

# **The Firm, Money, and Economic Calculation:**

## ***Considering the Institutional Nexus of Market Production***

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ABSTRACT. This paper examines the role of money and monetary calculation in the determination of the production structure of the economy.

### I

#### **Introduction: Firms and Calculation**

RECENT DISCUSSIONS ON THE RATIONALE and nature of the firm (drawing on the pioneering work of Coase (1937) and sometimes called the New Institutional Economics) suggest that firms derive their rationale from the fact that the organization of production matters for its results.<sup>1</sup> By the same token, as the economy changes, and the production structure changes along with it, the advantages of different types of organization also changes (see for example Langlois & Robertson, 1995; Williamson & Winter 1991). Still, with all the far-reaching economic changes that have occurred, the firm as a category (the modern business corporation) has remained a dominant form of economic organization. It is an institution that is unique to a market, that is, capitalist, economy. In an important way the market economy owes its success to the business firm.

In his discussion on the feasibility of central planning under state Socialism, Ludwig von Mises pointed to the ability of private owners (investors) to calculate profitability as being the indispensable ingredient of a decentralized system, the absence of which accounted for the inevitable failure of a centrally planned one (von Mises, 1920, 1966, 1981).<sup>2</sup> This was part of the famous Socialist Calculation debate (Hayek, 1935a, Hoff, 1981,

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Lavoie, 1985a, Ramsey-Steele 1992), which has recently showed signs of resurfacing (Horwitz, 1996, Ramsey-Steele, 1992). According to von Mises, in a centrally planned economy (in which the means of production are collectively owned) the planners lack any basis on which to price the means of production. Without private ownership, alternative outputs would not have prices, nor would the inputs required to produce them. Without this the value of alternative uses would not be discernible. The scope of the debate was considerably broadened by Hayek (in the 1930s) in his consideration of what information would be necessary for calculation of prospective profits by private owners, and the observation that much of this information was not available to be collected, but emerged from the market process itself. Abolishing private ownership abolished the source of this crucial information, much of it reflected in prices, necessary for basic economic calculation (Hayek, 1935, 210–11).

Horwitz (1996) recently pointed to the connection between these insights and the role of money. In a market economy the existence of money, together with the institution of private property, facilitate the emergence of money prices which form the basis of the necessary economic calculation that drives the market process. In light of the discussion about business organizations, how does the firm, a dominant market institution, fit in with this?

According to the modern theories of the firm, the advantages of corporate organization derive from incentive, control, and information issues. By combining resources within the orbit of a single firm, it is sometimes possible to reduce the costs of monitoring and controlling production teams. This helps avoid the need to monitor and enforce the fulfillment of specific arms-length contracts between independent parties, acquiring knowledge about team member contributions and capabilities as they exist and change over time. Instead, the firm provides the necessary relative predictability and stability of long-term, open-ended contractual obligations with employees.<sup>3</sup> The boundaries of the firm are balanced dynamically and experimentally by these advantages weighed against using specialists from the market. Juxtaposing this line of thinking with the von Mises/Hayek rejection of the feasibility of socialist planning and production raises interesting questions:

1. On the one hand, if socialism is indeed irrational, in the sense of precluding the ability to perform the necessary calculations, how is it that the firm is not similarly encumbered? After all, is not a state socialist

system simply one large firm? And are firms not islands of socialism in a market sea? If so, how does calculation proceed inside the firm?

2. On the other hand, if the market is necessary because it provides prices for productive calculation, why are firms necessary at all? Why not simply conduct all transactions through market spot and forward contracts?

We have already answered the second question. The answer given in the New Institutional Economics is that there are costs to using the market that are avoided by using the institution of the corporate firm. These transaction costs are related ultimately to the presence of certain types of irreducible uncertainty. The answer often given to question one is more interesting. It is a nonsequitur to conclude that if state socialism is impossible then anything resembling central planning, such as a firm, should also be impossible. In fact, they are not the same things. *Planning within firms proceeds against the necessary backdrop of the market.* Planning within firms can occur precisely because the market furnishes it with the necessary prices for the factor inputs that would be absent in a full-blown state ownership situation.<sup>4</sup>

## II

### **The Firm Provides the Necessary Structure for the Calculation of Profit**

THESE ANSWERS, HOWEVER, ARE NOT FULLY SATISFACTORY and raise some further interesting issues. We start by making the important assertion that if the market is necessary for the viability of the firm, the opposite appears to be equally as true. That is, *the firm is necessary for the smooth operation of the market process.* This assertion is based on noting the central importance of economic calculation in the market process and the way in which the firm provides for such calculation. We see this by examining the calculation of profits. The calculation of profits is both simple and indispensable for production decisions. It is simple in the sense that the arithmetic is simple, although the elements that constitute the evaluation are far from simple, and instead are highly speculative. It is indispensable in that it provides the basis for discrimination between viable and nonviable production projects (cf. Hicks, 1973, Lewin, 1997a).

1. *Retrospective Profits.* First consider profit in a retrospective context. That is, how do firms decide *which projects have been profitable?* Profit is revenue minus cost.<sup>5</sup> Revenues are the proceeds from the

sale of the relevant outputs, and are relatively easy to measure in a monetary economy. Costs, however, present formidable problems that affect the nature of team production, which is the essence of production in the firm. In a market economy, when inputs are purchased, their purchase price serves as the accounting cost. From an economic point of view, this price can be seen to represent the market value of opportunities foregone as a result of purchasing the input in question. But what about inputs owned by the firm? How does one determine the costs of using them? What we require is an estimate of the opportunities (revenues) foregone by using inputs in one combination rather than another (the next best alternative). This requires an estimate of the hypothetical relative contributions of inputs under alternative scenarios. However, in a world of genuine uncertainty (as opposed to probabilistic uncertainty) the nature of team production is such that it is impossible to objectively measure the precise contribution of any member of the team (physical or human). If one was required to determine completely accurate contributions and to use these contributions as the basis of cost calculations, the problem would be insoluble, as with full-blown state ownership devoid of monetary calculation where no clue at all is provided.

An important related question is: what is the relevant opportunity foregone? Should it be the value of the net revenue foregone by the firm by doing things one way rather than another, or is it alternatively the net revenue that would be added elsewhere in the economy by redeploying the input in question? This latter measure is an indication of what the input might fetch in the market if it were rented out, and is closer to what we usually understand by cost in the accounting sense. It is also the cost that is relevant for the actual or prospective investor in the firm, whose hypothetical alternatives involve moving between firms under the assumption that the firm takes care of the internal allocations. But from the point of view of efficient allocation as seen by the firm, the former measure, using the next best alternative wherever it occurs is the more relevant.

Thus, in the case of the market firm, the labor inputs are paid according to an implicit or explicit monetary contract, and similarly with physical inputs (capital goods) that are rented through the market. For the moment, we leave aside the determination of these rental

values. From the perspective of the decision makers in the firm, they are given by the market. For capital goods that are owned, however, the costs associated with their use, are more problematic and have to be estimated according to certain accounting conventions. These conventions use (in a manner to be explained) procedures to estimate the value of the asset in the current rather than in alternative uses. This implies that a basic ingredient for this conventional calculation is, and apparently must be, the value of the asset that in some way is derived from the estimated value of its alternative possible contributions to output. Another way of looking at it is, having arrived at a cost for the asset—derived (sometimes, perhaps mostly, implicitly) as the discounted value of its estimated next best output—one must then estimate (to arrive at an accurate current cost measure) how much of this value is “used up” per period (its displaced marginal value product) or sacrificed in current production. This is an estimate of how much value is foregone by pursuing this line of production as compared to the relevant alternative (how much revenue net of replacement could have been earned by this asset elsewhere in the relevant period). There is obviously no correct way to do this, so we are faced with the problem of measuring the relative contributions of the inputs, what has been called the *imputation problem*.

Where markets exist, the value of the joint output for any project as a whole, once measured or estimated, is much easier to determine than in the absence of markets. In a sense, one half of the problem is solved, that of valuing an output measured. As for measuring the contribution to output, there is no avoiding certain elements of convention. *What the institution of the firm does (together with the institutions of money and accounting) is to provide these conventions.* By distinguishing between contractual and owned inputs, one avoids the need to estimate the alternative marginal products of the former. The judgment involved in measuring the latter affects the profit calculation and lends to it an unavoidable element of arbitrariness. This means that profit, even measured retrospectively, necessarily contains elements of subjective judgment or convention.

We should distinguish two different aspects of the profit calculation. Profit, understood as the residual after all contractual obligations have been met, but *making no allowance for the costs or use of owned*

resources is, from the perspective of the firm, not arbitrary. Market prices provide the necessary objective ingredients for a simple calculation. From the long-term perspective, where all capital assets must be used up or completely replaced, profit appears less arbitrary. It is the division between true profit and profit unadjusted for user cost that is the problem. However this division is done, it clearly gets done. And the profit calculations that emerge provide a widely accepted way of adjudicating between viable and nonviable projects. This is reinforced in the long term by *the presence or absence of cash flow*. If the short-term division is injudiciously made, the cash flow eventually becomes negative as the underestimation of user costs becomes apparent and cash is absorbed in the replacement or repair of capital assets. So, in this way, the firm and the market provide the indispensable basis for the calculation of profits.

We have asserted that market prices provide the cost signal for contractual inputs, while leaving aside how the market price is determined. Of course, in the final analysis, when a rental price of a durable asset (a physical capital asset or the price of labor services) is determined by contractual arrangement, the terms of the contract, most especially the price, must be determined with reference to exactly the same considerations that are relevant in the case of owned resources, namely the value of opportunities. The market is a shorthand reference to the results of decisions taken by everyone else. What determines other people's decisions are the same things that determine the firm's decisions. Market prices emerge when assets are generic and have enough multiple uses in the market that people's judgments of their worth become embodied in the stock of information available to decision makers in general (e.g., the published set of prices for used cars, certain kinds of production equipment, or wages for certain labor services). They reflect to some extent the trial and error experience of many decision makers. And as such this kind of information is not available without the market.

Although necessarily subjective and involving elements of entrepreneurial judgment, calculations of profit involving the imputation problem are facilitated by the framework provided by at least three interacting institutions—the firm, money, and accounting practices—within the umbrella institution of private property. The indispensable

element of judgment involves the attribution of relative shares to the inputs, which is necessary to arrive at an estimate of what each input costs, that is, what sacrifice each input entails.

2. *Prospective Profits.* The framework discussed earlier provides the basis for the *prospective* calculation of profits as entrepreneurs project, on the basis of past information and conjecture, the emergence of profits. By comparison between prospective projections and retrospective calculations further decisions can be made.

Two important notes. First, there is nothing in this account to suggest that the decisions taken with regard to profitability are in a global sense optimal. Successful projects are viable, not optimal. There is no way to decide, in this open-ended framework, whether Pareto optimality will or will not emerge. This is related to the second point (already discussed in connection with the uncertainties surrounding team production). The prices of contractually purchased factor inputs are sometimes said to be equal to, or tend to be equal to their marginal products. As team production does not admit to any simple solution to the imputation problem, it is difficult to see how this could happen in any straightforward way. To be sure, in a market environment of negative feedback when certain key aspects of the environment, like the available set of techniques of production, consumer tastes, and so forth are unchanging, or changing very slowly, sufficient variations in adopted techniques result in the gravitation toward valuations of market-traded inputs that represent the values of their marginal products. Under the postulated conditions, the market provides for continuous variations in input and resultant variations, *ceteris paribus*, in output.<sup>6</sup> But this is by no means assured, and in the absence of stable processes, the prices of the factors must be seen to represent the market's assessment of their worth. That is, these prices are what people, given their best guesses and estimates, have been willing to pay. As time passes the prices change as the projects in which the inputs are employed succeed or fail and to the extent that they are specific to those projects. The market prices for inputs are not equilibrium prices but they do furnish an important and indispensable basis for the calculation of profits. Without market prices firms could not plan as they do.

## III

**Money and Production: Back to Menger**

THE ABILITY TO CALCULATE PROFIT, both expected and past, is essential to the working of the market process as we know it. It cannot be duplicated by a central planning system. It is a trial and error process in which the variables are not only the varied and often spontaneously emerging techniques of production, but also the various incentive information alignments that come with combinations of firm shapes and sizes and contractual obligations that characterize the market. In addition, the prices for the factor inputs, although not equilibrium prices, bear a crucial connection to the prices of the outputs they help to produce and, therefore, to the preferences of the consumers who buy them. Producers take their signals from prospective revenues and impute values to inputs when they exercise judgment in the formation of capital combinations (Lachmann, 1978, Lewin, 1997b). Without the institution of money this could not happen.

Without money and money prices, producers could not make the calculations necessary for production processes to be initiated and continued. Although central planners could use administered prices as the basis for capital projects, the values of these projects would seem to lack any basis in terms of the values of the outputs they produced. The administered prices would not be economically meaningful, not having emerged from a process of individual evaluations (notwithstanding that, some maintain that schemes exist for the discernment of individual valuations even in the absence of private property). The existence of money, with private property and the division of labor and capital, is seen as indispensable for economic development. Consider von Mises:

The phenomenon of money presupposes an economic order in which production is based on the division of labor and in which private property consists not only of goods of the first order (consumption goods) but also in goods of higher orders (production goods). In such a society [p]roduction is "anarchistic" (von Mises, 1981, p. 41).

This statement can be interpreted superficially as suggesting that these various ingredients (money, private property, division of labor, and capital goods) could exist independently and that it is their joint occurrence that ensures decentralized production. An advocate of central planning might wonder why



each of these ingredients is necessary jointly and concoct substitutes for one or the other (see Cottrell & Cockshott, 1993). From our perspective, this is a misconception. The institutions on which economic development is based are inextricably bound up with one another. They are part of the same institutional nexus, if any one is compromised they all collapse. So nationalizing the means of production will inevitably lead to a collapse of the monetary system and the unraveling of the fruits of the division of labor and capitalistic production. We can see this by considering how money develops, and of course, for this we must go back to Carl Menger.

In Menger's work (1981/1871), we find a full treatment of the question of the origins and development of money. Menger explains how, with the development of trade, certain commodities came to be traded more frequently than others. These products had a high level of marketability. At some point individuals began to accept these commodities, not in order to use or enjoy them, but for the purpose of trading them at a later date for what they really want. At that point the product became money.

Goods derive their value from individuals' appraisal of them. Because people value goods differently, trade is mutually advantageous. Wherever people gather, they develop trade. But trade without the benefit of money is limited severely by the need to uncover a double coincidence of wants. In perhaps more revealing terms, trade without money is limited by overwhelming information requirements. By providing a generalized means of purchase, money reduces dramatically the information necessary to conclude any number of transactions. This means that a monetary economy is fundamentally different from a barter economy. It is different because *a barter economy in which the same transactions are accomplished as in an existing monetary economy is literally inconceivable*. Without money, individuals could not acquire the information necessary to conclude transactions. Without an explanation of how individuals could obtain this information, there is no methodological basis for postulating such an economy.

What Menger shows is that money facilitates exchange. But he goes further and shows that money also facilitates production. Without money the degree of specialization would be attenuated greatly because of the increased risks involved. Specialized economic activity, like all economic activity, is conditioned by the individual's perceptions of the risks and benefits available. Specialization implies producing for exchange, that is, producing more than one intends to consume. In a barter economy special-

ization is limited by what producers believe consumers are willing to exchange for the producers' surplus and to what extent this corresponds to the consumers' desires. By committing resources to the production of only one or a few commodities, a producer risks the accumulation of unwanted stocks because of the inability to find consumers willing to exchange what is needed. This risk is reduced considerably in a monetary economy because what the producer needs is money. Or more accurately, with money the producer can be sure of obtaining what he or she needs. The producer may also postpone consumption decisions. In this way the existence of money supplies the degree of confidence necessary for producers to undertake a complex set of specialized activities. Producers need not worry about communicating their desires to consumers as the purchasers of their products. Money serves to separate the acts of purchase and sale and production and consumption.

When von Mises writes, "The phenomenon of money presupposes an economic order" with the division of labor. Menger has shown that the phenomenon of money develops along with these things. As Steven Horwitz points out, "[F]rom the start, the existence and use of money is *inherently linked* with private property in the means of production" (1995, p. 8, italics added; see also Horwitz, 1996).

It is difficult to exaggerate the importance of money in the smooth functioning of a modern economy. The institution of money is related intimately to other economic and noneconomic institutions. Horwitz (1992) has done some work on the analogies between money and language, but this is not as much an analogy as a vital connection. Money could not exist without language, it is, in a sense, a derivative of language. The use of money, in fact all trade, implies verbal communication. It also implies the use of arithmetic and this brings us back to the question of calculation.

#### IV

#### **Money and Calculation: The Ability to Budget**

VON MISES CLAIMS THAT THE INABILITY TO CALCULATE the economic significance of capital projects is what dooms central planning with public ownership of the means of production. Horwitz argues that von Mises bases

this claim on his understanding of the fundamental properties of money and the emergence of money prices for the heterogeneous means of production. We have discussed the more precise context of these money prices. For von Mises they are “aids to the human mind” in performing the calculations on which actions are based. The crucial point here is that the institution of money and money accounting allows decision makers to *budget*. Without the ability to budget, production could not occur, it could not be organized. Budgeting implies an intertemporal framework, the tracking of value over time. It provides the individual planner with meaningful orientation points against which to measure action. The meaningfulness derives from the fact that money prices within the framework of money accounting are *socially* meaningful, they are understood by all market participants, part of a shared language or orientation. When money is functioning normally (when there is no inflation), money prices represent a shared sense of what things are worth in the market. Meaningful money prices in the absence of private property is a contradiction. It is private property that allows for the orderly development of production activities. By “orderly” we mean widely understood and accepted; peaceful.

We can understand this in terms of the simple, idealized present value arithmetic that decision makers use when appraising capital projects. The *prospective* capital value of any project is thought of as the discounted present value of all of the useful outputs that it is expected to yield over its life. The *retrospective* capital value of the same project is the accumulated value of the investments actually made. Any difference between the two is a capital gain or loss (see Hicks, 1973, Lewin, 1997a). As a result of the occurrence of capital gains and losses, producers alter the capital structure. Successful ventures displace unsuccessful ones. The whole process proceeds peacefully, although not painlessly, as the economy engages in a form of implicit experimentation whose results are calibrated in the form of money.

In a single firm's accounting statement itemizing the total costs of a project and comparing this total to the revenues received is contained a wealth of scarcity information that neither the accountant nor any other agent in the system could ever gather. Each price of purchased, rented, and hired factors reflects a complex tension among diverse plans that have tried to pull the relevant factor into alternative uses. The profit and loss calculus itself then determines whether the particular combination of inputs under consideration yields an output that is expected to pay its way in the market. The fact that all this scarcity information is expressed in quantitative form permits

each decision maker to test extremely complex combinations of factors for their profitability while simultaneously relying on similar tests being conducted by rival decision makers (Lavoie, 1985b, p. 71).

These considerations bear on the question of the justification of earnings. A full treatment of the question would have to address the ethical context of private property. Any consideration of alternative modes of social organization however, would have to take into account the inseparable connection among the institutions of money, capital, private property, and the business organization. Any attempt to alter the organization of production in order to achieve outcomes perceived to be fairer cannot ignore the likely extreme costs in terms of loss of vitality and dynamism that translate into lower earnings for all segments of society.

## V

### **Conclusion**

IN THIS PAPER I INVESTIGATED THE ROLE OF MONEY and monetary calculation in the determination of the production structure of the modern economy. I found that the social institution of money is inextricably bound up with other social institutions like private property and business organizations. The possibility of conceiving theoretically of a system without money, in which all calculation is done in some arbitrary numeraire, should not blind us to the reality that in business organizations it is the ability to calibrate plans and results in the form of money that allows businesses to function smoothly. Money provides the report card for business. Anything that compromises the reliability of the monetary system compromises the functioning of the production system. This is equally true for the attempt to impose a collectivist economy without the use of money, reminiscent of the Bolshevik experiment, as it is of the many experiences of inflation. So much has been asserted many times. What I have underlined here is the crucial dependence of ordinary business calculations for the purpose of undertaking capital investments, on a reliable monetary system.

The ability to make useful calculations to guide decisions depends on the stability of certain critical elements of the institutional environment of which money is one and private property is another. The corporate structure also facilitates calculation in providing a cognitive framework, a set of rules, routines (some of them tacit), and conventions for the attribution of

input costs and governing individual behavior of firm members that serve to guide the decision makers' expectations.

### Notes

1. To be sure, this large and growing literature on the nature, rationale, and evolution of the firm includes a discussion of the extent and meaning of the transactions costs that are at its core. These transactions costs involve more than simply the costs of transacting through the market and are in essence information costs of various kinds that affect the costs of production. See for example, Langlois (1992), Demsetz (1997), and Foss and Knudsen (1996).

2. Von Mises said, "This is the decisive objection that economics raises against the possibility of a socialist society. It must forgo the intellectual division of labor that consists in the cooperation of all entrepreneurs, landowners, and workers as producers and consumers in the formation of market prices. But without it, rationality, i.e. the possibility of economic calculation, is unthinkable" (von Mises, 1927, p. 75).

3. We have not mentioned the limitation on individual liability provided by the modern joint stock corporation that may also be a factor.

4. Peter Klein recently used this type of reasoning in interpreting Murray Rothbard (who in turn was extending von Mises on the impossibility of Socialist calculation). "[N]o firm can become so large that it is both the unique producer and user of an intermediate product; for then no market based transfer prices will be available, and the firm will be unable to calculate divisional profit and loss and therefore unable to allocate resources correctly between divisions" (Klein, 1996, p. 15).

5. It is important to remember that profit depends crucially on the presence of uncertainty. In the present discussion, the absence of uncertainty would imply that all earnings (wages, rents, and interest) could and would be contracted for and there would be no residual to be taken as profit.

6. This is, of course, a nutshell evolutionary argument with a stable equilibrium. It contains the necessary elements of mutation (variation), selection (competition), and replication (continuity in the firm as an institutional entity that replicates certain kinds of behaviors). See Vroman (1995).

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