the plans of individuals mutually coherent and, indeed, realizable.

Shackle pointed out two ideas which we want to develop here. First, in his letters from September 1985 and August 1987, Shackle would affirm that institutions are both constraining and enabling. This is an important step forward in the work both of Shackle and of Lachmann whose radical form of subjectivism has often been said to make scientific inquiry very difficult if not impossible (Kirzner, 1992; Lewis, 2011).⁹ Part of the criticism stems from the fact that radical subjectivism and the stress on the heterogeneity of individual plans combined with fundamental uncertainty about the future leads to indeterminacy. But if institutions indeed do reduce uncertainty, and if they provide some solid points of coordination in an otherwise fluid world, the subjectivist research program might be viable after all. Even with regard to future action and imagination, themes central in Shackle’s later work (Shackle, 1979), existing institutions might help direct the actions of individuals as is emphasized in recent work in economic sociology on future-directed action (Appadurai, 2013; Beckert, 2016).

Taking into account that institutions often provide some solid points of coordination, Shackle says they are “vital resources.” This implies they are inputs for private production. This is a key point that highlights the nature of institutions as coordinative mechanisms and inputs into individual plans. That institutions are regarded as inputs is conducive to Lachmann’s own theory of institutional order.¹⁰ Secondly, Shackle wrote that the individual, while making use of

institutions, “is still their architect, he shapes and reforms them continually.” In addition to what we call the “input theory” where institutions may be seen as a kind of resources, Shackle also provides the basis of a “transformation theory” of institutions that we will further discuss along with other key points that emerge from this previously unpublished conversation between Lachmann and Shackle.

Instruments of Interpretation: The Input Theory

While there is no explicit connection between Lachmann’s analysis of capital structures and his work on institutional orders, we suggest there are a number of parallels. We have seen that Lachmann considers capital goods to be instruments designed to serve a purpose. Thinking about capital goods as instruments provides, we believe, an opportunity to bridge Lachmann’s analysis of capital with his analysis of institutions. Consider the following statement (Lachmann, 1956/1978, p. 22):

[I]n a world of continuous change prices are no longer in all circumstances a safe guide to action [...] nevertheless even here price changes do transmit information, though now incomplete information [...] such information therefore requires interpretation (the messages have to be “decoded”) in order to be transformed into knowledge, and all such knowledge is bound to be imperfect knowledge. In a market economy success depends largely on the degree of refinement of one’s instruments of interpretation.¹¹

As we have seen earlier, Lachmann suggested that a train schedule may be thought of as a kind of an institution that helps coordinate expectations of agents; the schedule is a kind of a signpost that helps reduce uncertainty. In the modern world, we can find a variety of such signposts both on the consumption side of the market ranging from online recommendation systems, a seemingly infinite amount of guide books, music charts, and book awards (Dekker & De Jong, 2018), and on the production side where rating agencies evaluate credit-worthiness of organizations, recruitment firms screen candidates for a job, and where a seemingly infinite amount of methods to evaluate firm performance exist. But all these sources of information are bound to be incomplete and to make sense of these signs, instruments of interpretation – be they impersonal and general, or tacit and specialized – are essential. Interpretation is needed to transform these institutional sources of information into knowledge that can guide action.

Instruments of interpretation are tools necessary to wrest meaning from the institutional signposts and other sources of information before these can serve as devices of coordination. It seems pertinent, therefore, to extend Lachmann’s analysis of capital structure to include certain institutional elements which comprise, among other things, instruments of interpretation. In doing so, we can now better understand why the institutional infrastructure on which market economies rest may be seen as an economic input. We present three parallels in Lachmann’s work between his institutional theory and his capital theory that justify extending the analysis of capital structure to include certain parts of the institutional infrastructures. First, the elements of stability and change in both;

secondly, the parallel between an institutional order and the capital stock; and thirdly, institutions and the capital goods as “nodal points.”

Elements of Stability and Elements of Change

First, while Lachmann thinks of heterogeneous capital goods in terms of their complementarity (element of stability) and substitutability (element of change), he also talks about the institutional order in terms of these two elements (Lachmann, 1971).¹² According to Lachmann, the coherence of an institutional order results from a complementarity of different rules and is therefore an element of stability in such an order.

The flexibility of the institutional order, however, represents the element of change. It is constituted by entrepreneurs adjusting or proposing new rules and developing new instruments of interpretation. The symmetry of opposing forces in the capital structure and in the institutional order as envisioned by Lachmann is the first hint that suggests that an institutional order may, in fact, be an extension of the capital structure in a society.

The Institutional Order and a Merchant's Inventory

Second, and related, is Lachmann's (1994, p. 278) illustration of the coherence of the institutional order:

We might look upon the institutional order as a merchant looks upon his inventory—that is, as consisting entirely of exchangeable parts. In the inventory, however, every part, by virtue of its being of value, is a substitute for every other part. But are all institutions substitutes for one another? Is there no complementarity among them? To the extent to which there is, there are limits to complete flexibility.

Lachmann, of course, did not believe that capital is a homogeneous mass and that the inventory of a merchant is ever likely to consist of perfectly substitutable parts. If there is a degree of complementarity of heterogeneous capital goods, the capital structure will not be completely flexible. Applying the same logic on the analysis of institutions, Lachmann argues that “new additions to the edifice of the legal order [...] must have some effect on some part of the latter” (Lachmann, 1979, p. 71).

Institutions and Capital Goods Are “Nodal Points”

Finally, as Steve Horwitz (1998) points out, Lachmann considered capital goods and institutions to be two different kinds of “nodal points.” While capital goods are “the *nodal points* of the flows of input [...] which they absorb, and of output [...] which they emanate” (Lachmann, 1956/1978, p. 58, emphasis in original), institutions are “nodal points of society, coordinating the actions of millions whom they relieve of the need to acquire and digest detailed knowledge about others and form detailed expectations about their future action” (Lachmann, 1971, p. 50). Lachmann did not provide a sharp demarcation of what institutions are and what they are not, nor is this the purpose of the present manuscript.¹³ We have seen that in his work institutions are simply conceived of as “signposts,” as a kind of “interpersonal stores of coordinative knowledge”

as Richard Langlois (1989, p. 237) puts it. What matters for our purposes is that just like the capital structure in a society creates a historical path which generates some predictability for economic actors, so does the institutional order.

The fact that Lachmann talks about capital goods as instruments and that he highlights the importance of instruments of interpretation in “wresting meaning from the market” is clearly a hint that some of these interpersonal stores of coordinative knowledge or, in other words, instruments of interpretation, are conceptually related to capital goods;¹⁴ this is because both the capital structure and the institutional infrastructures contain instruments that enter into entrepreneurial production plans, both capital goods and institutional infrastructures are economic inputs for which there is economic demand.

Joint Production: The Transformation Theory

We have suggested that instruments of interpretation, a subcategory of institutions, help coordinate individual plans. We may also say that instruments of interpretations are based on cognitive categories that group diverse artifacts together through classification schemes (Hayek, 1952). We use the concept of artifacts here to emphasize that goods are not naturally parts of categories, but instead only become comparable goods through classification processes. Through classification, artifacts may be turned into commodities by enabling a meaningful and justified comparison of these artifacts with others. This kind of comparison is a prerequisite for a legitimate monetary exchange whereby one special artifact, money, functions as a unit of measure. Some artifacts come to belong to categories that go together, they are complementary. But some categories may preclude their combination or commensuration with other classes of artifacts (Espeland & Stevens, 1998). Knowledge of categories makes comparison and calculation possible. Without it, market order would not be thinkable. The previously mentioned rating systems of credit-rating agencies are a case in point.

Institutions, like signposts, often change as a result of an ever-changing state of flux in the context these institutions form part of. On the one hand, through maintaining a relationship of stable categories between artifacts, institutions make the world less uncertain and more coherent. While institutions help us predict what other people will or will not do, through institutional changes categorical shifts introduce uncertainty. How can we understand these changes? If cognitive categories serve as instruments of interpretation, how can we extend the analysis of capital structures to better understand how are they produced, sustained, and transformed?

Like market prices, cognitive categories (or qualities) emerge from the process of competition – the meaning of competition is thus the discovery of costs, prices, and qualities (Dekker & Kuchař, 2016). We consider cognitive categories to be akin to instruments of interpretation and we assume that the institutions which are founded on these instruments result from a mixture of purposeful design and spontaneous emergence. This process can be understood through a transformational model of social activity developed by Lewis and Runde (2007).

In their model, as is the case in the present text, institutions are seen as “vehicles of human actions” (Lachmann, 1971, p. 141) that serve both as instruments and as constraints, that is, they both enable and limit human actions and interactions. The key idea of joint production implied by this model is “the recognition that as long as these ‘vehicles’ continue to be implicated in human action, they are reproduced, perhaps in a transformed way, through action over time” (Lewis & Runde, 2007, p. 174).¹⁵

In this view, the institutional infrastructure constrains and enables human actions and interactions which are in turn jointly producing and reproducing the very infrastructure while transforming it on the margin. This transformational model shows that “people continuously draw on social structure in acting, with their behavior leading either to the reproduction or transformation of those structures” (Lewis & Runde, 2007, p. 179). Entrepreneurs might, for example, seek to position their “new good” within an existing set of cognitive categories, thereby extending the range of these categories (“this is high fashion”), or they may seek to break an existing good out of an existing cognitive category as a strategy of differentiation (“this is much more than just a smartphone”).

Instruments of Interpretation Are Shared Goods

Another useful concept to understand the process of joint production is Arjo Klamer’s notion of shared goods. According to Klamer, there is a difference between private goods like ice cream or personal computers and shared goods like a friendship or a conversation. While eating the ice cream makes it impossible for anyone else to have that ice cream, for goods like a conversation or a friendship, argues Klamer, matters are different. “When you ‘consume’ a friendship, its value may actually go up. By making use of your friendship, you are actually producing it” (Klamer, 2016, p. 88). How can that be? For Klamer, goods like friendships or conversations are different from public goods, commons, or club goods; furthermore, neither friendships nor conversations are private goods. Like knowledge, these shared goods are “active goods,” in the sense that they have to be practiced in order to be consumed; they cannot be simply bought like private goods. Commons and club goods are in many aspects close to shared goods. However, unlike shared goods, commons are out there for anyone to plug in and make use of them. Club goods, conversely, are clearly defined by a membership while shared goods exist among groups of people without clear boundaries between those who are in and those who are out. Most importantly, shared goods are produced and reproduced by ways of contributions which are “intended to sustain, enjoy, and add value to a shared good. Contributions are a key activity in the practice that constitutes a shared good” (Klamer, 2016, p. 88).

Instruments of interpretation can be thought of as shared goods that are produced and reproduced through any action and interaction that makes use of these instruments. For instance, whenever we bring our products to the market, whenever we decide to offer our labor in the market, or whenever we share our human capital, under all these circumstances we use different kind of artifacts

(products, labor, human capital) to produce some kind of a private good that is later on usually bought and sold. Through all these actions, the framework of interpretation instruments is being shared, transformed, and thus jointly produced and reproduced along with the respective artifacts in question. Instruments of interpretation, a part of the institutional order, are jointly produced along with the actions and interactions they enable. Using them is often not simply a matter of “plugging in”; instead, using these instruments often requires prior commitment (as when you sign up for a particular rating system), or intimate knowledge of existing cognitive differences and social relations (as when you have to study or contribute first to be considered a “fashion designer”).

Joint Production of Instruments of Interpretation

The process of joint production of interpretation instruments can be illustrated by a simple model based on Cornes and Sandler (1996). In this model, we assume an artifact q ; q is an artifact that can be used to generate a private good Y_1 and a shared good Y_2 . We can say that using the artifact q , an agent jointly generates Y_1 and Y_2 . We propose to call the shared good Y_2 an interpretation instrument (or a classification scheme). The rules of classification Y_2 turn a particular artifact q into a particular good Y_1 . By using one unit of q , an agent produces α units of Y_1 and β units of Y_2 ; α and β are exogenously given coefficients reflecting a simple process whereby characteristics 1 and 2 are jointly produced in fixed proportions using the artifact q . Y_1 is a private characteristic, the total of which depends on the individual's acquisition of q . Y_2 is a shared characteristic, the availability of which depends on all individual's contributions.

The idea of contributing to a framework of interpretation instruments that legitimates an institutional infrastructure introduces a shared aspect of using goods that appear private: Y_1 and Y_2 are complementary goods, and using an artifact in a way that leads to the consumption of a characteristic 1 always relies on making use of a second characteristic that often remains assumed or tacit. Finally, we propose that the acquisition by i of an extra unit of the commodity q has three effects: first, the acquisition increases i 's consumption of Y_1 ; secondly, it increases i 's consumption of Y_2 ; and thirdly, it increases the quantity of Y_2 available to each of i 's neighbors.¹⁶

The third point is particularly important, not only does the use of characteristic 1 rely on the use of a complementary characteristic 2 (a classification scheme), making use of the second characteristic is non-rival; using the good in fact contributes to the production of this good. It is in this sense that we understand the notion of a contribution. An agent contributes to a joint production of an institutional infrastructure by making use of the interpretation instrument which is a complementary good to the (private) good they are particularly interested in using. Examples of these complementary goods (Y_2) may be diverse kinds of rules: rules that constitute sports and games, methodological rules in science, rules of political debate, rules that transform possession into property, norms of proper conduct with a type of property, etc. Examples of private goods

(Y_1) that are made possible by the complementary goods are things like free throws, peer review, elections, and buying and selling commodities in the market.¹⁷ By making use of Y_1 agents often tacitly contribute to a joint production of Y_2 . At the same Y_2 (which may be the prevailing classification scheme) is a substitute for an alternative Y_2' . Once Y_2' is proposed, it has the potential of substituting Y_2 as the shared classification scheme, thus making the production of Y_1' possible. While there is complementarity (or coherence, an element of stability), there is at the same time substitutability (an element of flexibility) among the instruments of interpretation. This reveals the connection between Lachmann's theory of capital with his theory of institutions.

Cross-complementarity

Extending the analysis of the capital structure to include interpretation instruments and institutional infrastructures confirms Lachmann's assertion that investment in some part of the capital structure may, under some circumstances, *increase* the demand for capital goods in other parts of the capital structure. In other words, efforts in the institutional infrastructure will often help create interpretation instruments that enable new combinations of existing capital goods and that may also turn existing artifacts into new commodities creating demand for new kinds of capital. The simplest instance is when a firm manages to establish a new product as distinct; other entrepreneurs can now make use of this new market category, by introducing a similar product.

We can now see that there is a kind of cross-complementarity between institutional elements and capital goods. When we want to buy and sell, to appropriate and exclude, or to transfer property rights, we must always rely on instruments of interpretation that render the artifacts we use compatible with these procedures. Without appropriate instruments of interpretation, certain artifacts will never become capital goods. If this is so, we in fact need instruments of interpretation to enable instruments of production designed for a particular purpose (capital goods). In this sense, instruments of interpretation and the institutions that are founded on them are shared economic inputs.

The model may help us understand, as Frischmann (2012) also suggests, that intellectual (including legal and institutional) infrastructures may be a special kind of shared goods and as such may benefit from a different kind of governance compared to standard private goods produced in competitive markets.¹⁸ That is to say, while novel "institutional forms are most frequently created by individuals through 'invention'" (Lachmann, 1971, p. 64), they are produced and reproduced jointly by sharing, imitation, and adjustment. This point has key implications not so much for the production of the new interpretation instruments as for their implementation and enforcement through institutional rules:

Imitation of the successful is, here as elsewhere, the most important form by which the ways of the elite become the property of the masses. [...] Institutions are the relics of the pioneering efforts of former generations from which we are still drawing benefit. (Lachmann, 1971, p. 68)

While we tend to think of capital in terms of private goods (rival and excludable), introducing knowledge (often non-subtractable and hardly excludable) into our understanding of capital structure should help us recognize that different kinds of capital goods, being heterogeneous, are produced in different ways. Some are best produced and consumed privately, while other kinds of capital goods may best be cultivated by sharing and contributions.

CONCLUDING REMARKS

We have presented fragments of previously unpublished correspondence between Ludwig Lachmann and G. L. S. Shackle on the importance of institutions for a properly subjectivist analysis of markets. From this conversation, we extract and develop two main ideas: the input theory and the transformation theory of institutions. Simply put, the institutional infrastructure is an input into economic activities and is produced, reproduced, and sometimes transformed by these economic activities that it constitutes and regulates. We suggest that instruments of interpretation – institutional elements on which institutional orders rest – are jointly produced shared goods.

Instruments of interpretation are elements of social infrastructures on which market interactions are built. We have shown that when agents use a private characteristic that relies on a second – complementary – characteristic, there will be three effects: First, individual consumption of the private good will increase. Secondly, the individual's consumption of the shared good (instrument of interpretation) will increase. Thirdly, and most importantly, the availability of the interpretation instrument to each of the individual's neighbors will increase as well. These effects illustrate that while institutional infrastructures are important complements of physical and human forms of capital, unlike them, these infrastructures consist of shared goods. They are produced, reproduced, and transformed by sharing and contributions through a process of joint production.

We have connected Lachmann's theory of capital and his theory of institutions. In Lachmann's view, both the capital structure and the institutional order are characterized by elements of stability and flexibility. The elements of both the capital structure and the institutional infrastructure, capital goods and instruments of interpretation, act as inputs into individual plans.

These insights provide a basis for further inquiry into the development of markets identifying cross-complementarities between the elements of institutional orders and capital structures. In particular, our argument suggests that there might be more external effects from market interactions than is typically believed. While we have studied how agents tend to benefit from the institutional order produced and maintained by others, future studies might also explore how this cross-complementarity may hamper economic action.

NOTES

1. Cf. Brian Loasby (1998, p. 25) who considers capital as a kind of knowledge in a broad sense of the word:

Lachmann insisted, the plans of individuals, or of organisations, rest on complementary assemblages of knowledge and of other kinds of capital, the productive capacity of an economy depends upon complementarities, which are partly crafted, but also partly the unintended consequences of human action which was directed towards other purposes.

2. Lachmann, recognizing the organic evolution of institutional structures, seems to have also stressed the importance of design in the emergence of institutions. In the following paragraphs of the letter from May 2, 1985, he writes:

I distrust Hayek's attempt to reduce the fundamental institutions of the market economy, such as the family and property, to products of the process of cultural evolution. If they are indeed such products, so are the Soviet Union and the British welfare state. Since the dawn of history political rulers have tried to interfere with markets and to manipulate them in their interests. Was all this merely a matter of "fatal conceit"? No constellation of social forces behind them?

3. Avner Greif (2006, p. 14) points out that "institutions have been defined in many ways, but all definitions consider an institution as either, for example, rules, the rules of the game, beliefs, norms, or behavioral traits." Greif recognizes that:

institutions are not monolithic entities but are composed of interrelated but distinct components, particularly rules, beliefs, and norms, which sometimes manifest themselves as organizations. These institutional elements are exogenous to each individual whose behavior they influence. They provide individuals with the cognitive, coordinative, normative, and informational micro-foundations of behavior as they enable, guide, and motivate them to follow specific behavior.

While we are very sympathetic to this perspective that treats institutions as bundles of institutional elements, we add the idea that while certain institutional elements are mostly exogenous to each individual whose behavior they influence some of these elements are at the same time produced, reproduced, and transformed by the very behavior they make possible. We, along with Lachmann, call these institutional elements "instruments of interpretation."

4. Lachmann suggested that "American railroads, by creating investment opportunities which in turn created new opportunities for further investment, engendered almost a wave of internal investment repercussion" (Lachmann, 1948, p. 710). The reason for such a repercussion is that the "building of a railway, by making possible new types of intensive farming and other uses of adjacent land, engenders a land boom. [...] new investment makes it possible to use certain existing capital resources complementary to it in a new and more profitable way" (Lachmann, 1948, pp. 700–701).

5. One could imagine a basic commodity such as crude oil. But in a complex economy, most capital goods are specific to particular tasks, as is evident in the case of human capital.

6. Lachmann wrote "Please permit me to present you 4 reasons" why subjectivists must not neglect institutions. Unfortunately, both the archives in Johannesburg and in Cambridge contain a partial copy of the letter in which only the first two reasons and a fragment of the third one are provided. The third reason draws on Shackle's own statement in another chapter and does not appear to be important for our purposes.

7. In August 1961, in his Presidential address on "Cost Inflation and Economic Institutions" delivered at the General Meeting of the Economic Society of South Africa, Lachmann pointed out that market forces "do not operate in a vacuum" and attributed this idea to classical economists who "regarded the market as an area which is embedded

within a framework of institutions” (Lachmann, 1962, p. 177). Lachmann furthermore observed:

All institutions are subject to historical change. In the course of it they may on the one hand acquire new functions, while old functions become obsolete [...] it may happen that what was originally quite a sound institution may turn out to become most unsound, or (though I would not know of one example!) it may happen the other way round. (Lachmann, 1962, p. 177)

8. The importance of reading signs is a prominent theme in Lachmann. In his 1961 Presidential address, Lachmann would point out that prices, profits (p. 185) but also excess capacities caused by malinvestment (p. 186) are specific examples of “signposts” that may “guide all productive activity” or direct new investment, respectively. In 1961, however, Lachmann did not yet explicitly write of institutions as signposts.

9. It is worth emphasizing that this step forward is not reflected in the published major works of Lachmann or Shackle. Shackle did not publish major work after 1982, Lachmann’s final book *The Market as Economic Process* (1986) is more reflective and does not develop his institutional theory.

10. For a more recent treatment of intellectual infrastructures of which institutional infrastructures constitute a subset, see Hadfield (2016, p. 86), who makes the case that law – “this amorphous collection of legal materials, organizations, norms, beliefs, and practices [...] [but also] mechanisms for connecting people’s actual behavior with the rules” – is an economic input, for which there is economic demand. The institutional framework enters into any production function along with other production factors that form parts of the entrepreneurial plan.

11. Prices are important for coordination of plans to happen in markets (Hayek, 1945), but more is needed than just price information for markets to clear (Kučař & Dekker, 2017). Endres and Harper (2013) borrow an image that Lachmann paints of entrepreneurs who “wrest meaning from the market” (Lachmann, 1951, p. 102) through recurrent application of interpretive practices that help them understand the meaning of price signals, through this process, entrepreneurs “approach capital structures like complex networks of artefacts that require continuous interpretation” (Endres & Harper, 2013, p. 325).

12. According to Lachmann:

Institutions serve to co-ordinate plans in large societies. To serve this purpose they must form a structure to which coherence and permanence can be attributed, as no institution stands by itself and all action extends into the future. (Lachmann, 1971, p. 88)

13. It often seems that Lachmann considers institutions to be both rules of the game and the players of the game – organizations – at the same time. Furthermore, Lachmann reminds us of the difference between legal rules and institutions, we should:

distinguish carefully between legal norms and those recurrent patterns of conduct which we call institutions. [...] the mere fact that each institution denotes a recurrent pattern of conduct does not by itself entail the existence of an over-all institutional order. (Lachmann, 1971, p. 75)

Institutions as recurrent patterns of conduct form networks of:

constantly renewable meaningful relations between persons and groups of persons who may not all ascribe the same meaning to the same set of relations. The task of the student of institutions is to distill such meanings from his observations and to interpret them to his audience. (Lachmann, 1994, p. 275)

It should perhaps be added that these meaningful relations may be both interpersonal and person-artifact relations.

14. See Foss and Garzarelli (2007) who have also argued that institutions are a kind of “knowledge capital.”

15. See also Endres and Harper (2013, p. 307) on this point: “domain-specific institutions that influence entrepreneurial actions and often emerge from, and are maintained by, those very actions.”

16. Relatedly, James Buchanan (1975, ch. 7) also considered law to be a form of shared public capital. According to Buchanan, when we restrict our liberty submitting ourselves to the force of law, we produce an externality that benefits others. For example, when we obey the law which specifies that under certain circumstances, a possession of an artifact is recognized as private property, and when we take into account the dos and don’ts that such an institution legitimates, we make the property safer benefitting purely the owners. In this sense, argues Buchanan, law is a kind of public good produced and reproduced by people who voluntarily restrict their liberty thus producing positive externalities as a by-product of their conduct.

17. A referee asked us: “If I get fouled and shoot some free throws, have I contributed to the rules of basketball?” The point here is that it is not just whether we follow the rules when we shoot a free throw after being fouled but also how we go about doing it. There are certain rules and conventions that tell the players how to do things, they enable and constrain what is possible. The example of Wilt Chamberlain who has forgone the underhand foul shot technique for reasons of peer pressure even though his percentage had significantly improved by this technique is a case in point. We suggest that when making use of certain formal rules and informal norms to perform things like free throws, voting, peer review, or buying and selling, we also (mostly unintentionally) reproduce these rules and sometimes we even manage to contribute to their transformation. There is more to free throws than standing on a line and shooting.

18. See also Hall and Jones (1999) on the importance of social infrastructures based in language for economic development.

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