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Abstract
This talk addresses the interaction of knowledge and organization in IB research, particularly research on the MNC. The argument is made that although the MNC literature is quite advanced with respect to its treatment of firm-level knowledge, several connected problems remain. In particular, there has been an over-emphasis on knowledge flows and an under-emphasis on knowledge stocks; the microfoundations of MNC knowledge are unclear; and there is a no clear understanding of the causal relations between knowledge stocks and flows and organizational control. A control theory approach that may resolve some of these problems is then sketched.

Keywords
The MNC, knowledge, organizational control, control theory.

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Introduction

I don't consider myself an international business scholar, so my perspective in this talk will be that of an outsider to the field. Bringing outsiders in is sometimes warranted, because it may provide a useful fresh look. Of course, there is also the possibility of utter confusion and misunderstanding. What alternative has materialized is something I shall leave to your judgment at the end, and take consolation in the fact that keynote speeches are acknowledged vehicles for airing crazy ideas.

I shall do two things: First, I shall critically discuss the current treatment of knowledge and organization in the theory of the MNC. I wish to argue that in spite of the present popularity of "knowledge-based" approaches in the international business literature, the field is still far from a coherent knowledge-based understanding of the MNC. There is no elaborate and coherent conceptualization of what it means to say that the MNC is a "knowledge-based entity." There is (still) little understanding of how organizational control impacts processes of knowledge sharing (transfer), integration, and creation. Conversely, understanding of how existing stocks of knowledge ("capabilities"?) constrain the application of mechanisms of organizational control is lacking. Thus, causality is unclear, in the sense that extant research is not really clear about under which conditions knowledge characteristics are best seen antecedents to the choice of mechanisms of organizational control, and, conversely, under which conditions mechanisms of organizational control can be chosen so as to influence the characteristics and flows of knowledge. Thus, the causal-temporal structure of managerial choices relating to knowledge and organization in the MNC is not clear.

Part of the problem is that we don't have much of a useful apparatus to help us frame these issues. I don't necessarily call for finely honed, formal models. That may be an ultimate ambition. However, what I believe is badly needed in the theory of the MNC, and perhaps the international business field at large, are apparatuses that are in between the loose, verbal account and the full-blown formal model. We may call such apparatuses "heuristic frames" (Winter 1987), because they identify the variables that we are talking about, and lay out their temporal-causal relations in a "heuristic" and not fully formal manner. This leads into the second point of this talk: The issues may very usefully be framed by means of using *control theory* as a relevant heuristic frame. The remainder of the talk is organized around these two points.

Knowledge Gaps in the MNC Literature

Knowledge and Economic Organization in the IB Literature

It is to the lasting credit of the theory of the MNC that it took knowledge seriously as a key factor in understanding economic organization long before the mainstream economics of organization did this. As late as 1998 Bengt Holmström and John Roberts (1998: 90), two of the leaders of formal organizational economics, observed that

> Information and knowledge are at the heart of organizational design, because they result in contractual and incentive problems that challenge both markets and firms … In light of this, it surprising that leading economic theories … have paid almost no attention to the role of organizational knowledge.

Observe that at the time that this statement was made, organizational knowledge had already been a favorite construct in the international business field for more than a decade, challenging, or at least complementing, the "leading economic theories" in that field. And the idea that economic organization – specifically, the comparative contracting issue of whether to export, license, establish foreign operations, etc. – may be influenced by the characteristics of firm-specific assets other than that of asset specificity had been around much longer.

In general, it seems that the MNC, or more generally, IB field has considerable lead-time with respect to understanding how knowledge and economic organization connects. In particular, the recent emphasis in the so-called "differentiated MNC literature" on orchestrating knowledge flows between MNC units has brought some — mainly empirically based — insight into the organizational requirements of knowledge transfer, and the literature as a whole identifies key tradeoffs in organizational design, such as those between keeping knowledge local or sharing it. These are tradeoffs that may apply to any firm, but they are perhaps best and most vividly understood in the context of the MNC. In fact, the argument may be made that the international business field would seem to be a preeminent testing ground of knowledge-based theories, particularly as these pertain to economic organization, because the knowledge issues that may drive economic organization (e.g. costs of communicating across a market interface) are simply more likely to be pronounced in an international than a national context.

Three Related Problems

Enough of praise. There are a number of (related) problems with extant work on knowledge and organization in MNCs.[1] These are 1) an absence of methodological individualist (or micro-) foundations, 2) lack of understanding of the MNC knowledge structure, and 3) unclear causality. In my view, these three problems together provide the main reason for our lack of understanding of how knowledge and organization interact in the MNC. Consider them *seriatim*.

Absence of methodological individualist (micro) foundations. Like the knowledge-based literature in general, notions of firm- or unit-specific "capabilities," "competencies," "knowledge assets," etc. abound. These are aggregate concepts. Such concepts are, of course, not illegitimate *per se*, provided their foundation in individual behavior is understood. However, this is hardly case for a notion such as firm-level "competence." Definitions of these terms, to the extent that they are given at all, tend to "define" these ill-defined concepts in terms of other ill-defined concepts, such as defining competence in terms of "capabilities" and "routines"). If pressed on the issue, proponents of notions of competence etc. tend to invoke a number of conceptually different entities, such as heuristics and strategies, organizational processes and arrangements, cognitive issues (e.g., "organizational memories"), and incentives ("truces") — many of which are equally in need of clear definition and conceptualisation[2] and whose interrelations are entirely unclear.

Even more problematically, there is no real theory of choice behavior in recent "knowledge-based" work. This may be seen from the way in which writers treat economic organization in a methodological collectivist way, namely in terms of postulating crude

[1] In actuality these are largely problems that plague the whole "knowledge movement".

[2] For a fuller discussion and critique, see Foss (2003).

causal relations between capabilities and economic organization, little attention being paid to the micro-analytic issues involved. Not surprisingly, these stories are vulnerable to basic critiques from the perspective of comparative contracting (Foss 1996; Williamson 1999). Do these points matter for international business research, or are they merely methodological niceties?

I think they do matter, both for theory building and for managerial implications. For example, in much of the capabilities view, there is an unstated assumption that knowledge inside firms is assumed be relatively homogenous, and therefore not very costly to communicate, while knowledge between firms ("differential capabilities") is taken to be (very) heterogeneous (and therefore costly to communicate). Of course, recent work on the "differentiated MNC" goes beyond this because of its heavy focus on cognitive and motivational impediments to knowledge transfer between MNC units; thus, "differential capabilities" *within* the firm (i.e., the MNC) are certainly recognized in this literature. Still, because there is little explicit attention to individual rational choice in this approach, arguments pertaining to intra-MNC knowledge transfer acquires an *ad hoc* character, and, indeed, the literature seems to be very much empirically driven. The managerial implication of the lack of proper methodological individualist foundations is that it is unclear how knowledge processes may be influenced by mechanisms of organizational control, since there is no specification of how these controls influences individual behavior with respect to accumulating, building, sharing, integrating, etc. knowledge.

Lack of understanding of the MNC knowledge structure. This is a theme that I have pursued recently with my colleague Torben Pedersen (Foss and Pedersen 2003). It is related to the previous point. Although work on the MNC, and particularly recent work on the differentiated MNC, certainly does not assume that all intra-MNC knowledge is essentially homogenous, it remains true that comparatively little research has been devoted to understanding the ways in which knowledge may be stratified, distributed, partly overlapping, complementary or, in another word, *structured* inside MNCs (see Lyles and Schwenk 1992). In fact, in general much more attention has been devoted to understanding knowledge *flows* between MNC subsidiaries than to understanding the stratification of knowledge *stocks* across the MNC. This is not satisfactory, for flows emerge from stocks, as it were, and they change other stocks.

Unclear causality. The interaction between knowledge and organization is less clearly conceptualized and framed in the IB literature than one could wish for. The key problem in thinking about the interaction of knowledge and organization in the MNC has to do with causality and temporality. Does knowledge constrain organization, or is it rather somehow the way around, or is there some degree of simultaneity in their determination, or is it the case that different kinds of organizational control influence knowledge flows whereas knowledge stocks function as constraints on the feasible values of organizational instruments, etc., etc.? These are important scientific questions, and there are obvious managerial implications of getting the causality right. However, the IB literature does not offer much of a theoretical framework to handle this kind of questions.

Research Opportunities: Knowledge and Organization

Whereas the MNC literature is much more advanced than the economics literature on organization with respect to its treatment of knowledge, the latter is considerably more advanced with respect to its treatment of incentives and property rights and how allocations of these influence value-creation through the impact on various externality problems. There

is a lot to be said for bringing these two bodies of thought even more closely together. I also think there is something to be said in favor of the notion of letting an economics-based "rational action approach" take the lead in such an endeavour (see further Buckley and Casson 2001).

Early economics-based contributions to the emerging MNC literature highlighted the "internal market" aspects of the MNC (Buckley and Casson 1976). This remains a good starting point for analysis. Specifically, we may look at "internal market failures" related to the internal supply of various kinds of public goods and open access resources, and how firms may deal with such failures (Vining 2003). Knowledge resources at various levels of the MNC may be analysed in pretty much the standard terms of the theory of public goods (i.e., degrees of excludability, rivalry in use, strategic behavior in connection with eliciting information, bargaining problems, etc.).

This may help us understand better the peculiar management problems associated with building, transferring and integrating knowledge in the MNC. Thus, we will become knowledgeable about how reward systems, monitoring, and the allocation of decision and ownership rights in MNCs influence these knowledge processes. However, an important extra benefit is that we will better *understand the MNC as a knowledge structure.* This is hardly a conventional argument, so I elaborate a bit here.

One may think of the overall MNC knowledge structure as a set of nodes connected by arrows. The individual nodes refer to *knowledge elements*, such as, for example, a marketing capability in a subsidiary in a certain country, or a patent held by the corporate center. Nodes may be identical, as when two subsidiaries exploit the same patent. Notions of organizational knowledge structures (as in Lyles and Schwenk 1992) and perhaps "core competences" and the like can be represented as the set of identical nodes over subsidiaries and MNC headquarters. Nodes may represent tacit or explicit knowledge, or knowledge with or without public good character. Unidirectional arrows represent one-way *spillovers*; arrows that go in both ways represent *complementarities* between knowledge elements.

How does organization, and organizational economics ideas, relate to such a knowledge-based conceptualization? A useful first beginning may be to conceptualise knowledge resources in the terms alluded to above, as being different in terms of their degree of *excludability*. To some extent this is already done in the MNC literature; thus, the familiar tacit-explicit knowledge distinction is (also) about the extent to which knowledge is excludable from other potential users.

However, a key insight in the relevant economics literature, which I see only partly reflected in the MNC literature, is that *excludability is endogenous* to managerial action. Thus, depending on the relevant costs and benefits, knowledge can be made available to multiple agents. Much more is involved in this than the transfers of knowledge between MNC units that are so intensively discussed in recent literature. Also involved is the fact that agents or MNC units may choose to make the knowledge they control excludable in various ways, for example, because this gives them bargaining power in dealings with other MNC units. A further dimension is that excludability has to do with knowledge characteristics, as already indicated. However, knowledge characteristics are not exogenously given; they are endogenous to instruments of organizational control (among other things). Thus, incentives may be provided for revealing knowledge, organizational knowledge management initiatives may be started, and expatriation initiatives clearly influence the dissemination of knowledge within the MNC, all of which makes knowledge

less excluded and excludable. Alternatively, knowledge may deliberate be kept local and tacit.

This line of reasoning suggests that what I earlier called the "MNC knowledge structure" is to some extent endogenous to organizational arrangements and managerial actions. In other words, fully understanding the way in which knowledge inside the MNC is shared, dispersed, transferred, integrated, etc. requires that attention be paid to the latter "control variables," to use a terminology that I shall explain in the following.

Knowledge and Organization in the MNC: A (Sketch of a) Control Theory Heuristic Frame

To briefly take stock, I have made the argument that there is an ill-understood intersection between MNC knowledge, individual behaviour and organizational control. One of the reasons why it is ill understood is that it is hard to see which models can assist understanding here. Thus, the issues seem so complex and intricate that modelling them in the rigorous fashion of the formal economist perhaps is and must remain a hopeless ambition. On the other hand, current thinking on issues in the intersection between MNC knowledge, individual behaviour and organizational control is too unsystematic and unclear, as argued earlier. I agree wholeheartedly with Peter Buckley's observation that what is required in the core theory of international business research is "… careful redefinition of the relationship between key explanatory variables so that new developments grow organically from the theory rather than being added in a piecemeal and arbitrary fashion" (Buckley 1990: 663). Issued 13 years ago, this statement still holds true.

What we certainly can and should strive for are frameworks that " … identify the relevant variables and the questions that the user must answer in order to develop conclusions tailored to a particular industry and company" (Porter 1994: 428). And we can do more than that, for we can also strive towards identifying and agreeing on which variables we wish to think of as relatively fixed, at least in the short run, and which variables we may think of a given to short-run managerial manipulation, and, finally, how these variables relate over time. In other words, we can and should think systematically about how we conceive of the time structure of managerial choice related to the interaction between knowledge and organization variables (Postrel 2003). As I see it, the constraints on this "modeling problem" is that we wish

- … to make room for conscious managerial choice, but, given the complexity of the choice problem(s) facing MNC management, we may not wish to portray decision-makers as cognitive gods, that is, some notion of bounded rationality may be appropriate;
- … utilize some of the "stylized facts" relating to the time structure of managerial choice, for example, that firm-level routines and capabilities may only change slowly, while some kinds (certainly not all) of organizational control (e.g., relating to delegation and the provision of incentives) can be changed in the short(er) run;
- … to embed the interaction of MNC knowledge and organization in a strategic context where the "MNC knowledge structure" is to some extent endogenous to organizational arrangements and managerial actions.

Following the leads of Paul Rubin (1973), Sidney Winter (1987) and Steven Postrel (2003), I argue that ideas from *control theory* may be particularly helpful for framing the issues.[3] Admittedly, this is not the only possible heuristic frame, but is arguably the one that best meets the above restrictions on the relevant modeling problem.

Control Theory

The fundamental idea in control theory is summed up in the Alcoholics Anonymous serenity prayer:

> "God grant me the serenity to accept the things that I cannot change, courage to change the things I can, and wisdom to know the difference" (cited in Winter 1987: 162).

Generalizing and adding a bit to the "wisdom" part, very little can be changed in the very short run, some things can be changed in the longer run, and almost everything can be changed in the very long run. (Economists will recognize this from Marshallian price theory). The "courage" to change things is strategic decision making within such a temporal framework.

More formally, control theory makes a distinction between three types of variables, namely "control variables," "state variables," and "environmental variables." Control variables are those variables that can be set instantaneously at the various values within their feasible ranges (i.e., control variables may be constrained). State variables are those that change under the influence of the control variables. State variables may be constrained by boundary conditions that determine starting values. Environmental variables are parameters. Transition equations describe how changes in state variables are related to the levels of state variables, and the values of control and environmental variables. An objective function describes how the overall objective relates to state, control and environmental variables.

The relevance of these distinctions for the problems that were considered earlier is that they indicate one way to structure and make sense of the causal-temporal structure of managerial choices relating to organization and knowledge. In the context of the arguments I have sketched in the earlier sections, MNC knowledge stocks may be thought of as state variables, and various kinds of organizational control (monitoring, incentives, order-giving) may be thought of as control variables. Note also that control variables – those that most directly reflect managerial choice – may be constrained within certain intervals. This directs our attention to the foundations of managerial choice behaviour. Thus, Winter (1987: 162) suggests that *managerial attention* is the ultimate constraint on managerial choice, and Postrel (2003: 4) notes that for this reason, "… the allocation of attention is the ultimate control variable at the disposal of the firm" (an idea that goes back at least to Edith Penrose 1959). This provides at least the beginnings of a theory of individual behaviour, for economizing with bounded rationality may in this manner be placed center stage in our thinking about how knowledge and organization connects.

[3] The classical mathematics reference is Pontryagin et al. (1962). The use of control theory to address knowledge issues was first suggested by Rubin (1973) (modelling Penrose 1959) and was taken further by Winter (1987). Postrel (2003) applies control theory to the resource-based view of the firm.

A Model Sketch[4]

So, here is one way in which thinking about the causal-temporal structure of managerial choices relating to knowledge and organization in an MNC setting may be represented. To repeat, the purpose of the following is simply to suggest that thinking may be somewhat advanced by laying out explicitly what one considers to be the relevant variables and how they connect, what Winter (1987) calls a "heuristic frame." For this reason, the following is grossly simplified, makes several affronts to realism, and involves highly questionable assumptions (e.g., that "knowledge characteristics" may be represented as "a state variable" and that the external environment can be "freezed"). So be it.

I take the objective of the MNC to maximize profits over some time horizon (there are t time periods) by means of building knowledge assets, and deploying them through the use of organizational control to their best uses, for example, by means of intra-MNC knowledge transfer. Ultimately, building knowledge assets is attractive because it may result in new product characteristics and/or lower costs of production. However, there are various (investment and organizational) costs of building, sharing, integrating, etc. such assets. Moreover, managerial attention is limited, so it has to be economized with.

Control variables. The "building" aspect of earning profits from knowledge assets suggests the importance of managerial choice. The relevant managerial control variables are, first, a vector of instruments of organizational control, O_t. These may include designing incentives for knowledge building and ways of transferring best practices, monitoring these activities, etc..[5] A second important control variable is investments in knowledge building, I_t, in the form of investments in organizational control designed to foster knowledge building, purchasing knowledge on the relevant markets, hiring new knowledge workers, acquiring knowledge-intensive new firms and integrating them into the MNC network, etc. The Penrose-Winter-Postrel argument concerning scarce attention in organizations suggests the importance of devoting attention to organizational control, a_t, as a control variable.

State variables. The state variables are, first, the aggregate MNC knowledge stock, S_t; second, attention capacity, A_t; third, knowledge characteristics, H_t.[6] Of course, treating such a thing as "knowledge characteristics" as a variable is a very crude simplification. If it assists intuition, think of it as some measure of, say, the tacitness of the MNC knowledge stock. The important thing is that knowledge characteristics may change under the impact of the application of organizational instruments. For example, knowledge sharing programs may be coupled with explicit monetary rewards to assist in making knowledge more explicit and easier to share.

Environmental variables. The environmental variables include wages, w; and a stochastic knowledge shock process that represents innovations outside the firm, $\{\gamma_t\}$.

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[4] The following is a modification of Postrel (2003).

[5] Although these variables are, of course, discrete, they may be modelled as being continuous within their feasible ranges; for example, incentive intensity lies in the interval [0,1] (the β of agency theory).

[6] Any organization theorist will also tell us that important aspects of organization belongs to the class of state variables, notably organizational beliefs and culture. Indeed, some may argue that there is no clear line of demarcation between these aspects of organization and such knowledge assets as "organizational competence." All this may be granted; however, for the sake of simplicity, we neglect all this.

Objective function. We fix prices, **p**; production capacity, **K**; capital costs, **r**, and abstract from the actions of rivals. Given this, the instantaneous profits for the firm can be written as[7]:

(1) $\pi_t = \mathbf{p}q_t - \mathbf{Kr} - C_t - I_t - wA_t$, where

(2) $q_t = \min [D_t, \mathbf{K}]$.

(3) $D_t = D (V_t - \mathbf{p})$.

(4) $V_t = V (O_t , H_t, A_t)$.

(5) $H_t = H (O_t, I_t)$

(6) $C_t = C (q_t, \mathbf{K}, O_t, A_t, S_t , H_t, \{\gamma_t\})$.

Here, D is demand and V is the willingness to pay. Willingness to pay depends on product characteristics that in turn can be influenced by means of organizational control. The idea is that instruments of organizational control can be adopted to initiate and accomplish, for example, the transfer of knowledge of how to provide certain product certain characteristics from one MNC unit to another one. Knowledge characteristics influence the costs and benefits of such transfer processes. Attention also influences willingness to pay, because attention may be allocated to innovating new product characteristics.

Organizational control also enters into the determination of production costs, together with output, capacity, the aggregate MNC knowledge stock, S_t and stochastic shocks to technology. The idea here is the same as above: Instruments of organizational instruments may be chosen to influence the transfer of knowledge about production processes; to the extent that best practice is successfully transferred, production costs are lowered. Moreover, such instruments may be chosen to influence process innovation; for example, rewards may be tied to the discovery of incremental improvements of processes. Finally, knowledge characteristics also determine overall MNC costs of production. This is because knowledge characteristics co-determine the transfer of best-practice technology. Thus, MNCs that can easily transfer best-practice technology likely have lower overall costs of production than those MNCs where transfer is more difficult. The allocation of attention influences costs of production; for example, managerial attention may be allocated to breaking bottlenecks in the production process, reducing cost of production.

Transition equations. The three state variables are updated in the following way:

(7) $S_t = S_{t-1} + s (I_t, O_t)$.

(8) $A_t = A_{t-1} + a (I_t, O_t)$.

(9) $H_t = H_{t-1} + h (I_t , O_t)$.

Thus, the MNC knowledge stock evolves under the application of organizational control instruments and investments in knowledge building; attention capacity may be expanded through such investments as purchasing knowledge on the relevant markets, hiring new knowledge workers, and acquiring knowledge-intensive new firms; and the characteristics of the MNC knowledge structure evolves under the application of instruments of

[7] The actual objective function is of course the expected presented discounted value of (1).

organizational control applied to manipulating this structure as well as investments in knowledge building.

Feasible sets and initial conditions. In any period control variables are set within their relevant feasible sets. Investments in knowledge acquisition, I_t, are obviously constrained upwards by the size of internal cash flows and the character of capital markets. I_t may be negative, as when knowledge erodes ("organizational forgetting"?). It is constrained in the downward direction by the complete erosion of the MNC knowledge stock. Given the primitive way that organizational control, O_t, have been characterized, it is perhaps premature to go into detail about how it is constrained. However, such elements of of the O_t vector as incentive pay is constrained, for the individual agent, by how much of the total wage that can be paid as variable pay (namely (close to) 100 %).

Implications

One could try to solve the dynamic programming problem implied by (1) – (8), a pretty complex affair given the size of the problem. However, the main point of the exercise is to *exemplify* by means of sketching a heuristic frame how thinking about key relations between important variables may be furthered. Thus, although the above heuristic frame is entirely (hopelessly?) simplistic, it nevertheless helps us to focus attention on some key points:

- As stated, it lays bare the temporal-causal structure between key variables related to the building and transfer of knowledge in the MNC and the role played by organizational control in this process.
- In particular, the argument has been made that some variables are more constraining than others. Thus, "capabilities" is a shorthand for the constraints represented by the existing MNC knowledge stock, the existing amount of available attention, and the characteristics of knowledge. These state variables both constrain and enable the MNC's shorter-run actions. The control theory heuristic frame therefore clarifies which are the "stock-like" variables and which are the "flow-like" variables and how the relate.
- The key to understanding how capabilities develop in the MNC lies in understanding the functional forms s (), a (), and h () in the transition equations ((6) – (8)).
- The development of capabilities may be understood in terms of, relatively operational, control variables, notably organizational control and investments in building knowledge.
- The functional forms in the transition equations suggests that the relevant control variables, that is, organizational control and investments in building knowledge, may be either substitutes or complements with respect to their impact on the relevant state variables. This suggests an empirical research agenda of considerable managerial relevance.
- MNCs may differ because the functional forms of their transition equations, that is, s (), a (), and h (), differ. Thus, not all firms are equally capable in building and transferring knowledge inside the MNC, augmenting the MNC knowledge stock

from outside sources, and influence the characteristics of knowledge so as to facilitate knowledge transfer.

- Over time the allocation of attention means that the MNC cannot be the best at all activities. The reason is that allocation constraints means that firms cannot devote optimum attention to all activities (Postrel 2003: 10). In terms of the model, attention influences both process innovation and the introduction of new product characteristics and these activities compete for scarce attention. Increasing returns to allocating attention to one activity causes knowledge specialization. The ultimate constraint on the building of capabilities may be the available attention.

- The heuristic frame not only implies more precision about the relations between the key variables, it also suggests a sort of micro-foundation for thinking about knowledge in the MNC. The emphasis on the allocation attention and on managers as being forward looking but bounded rational is one component of such a foundation.

Conclusions

This talk has roamed widely, as, I suppose, befits a keynote speech. Whether it has roamed too widely is up to you to decide. To briefly take stock, among the points I have made are these:

- Although it is to the lasting credit of the MNC literature that it at very early treated knowledge issues in the context of organization, much of the thinking about these issues suffer from two problems:
    - 1. A lack of clarity with respect to the temporal-causal relations between key organizational and knowledge-related variables.
    - 2. An absence of a clear rational action foundation for thinking about how knowledge and organization connects.
- Control theory provides a convenient heuristic frame for thinking about these issues, that is, identifying which are the relevant variables and how they connect.
- A number of conclusions follow immediately from such an approach. In particular, we are led to think in a more disciplined manner about the nature, characteristics, and development of MNC knowledge, about what are the constraints on the development of such capabilities, and how knowledge stocks and knowledge flows interact in the process under the impact of mechanisms of organizational control.

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