On the joint production of interpretation instruments∗

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Abstract

Ludwig Lachmann thought of heterogeneous capital goods in terms of their complementarity (element of stability) and substitutability (element of change). We argue that institutions are interpretation instruments, a kind of “knowledge capital” (Foss and Garzarelli 2007), and as such should be included in our analysis of capital structure. There is a mere hint in Lachmann’s work at this idea. By way of an analogy with capital goods, he talks about institutions in terms of their coherence (element of stability) and flexibility (elements of change). Introducing knowledge into the capital mix brings about a couple of problems. Should we think about knowledge as a private good or is knowledge capital a shared kind of good? How is knowledge capital produced? How does the production of knowledge capital relate to other capital goods in the capital structure? In what way is knowledge capital complementary to other capital goods? By developing a theoretical framework based on Cornes and Sandler (1996) we analyze the joint production of knowledge capital. Agents jointly contribute to the production of interpretation instruments generating a normative framework by using private goods. The model assumes that private goods (physical capital) and public goods (knowledge capital) are complementary goods; using an artifact in a way that leads to the consumption of a private characteristic always relies on making use of a second (public) characteristic that often remains assumed or tacit. We show that the acquisition of an extra unit of the private good has three effects: First, it increases the individual consumption of the private good. Second, it increases the individual’s consumption of the public good (instrument of interpretation). Third, and most importantly, it increases the availability of the interpretation instrument to each of the individual’s neighbors. Knowledge capital is a kind of a shared good.

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Our goal in this paper is to combine two different but essential themes in the work of Ludwig Lachmann—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 emphasized the coherence between different institutions, in his work on capital he would highlight the complementarity of heterogenous capital goods. Both coherence and complementarity are elements of stability. In this paper 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, that is, we can arrive at a thicker understanding of the workings of markets. The market economy as we understand it is a set of relationships between interacting agents and the artifacts they exchange. Under certain circumstances, the market economy can function as an engine of wealth creation and it is precisely for this reason that Lachmann singles out the institutions of property and contract as key to the functioning of markets. The institutional structure, like the structure of capital goods in the economy, is an emergent property of the system, which structures interactions on markets.

This institutional structure forms a kind of shared framework which enables economic agents to interact within uncertain environments. We call this shared framework the ‘knowledge capital’ (Foss and Garzarelli 2007) of an economy. We show that while knowledge capital is a key complement of physical and human forms of capital, unlike them, knowledge capital is a shared good. Because its use is often non-exclusive and non-subtractible, the knowledge capital is being produced and reproduced by sharing and contributions through a process of joint production. This shared framework, like language which Friedrich Hayek would single out, is essential for the proper functioning of the economy, but existing accounts of the market 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.

1 Seen and unseen infrastructures

Economists often tend to assume that the institutional framework is somehow given, that it somehow simply exists. In many aspects, neoclassical and in some cases even new institutional economics is not well suited for the analysis of institutions which are often considered to be mere constraints, formal or informal (North 1991). These constraints upon optimizing behavior of agents are usually exogenously introduced in the analysis. We can, however, find analyses that endogenize the institutional framework and consider it an integral part of the market process, not just as some kind of an appendix to that process that is to be decided in the murky alleys of politics.
A major step toward endogenizing institutions has been Brett Frischmann’s work on infrastructures (Frischmann 2012). Infrastructural resources run on the background of any kind of social and economic interaction. More specifically, we can say that they are “consumed nonrivalrously for some appreciable range of demand,” that a “demand for the [infrastructural] resource is driven primarily by downstream productive activity,” and finally, that the infrastructural resources tend to “be used as an input into a wide range of goods and services” (Frischmann 2012: xiv). Typically, things like roads and highways, railways, bridges, lighthouses, water systems, power grids, optical fibers, etc., come to mind. The historical importance of these kinds of infrastructures cannot be underestimated, think just about the impact of railway building in North America (Fogel 1970; Kuntz Ficker et al. 1996). Very often, we tend to think about these kinds of infrastructure as of public goods in the sense of their consumption being non-rival and non-excludable. A standard textbook scenario demonstrates that private initiative will fall short of providing these kinds of infrastructures in a satisfactory quality and quantity and that, therefore, these goods should be provided by a political authority. This conclusion has been challenged by a number of prominent authors.

Ronald Coase (1974) showed, for example, that lighthouses—which have been considered to be a public good par excellence ever since The Wealth of Nations has been written—in fact used to be built by privately by daring English constructors and only later on seized by the Crown. James Buchanan (1965) has argued that many of the goods that are considered public are actually provided by clubs that ask their members for subscription fees. Finally, Elinor Ostrom (2005; 2010) convincingly argued that the range between purely private and purely public goods is quite disparate and multidimensional and that many externalities that would theoretically take place when producing some goods, can be dealt with through a commons-like governance where community members enact and enforce institutional rules in a decentralized ways. Frischmann points out that although, like standard public goods, infrastructures are characterized by the indivisibility in consumption that involves high fixed costs and relatively low variable costs, “some infrastructural capital may be managed in a manner that sustains and leverages nonrivalry to achieve increasing returns” (Frischmann 2012: 22).

Frischmann (2012) extends the analysis of physical infrastructures to include intellectual infrastructures. We might think of language as a central example of intellectual infrastructure. But apart from language, intellectual infrastructures “include a broad set of resources that create benefits for society primarily through the facilitation of downstream productive activities, many of which generate spillovers” (Frischmann 2012: 275). They are simply non-rival inputs into a wide variety of outputs; think basic research, general purpose technologies or infrastructural ideas.

A tendency to apply the “tragedy of commons” thinking to the production of intellectual infrastructure often prevails suggesting that a strict enforcement of intellectual property laws is key for a successful development of new knowledge. But Frischmann provides a different perspective sug-
gesting that people often come up with new ideas and new ways of doing things not because they maximize profit aligning expected revenue with expected costs on the margin. Rather, it seems to be the case that “in many situations, people create, invent, and innovate because the anticipated returns from their own use of the results are sufficient to justify the investment” (Frischmann 2012: 262). That is, often people come up with new apps because they have a problem of their own that needs solving. “In some contexts, people produce intellectual resources and welcome free riding by others. Sharing intellectual resources can be a viable strategy for increasing returns generated through other means” (Frischmann 2012: 262). Frischmann argues that from an empirical perspective, there is a non-negligible proportion of cases which show that when the expected benefit is greater than the fixed cost, new knowledge is produced and after that often shared at zero price. This process introduces some positive spillovers that happen when people imitate each other. But if intellectual property law is strictly enforced, many of these spillovers that we often take for granted may simply go away. As Elinor Ostrom argued, there are no institutional panaceas and nor is the commons-governance of intellectual infrastructures suggested to be one. But the point is different here, Frischmann does not argue that we should get rid of private-property-in-ideas metaphors in all cases, rather, the argument is that in many cases, sharing and governing our intellectual infrastructure as commons will have non-trivially positive economic consequences.

The importance of infrastructures seems to be most conspicuous in the case of its malfunction. That is especially true when we talk about “legal infrastructure” as Gillian Hadfield does in her recent book titled Rules for a Flat World (2017). Most people are well aware of the importance of physical and intellectual infrastructures. We recognize the importance of uncongested highways or high high-speed railways during our daily commutes, we are well aware of the enabling power of language and such realizations become much more vivid when the road becomes congested, when the railway workers go on a strike or when we cannot simply “plug in”, as Hadfield puts it, into a framework of people who share our language or adhere to a common legal code. With legal infrastructure, which may be considered a subset of Frischmann’s intellectual infrastructure, things are different to the extent that the enabling function of legal and institutional rules is almost always hidden, it mostly runs in the background and what we typically notice about law is that it tells us what not to do. Way too often we seem to want less law thinking that less law implies less constraints.

But Hadfield asks the reader to put herself in the shoes of an entrepreneur with a great new idea. What does the entrepreneur need to turn the new idea into a useful innovation? Some money, a team of people, partners and employees perhaps, some space, a computer with a decent connectivity. But also, argues Hadfield, “you need some law. ... You will want law. You will be looking for law. You will be frustrated by the inadequacies of the law you have available to you. You just may not realize that what you are looking for is law. More precisely you will be looking for good legal infrastructure”
Hadfield points out that it is not plausible to think of a world without law. Yes, we can think of a world where the rules of the game are not written down, where the rules are contradictory, incomprehensible, or simply hard to learn. Even if we think of societies that, by western standards, lack a well-developed rule of law, we nevertheless usually find “a thick web of rules: what can be said, worn, or eaten; with whom; when; and using what methods or tools or rituals ... All those societies today that we think of as lacking in rule of law are a minefield of rules about what people can and cannot do” (Hadfield 2017: 89). Entrepreneurs, even if they do not realize that they do so, are always looking for good legal infrastructures which, in Hadfield’s definition is made up by “all the legal resources that will make a difference to your venture” (Hadfield 2017: 86). Mind you, Hadfield does not conflate law with legislation, that is with the codified formal rules. Quite the opposite, according to her the legal infrastructure is this amorphous collection of legal materials, organizations, norms, beliefs, and practices ... we are not just talking about formal legal rules and procedures—the language in statutes and court decisions that garner so much political attention. We are not just talking about “the law” or even “the legal system.” Yes, formal legal rules and procedures matter. But formal rules are just so many inky squiggles on paper if the mechanisms for connecting people’s actual behavior with the rules are missing or ineffective or too expensive. (Hadfield 2017: 86)

In Hadfield’s book we can find a number of illustrations of why entrepreneurs hunt for good legal infrastructure. Just to hire someone who will help us develop our idea, one must count on rules of contract and employment law you probably don’t know exist that allow you to lay off employees if you are overly optimistic about how fast your business will grow, or to stop them from moonlighting for your competitor. You’ll be looking to immigration rules to make sure the amazing foreign-born computer science interns you want to hire permanently can get visas. Corporate law will allow you to form a company free of the risk that your partners’ personal creditors can come after company assets. Trademark law will step in to make sure that a competitor doesn’t confuse your customers by copying your impressive logo and maybe your URL. You’ll be counting on the contracts with your landlord and local housing codes to ensure the lights stay on, the heat is working, and security is maintained as advertised at the front door (Hadfield 2017: 84).

Hadfield makes the case that legal infrastructure is a form of capital (Hadfield 2017: 89) that is, because of its widespread availability, a shared good. Just like with other kinds of infrastructure, we do not typically have the legal infrastructure tailored and constructed just for our purposes. The legal
infrastructure must be general enough to allow entrepreneurs with different kinds of plans to plug into it and make use of it. As such, the legal infrastructure seems to be a part of the environment, “it was there before you got here” (Hadfield 2017: 87) and that may be the case why economists often take it as an exogenous variable. But Hadfield suggests that we should “get past any simplistic idea that the problems we face with law are ones that would be solved by just having less of it” (Hadfield 2017: 89), the question often is not how much law do we have (although that is important too in the world of burgeoning red tape), but rather what kind of legal infrastructure do we have access to. This is because law is an economic input, and because there is an economic demand for law. That legal infrastructure enters into any production function along with other production factors that form parts of the entrepreneurial plan is a key insight of Hadfield’s book.

But if we admit that there is a sense in which law is an infrastructural production factor, we must wonder what the market for that production factor looks like. Is there a market for law that can be understood in a way as we understand the law for other capital goods and production factors in general?

2 Lachmann, capital structure and institutional order

Ludwig Lachmann has contributed to our understanding of capital formation and its effects on production on the one hand, and to the analysis of institutional order on the other hand. If we consider the legal infrastructure that comprises of legal rules, institutions, organizations, norms and beliefs as a kind of a capital that enters into the production functions of entrepreneurs by way of their plans, we should wonder about where this kind of capital comes from and how is it produced. While Lachmann himself does not provide answers to this question, it is not a long way from bridging his analysis of institutions and capital structures to arriving at some tentative conclusions.

Let’s first zoom in on some of the main themes in Lachmann’s analysis of capital. 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 according to Lachmann—who was influenced by Friedrich Hayek on a number of issues, including capital structure—capital goods are heterogeneous and what counts as capital is subjective. Consider a bottle of Hendricks Gin. The same bottle may be a consumption good or a capital good depending on whether it is found on a supermarket shelf by a consumer who likes to have a sip of Hendricks now and then or whether it is bought wholesale by someone who owns a bar and plans to serve it with tonic. In the second case, gin and tonic are capital goods which are complementary as a part of the business plan. Gin and tonic are heterogeneous capital goods because one cannot be easily substituted for another as a part of the plan. What is a capital good is subjective and the substitutability or complementarity
of capital goods depends on a number of marginal adjustments that entrepreneurs might make to their plans.

If a plan is successfully carried out, the entrepreneur will consider all the goods that make up the plan 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 complementary and substitutive relationships of investment goods with regard to the existing capital structure is a phenomenon that Lachmann called “investment repercussion” (1948) which can help us understand why it is that additional investment does not necessarily need to push returns on capital down.

In a hypothetical state of equilibrium where no plans are ever revised, all capital goods are perfectly interchangeable and “the effect of investment on further investment decisions is bound to be depressing ... over time, and in the absence of unforeseen change, the marginal efficiency of capital will decline” (1948: 699). But 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 which in the US (and in other places) created investment repercussions in terms of the formation of new capital goods and investment opportunities.1 Today’s examples might involve new kinds of investment opportunities made possible by the introduction of smartphones and automation in general (think about the difference between placing an order with a live shop assistant on the phone and 1-click-ordering).

Because capital is a fundamentally subjective concept, Lachmann is skeptical as to our ability to systematically measure capital stocks (Lachmann 1941). But even if we could not 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: 368-369). These propositions stand 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: 376). Capital, as Walter Grinder reiterates, is therefore “not a homogeneous aggregate, but rather a complex interdependent structure of heterogeneous producer’s goods” (Grinder 1977: 15). These goods when applied “for the same

1 “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: 700-701) In the case of “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: 710).
end, or a group of consistent ends” (Lachmann 1947: 110) will be complementary capital goods, rather than perfectly interchangeable substitutes.

Lachmann sees capital goods as *instruments* which are “designed for a purpose” (Lachmann 1947: 112). These purposes may be highly specific but also 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. 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: 113).

In the review of *Human Action*, 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’ by buying and selling them, 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: 422). It seems to be the case that the design of the structure of capital instruments (which goods are capital goods and how do they fit together in an economy) is thus partially an emergent phenomenon.

Thinking about capital goods as instruments designed for a purpose provides, we believe, an opportunity to bridge Lachmann’s analysis of capital with his analysis of institutions. Consider the following statement in Lachmann (1978: 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 ... a market economy success depends largely on the degree of refinement of one’s *instruments of interpretation* (emphasis added).

As important as prices are for coordination of plans to happen in markets (Hayek 1945), more is needed than just price information for markets to clear (Dekker and Kuchař 2017). Endres and Harper (2013) borrow an image that Lachmann paints of entrepreneurs who “wrest meaning from the market” (Lachmann 1951: 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 and Harper 2013: 325). Budget constraints are not the only kind of limitations that entrepreneurs face and while at times, certain capital structures will not be feasible due to high costs, it may well be the case
that certain capital structures, while feasible financially, may be out of bounds due to institutional constraints. How can we better understand this somewhat abstract problem?

Take the following example. In Kuchař (2016), one of us has shown that the constitution of the surrogacy market in the United States crucially depended on the reconsideration of ‘motherhood’ as a moral and legal category. Most of us (at least throughout the 1980s and 1990s) would not think twice about what motherhood is, how it is established and what rights and responsibilities it entails. Under normal circumstances, we would have no doubts whether a woman who went through the physical acts of gestation and birth is the gestational, birth- and legal mother. Furthermore, we would most likely feel repugnance for a mother who wants to sell her child. But with the advent of IVF and with the shortages in the adoption market, “renting out one’s womb” (Epstein 1995) for money has become a physically viable alternative in which case, as many entrepreneurs did, a womb may be seen as a capital good to be contractually rented out. It would take some time before this interpretive shift (womb=capital) would be reflected in the US legal framework through redefining the very concept of motherhood. It was in 1985 that a judge decided that a woman who gives birth to a child that she gestated shall not be considered a legal mother if she had contractually agreed to relinquish the child after birth. This reinterpretation of motherhood was key for the enforcement of surrogacy contracts. If the birth mother’s name goes on the birth certificate, relinquishing child for money is a crime. If the contractual mother’s name goes on the birth certificate after the birth mother gives birth to the baby, relinquishing the child for money is more like paying for a nanny or a baby sitter. In this case, we talk about gestational carriers.

The technology of IVF was not designed with the purpose of solving adoption market shortages through gestational surrogacy and, in fact, the inventors of IVF were opposed to its application in the surrogacy market. But pioneers of surrogacy understood quite early that a womb combined with the technology of IVF might constitute a profitable business plan. This is a result of refining one’s instruments of interpretation but refined as they might be, such interpretations would not have much importance had the new categories of birth mother, gestational mother, and contractual mother been legally recognized. The 1985 judicial decision which legally separated motherhood into three different categories created an instrument through which an interaction between contractual parties might be interpreted as constituting a set of rights and responsibilities we normally recognize in a parent. This instrument, as we wish to suggest, is an integral part of the entrepreneurial plan along with the petri dish, the gametes, the womb, etc. The precedent is complementary to recognizing the role of the intended parents and the gestational carrier as a part of a surrogacy contract and it is a key instrument to successfully carrying out the plan.

Consider another example. Earlier on this year a judicial decision in New Zealand granted the Whanganui river legal rights a human being might enjoy. This decision has been followed by a similar
one taking place in India where the rivers Ganges and Yamuna acquired the same kind of rights (Carpi and Leiboff 2016; Roy 2017; Safi 2017). Consequently, a damage done to the river will legally fall into the same category as a damage inflicted on a person. From a law and economics perspective, this is akin to a hike in expected costs for transgressors with economic consequences that may be at odds with those that the designers of such a legal act might have intended. But let us look at the matter from a different, slightly less positivistic perspective. If certain lands or waters are genuinely considered as unique and sacred and if such an interpretation is by and large enforced by customs and habits, then we have an interpretation instrument which may, or may not, be reinforced by a formal rule. An instrument of interpretation which says “the Whanganui river is unique and sacred and must not be treated as means to an end without the consent of its caretakers” creates a kind of complementarity between the river and certain kind of entrepreneurial plans that may or may not be feasible.

Dumping sewage into the river may, for example, be off limits. Appropriating or even renting out certain areas of the river may now be off limits if the caretakers consider the river to be an extension of their bodies and souls. In a way that certain societies consider selling babies as repugnant and do not permit markets in babies, it may be that certain interpretation instruments may be complementary to a particular set of proper and permissible uses of the land or water in question. Furthermore, it will be the case that certain instruments of interpretation may be substitutes for other interpretations that might permit appropriation, exclusion and contractual interactions permitting access, etc. Institutions comprise of instruments of interpretations that rely on cognitive categories which, as we will show further, are jointly produced.

While there is no explicit connection between Lachmann’s analysis of capital structures and his work on institutional orders, there is a number of parallels. It is thus not a stretch to extend his analysis of capital structure to include institutions which comprise, among other things, of instruments of interpretation.

First, while Lachmann thinks of heterogenous capital goods in terms of their complementarity (element of stability) and substitutability (element of change), but he also happens to talk about the institutional order in terms these two elements (Lachmann 1971).\(^2\) 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, on the other hand, represents the element of change. The symmetry of opposing forces in the capital structure and in the institutional order, as envisioned by Lachmann, may suggest that an institutional order may, in fact, be an extension of the capital structure in a society.

\(^2\)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: 88).
Second, and related, is Lachmann’s (1991: 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 homogeneous 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” (1979: 71).

Finally, as Steve Horwitz (1998) points out, Lachmann considers 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 1978: 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: 50, emphasis added). 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, in his work institutions are simply conceived of as “signposts”, as a kind of “interpersonal stores of coordinative knowledge” as Richard Langlois (Langlois 1989: 237) puts it.

The fact that Lachmann talks about capital goods as instruments and that, as we have seen above, he highlights the importance of instruments of interpretation in “wresting the meaning from the market” might also be a hint that these interpersonal stores of coordinative knowledge or, in other words, instruments of interpretation, are conceptually related to capital goods. Following Foss and Garzarelli (2007), and recognizing Lachmann’s emphasis on instruments of interpretation, we want to argue that institutions are a kind of “knowledge capital” and as such should be included in our analysis of capital structure and its productivity.

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3It 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 overall institutional order” (Lachmann 1971: 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 distil such meanings from his observations and to interpret them to his audience” (Lachmann 1991: 275). It should perhaps be added that these meaningful relations may be both interpersonal but also person-artifact relations.
Institutions, which are a kind of knowledge capital, are based on cognitive categories that group things together through classification. Through classification, artifacts may be turned into commodities by enabling a comparison of these artifacts with other artifacts. 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. Knowledge of categories makes comparison and calculation possible. Without it, market order would not be thinkable.

But 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 a little less uncertain. They help us count on what other people will or will not do. On the other hand, through institutional change, categorical shifts in our knowledge capital introduce uncertainty. How are the cognitive categories that make up knowledge capital produced? If cognitive categories serve as instruments of interpretation, how can we extend the analysis of capital structure to better understand their formation?

3 Jointly produced institutional frameworks

Cognitive categories, like market prices, emerge from the process of competition. The meaning of competition is thus the discovery of costs, prices and qualities (Dekker and Kuchař 2016). Cognitive categories and the institutions which are founded on them result from a mixture of purposeful design and unintentional emergence. Here, the notion of co-determination that Lachmann employs while explaining the origins of modern joint-stock companies is quite useful. “Modern joint-stock enterprise,” argues Lachmann, “could not have come into existence without a legal form expected to be permanent (1979: 73). Modern joint stock companies cannot, in other words, exist without a particular institutional framework. But that institutional framework, which includes company law, is a “joint creation of market growth and the legislative embodiment of ideas pertaining to the market, [it] is the final product of a long process of interaction of business men and lawyers” (1979: 73). We want to show how do the interactions of market participants jointly produce the institutional framework building on Lachmann’s concept of co-determination.

The process of co-determination can perhaps be better 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: 141) that serve both as instruments and constraints, that is, they both enable and limit human actions and interactions. But the key idea of co-determination 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 and Runde 2007: 174). This is a realist view of co-determination of human agency and social structure. In this view, the institutional framework constraints and enables human actions and interactions which are in turn jointly producing and reproducing the very framework while transforming it on the margin. This transformational model shows that “people continuously draw on social structure in acting, with their behaviour leading either to the reproduction or transformation of those structures” (Lewis and Runde 2007: 179).

Institutions revolve around instruments of interpretation, these interpretation instruments are jointly produced and reproduced through any action and interaction that makes use of these instruments. 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. But there is also something else that is tacitly being produced in this process. Through all the above mentioned 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. We want to propose that the notion of joint production is key to our understanding of how we construct the institutional order that constrains and enables human interactions in markets. In what follows we develop a model to show that these interpretation instruments on which the institutional order is built are shared and produced by way of contributions.

3.1 A model of joint production

As we have said above, there are diverse kinds of artifacts. We have mentioned products and human labor but we may also think of a ring an artifact, a property right is an artifact, and so on. Let us further assume that all artifacts are produced by humans and that all artifacts are produced and consumed socially. That all artifacts are used socially means that there are multiple outputs that using an artifact might generate, some are private but some are always inevitably social (these outputs might, however, be infinitesimally small, thus almost invisible). We will specify a model of joint production based on the work of Cornes and Sandler (1996). A principal difference is that, unlike Cornes and Sandler who introduce a difference between purely private and public goods, we believe that from a certain perspective, all goods, even those that seem purely private, carry a public aspect with them. This aspect has to do with the framework of rules and norms that regulate the proper and permissible applications of diverse artifacts.

4See also Endres and Harper (2013: 307) on this point: “domain-specific institutions that influence entrepreneurial actions and often emerge from, and are maintained by, those very actions.”
Let’s assume an artifact \( q \); \( q \) is an artifact that can be used to generate a private good \( Y_1 \), and a public 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 public good \( Y_2 \) an interpretation instrument (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 \( \alpha \) units of \( Y_1 \) and \( \beta \) units of \( Y_2 \); \( \alpha \) and \( \beta \) are exogenously given coefficients reflecting a simple process whereby characteristics 1 and 2 are jointly produced in fixed proportions by 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 public characteristic, the availability of which depends on all individual’s contributions.

The idea of contributing to a framework of classification that generates an institutional framework of interpretation instruments introduces another social/public aspect of using goods that appear private: \( Y_1 \) and \( Y_2 \) are complementary goods, 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. Additionally, 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 \( Y_1 \). Second, it increases \( i \)'s consumption of \( Y_2 \). Finally, it increases the quantity of \( Y_2 \) available to each of \( i \)'s neighbors.

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), making use of the second characteristic is non-rival, using the good in fact contributes to the production of this good. In this sense we understand the notion of contribution. An agent contributes to a joint production of an institutional framework by making use of the interpretation instrument which is a complementary good to the (private) good they are particularly interested in. Examples of these complementary goods \( (Y_2) \) may be diverse kinds of rules: rules of basketball, rules of science, rules of democratic society, rules of property and contract, etc. Examples of private goods \( (Y_1) \) that are made possible by the complementary goods are things like free throws, peer review, elections, buying and selling commodities in the market. By making use of \( Y_1 \), agents often tacitly contribute to a joint production of \( Y_2 \).

Using the notation introduced by Cornes and Sandler we could say that there is a utility function that could help us understand agent’s behavior: \( U(.) = (Y_1, Y_2) \). In this case the utility function works with Leontief preferences as the two characteristics are complementary. One cannot make use of a commercial contract without the framework (the legal infrastructure) that enables this contract by way of a set of particular rules. Furthermore, writing down a contract and making use of it contributes to a reproduction of this complementary good that makes the contract possible. This utility function could further be written as follows: \( U(\alpha q, \beta (q + \tilde{Q})) = \hat{U}(q, \tilde{Q}; \alpha, \beta) \). If one makes use of an artifact \( q \) this artifact leads to multiple outputs, in our case the artifact generates two characteristics, a commercial contract (buying, say, a washing machine) and the framework which makes the contract possible (let’s say this is a civil code). The coefficients \( \alpha \) and \( \beta \) tell us something about how making use
of the artifact influences the production of the two characteristics. \( \hat{Q} \) is a sum of all other agents’ contributions to a given institutional framework. If \( \alpha, \beta \) and \( \hat{Q} \) are fixed, we have \( U(q) \).

We further observe that the same artifact may generate different goods under different classification schemes. We may assume that \( Y_1 \) is a complement for \( Y_2 \) and that \( Y'_1 \) is a complement for \( Y'_2 \). If this is so, then \( Y_2 \) and \( Y'_2 \) are substitutes, or in other words, competing instruments of interpretation. In this case, \( q + \hat{Q} \) could be seen as a particular set of complementary interpretation instruments consisting of an individual contribution \( q \) and a sum of individual contributions of others \( \hat{Q} \) who make use of the good (a particular interpretation instrument). \( \beta \) is a coefficient of contribution, it signals how does an application of the scheme (making use of the artifact in a particular way) contribute to the reproduction of the institutional framework.

\[
Y_2 : q_a \rightarrow Y_1 \quad \Rightarrow \quad U(Y_1, Y_2) = U(\alpha q_a, \beta (q_a + \hat{Q}_a))
\]

\[
q
\]

\[
Y'_2 : q_b \rightarrow Y'_1 \quad \Rightarrow \quad U(Y'_1, Y'_2) = U(\alpha q_b, \beta (q_b + \hat{Q}_b))
\]

Analyzing the model has a couple of consequences. First, 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 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.

Second, entrepreneurs can be agents of change in one domain of the capital structure while reifying (often unintendedly) status quo in other domain at the same time. Entrepreneurs thus do not necessarily need to be agents of change in all domains. Depending on where they are in the productive cycle, entrepreneurial rebels in fact often turn into abiding status quo entrepreneurs who buy low, sell high, but do not challenge any rules. Those entrepreneurs who innovate in the infrastructural part of the capital structure may come up with new interpretation instruments that may become substitutes for other interpretation instruments conducive to some production plans. Innovation in one part of the capital structure may thus lead to destruction in other parts of the capital structure that may or may not be offset by new combinations and new production plans. There is no reason to believe that the capital structure will tend toward some kind of balance or equilibrium.

But innovating in those parts of the capital structure that rely on established complementary institutional frameworks will often, while disruptive in the product space, in fact lead to a reification of a status quo in the infrastructural part of the capital structure. Certain recombination of capital goods do
not require new interpretation instruments nor do they need novel institutional forms, the established categories will do and, while the entrepreneur may not be even aware about these consequences, their reshuffling of some capital goods will push the system toward a greater institutional stasis.

Third, we can also confirm the idea that while “no institution can exist for long unless it satisfies some need ... not every need generates an institution” (Lachmann 1971: 67). As Hadfield (2017) stresses, institutional infrastructures are economic inputs for which there is economic demand. Way too often the problem is that suppliers of this input are not responsive enough to changing demands for legal and institutional frameworks. Hadfield calls for greater competition in the provision of law which should provide a greater pool of innovative institutional solutions from which to choose when regulating markets in new previously unimaginable commodities. But the important point here is also that the notion of law as public good being produced by a political authority is an obsolete concept.

The model shows, as Frischmann (2012) also suggests, that intellectual (including legal and institutional) infrastructures may be a special kinds of knowledge commons and as such may benefit from a different kind of governance compares to standard private goods produced in competitive markets. That is to say, while novel “institutional forms are most frequently created by individuals through ‘invention’” (Lachmann 1971: 64), they are produced and reproduced jointly by imitation. 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: 68). While we tend to think of capital in terms of private goods (rival and excludable), introducing knowledge (often non substractible and hardly excludable) into the capital mix should help us recognize that different kinds of capital, being heterogeneous, may be produced in different ways. Some are best produced and consumed privately, while other kinds of capital may best be nourished by sharing and contributions. Complementarities between shared and private capital structures open up a new chapter of institutionalism in economic and sociology.

**Concluding remarks**

We argue that instruments of interpretation, on which institutional orders rest, are jointly produced shared goods. We have developed a model to show that instruments of interpretation are a form of intellectual infrastructure on which market or social 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. Second, the individual’s consumption of the public good (instrument of interpretation) will increase. Third, 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 knowledge capital is a key complement of physical and human forms of capital, unlike them, knowledge capital is a shared good produced, reproduced and transformed by sharing and contributions through a process of joint production.
References


