РАЗДЕЛ 1
НАУЧНЫЕ ИССЛЕДОВАНИЯ И КОНЦЕПЦИИ

SECTION 1
ACADEMIC INVESTIGATIONS & CONCEPTS

CORPORATE GOVERNANCE, CAPITAL THEORY, AND CORPORATE FINANCE THEORY: AN APPROACH FROM PROPERTY THEORY

David Ellerman*

Abstract

An analysis of the corporate governance debate is developed using a descriptive theory about the system of private property and contract in a market economy. There are strong implications for capital theory and corporate finance theory. The structure of the main results is that what often appears as being an owned property right is upon analysis seen to be only a contractual position--and contractual positions only extend a few years into the future. An enterprise could be described concretely as specific people working with specific machines producing a certain product or it could be described more abstractly using the economists' notion of a production function. But either way, it is not determined who is legally undertaking the enterprise until the contracts between the factor suppliers are given. Thus the determination of who undertakes an enterprise is contractually determined; it is not an owned property right. In this sense, there is no such thing as the "ownership of the firm" since the party undertaking an enterprise, the residual claimant, is determined by the direction of the hiring contracts. There is the ownership of a conventional joint stock corporation, but a corporation does not "own" the enterprise that it is currently undertaking by virtue of its contractual position. For another party to take over the enterprise, it is sufficient to redo the contracts, not "buy the firm." Since a corporation's paid contracts at best extend only a few years into the future, there is no basis for the common assumption in capital theory or corporate finance theory that the corporation "owns" the future enterprise cash flows in perpetuity. This simple result thus has rather strong implications for considerations of enterprise governance as well as for capital theory and corporate finance theory. Many of the "ownership" assertions that fuel the debate about enterprise governance are groundless, and the discounting of future enterprise net returns beyond the horizon of current contracts does not represent the valuation of current property rights.

Keywords: capital theory, corporate governance, corporate finance, property rights

* University of California at Riverside, www.ellerman.org

1. Introduction

The purpose of this paper is to apply certain arguments about property rights and democratic principles to the corporate governance debate. The target of analysis is the standard shareholder-oriented model or, simply, the "standard model" using the terminology of Hansmann and Kraakman [2000]. There are both descriptive arguments and normative arguments. Since the normative principles are rather basic and not particularly controversial, the main arguments are descriptive and often at a rather conceptual level. Since the normative principles will be clearly labeled, the arguments will otherwise be conceptual-descriptive.

2. Conceptual-descriptive analysis of the "firm"

2.1. The enterprise-corporation distinction

Let us begin with a basic conceptual distinction that, by itself, will allow us to shed some light on the arguments made about the standard corporation. Start with the picture of a corporation operating a certain widget factory as a going concern. We need to tease apart the enterprise itself from the legal entity of the corporation. For instance, economists might think of the enterprise as being abstractly represented by a production function or production set giving the relationships between inputs and outputs in the enterprise. But one could also make the picture of the enterprise more concrete. Eschewing all legal notions of property or contracts, one could describe certain named individuals working in a specific building with certain machinery producing specified products. There are many legal shells that might be fitted to that non-institutional description (abstractly as a production function or concretely with specific people and assets). The enterprise might be organized as: an unincorporated proprietorship, a partnership, a worker cooperative, a municipal corporation, or a standard corporation [see Hansmann 1996 for the varieties of legal forms]. All of these different legal forms could be fitted onto the enterprise all using the "same" production function or, indeed, with the same named individuals and assets.

2.2. Necessary and sufficient conditions for a legal entity to operate an enterprise

What then is the connection between the enterprise and a legal entity? Is it "ownership" or some other relationship, and if the latter, what other relationship?

Does the corporation have to "own the factory" in order to be operating it? Clearly the answer is no. Land and factory buildings can be leased from another legal entity which could be another corporation. That means that corporation Beta could be operating a widget-producing business in a factory building owned by another corporation Alpha. Thus the relationship between the enterprise and the corporation operating the enterprise is not "owning the factory" (since the landlord corporation Alpha is not operating the widget enterprise).

It is sometimes said that the (operating) corporation "owns the capital" or "owns the means of production" in the sense of the machinery (in addition to the building and land). But the same leasing argument holds. The machinery could have been leased, and some machinery such as trucks or mainframe computers often is leased. The same holds for financial capital; funds are routinely borrowed and lent. Similarly, the corporation may own certain intellectual property rights used in the enterprise but these can also be leased or licensed from other parties.

This leasing or rental argument shows that in order for a corporation to be operating or undertaking a certain enterprise, it need not own the land, buildings, machinery, funds, or technologies used in the enterprise—that is, it need not own the capital or "means of production."

Some of the corporate governance debate has challenged the role of the shareholders as the "owners" of the corporation (e.g., in the context of a stakeholder model). That is not the point being made here. Our conceptual entry-point is the relationship between the corporation and the enterprise, not the relationship between the shareholders and the corporation. All that has been said so far is quite consistent with the standard role of the shareholders as owning the corporation.

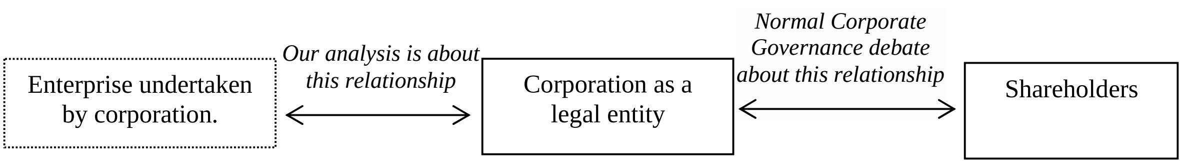

Fig. 1. A new conceptual entry-point to analyze corporate governance

Since the ownership of the capital assets (e.g., machinery, buildings, and land) used in the enterprise is not necessary for the operating corporation, what is the relationship between the enterprise and the corporation undertaking the enterprise? Since a corporation could be undertaking a certain enterprise with only a leasing or rental relationship to the assets, it is useful to consider what is purchased in a rental or leasing contract. Abstractly, a capital assets could be conceptualized as a stream of services plus some "scrap" left at the end of the service life of the asset. When one buys an asset, one buys the whole remaining stream of services plus the scrap. When one leases the asset, one buys only a part of the stream of services, e.g., so many machine-hours, truck-months, or acre-years. The contract to rent a car for a day is the contract to buy a car-day of services.

A related question is what property does the operating entity use up each time period and thus would show up as an expense of operating for the period? The operating company expenses only the services of the asset being used for the time period, not the whole asset. Thus the "property" that is used up is the services of the assets, the services that would be acquired bit-by-bit if the asset is leased or all at once if the asset were purchased. But in either case, the operating entity needs to own the services that are used up during the operating time period. The entity also needs to also own the services of the people working in the enterprise and those services are also expensed. The operating entity would need to buy or already own the raw materials or intermediate semi-finished goods used during the time period in the enterprise, all of which are also expensed. Having thus borne all the expenses of producing the outputs (e.g., widgets), that same legal entity then has the defensible and undivided legal claim on the ownership of the products which would then ordinarily be sold.

Thus we have an answer to our question about the relationship between the enterprise and the corporation or other legal entity operating the enterprise. The necessary and sufficient conditions for a legal entity to operate an enterprise is that it needs to own the services of all the fixed capital, the services of the people working in the enterprise, and the other inputs (raw materials and semi-finished goods) used up in the enterprise. In accounting terms, the entity needs to own all the goods and services that should be expensed since they went into producing the products of that time period. The control rights over the enterprise derive from the ownership of all the services and other inputs to be used up in producing the products. Having only the ownership of those used-up services and other inputs is sufficient to claim and sell the products. That is how a legal entity becomes the one that undertakes or operates a certain enterprise. Some entities own more. They don't just lease the land, buildings, or machinery; they own those assets. To check our answer, we need to verify that this additional ownership is not necessary. Start with the case with operating company Alpha does own those assets. Then consider the alternative arrangement where it retains that ownership but leases out the assets to another company Beta. Company Beta then leases the real estate and buildings from Alpha, hires the workers, and buys the other inputs from suppliers. Then Beta would become the company operating the enterprise even though Alpha still owns the fixed assets. This verifies that input ownership was the necessary and sufficient condition. This result could be stated as the equivalence: "A legal entity operates an enterprise during a time period if and only if the entity owns the inputs used up by the enterprise during the time period".

2.3. The fundamental myth and the non-ownership of the enterprise or "firm"

There are a number of ways this Basic Result can be reworded to see its wide implications. The phrase "ownership of the firm" is unfortunately used both in the sense of ownership of the corporation and "ownership of the enterprise." Our Basic Result shows that there is no such thing as the "ownership of the enterprise." A corporation may or may not operate or undertake a certain enterprise depending on its contracts. It has to get the ownership of the inputs used up in the course of the operation. Some inputs might be services provided by owned assets but since the abolition of slavery, the workers always have to be rented or hired. That is, their services need to be contractually purchased using the employment contract for the relevant time period (unless the workers are undertaking the operation themselves). Intermediate goods not supplied by vertically integrated operations will also need to be contractually purchased. Thus "undertaking the enterprise" is a contractual position (buying or already owning the requisite inputs of goods and services) all of which is something the corporation does, not something that is part of what the corporation owns. In accounting terms, the enterprises undertaken do not show up as assets on the corporation's balance sheet. Thus the ownership of the corporation does not entail an "ownership" relation to the enterprises or operations that the corporation undertakes according to its contracts now and in the future. If we take "firm" to mean the enterprise operated by a corporation, then there is no "ownership of the firm." One must be careful not to use expressions like the "firm." "company," or "enterprise" to refer ambiguously to both the corporation as a legal entity and to the enterprise or operation contractually undertaken, and then to let the "ownership" language slide semantically from the former to the latter [see Hansmann's 1990 article entitled *Ownership of the firm* or his 1996 book entitled *The Ownership of Enterprise* as cases in point]. We will now see the same pattern repeating itself in many areas. A certain activity is contractually determined but the conventional view is that there is some "ownership" of the activity. Since that same conceptual error comes up in so many forms, I will call it the *"fundamental myth"* of the property system. This argument might be better understood by considering a productive opportunity both outside and inside a corporate form. Consider a simplified process where the labor L is applied using the services K of a widget-maker machine in order to produce the widgets Q during each time period. If the machine is owned by an individual, then it is clear that the person could hire in the labor L and produce Q—or could hire out the services K to another party. The pattern of contracts determine whether the individual operates the enterprise or as an input supplier to the enterprise. Now suppose that the individual incorporates a company and issues all the stock to himself in return for the machine. This legal repackaging changes nothing in the market logic of the argument that separated capital ownership from the contractual role of undertaking the enterprise. The corporation (rather than the individual) would own the widget-maker machine and, depending on the direction of the hiring contracts, may or may not undertake the operation using the widget-maker. The process of incorporation does not miraculously transubstantiate the ownership of a capital asset into the "ownership" of the operation using the capital asset. In real-world markets, there are likely to be large transaction costs to rearranging the input contracts. The incumbent corporation undertaking an operation has sizable first-mover advantages so that any challenging party would have to incur such high transaction costs to redirect the input contracts that it might be just as cheap or cheaper to simply buy the corporation and thereby take over the incumbent's position in the existing pattern of input contracts (assuming the other parties choose to continue or renew the contracts). These transaction cost barriers create the image that the existing corporate residual claimant "owns" the production opportunity.

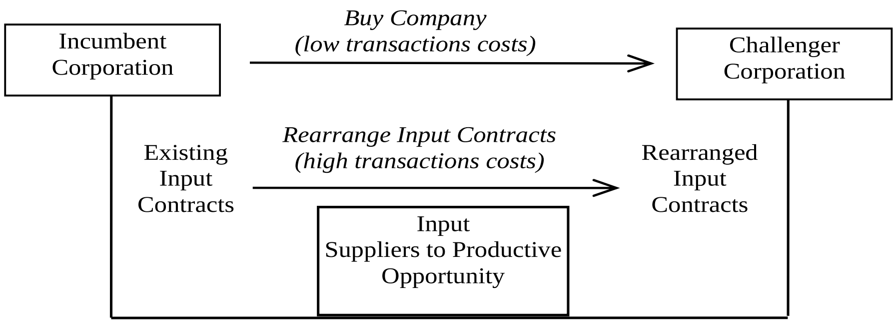

Fig. 2. Two ways to take over a production opportunity and thus "become the firm"

One of the advantages of idealized frictionless models in economics, as in physics, is that they show the basic logic of the system without irrelevant distractions. In a world without transaction costs, the input contracts could be costlessly rearranged to switch operations from one party to another without changing the ownership of a corporation from one party to another. That shows the underlying logic of the contractual determination of undertakes an enterprise in a private property market economy. The transaction cost barriers to rearranging contracts in real-world markets add to the illusion of a property right such as the everyday notion of "ownership of the firm." Transaction cost barriers are only that; they are not property rights. For instance, as transaction costs change it might become more feasible to take over the enterprise by rearranging input contracts rather than by purchasing the corporation. This would not violate the corporation's "ownership of the enterprise" since it had no such property right in the first place.

2.4. Non-ownership of production functions

Since economics represents the enterprise abstractly with a production function or production set giving the technologically feasible combinations of inputs and outputs, the result could be restated that there is no such thing as the "ownership of a production function" in a private property market economy. Unfortunately economists routinely let the "ownership" language slip from corporations to abstract representations of possible enterprises, operations, opportunities, and ventures—thereby creating another version of the fundamental myth. For example, entrepreneurs are "bidding for ownership of the firms" [Hirshleifer 1970, 124] and become the "owners of the productive opportunity" [125]. A proprietor may sell "the rights to the transformation function" or "his rights to the venture" [Fama and Jensen 1996, 341] to another proprietor. The entrepreneur is the "owner of a production function" [Haavelmo 1960, 210] and even Robinson Crusoe "owns the firm" [Varian 1984, 225].[1]

[1] The carry-over of corporate ownership to production sets is the unfortunate conceptual error that allows the "proof" of the existence of a competitive equilibrium with positive pure profits in the Arrow-Debreu model [see Arrow and Debreu 1954, Arrow 1971, and Arrow and Hahn 1971]. This conceptual critique of the Arrow-Debreu model (as opposed to the usual critiques based on lack of empirical realism) was detailed in Ellerman 1982, 1992 or 2000

2.5. Contractual determination of residual claimancy

We have seen that for a legal party to undertake an enterprise or productive opportunity means to contractually acquire or already own the goods and services that will be used up as inputs in the enterprise. Having borne those expenses, the same legal party then has the defensible legal claim on the produced outputs which are sold to obtain the revenue of the operation. The revenue minus the costs is the profit or "residual" of the operation. In this manner, the legal party becomes the "claimant" of that residual, i.e., the "residual claimant." Thus residual claimancy is not part of the "ownership" of the corporation; that would be another version of the fundamental myth. It is by virtue of the corporation's contractual position that it is undertaking the enterprise with that residual. Here again, one must be careful not to let the "ownership" language slip over from the corporation to the operations that the corporation may from time to time undertake according to the contracts it makes.

2.6. Nexus-of-contracts theory and the enterprise-corporation distinction

This point about the contractual determination of residual claimancy allows a suggested interpretation of the rather confused discourse about the corporation being "a nexus of contracts." Some writers interpret this nexus-of-contracts theory as merely holding that the corporation is a "nexus" in the sense of being the "common signatory" [Hansmann 1996, 18] of the contracts with creditors, suppliers, employees, and customers. That is a correct description of the corporation undertaking an enterprise, and if that is all the nexus-of-contracts theory means, then it is a banality. But some writers use the weasel-word "firm" and then they tend to dissolve "the firm" into the nexus of contracts.

> Each factor in a firm is owned by somebody. The firm is just the set of contracts covering the way inputs are joined to create outputs and the way the receipts from the outputs are shared among inputs. In this 'nexus of contracts' perspective, ownership of the firm is an irrelevant concept. [Fama 1996, 304] Or again.
>
> This is the set of contracts theory of the firm. The firm is viewed as nothing more than a set of contracts. One of the contract claims is a residual claim (equity) on the firm's assets and cash flows. [Ross and Westerfield 1988, 14]

These statements make little sense if "firm" is taken to mean the corporation (e.g., try interpreting the balance sheet of General Motors as "nothing more than a set of contracts"). But much sense could be made out of these statements if one interpreted "firm" to mean the enterprise or operation undertaken by a legal party such as a corporation. Indeed, the "ownership of the firm" in the sense of the contractually determined enterprise "is an irrelevant concept." We saw before the sliding semantics of "ownership" carrying over from the corporation to the operations or enterprises undertaken by a corporation. Now we see, in the nexus-of-contracts theory, the sliding semantics going the other way. The nexus-of-contracts theory is used in the corporate governance debate to slide the correct observation about the contractual determination of the enterprise (as the "firm") undertaken by a corporation over into an incorrect characterization of the corporation (as the "firm") as being "nothing more than a set of contracts."

2.7. Contractual determination of whole product appropriation

The point about residual claimancy is couched in terms of revenues, expenses, and their difference, the profits or residual. It will be useful here and for our later concerns to restate this point in terms of the underlying property rights and obligations. The revenues are the economic value of the outputs produced by the enterprise, and the expenses are the value of the inputs used up in the production of those outputs. In ordinary discourse, the "product" is taken to mean just the outputs, but economists have found it convenient to use a more comprehensive and algebraically symmetric notion of the "product" as the production vector (an ordered list of positive and negative quantities) where the produced outputs are listed as positive and the used-up inputs as negative. Suppose we abstractly represent the production function for an enterprise as $Q = f(K,L)$ where K and L represent the services of capital and labor expended during the time period and Q the units of output. Then the corresponding production vector [2] would be the ordered list $(Q,–K,–L)$. For historical reasons [e.g., Menger 1899], I will call these production vectors the whole product.

When new property such as Q is produced, then the question of who gets the initial property right is the question of appropriation. When property is consumed, used up, or otherwise destroyed, then there is the question of who is the terminal owner of that property (e.g., in a suit for damages, the plaintiff is seeking material damages to in effect transfer the terminal ownership of the destroyed property to the defendant—in addition to any penalty damages).

among other places. Clearly if production sets are not "owned," then the possibility of positive profits would lead others to bid slightly higher for the inputs (while still allowing positive profits) to forestall any proposed set of equilibrium contracts allowing positive profits.

[2] The production vector is also called a "production possibility vector" [Arrow and Debreu 1954, p. 267], an "activity vector" [Arrow and Hahn 1971, p. 59], a "production" [Debreu 1959, p. 38], an "input-output vector" [Quirk and Saposnik 1968, p. 27], or a "net output vector" [Varian 1984, p. 8].

This negative version of appropriation was an original meaning of "expropriation."

> This word [expropriation] primarily denotes a voluntary surrender of rights or claims; the act of divesting oneself of that which was previously claimed as one's own, or renouncing it. In this sense, it is the opposite of 'appropriation'. A meaning has been attached to the term, imported from foreign jurisprudence, which makes it synonymous with the exercise of the power of eminent domain, ... [Black 1968, 692, entry under "Expropriation"]

Since the word "expropriation" has now been expropriated for other uses, I will just extend the word "appropriation" to include the "negative property rights" of the liabilities for the consumed, used up, or destroyed property rights. Thus the whole product (Q,–K,–L) could be described as the list of the output-assets (positive property rights) and the input-liabilities (negative rights or liabilities). Then the basic question is: "Who is to appropriate the whole product?". The conventional answer would be an expression of the fundamental myth: "The owner of the enterprise." But question is actually answered by what might be called the "laissez faire mechanism of appropriation" which operates in a private property market economy when the legal authorities do not intervene as in a trial for damages. In the course of normal operations, one legal party will contractually acquire or already own all the goods and services that are used up in the enterprise during the time period. If there is no legal intervention to reassign the ownership of the used-up inputs, then that last input owner will swallow those costs and, in effect, "appropriate the input-liabilities." But having done that, the same legal party then has the defensible claim on the produced outputs. That is the laissez faire mechanism of appropriation. One legal party shoulders the input-liabilities –K and –L and thus has the undivided claim on the produced outputs Q so, in sum, one legal party thereby legally appropriates the whole product (Q,–K,–L). All this is a description of what is happening underneath the determination of residual claimancy at the underlying level of positive and negative property rights. If the unit prices of the outputs, capital services, and labor services are respectively p, r, and w, then the value of the whole product is exactly the residual or profit: $\pi = pQ - rK - wL$.

Thus the contractual determination of the residual claimancy is the reflection at the level of revenues and expenses of the underlying contractual determination of the appropriation of the whole product. It is hard to compare this treatment of appropriation with the conventional literature since that literature does not even broach the question.

For example in the Putterman and Kroszner anthology [1996] of papers on the "economic" nature of the firm, none of the papers pose the question of appropriation in their treatment of the firm. The question of appropriation in the firm is similarly ignored in the "economics of property rights" [e.g., Furubotn and Pejovich 1974] and in the so-called "property rights approach" to the firm [e.g., Hart and Moore 1990; Hart 1995].

Thus the conventional literature has not advanced beyond the fundamental-myth phraseology of "ownership of the firm" to understand that the positive and negative results of the enterprise (represented by a production vector or whole product) are legally appropriated in a manner determined by the contractual fact-pattern.

2.8. Property fallacies in capital theory

There has been much intellectual interchange between the analysis of corporations (e.g., in the corporate governance debate or corporate finance theory) and capital theory in economics which focuses on capital goods (e.g., machinery, structures, improved land, and intellectual property rights) and their ownership. To carry over our discussion, we have to make the analogous conceptual distinction between the capital goods with their owner and the enterprise or operation where the capital goods might be used. The owner of the capital goods could be a corporation (as above) or a natural person (sans shareholders).

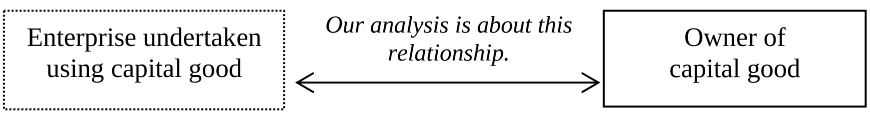

Fig. 3. Conceptual entry-point to analyze capital theory

The argument recapitulates the argument given above that distinguishes a corporation from the enterprises that might be undertaken by a corporation. In this case, the owner of the capital good may or may not undertake the enterprise, operation, or productive opportunity in which the capital good is employed depending on the contracts. The capital good owner might hire in the necessary labor and buy the other inputs, or the owner might hire out the capital good to some other party who would undertake the enterprise. In every case, the whole product of the productive opportunity would be legally appropriated by the party who was the last owner of the used-up inputs (which includes the capital services acquired in a capital rental or leasing contract). In capital theory, the fundamental myth takes the form of seeing the "ownership of the enterprise" undertaken using the capital good as part and parcel of the ownership of the capital good. Yet we have seen that the appropriation of the whole product of the enterprise and the claim to its value, the profit, is contractually determined. The fundamental myth is embedded in the conceptual definitions of capital theory. To be specific, let us take the simple case where the capital good supplies K units of capital services for n years and then has no scrap value. In each year, the enterprise is that represented by a production function Q = f(K,L) with the whole product (Q,–K,–L) per year. Thus the ownership of the capital asset could be represented as the ownership of the stream of capital services K, K, …, K for n years.

One of the simplest forms of the fundamental myth is the assumption that the bundle of rights that constitute ownership of a capital asset includes "a right of ownership-over-the-asset's-products, or *jus fruendi"* [Montias 1976, 116] or simply "the right to the products of the asset" [Putterman 1996, 361]. Note the use of the phrase "products of the asset" as if that were a well-defined notion. The ambiguous *jus fruendi* expressions are innocuous if the "products of the asset" are just the services K. But the expressions involve the fundamental myth if the "products of the asset" includes the results of the enterprise with the product Q. That latter version of the fundamental myth pervades orthodox capital theory and is then carried over to corporate finance theory (viewing a corporation as a complex machine). The asset owner has the property right to the stream of capital services K or, in vectorial terms, (0,K,0) each year for n years. But if the asset owner also has the contractual role of undertaking that production opportunity for the n years, then that party will additionally appropriate the whole products (Q,–K,–L) which sum (vectors or ordered lists add by simply adding the corresponding components (first to first, second to second,…). for the stream of net ownership vectors (Q,0,–L) for n years [the first row plus the second row equals the bottom row in the following table 1].

Table 1. A property vectors classification

	Year 1	Year 2	...	Year n
Property vector owned by asset owner.	(0,K,0)	(0,K,0)	...	(0,K,0)
Property vector appropriated by last owner of inputs (residual claimant).	+ (Q,–K,–L)	+ (Q,–K,–L)	...	+ (Q,–K,–L)
Net property vector accruing to asset owner who is *also* the residual claimant.	= (Q,0,–L)	= (Q,0,–L)	...	= (Q,0,–L)

Orthodox capital theory then discounts the value of the net vectors (Q,0,–L) [bottom row in table 1] back to the present to arrive as the "capitalized value of the asset" as if the right to the whole products [second row] had been part of the ownership of the assets. But the appropriation of the whole products is contingent on a certain contractual fact-pattern, and it is not a violation of the ownership rights of the asset owner to have the asset hired out instead of labor being hired in. Thus the value of the whole products ("profits") might or might not go to the asset owner depending on the future pattern of the input contracts. The so-called "capitalized value of the asset" is actually the value of the asset [discounted value of the (0,K,0) stream in the first row] plus the discounted value of the stream of whole products [discounted value of the (Q,–K,–L) stream in the second row]—where the latter may or may not accrue to the asset owner. Keynes provides us with a particularly blatant example of the fundamental myth.

When a man buys an investment or capital-asset, he purchases the right to the series of prospective returns, which he expects to obtain from selling its output[3], after deducting the running expenses of obtaining that output, during the life of the asset. [Keynes 1936, p. 135]

In fact, the man buys only the rights to the stream of capital services K (and any terminal scrap). Depending on who hires what or whom, he may or may not be the residual claimant in the production opportunity using that asset. In Table 1 and the surrounding text, I made the point without using prices to emphasize that the basic point has to do with the contractual determination of the whole product appropriation, not with the determination of the interest rate or capital rental rate. Nevertheless, the same point can be made in a manner more familiar to economists by bringing in prices.

Let p, r, and w again be the unit prices of the outputs, capital services, and labor services respectively so the value of the whole product is the profit:

π = *Profit = Market Value of Whole Product = pQ – rK – wL.*

If i is the constant interest rate, then a future value FV at the end of one year has the present value PV = FV/(1+i). Suppose the capital good only yields K units of capital services for two years with no maintenance and then has no salvage value. Thus the

[3] Note again the notion of a capital asset and "its output" as if there was some well-defined way to attribute the product of the enterprise to a capital asset used in the enterprise.

net present value of the services yielded by the capital good is rK/(1+i) + rK/(1+i)2. The capital good has a current competitive price C. Arbitrage between the two possibilities of renting the capital good (buying the services K) or buying it will equalize the price of the good with the present value of the rental payments:

$$C = \frac{rK}{(1+i)^1} + \frac{rK}{(1+i)^2}.$$

Market Cost = Capitalized Value of Rental Stream
The capitalized present value of the profit π from each year's operations is:

$$\Pi = \frac{\pi}{(1+i)^1} + \frac{\pi}{(1+i)^2}.$$

One of the basic concepts of capital theory is the notion of the capitalized value of an asset. The definition is usually stated in a rather general fashion; owning the asset "yields" a future income stream and the discounted present value of the income stream is the capitalized value of the asset. But there are quite different ways in which "owning an asset" can "yield" an income stream. There are the "active" and the passive uses of capital. The capitalized value concept is unproblematic in the passive case where the income stream is the stream of rentals (net of maintenance) plus the scrap value. The capitalized value of that stream is, under competitive conditions, just the market cost C of the asset. Bonds and debentures provide similar examples of income streams generated by renting out or loaning out capital assets, i.e., by the passive use of capital. Capital theory would be somewhat less controversial if it stuck to such examples of hired-out capital. However, the capitalized value definition is also applied to the quite different active case where, instead of hiring out the capital, labor is hired in, a product is produced and sold. In the example, the annual net proceeds to the capital good owner acting as the employer are:

$pQ - wL = \pi + rK$.

The fundamental myth is then used when the present value of the stream of net proceeds is called "the capitalized value V of the capital asset" as if to impute all the net proceeds to the capital asset:

$$V = \frac{pQ - wL}{(1+i))^1} + \frac{pQ - wL}{(1+i)^2}.$$

The net proceeds pQ – wL can, however, be analyzed into the stream of implicit rentals rK on the capital assets plus the profits π which are the value of the future appropriated whole products.

$$V = \frac{pQ - wL}{(1+i)^1} + \frac{pQ - wL}{(1+i)^2} = \left(\frac{rK}{(1+i)^1} + \frac{rK}{(1+i)^2}\right) + \left(\frac{\pi}{(1+i)^1} + \frac{\pi}{(1+i)^2}\right) = C + \Pi.$$

Thus the so-called "capitalized value V of the capital asset" is actually the market price of the capital asset C plus the present value Π of the whole products appropriated in the future. The rentals are the return to the capital asset; the property assets and liabilities underlying the profits are the whole products which are the return to the contractual role played by the capital owner (when the capital is used actively). The rights to the whole products are not part of the rights to the capital asset. That is one way in which the fundamental myth is embedded in conventional capital theory.

2.9. Property fallacies in corporate finance theory

The intellectual interchange between capital theory and corporate finance theory involves the interchange of the "virus" of the fundamental myth. There is no legal necessity that the owner of the capital asset be the residual claimant (in the enterprise using the asset), and the same holds when the owner is a corporation. Yet corporate finance theory carries over the same capital-theoretic mistake of interpreting the whole product as part of corporate ownership.

For instance, the discounted cash flow method of valuation routinely assigns to the corporation the present value of the net cash flows [e.g., from (Q,0,–L) on the bottom row of the table] from production rather than the present value of the cash flows from the services of the underlying corporate assets [e.g., from (0,K,0) on the top row].

There, in valuing any specific machine we discount at the market rate of interest the tream of cash receipts generated by the machine; plus any scrap or terminal value of the machine; and minus the stream of cash outlays for direct labor, materials, repairs, and capital additions. The same approach, of course, can also be applied to the firm as a whole which may be thought of in this context as simply a large, composite machine. [Miller and Modigliani 1961, 415]

But in order to plausibly count the future whole products as part of the present property rights of the corporation, all the future input contracts would have to be made in favor of the corporation at the present time. Moreover, since contracts are generally not enforceable until one side performs, the corporation would have to have paid all future input contracts at the present time. Only then could the corporation have a plausible claim on the future whole products of the enterprise. Since those conditions would hardly be fulfilled, the usual discounted cash flow method of valuation does not value the property rights "of the corporation." It values the underlying net assets of the corporation plus the additional value that would accrue to the corporation if it had the contractual role of residual claimant throughout the projected future time periods. It is simply another example of the fundamental myth to impute the future stream of whole products to the corporation as is done in the standard valuation formulas [see Miller and Modigliani 1961 and Ellerman 1982 for the for the equivalence between various formulas]. The valuation formulas for corporations and corporate shares in corporate finance theory are quite elegant mathematically but they are built upon the fatal conceptual flaw of the fundamental myth. It should be reiterated that this is not a normative critique of corporate finance theory. The flaws are conceptual. The future whole products of enterprises that might be undertaken by a corporation are not part of the present property rights of the corporation. And even the idealized models of corporate finance theory do not assume that all future input contracts are made and paid for at the present time, so it is a conceptual flaw to count the future whole products as part of present property rights in the ideal models—not to mention in the real world of corporate finance. Far from being the "end of history" [Hansmann and Kraakman 2000], even the most sophisticated treatments of "the standard model" in corporate finance theory are build on fundamental conceptual flaws.

2.10. The control version of the fundamental myth

Control or decision-making is tied to ownership so when ownership is misinterpreted in the fundamental myth, there is going to also be a "control version" of the fundamental myth. The analysis was based on the distinction between the ownership of a corporation or capital asset on the one hand and the contractually determined position of undertaking a certain enterprise on the other hand. Let us start with the simple case of owning a capital asset used in an enterprise. It is said that the asset owner has the "control rights over the use of the asset." But there are two quite different meanings of "control" according to whether the asset is used passively (hiring it out) or actively (hiring in the other factors and undertaking the enterprise oneself). The asset owner always has as a part of ownership the negative control rights, namely that the owner's consent must be given before another party may use the asset. That negative control right would be exercised in either agreeing or not agreeing to a proposed leasing or rental control. When the asset is leased out, the leasor may impose restrictions on how the asset may be used by the lessee. But within those constraints, the lessee has the positive or discretionary control or decision-making rights over the use of the asset. Indeed in the conduct of the enterprise, the discretionary control over one input is inseparable from the discretionary control over the other inputs; they are all tied together in the activity of the enterprise. Correspondingly, those positive or discretionary rights are unified in the hands of that one legal party who is the owner of all the goods and services used up in the enterprise. Those discretionary control rights were obtained in the input contracts. The control-version of the fundamental myth is the idea that the discretionary control of the whole enterprise in which an asset is being used is part and parcel of the ownership of the asset (just as the product-version saw the product of the enterprise as the "product of the asset"). The discretionary use rights over many different assets (e.g., land, structures, machinery, and so forth) may have to be unified in order to establish the discretionary control rights over the intertwined use of the assets in the enterprise. There is no basis to think that the discretionary control over the enterprise (just like the products of the enterprise) was the property of any one of the assets being used. Unfortunately the control-version of the fundamental myth is part of the common thought-pattern that the owner of the assets used in an enterprise has the "control rights" over the enterprise.[4] The same distinction can now be carried over, mutatus mutandis, to control rights in the context of a corporation. Here again, the conceptual entry-point is not the shareholder-corporation interface but the enterprise-corporation relationship. Our point would hold if there was one shareholder with 100% ownership in a closely-held company. The point is that the discretionary control rights over the enterprise using some of the corporate assets is not part of the corporate control rights resulting from ownership of those assets. The assets might be leased out to some other party who would unify the discretionary control rights involved in the operation of the enterprise as a going concern. When the corporation itself undertakes the enterprise, then the corporation does have the control rights over the enterprise but precisely because the corporation itself unifies the discretionary control rights over the goods and services used up in the enterprise. Those discretionary control rights do not flow from the simple ownership of the capital assets used in the enterprise; that is the control-version of the fundamental myth. In particular, the discretionary control rights over the people working in the enterprise are based on the employment contract, not on the "ownership of the means of production."

2.11. Some intellectual history of the fundamental myth

Karl Marx shares some responsibility for the fundamental myth by having given it his imprimatur. In feudal times, the governance of people living on land was taken as an attribute of the ownership of that land: "ownership blends with lordship, rulership, sovereignty in the vague medieval dominium,...." [Maitland 1960, 174] The landlord was Lord of the land.[5] As Gierke put it, "Rulership and

[4] For instance, the "rights of authority at the firm level are defined by the ownership of assets, tangible (machines or money) or intangible (goodwill or reputation)." [Holmstrom and Tirole 1989, 123]

[5] In the introduction to some of Maitland's writings, Robert Schuyler quoted his description of the evolution of

Ownership were blent" [1958, 88]. Leaving side the question about this being an accurate rendition of medieval governance, Marx mistakenly carried over that idea to his analysis of capital in capitalism. The command over the production process was taken as part of the bundle of capital ownership rights.

> It is not because he is a leader of industry that a man is a capitalist; on the contrary, he is a leader of industry because he is a capitalist. The leadership of industry is an attribute of capital, just as in feudal times the functions of general and judge were attributes of landed property. [Marx 1977 (1867), 450-451]

Like latter-day capital theorists, Marx was simply wrong; he bought the fundamental myth. Marx's "ownership of the means of production," indeed Marx's notion of "capital," involves the mythical "ownership of the enterprise or firm." By "capital" Marx did not simply mean financial or physical capital goods; he meant those goods used by wage labor in capitalist production. Outside of capitalist production, "capital" becomes just the "means of labor." In short,

Marx's "kapital" = "means of labor" + "contractual role of undertaking the enterprise."

If we use the word "kapital" (with a "k") in that Marxian sense, then not all of what is included in "kapital" can be owned. There is the ownership of the means of labor (financial and physical capital goods directly owned or indirectly owned through the legal shell of a corporation), but there is no "ownership" of the residual claimant's contractual role of undertaking the enterprise, and thus there is no "ownership" of the "means of production" or "kapital" in Marx's sense. The attempt to redefine "ownership" to include a contractual role but to continue speaking of it as a property right might called Marx's straddle.

There is a similar semantic straddle in the common language notion of "owning a factory." There is the ownership of factory buildings (or corporations with such assets), but there is no "ownership" of the going-concern aspect of operating a factory as that is a contractual role in a private property market economy. By sliding from one meaning of "owning a factory" to the other, one mistakenly thinks that there is the "ownership" of the going-concern use of a factory.

Conventional economics is prone to exploit its own version of Marx's straddle. When faced with the argument for the contractual determination of residual claimancy (or whole product appropriation), the orthodox response is sometimes: "Yes, but it is that contractual role that is called ownership* " (the asterisk indicates the non-standard use of the word). Conventional economics then goes ahead and talks about "ownership*" as if the contractual role were an attribute of capital and could be bought and sold as a property right. Ordinarily the mental model is little more than a continual confusion of the "ownership of the going-concern enterprise" (which does not exist) with the ownership of a corporation (which does exist but the corporation's relationship to the enterprise it undertakes is not one of "ownership"). By agreeing that there is the ownership of "kapital", Marx swallowed the fundamental myth of capitalist ideology even though he took great pride and joy in exposing other aspects of capitalist mythology. Indeed, it was Marx's mistaken notion of "kapital" that makes his name "capitalism" a misnomer for the system of production based on the employment contract. It should also be noted that this analysis of the "ownership of the firm" is entirely descriptive; it is not normative. The point is not that the "ownership of the firm" should not exist; the point is that it does not exist. In contrast, Marx argued descriptively that the "private ownership of the firm" does exist as a part of the capitalist system, and he argued normatively that it ought not exist.

3. Normative analysis I: the responsibility principle

3.1. Who ought to appropriate the whole product?

The laissez-faire or market mechanism of appropriation leaves the input expenses where they have fallen and assigns, as it were, the produced outputs to the same party. Thus the last legal owner of the inputs legally appropriates the whole product under the normal operation of the market without state intervention, e.g., without holding a trial to assign legal responsibility for damages. That is the answer to the descriptive question of how does the market initiate and terminate property rights. The corresponding normative question is the question of "Who ought to appropriate the whole product?". To whom should the legal liabilities and assets created in production be assigned? What is the normative principle that specifies who should be assigned the legal responsibility for the used-up inputs and produced outputs?

To see the underlying juridical principle, let us see how the assignments are made in an explicit civil or criminal trial. The standard principle for the assignment of legal or de jure responsibility can be easily seen in a civil trial to assign legal liability for damages to someone's property. The standard principle is to assign the legal or de jure responsibility for the damages to the party who was in fact responsible (i.e., de facto responsible) for the damages. The purpose of the trial is to ascertain if

the word. "We make one word of [landlord], and throw a strong accent on the first syllable. The lordliness has evaporated; but it was there once. Ownership has come out brightly and intensely; the element of superiority, of government, has vanished." [Maitland quoted in Schuyler 1960, 42] purpose of the trial is to ascertain if the defendant was in fact responsible for causing the damages (e.g., if the defendant knowingly caused the damages by his or her intentional actions). There are, of course, many shades and degrees of factual responsibility and there may be mitigating and extenuating circumstances in any given case. But the basic principle is clear—to assign legal liability to the de facto responsible party (if any)—and that is the natural principle of responsibility which is investigated here. The principle is clear to see in a trial for damages but there is no reason for the basic principle to change when property is consumed, used up, or otherwise destroyed in the absence of a trial.

Moreover, the same principle would consistently apply to the opposite cases where property is created or produced. That is, the legal responsibility for and thus the legal ownership of produced property should be assigned or imputed to the party (if any) who was in fact responsible for producing the property. Thus there is a simple and basic juridical principle that will be taken as the basis for the normative theory of property appropriation investigated here:[6]

Responsibility Principle: Assign de jure responsibility in accordance with de facto responsibility.

This is a clear principle within the domain of intentional human actions, but that domain is far from universal. The principle gives only limited help in the domain of accidents, and it gives no help whatsoever in the assignation of legal responsibility for the property that is created or destroyed solely by natural forces. As the domain of the responsibility principle recedes, other non-responsibility-based principles of an economic or contractarian nature might be applied to the assignment of property rights. For our purposes here, our attention can be restricted to the results knowingly produced by intentional human actions—where the responsibility principle can be clearly applied. This is because our topic is the appropriation of the whole product of an enterprise, and the human activity of production is perhaps the epitome of planned, deliberate, and intentional human actions.

3.2. The fundamental theorems of property theory

We have seen that there is a laissez faire or market mechanism of legal appropriation and we have seen that there is normative principle to determine who ought to appropriate the whole product. The next question is under what conditions does the market mechanism of appropriation function correctly in the sense of satisfying the responsibility principle. This question is answered by two "fundamental theorems" proven elsewhere in a mathematical introduction to property theory [Ellerman, 2001]. The property system underlies the operation of the price system. The two property theorems are the property theoretic versions of two price-theoretic results called the "fundamental theorems of welfare economics": (1) under certain assumptions, a competitive equilibrium is Pareto optimal, and (2) under certain assumptions, given a Pareto optimal state, there exists a set of prices such that a competitive equilibrium at those prices will realize the Pareto optimal state.[7]

The mathematical treatment of property theory, in effect, inaugurates the field of mathematical jurisprudence in the sense that it is based on juridical principles such as the responsibility principle and does not attempt to reduce "law" to economics. In contrast, the "law and economics" literature attempts to reduce legal rules and juridical mechanisms to efficiency considerations such as the minimization of transactions costs.

Similarly "the 'new institutional economics,' [consists] in large part of transactions cost analysis of property rights, contracts and organizations." [Rutherford 2001, 187]

Property theory uses jurisprudential norms central to the subject matter such as the responsibility principle. The fundamental theorems relate the responsibility principle to the legal mechanism for the laissez faire appropriation of the assets and liabilities created in production (or consumption) activities. By attempting to reduce "law" to "economics," the law-and-economics literature and the new institutional economics neither formulates the responsibility principle nor the market mechanism for legal appropriation.

The basic ideas can be presented in non-mathematical form to illustrate the simple logic of the theorems (particularly the first theorem). Legal parties are groups of people who act together as a unit (e.g., cooperate together in an enterprise). Between the parties, the legal transfers of property rights are taken to be the voluntary transfers representing a meeting of minds in a contract, i.e., voluntary contracts.

Between the parties, there are also the factual transfers in the possession and control of the items of property or "commodities." It is important not to confuse transfers in possession with movements in physical space. For instance, when a house is sold and the house is said to be transferred to the new owners, that is a transfer in "possession space," not

[6] In the words of a law professor, "the libertarian entitlement thesis, to the effect that persons are entitled to retain the fruits of their labor, and the libertarian thesis about outcome-responsibility, to the effect that persons are responsible for the harms that they cause, are two sides of the same coin. ... The basis of this unity is the idea that people 'own' the effects, both good and bad, that causally flow from their actions." [Perry 1997, 352]

[7] See Arrow 1951, Debreu 1951, Gale 1955, or Quirk and Saposnik 1968.

physical space. When the new owners move into the house, they move in physical space while the house stays in the same place. Factual transfers in possession and control refer to the movements in possession space, not physical space. People grouped together as "parties" in effect form the fixed coordinates in possession space and the commodities (including fixed assets) move from one coordinate to another in a factual transfer of possession. Given a legal transfer in the form of a voluntary contract to transfer the property rights in some commodities from one party to another, the contracts are fulfilled by the corresponding transfers in possession. When a contract is not fulfilled by the factual transfer in possession, then the contract is said to be breached.

When one party's property is stolen or converted without consent, that is a factual transfer that is not covered by voluntary contract. Such uncovered factual transfers are called externalities. When the voluntary contracts for a time period are all fulfilled by the corresponding transfers in possession, and all factual transfers are covered by voluntary contracts, then that is called a contractual matching. There is a contractual matching if and only if there are no breaches and no externalities.

The laissez faire or market mechanism of appropriation is based solely on the legal transfers. When there is no intervention by the legal authorities, then the legal liability for consumed, used-up, or otherwise destroyed commodities is imputed, as if by an invisible judge, to the last legal owner of those commodities. Having borne those expenses, the same party would have the legally defensible claim on any produced outputs and thus would be the first seller of the outputs. With no legal intervention to alter that defensible claim, the first ownership of the produced outputs are imputed, as if by an invisible judge, to that first seller.

When does that laissez faire mechanism (the "invisible judge") make the imputations in accordance with the responsibility principle? This is answered by the:

First fundamental theorem of property theory: If there is a contractual matching, then the market mechanism of appropriation satisfies the responsibility principle. [see Ellerman 2001]

The logic of the result is fairly simple. When there is a contractual matching, then factual possession always agrees with legal ownership. Thus the last buyer of the inputs will be the last possessor of the inputs. And for people to be de facto responsible for consuming, using up, or otherwise destroying commodities, they must be the last possessor of the commodities. Thus imputing legal liability to the last owner automatically imputes it to the de facto responsible party.

Moreover the people who produce commodities (e.g., the farmer who raises a crop) will be the first possessors of those commodities. If possession agrees with ownership by virtue of the assumed matching, then imputing the initial property right to the first seller will automatically assign the initial right to the de facto responsible party. Thus when there is a contractual matching, then the market mechanism automatically assigns legal responsibility in accordance with de facto responsibility. That theorem is the basis for the "natural system" of private property and voluntary contracts.[8]

The contrapositive of the theorem states that if the responsibility principle was violated within the production activities of the parties, then it would show up as a mismatch in the contractual mechanism, i.e., as a breach or an externality. This is a property-theoretic refutation of Marx's charge that there could be exploitation in the "hidden abode of production" while the sphere of exchange "is in fact a very Eden of the innate rights of man" [Marx 1967, 176].

3.3. Avoiding metaphorical notions of "responsibility"

Before proceeding with the analysis, it will be useful to consider some of the metaphorical notions of "responsibility" that have been quite popular in conventional economics. Only persons can be de facto responsible for anything. Things can bear no responsibility. Responsibility is imputed back through things to their human users.

However, neoclassical economists are fond of interpreting the causal efficacy of nonlabor inputs in an animistic way as a type of "economic responsibility" [Wieser 1930 (1899), 76] but that is only a metaphor. Knives have a certain efficacy or productivity but they have no de facto responsibility for the crimes committed with them. The de facto responsibility for the intended results of deliberate human actions using various instruments is borne solely by the human users, and it includes the responsibility for using up the services of the instruments.

> The judge ... who, in his narrowly-defined task, is only concerned with the legal imputation, confines himself to the discovery of the legally responsible factor,—that person, in fact, who is threatened with the legal punishment. On him will rightly be laid the whole burden of the consequences, although he could never by himself alone—without instruments and all the other conditions—have committed the crime. The imputation takes for granted physical causality....
>
> If it is the moral imputation that is in question, then certainly no one but the labourer could be

---

[8] The second "fundamental theorem" is less basic to understanding the property system although it is more difficult mathematically. It gives the conditions on the production-consumption intentions of the parties so that there exists a set of legal transfers to be fulfilled by factual transfers that will realize those intentions.

> named. Land and capital have no merit that they bring forth fruit; they are dead tools in the hand of man; and the man is responsible for the use he makes of them. [Wieser 1930 (1899), 76-79]

Thus even as Wieser introduces metaphorical notions of "economic responsibility" and "imputation" in his treatment of marginal productivity theory, he recognizes that for the ordinary non-metaphorical notion of imputation, "no one but the labourer could be named" and that the "imputation takes for granted physical causality."[9] However after Wieser's 1899 book, the idea of interpreting marginal productivity metaphorically as representing each input unit's "responsibility" for a share of the product conquered conventional economics "like the Inquisition conquered Spain." Even though "every school-boy knows" that things cannot be responsible, the author has not been able to find a single conventional economics textbook published in the entire 20th century which, like Wieser, admits that fact.

3.4. Application to appropriation of the whole product

It is this principle of responsibility from jurisprudence that is being applied to the normative question of who should legally appropriate the whole product. The (stylized) facts are taken to be that in a given economic enterprise, the people working in the enterprise (managers and workers) cooperate together to use up the inputs in the process of producing the outputs. The people working in the given enterprise (managers and workers) will be referred to as "Labor."

In our simple canonical example, Labor, by performing the intentional human actions L, uses up the nonlabor or capital inputs K in order to produce the outputs Q. It is no accident. The using-up of the inputs K and the production of the outputs Q are the deliberate and intentional results of the actions L of the managerial and non-managerial workers in the enterprise. Thus the people working in the productive opportunity are jointly de facto responsible for producing the property vector (Q,-K,0). I have employed the convention used in economics of reifying the human activity of producing (Q,-K,0) as the labor L which must then be seen as being both produced and used up in the production process. Thus Labor's production of Q by using up K is represented as the production of L and then as the using up of L and K in the production of Q. In vectorial terms,

Labor's Product = (Q,-K,0) = (0,0,L) + (Q,-K,-L) = Labor Services + Whole Product.

This set of facts coupled with the principle of responsibility yields the assignment of the legal responsibility for Labor's Product (labor services plus whole product) to Labor. Thus Labor should, by the principle of responsibility, legally appropriate the whole product (in addition to the labor services). In short, the people working in an enterprise should "be the firm" (in the sense of whole product appropriator or residual claimant). The principle of responsibility implies that production should be legally organized as what are called "democratic firms" or "labor-managed firms" where the legal party consisting of the people working in the enterprise is the residual claimant. This result that Labor should appropriate the whole product does not imply that present labor should "appropriate" the capital asset being used, which in the example yields the stream K, K, ..., K of capital services.

This is a very striking result. Yet it is surprisingly robust. The principle of responsibility is clear, for example, in criminal and civil trials, and there seems to be no reason why the same principle should not apply when no civil or criminal wrongs have been committed. There is much controversy about the borderline cases of responsibility (e.g., impaired capacity and insanity), but the principle has only been applied in the case of productive work which epitomizes deliberate and intentional human actions. It remains to reconcile the application of the responsibility principle as implying democratic firms with the almost universal presence of the firms based on the employment relationship (the so-called "capitalist" firms) in the current system of property and contract. Since Labor is not the residual claimant or whole product appropriator in a firm based on the hired labor, the responsibility principle is violated in those firms. By the first fundamental theorem, there must be a mismatch at the level of contracts. What is that mismatch?

3.5. De facto inalienability of human action

There is a systemic breach of the employment contract since human labor is de facto non-transferable between persons. When things (i.e., non-persons) are sold or rented, the factual possession of the thing can be transferred from the seller to the buyer. The buyer can then use the thing and be solely de facto responsible for that use. The legal imputation—according

[9] Wieser's development of economic notions of "responsibility" and "imputation" illustrates an important intellectual strategy of the Economics profession. How is Economics to protect itself against the "nightmare" of being invaded by Jurisprudence or Political Theory and from having some "economic" question addressed by juridical or political principles outside the professional expertise of economists? Offense might be the best defense, and thus there have been "economic" theories of law, politics, and much else. These intellectual forays might involve developing "economic" versions of non-economic concepts (e.g., Wieser's metaphors) and then redefining the important questions as the questions that could be dealt with using economics concepts (e.g., ignoring questions of property appropriation in production in favor of wage and price determination by marginal productivity theory).

to the contract—of the liability for using the thing would be correct in terms of the responsibility principle. But the same cannot happen when it is human actions or "labor services" that are bought and sold in the employment contract. One person (the so-called "employee") can only agree to co-operate with another person (the so-called "employer") by voluntarily following that person's instructions but the "employer" and "employee" are then jointly de facto responsible for the results. The only way that the first person could escape any shared de facto responsible would be if he or she was coerced, but we are considering the voluntary employment contract. Voluntary labor services are de facto non-transferable.[10]

The "trick" is that although the voluntary co-operation of the employees with the employer does not fulfill the employment contract, the legal authorities in the current system nevertheless "count" that jointly responsible co-operation as "fulfilling" the labor contract. Since the contract was "fulfilled," there are no grounds for legal intervention. The market mechanism of appropriation then applies and legally imputes the whole product solely to the employer. That is how one party consisting of all who work in the enterprise (employees and working employers who are natural persons) are de facto responsible for producing the whole product and yet the whole product is legally appropriated any another party, the employer.

That employees' share de facto responsibility is a matter of fact. The legal authorities fully admit that fact when the actions are criminous. This can be illuminated by considering the parable of the criminous employee. Suppose that an entrepreneur hires a van for a week from a car-hire company in an impersonal market transaction. The van-owning company or its representatives are not otherwise involved with the entrepreneur. The entrepreneur also hires a worker as his assistant. In addition to employing the van and the worker in normal business, the entrepreneur employs them to rob a bank. The employer and employee are caught and hauled before a judge. The employee claims that his position is quite analogous to that of the van-owner. In both cases, certain services (man-days or van-days) were sold to the entrepreneur, and the later use of those services by the entrepreneur is not the responsibility of the original seller of the services. The entrepreneur telling the employee to do this or that is like the entrepreneur "telling a grocer to sell [him] this brand of tuna rather than that brand of bread" [Alchian and Demsetz 1972, 1994]. The grocer bears no responsibility for the subsequent use made of the tuna or bread. The judge would no doubt be unimpressed by this argument. The visible judge would "pierce the veil" of the labor contract to point out the factual difference in the alienability of labor services on the one hand and the services of a van or any thing (such as tuna or bread) on the other hand. The use of the van could in fact be transferred from the owner to the entrepreneur so that the entrepreneur could use the van without the owner being involved. But it is factually impossible for a person to do the same with his or her own actions. At best the worker can only agree to co-operate with the entrepreneur, but then the worker shares the de facto responsibility for the results. Having established those facts, the judge would hold them both legally responsible for the robbery. The servant in work becomes the partner in crime.

> All who participate in a crime with a guilty intent are liable to punishment. A master and servant who so participate in a crime are liable criminally, not because they are master and servant, but because they jointly carried out a criminal venture and are both criminous. [Batt 1967, 612]

It is sometimes thought that the worker is responsible because an employment contract involving a crime is null and void, but the logical order is the reverse. The employee is legally guilty because he knowingly committed a crime, not because of the bogus contract, and thus the employment contract must be set aside in order to view the worker as a co-venturer and to explicitly apply the responsibility principle. The fact that the van rental contract was not per se void (unless some personal involvement of the van owner could be demonstrated) hints at the deeper contradiction between the employment contract and the responsibility principle.

The parable of the criminous employee illustrates the non-transferability of de facto responsibility for human actions. Yet the facts of the matter do not change when the actions are legal. Workers do not become some type of non-responsible instrument when they do not commit crimes. Thus the argument that workers have "transferred" their de facto responsibility fails. The previous conclusion that labor is de facto responsible for the whole product is sustained, and thus the responsibility principle implies that the people who work in an enterprise should legally appropriate the positive and negative fruits of their labor.

The de facto non-transferability of human labor implies that the contract for renting human beings, the employment contract, is inherently null and void

[10] Using the imagery of "possession space," people form the fixed coordinates of possession space, so there is no such thing as the voluntary transfer of the activities or actions of one party to another party. For example, something might move from the coordinate 5 on the X-axis to the coordinate 8, but it would be nonsense to think of the coordinate 5 as itself moving to the coordinate 8 on the X-axis. Similarly, commodities move between people in possession space, but people cannot move between people even though a legal system might erect a systemic "fraud" of saying that one person would be treated as being in the possession of another.

like the longer term self-sale contract. It is not a question of "buy or lease"; neither concept should be applied to persons. With the contract for renting persons recognized as being null and void (as the contract for buying persons is currently recognized), Labor would always have to hire capital and then the market mechanism would correctly impute the whole product to Labor (as indicated in the first fundamental theorem of property theory).

3.6. Brief intellectual history of responsibility theory of appropriation

The normative theory of property appropriation based on the responsibility principle is not new; it represents a reworking and reformulation in a modern and consistent form of what was variously called the "natural rights theory of property" [e.g., in Schlatter 1951]or the "labor theory of property" associated with John Locke. The intellectual history of these ideas will be reviewed by considering the main ways in which the classical ideas needed to be changed or reformulated to arrive at the modern theory.[11]

One important step was expanding the site of appropriation from some Lockean "original state of nature" to any human activity where property is produced or consumed. The discussion of the appropriation or initiation of property rights is ordinarily relegated to a rather mythical original state of nature [e.g., in the philosophical literature] or to a situation where property previous held in common is being privatized. For instance, Harold Demsetz [1967] considers how private property in land with fur-bearing animals was established as a result of growth in the fur trade. John Umbeck [1981] considers how gold rights were established in the 1848 California gold rush on land recently ceded from Mexico. Yoram Barzel [1989] considers how the common property rights to minerals under the North Sea were privatized. But in Barzel's book [see particularly Chapter 5 "The formation of rights", 1989] as elsewhere in the economics of property rights literature, there is no recognition that the appropriation of the outputs (and the symmetrical termination of rights to the used up inputs) takes place in normal production. Thus the question of appropriation at the heart of property theory is not even posed in the "economics" literature on property rights and the firm.

Another advance was the inclusion of the liabilities for the used-up inputs in the concept of the "whole product" so that the question of appropriation could be posed in an algebraically symmetric (plus and minus) manner. Classical treatments of the labor theory of property [e.g., see Menger 1899] tended to assert "Labour's Claim to the Whole Product" without being clear about the inclusion of the negative liabilities. This view of "immaculate appropriation" led to much easy criticism of the theory as having neglected the other scarce inputs. The algebraically symmetric description of production (using a vector with the outputs as positive and the inputs as negative) came into common usage in recent decades as production opportunities came to be described with production sets rather than production functions. Applying the old label of "whole product" to these production vectors allows the modern and consistent reformulation of "Labour's Claim to the Whole Product."

It is perhaps ironic that the usual treatment of marginal productivity theory also indulges in the notion of "immaculate" production. A unit of an input cannot produce its "marginal product" ex nihilo. Other inputs need to be used up. Marginal productivity theory can be reformulated using the vectorial marginal productivity of a factor so that the market value of the vectorial marginal product of a factor equals the price of the factor when profits are maximized.[12]

Another necessary advance was identifying "responsibility" as the unique characteristic of actions of persons in contrast with the causally efficacious but "non-responsible" services of things. This was admitted by Wieser (an economist also trained as a lawyer) who introduced the "economic" (i.e., metaphorical) notion of "imputation" (Zurechnung), but then was promptly forgotten by the rest of the conventional economics profession. A key step was identifying the basic normative principle of the "labor theory of property" with the natural principle of responsibility ("Assign de jure responsibility in accordance with de facto responsibility"). Since the responsibility principle is fundamental to ordinary "bourgeois" jurisprudence, this interpretation of labor theory of property removed any bizarre or "radical" connotations of the theory and made it understandable to the layperson.

This interpretation of the "labor theory of property" decisively separated it from the hopelessly erroneous "labor theory of value." The labor theory of value, particularly in its Marxian form, is surely one of the most spectacular failures in the history of economic thought. Once the labor theory of property

[11] See Ellerman 1992 for a more complete treatment.

[12] See Chapter 5 "Are Marginal Products Created *ex Nihilo*?" in Ellerman 1995. It is noteworthy that this simple vectorial treatment of marginal productivity theory is not developed in the conventional literature—perhaps because it does not lend itself to the simple "division of the product" metaphor. In any case, the "division" and "distribution" metaphors are wrong-headed from the property viewpoint since one party legally appropriates the whole product (which includes the liabilities for the used-up inputs). The basic property question is not how to "divide" the product, but who ought to appropriate the whole product.

is cleanly formulated as the responsibility theory of property appropriation, it is seen to have nothing whatever to do with value or prices. There is always a strong temptation to try to attack the labor theory of property by associating it with the labor theory of value, Marxism, and all that—an attack that is particularly ironic since the responsibility principle is the basis for the just appropriation of private property. The first fundamental theory of property theory outlined above shows how the operation of the "natural system of property and contract" automatically satisfies that principle.

4. Concluding remarks

This essay has tried to cover much ground. It began with a rethinking of the rights of capital based on distinguishing between what is actually owned, e.g., a corporation or a capital asset, and the contractually-determined enterprise undertaken by a corporation or by the owner of a capital asset. That simple conceptual distinction undercuts a surprising amount of conventional thinking about the "ownership of the company" (meaning the "ownership" of the contractually-determined enterprise undertaken by a company) as well as conventional capital theory and corporate finance theory. The roots of the mistakes uncovered by this descriptive analysis can be traced to Marx and even his name of "Capitalism" for the current system so the mistakes are in fact shared by conventional "capitalist" and Marxist thinkers.

The second part of the paper shifted to a revival and modern treatment of the older ideas generally known as the "labor theory of property" or the "natural rights theory of property." That old idea was reinterpreted in terms of the juridical principle of assigning legal responsibility in terms of de facto responsibility.

Moreover, as we see from the treatment of the employment contract in the context of civil or criminal wrongs, de facto responsibility cannot in fact be transferred between people. One person can at most co-operate voluntarily with another but then they are jointly de facto responsible for the fruits of their combined labor. Those principles applied to the firm yield an argument for the democratic firm where the members of firm would be the people (management and labor) who work in it and where all capital, whether supplied externally or internally, would be treated as a hired factor. This does not violate any alleged "property rights" of capital since, as was shown in the first half of the paper, the ownership of capital does not include any "ownership" over the enterprise undertaken using the capital.

References

1. Alchian, A. and H. Demsetz, 1972. Production, Information Costs, and Economic Organization. American Economic Review.62: 777-795.
2. Arrow, K. J. 1951. An extension of the basic theorems of classical welfare economics. In Proceedings of the Second Berkeley Symposium on Mathematical Statistics and Probability. J. Neyman Ed. Berkeley: University of California Press: 507-32.
3. Arrow, K.J. 1971. The Firm in General Equilibrium Theory. In The Corporate Economy. R. Marris and A. Woods eds. Cambridge: Harvard University Press.
4. Arrow, K. J. and G. Debreu 1954. Existence of an Equilibrium for a Competitive Economy. Econometrica. 22: 265-290.
5. Arrow, K. J. and F. H. Hahn 1971. General Competitive Analysis. San Francisco: Holden-Day.
6. Barzel, Y. 1989. Economic Analysis of Property Rights. New York: Cambridge University Press.
7. Batt, Francis 1967. The Law of Master and Servant. Fifth edition by G. Webber. London: Pitman.
8. Black, H. 1968. Black's Law Dictionary. St. Paul: West Publishing.
9. Debreu, G. 1951. The coefficient of resource utilization. Econometrica. 19: 273-92.
10. Debreu, G. 1959. Theory of Value. New York: John Wiley & Sons.
11. Demsetz, H. 1967. Toward a Theory of Property Rights. American Economic Review. 57(May 1967): 347-359.
12. Ellerman, David P. 1982. Economics, Accounting, and Property Theory. Lexington MA: D.C. Heath.
13. Ellerman, David P. 1992. Property & Contract in Economics: The Case for Economic Democracy. Cambridge: Blackwell.
14. Ellerman, David P. 2000. The Arrow-Debreu Model: How Math Can Hide a Fatal Conceptual Error. Forum for Social Economics 29: 33-48.
15. Ellerman, David P. 2001. Introduction to Property Theory: The Fundamental Theorems. Policy Research Working Paper #2692. Washington: World Bank.
16. Fama, E. 1996. Agency problems and the theory of the firm. In The Economic Nature of the Firm. Second edition. L. Putterman and R. Kroszner Eds. Cambridge, Cambridge University Press: 302-314.
17. Fama, E. and M. Jensen 1996. Organizational Forms and Investment Decisions. In The Economic Nature of the Firm. Second edition. L. Putterman and R. Kroszner, Eds. Cambridge, Cambridge University Press: 336-344.
18. Furubotn, E. and S. Pejovich, Eds. 1974. The Economics of Property Rights. Cambridge: Ballinger Publishing Company.
19. Gale, David 1955. The Law of Supply and Demand. Mathematica Scandinavia. 3: 155-69.

20. Gierke, Otto von 1958. Political Theories of the Middle Age. Trans. F. W. Maitland. Boston: Beacon Press.
21. Haavelmo, T. 1960. A Study in the Theory of Investment. Chicago: University of Chicago Press.
22. Hansmann, H., 1990. Ownership of the firm. In Corporate law and economic analysis. Ed. by L. A. Bebchuk. Cambridge: Cambridge University Press: 281-313.
23. Hansmann, H. 1996. The Ownership of Enterprise. Cambridge: Harvard University Press.
24. Hansmann, H. and R. Kraakman 2000. The End of History for Corporate Law. Law and Economics WP No. 235, Yale Law School.
25. Hart, O. 1995. Firms, Contracts, and Financial Structure. Oxfore: Clarendon Press.
26. Hart, O. and J. Moore 1990. Property Rights and the Nature of the Firm. Journal of Political Economy. 98: 1119-59.
27. Hirshleifer, J. 1970. Investment, Interest, and Capital. Englewood Cliffs: Prentice-Hall.
28. Holmstrom, B. and J. Tirole 1989. The Theory of the Firm. In Handbook of Industrial Organization Vol. I. R. Schmalensee and R. Willig Eds. Amsterdam, North-Holland: 61-133.
29. Keynes, J.M. 1936. The General Theory of Employment, Interest, and Money. New York: Harcourt, Brace & World.
30. Locke, John 1960 (1690). Two Treatises of Government. Ed. Peter Laslett. New York: New American Library.
31. Maitland, F.W. 1960. Frederic William Maitland: Historian. R.L. Schuyler ed. Berkeley: University of California Press.
32. Marx, Karl 1967 (1867). Capital: A Critique of Political Economy. Volume I. Trans. S. Moore and E. Aveling. New York: International Publishers.
33. Marx, Karl 1977 (1867). Capital: A Critique of Political Economy. Volume I. Trans. B. Fowkes. New York: Vintage Books.
34. Menger, Anton 1899. The Right to the Whole Produce of Labour: The Origin and Development of the Theory of Labour's Claim to the Whole Product of Industry. Trans. M.E. Tanner. Intro. by Herbert S. Foxwell. London: Macmillan and Co (Reprinted by Augustus Kelley).
35. Miller, M. H. and F. Modigliani 1961. Dividend Policy, Growth, and the Valuation of Shares. The Journal of Business. 34(October 1961): 411-433.
36. Montias, J. M. 1976. The Structure of Economic Systems. New Haven: Yale University Press.
37. Perry, Stephen 1997. Libertarianism, Entitlement, and Responsibility. Philosophy & Public Affairs. 26 (4), 351-96.
38. Putterman, L. 1996. Ownership and the nature of the firm. In The Economic Nature of the Firm. L. Putterman and R. Kroszner Eds. Cambridge, Cambridge University Press: 361-369.
39. Putterman, L. and R. S. Kroszner, Eds. 1996. The Economic Nature of the Firm. 2nd edition. Cambridge: Cambridge University Press.
40. Quirk, J. and R. Saposnik 1968. Introduction to General Equilibrium Theory and Welfare Economics. New York: McGraw-Hill.
41. Ross, Stephen A., and Randolph W. Westerfield. 1988. Corporate Finance. St. Louis: Times Mirror/Mosby.
42. Rutherford, M. 2001. Institutional Economics: Then and Now. Journal of Economic Perspectives 15(3 Summer): 173-94.
43. Schlatter, Richard 1951. Private Property: The History of an Idea. New Brunswick: Rutgers University Press.
44. Schuyler, R.L. 1960. Introduction. In Frederic William Maitland: Historian. R.L. Schuyler Ed. Berkeley: University of California Press: 1-45.
45. Umbeck, J. 1981. Might Makes Right: A Theory of the Formation and Initial Distribution of Property Rights. Economic Inquiry. 19(1): 38-59.
46. Varian, H. 1984. Microeconomic Analysis. 2nd ed. New York: W.W. Norton.
47. Wieser, F. von 1930. Natural Value. Trans. C.A. Malloch. New York: G.E. Stechert and Company.