Kautilya on Moral and Material Incentives, and Effort

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> The ruler's duties are stated to be five: punishment of the wicked, rewarding the righteous, development of state revenues by just means, impartiality in granting favors and protection of the state.
> —Kautilya

The words *incentives* and *economics* have become almost synonymous. In a 1999 article in the *Journal of Economic Literature*, Canice Prendergast aptly identified incentives as no less than the "essence" of economics.[1]

Correspondence may be addressed to Balbir S. Sihag, University of Massachusetts, Lowell, MA 01854; e-mail: balbir_sihag@uml.edu. I am deeply indebted to Louis Haddad for encouraging me to explore this topic and also for extending and enriching the analysis. Many helpful comments from Monica Galizzi, Ruth Grant, and Eric Rasmusen on an earlier draft are appreciated. I am also grateful to the referees for significantly enhancing the content and clarity. However, only I deserve prosecution for any remaining errors.

1. Similarly, Roger B. Myerson (1999) remarks that "a generation before Nash could have accepted a narrower definition of economics, as a specialized social science concerned with the production and allocation of material goods." He adds, "But today economists can define their field more broadly, as being about the analysis of incentives in all social institutions." Ruth W. Grant (2002) writes, "The ubiquity of the use of incentives in managing many different spheres of life is a sign of the increasing influence of the economic paradigm on the way in which we conceive of our public relationships and of our individual psychology." S. Todd Lowry (1987, 247) defines economics from the Greek perspective as follows: "Thus their *oikonomia* or political economy was the study of the efficient management of personal and political affairs, with emphasis upon the human factor. Modern political economy, on the other hand, concentrates primarily upon the material factors of economic life and only secondarily upon human responses to them." See Groenewegen 2002, 68, for the definitions by Adam Smith, Alfred Marshall, Lionel Robbins, and other prominent economists.

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Innumerable books and articles have appeared during the last three decades suggesting incentive-compatible contracts for alleviating the problem of moral hazard created by asymmetric information and the lack of precise links between effort and efficiency in situations related to principal-agent relationships and insurance contracts.[2] Recently, Ruth Grant (2002) explored in depth the history of incentives during the last two centuries in the Western world and criticized their excessive and indiscriminate use in economic matters without adequate attention paid to their ethics. Grant places incentives on a par with coercion and persuasion as instruments of power and control and suggests evaluating incentives from the (broader) perspective of philosophy and political science rather than from that of economics. Both factual and substantive arguments are advanced to enrich her observations regarding the true origin, scope, and ethics of well-thought-out incentives.

Grant points out that the classical economists (with the exception of John Stuart Mill and David Ricardo) did not even use the word *incentive*. However, at least two ancient thinkers did, assigning an important role to economic incentives, provided they were fair. It should come as no surprise that Nobel laureate Herbert Simon had to search the writings of ancient thinkers for any reference to incentives. He specifically acknowledges the contributions of Xenophon (430–354 BCE), a contemporary of Plato, by opening part 3 of his seminal work *Models of Man* (1957) with a quote from the *Anabasis*.[3] I present the ideas of another ancient writer, Vishnugupta Chanakya Kautilya, who wrote *The Arthashastra* (*The Science of Economics*) during the second half of the fourth century BCE.

2. According to Y. Kotowitz (1987, 549), "Moral hazard may be defined as actions of economic agents in maximizing their utility to the detriment of others, in situations where they do not bear the full consequences or, equivalently, do not enjoy the full benefits of their actions *due to uncertainty and incomplete or restricted contracts* which prevent the full assignment of full damages (benefits) to the agent responsible." Allard E. Dembe and Leslie I. Boden (2000) explore the history of its two origins and two meanings. They assert, "Moral hazard is a concept that has been employed in various ways by different disciplines for more than 200 hundred years. There are two distinct historical pathways that have recently blended to create the contemporary environment in which moral hazard is discussed. One path originates in the literature concerning insurance and the other stems from statistical and economic analysis of probability and economic decision-making." They give credit to Kenneth J. Arrow's (1963) seminal work for the current interest in this area. According to them, "Arrow's work thus represents an important historical turning point in which the value-neutral approaches traditionally used in the mathematical treatment of risk-bearing merged with the highly moralistic rhetoric that had previously existed in the insurance literature." The subject of this essay, Kautilya, did not make a distinction between its two meanings and tried to alleviate the problem insofar as it arose from dishonesty and laziness.

3. See Lowry 1987, chap. 3, for an in-depth analysis of Xenophon's ideas.

It may be noted that Kautilya recognized the principal-agent problem and suggested various mechanisms to induce agents to supply optimum effort and also not to collude, quarrel, steal, or desert the king.[4] He implicitly proposed a conceptual framework that was comprehensive and consisted of three components. The first component called for matching the incentive to the agent. Kautilya introduced material incentives and disincentives to alleviate the problem of moral hazard and considered them as complementary to persuasion as well as to existing moral incentives and never as a substitute for them.[5] (Incidentally, modern economists also fully understand that incentive-compatible contracts work much better in an ethical environment, since contracts are usually incomplete and implicit.)[6] Kautilya understood that different individuals possessed

4. Regarding what I may call the reemergence of the principal-agent problem, Adolf A. Berle and Gardiner C. Means (1932) observed that there was a separation of ownership and control in public corporations and suggested that incentives were required to induce the CEO, the agent, to adhere to the objective of the shareholders, the principal. Since then, a considerable amount of effort has been devoted to exploring a whole set of mechanisms to resolve the principal-agent problem. However, Joseph E. Stiglitz (1987, 966) credits Stephen Ross for coining the term *principal-agent* in 1973. Eric Rasmusen (1994, 209) discusses various mechanisms such as piece rates, profit sharing, efficiency wages, bonuses, merit pay, tournaments, deferred compensation, promotions, and even boiling in oil (i.e., heavy punishments) to induce workers to supply the optimum level of effort. Recently, Prendergast (1999) provided a comprehensive survey of the various incentives offered by firms to elicit effort from workers. The survey concentrated primarily on two issues: the extent to which incentives matter and the degree to which contracts are designed to incorporate the trade-off between insurance against risk and incentives for effort. This is an extremely active field of investigation.

5. The Web site LaborLaw Talk contains a dictionary that defines *incentives* as follows. "1. Remunerative incentives (or *financial incentives*) are said to exist where an agent can expect some form of material reward—especially *money* in exchange for acting in a particular way. 2. *Moral incentives* are said to exist where a particular choice is widely regarded as the *right thing to do*, or as particularly admirable, or where the failure to act in a certain way is condemned as indecent. A person acting on a moral incentive can expect a sense of self-esteem, and approval or even admiration from her community; a person acting against a moral incentive can expect a sense of guilt, and condemnation or even *ostracism* from the community. 3. *Coercive incentives* are said to exist where a person can expect that the failure to act in a particular way will result in *physical force* being used against her (or her loved ones) by others in the community—for example, by inflicting pain in punishment, or by imprisoning her, or by confiscating or destroying her possessions." The dictionary page may be found at http://dictionary.laborlawtalk.com/incentive.

6. Horne H. Carmichael (1989) defines implicit contracts as follows: "Self-enforcing contracts are collections of promises that, while they might not be legally binding, are nonetheless credible. Everyone can be confident that the promises will be kept." He adds, "They are based on understandings between workers and their firms, not on legal rights." Implicit contracts are self-enforcing. Jeffrey Church and Roger Ware (2000, 73) define a complete contract as "one that will never need to be revised or changed and is enforceable." They point out the possibility of opportunism and the costs of holdup if contracts are incomplete although there are prohibitive transaction costs to a complete contract.

different propensities; therefore, to ensure effectiveness, he recommended matching the incentive to the agent. According to Kautilya's conceptual framework, material incentives were intended to strengthen the practice of ethics and not to undermine it. His implicit conceptual framework on incentives and their relationship to persuasion are made explicit in section 2 of this article.[7]

The second component involved matching the material incentive to a worker's needs and position. Kautilya offered an analysis that was much broader than the usual trade-off between incentives and insurance against risk or just a combination of rewards and punishments.[8] He attempted to limit distractions and to find the right mix of job security, efficiency wages, and sanctions (i.e., disincentives, such as investigations or audits, fines, and dismissal) to address the problem of moral hazard and promote economic efficiency. He also realized if the agent was opportunistic—and in this article, by *opportunistic* I mean amoral and willing to cheat—even a blend of moral and material incentives was not likely to work and needed to be combined with audits or supervision. His understanding and suggestions on introducing combinations of appropriate incentives and disincentives to elicit optimum effort and loyalty are discussed in section 3. His other incentive programs, such as bonuses to reward better quality and extra output, promotions, and job tenure for honesty, are also treated in that section.

Finally, the third component of Kautilya's conceptual framework dealt with the design and enforceability of payment systems. Kautilya implicitly proposed incentive-compatible labor contracts to alleviate the problem of moral hazard, that is, contracts designed to encourage agents to maximize the principals' objectives. For example, customarily wages were paid as a share of the produce; but he made two exceptions that come very close to what nowadays is called multitasking. Similarly, he proposed a wage-

7. As Joseph J. Spengler (1971, 74) observes, "His analysis, of course, was implicit, not explicit; it rested upon the assumption that individual behavior could be controlled in large measure through economic rewards and penalties, particularly when these were commensurate with the action to be encouraged or discouraged. Accordingly, while Kautilya looked at economic issues through the eyes of an economic administrator, he was aware that rules must fit man's economic propensities and foster rather than repress useful economic activity."

8. Recently, James Andreoni, Marco Castillo, and Ragan Petrie (2003) explored the complementary role of rewards and punishments, concluding that "rewards and punishments act to complement one another." They continued, "The process suggested by our data is that the stick can help by getting people to move away from perfect selfishness and to test the waters of cooperation. The carrot can then take over by encouraging further cooperation, rendering the stick a rarely used but necessary tool."

payment system where supervision was possible and desirable but otherwise sharecropping was to be adopted. These are presented in section 4.

The interpretations, to a large extent, are based on L. N. Rangarajan's translation of *The Arthashastra*, published by Penguin Books India in 1992; but in a few cases they are based on R. P. Kangle's 2000 translation, published by Motilal Banarsidass, in Delhi. Kautilya (popularly known as Chanakya) also completed two other works: *Chanakya-Sutras* (*Rules of Science*) and *Chanakya-Rajanitisastra* (*Science of Government Policies*). Section 1 offers a brief introduction to Kautilya and his times, to some of his stylized facts, to his ideas on linking a worker's pay to his abilities, expertise, and experience, and to his conceptual framework on incentives, which in turn links the presentations in sections 2 and 3.

1. Kautilya's Conceptual Framework on Incentives

Kautilya and His Times

Vishnugupta Chanakya (his father's name) Kautilya was born in India during the fourth century BCE. No one knows the precise date of his birth or death. However, he has been credited for destroying the unscrupulous Nanda dynasty and installing Chandragupta Maurya (321–297 BCE) on the throne. He wrote *The Arthashastra*, which has 150 chapters distributed among fifteen books. Charles Drekmeier (1962, 260) describes Kautilya's work and his times very eloquently:

> By the fifth and fourth centuries B. C. the ancient tribal institutions had lost their ability to regulate society effectively. New modes of production, new types of social relationships, new salvation theologies were changing the old ways. Kautilya was the theorist who most clearly saw the need for expanded state authority to fill the ever-widening gaps left by the declining authority of tradition. The king needed greater freedom of movement if he was to provide security and the conditions of prosperity. The state was forced to take measures that frequently ran counter to the accepted moral standards of the community. But Kautilya well knew that such policies were all that could save society from collapse. He was led inevitably to a theory approximating the reason of state arguments of sixteenth-century Europe. But he sought to emphasize the fact that such actions were not irresponsible. Indeed it is the duty of the ruler to his subjects that compels him to take drastic

steps to ensure their welfare. Survival and progress are recognized as bestowing authority.[9]

Kautilya's Stylized Facts

According to Kautilya, the king could not run the country alone and therefore needed to establish a bureaucracy to assist him. Kautilya ([4th century BCE] 1992, 177) observed, "A king can reign only with the help of others; one wheel alone does not move (a chariot). Therefore, a king should appoint advisers (as councillors and ministers) and listen to their advice."[10] Also he recommended many enterprises to be run by the public sector. These included the cultivation of crown agricultural lands; mining and metallurgy; animal husbandry; manufacturing (textile, salt, and liquor); and leisure and entertainment (betting and gambling, courtesans, prostitutes, and entertainers).[11] Interestingly, the state had a monopoly over the manufacturing and sale of liquor and also controlled betting and gambling. All the public enterprises were run primarily for profit (but without compromising ethical values), yielding a substantial amount of revenue to the state. Therefore, ethical and efficient management was heavily emphasized.[12]

9. On Kautilya and his times, see Basham 1959, Drekmeier 1962, and Kangle 2000. Drekmeier (1962, 35) notes the following: "From roughly the seventh to the fourth century B.C., India was the scene of the formulation and spread of a remarkable number of doctrines, pantheist and materialist, atheist and rationalist. Many asserted the complete freedom of the human mind from religious doctrine and were outspoken in their criticism of the Vedas and the Brahmanical system—going so far as to call the Vedic teachers imposters."

10. Kautilya's observation reminds one of Herbert Simon's definition of bounded rationality. Simon (1957, 198) asserts, "The capacity of the human mind for formulating and solving complex problems is very small compared with the size of the problems whose solution is required for objectively rational behavior in the real world."

11. Kautilya did not recommend but accepted the existence of prostitution. However, he recommended the strictest possible controls over its operation. Needless to say, the definition itself of what is ethical has been changing over the years, thus making comparisons across time very difficult. Calvin G. Mackenzie and Michael Hafken (2002, 7) observe that "an added problem is that of changing standards and then of changing laws. Some practices, once very common, would now get the practitioners indicted in federal courts." It may also be noted that there is no such thing as national values: no country is homogeneous in terms of values. Moreover, as Charles Kindleberger (1964, 92) observes, "national characteristics and values differ, but these also differ from class to class. At one time the values of one class dominate; at another, those of another. This may account for some of the contradictions in national character and the changes that supervene. We can distinguish the aristocrat, the bourgeois, the town worker, and the countrymen, each with separate attitudes and beliefs."

12. In another article (Sihag 2005a), I present Kautilya's ideas on ethical management as follows: "Kautilya emphasized the role of the moralist approach in character building and

Kautilya ([4th century BCE] 2000b, 106) believed that "the intrinsically pure man is rare."[13] According to him, some bureaucrats might become corrupt and lazy. However, perhaps due to the methods of recruitment, training, or rewards, the secret service agents were believed to be honest and were deployed to check on the honesty and loyalty of the officials and also of the taxpayers.

Kautilya believed that it might be difficult to detect the corrupt practices of the bureaucrats. He stated, "Just as it is impossible to know when a fish moving in water is drinking it, so it is impossible to find out when government servants in charge of undertakings misappropriate money" ([4th century BCE] 1992, 281). He added, "It is possible to know even the path of birds flying in the sky but not the ways of government servants who hide their [dishonest] income" (283). Kautilya did not have the tools to develop a formal model of the trade-off between market failure and government failure (corruption etc.), but he clearly understood the issue.[14]

Kautilya on Job Qualifications

Kautilya presented not only a complete salary structure according to qualifications but also developed comprehensive procedures to verify the credentials of potential candidates. "*A councillor or minister* of the highest rank should be a native of the state, born in a high family and controllable [by the king]. He should have been trained in all the arts and have logical ability to foresee things. He should be intelligent, persevering, dexterous, eloquent, energetic, bold, brave, able to endure adversities and firm in loyalty. He should neither be haughty nor fickle. He should be amicable and not excite hatred or enmity in others" (120).

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that of the legalist approach in developing rules, regulations and appropriate sanctions for non-compliance." I add, "Kautilya did not want the suppliers of goods and services and traders to subsidize their customers. However, he expected that they delivered the best possible quality products and services, and did not cheat or charge monopoly prices."

13. Eric Rasmusen (1994, 210) quotes Fei Tzu on integrity as follows: "Hardly ten men of true integrity and good faith can be found today, and yet the offices of the state number in the hundreds. If they must be filled by men of integrity and good faith, then there will never be enough men to go around; and if the offices are left unfilled, then those whose business it is to govern will dwindle in numbers while disorderly men increase. Therefore the way of the enlightened ruler is to unify the laws instead of seeking for wise men, to lay down firm policies instead of longing for men of good faith."

14. Recently, Daron Acemoglu and Thierry Verdier (2000) provided such a formal model. Joseph E. Stiglitz (1998) also discusses government failures.

Kautilya on Salaries and Qualifications

Kautilya stated, "Those who have all the qualities are to be appointed to the highest grade (as Councillors), those who lack a quarter to the middle grades and those who lack a half to the lowest grades" (120). He specified the salaries of the highest grade between 4,000 and 48,000 panas, of the middle grade between 250 and 3,000 panas, and of the lowest grade between 60 and 120 panas (289–92). Interestingly, a salary of 48,000 panas for the chief of defense equaled the combined salaries of all other senior management officials (the four chief commanders [8,000 panas each] and four divisional commanders [4,000 panas each]).

Kautilya on Verification before Appointment

Kautilya recommended a complete verification and evaluation of an applicant's abilities and capabilities:

> Of these qualities, nationality, family background and amenability to discipline shall be verified from reliable people [who know the candidate well]. The candidate's knowledge of the various arts shall be tested by experts in their respective fields. Intelligence, perseverance and dexterity shall be evaluated by examining his past performance while eloquence, boldness and presence of mind shall be ascertained by interviewing him personally. Watching how he deals with others will show his energy, endurance, ability to suffer adversities, integrity, loyalty and friendliness. From his intimate friends, the King shall find out about his strength, health, and character (whether lazy or energetic, fickle or steady). The candidate's amiability and love of mankind [absence of a tendency to hate] shall be ascertained by personal observation. (201)

It is obvious that he followed what today are standard hiring practices, including requiring reference letters and character references and inviting the candidate for a personal interview.

Kautilya stated,

> The ancient teachers have laid down that the king shall allot duties to the ministers appropriate to their integrity as determined by the four tests. For example, he shall appoint those proved pure by the test of *dharma* to judicial and law and order posts. Those proved pure by the *artha* test shall be appointed as the Chancellor or the Treasurer, those proved pure by the test of *kama* as controllers of recreation inside and outside the palace and those proved by the test of fear to duties near the

> [person of the] King. Those who succeed in every test shall be appointed to the highest office of councillor. Those who fail every test shall be sent off to [difficult] posts such as mines, forests, elephant forests or factories (201–2)

According to Kautilya (and other ancient thinkers), a person should be appointed as a judge only if he had unbending moral values (the *dharma* test), and a person should be appointed as a treasurer or chancellor only if he was incorruptible (the *artha* test).

Kautilya on Coercion as an Instrument of Control

Kautilya was against the indiscriminate use of coercion. He was aware of the unethical use of power and he wanted to accomplish with incentives what was accomplished earlier by coercion. For example, Kautilya observed that "some teachers say: 'Those who seek to maintain order shall always hold ready the threat of punishment. For, there is no better instrument of control than coercion.' Kautilya disagrees" (108). He described coercive practices as follows: "A decadent king . . . oppresses the people by demanding gifts, seizing what he wants and grabbing for himself and his favourites the produce of the country [i.e. the king and his coterie consume more than their due share thus considerably impoverishing the treasury and the people]" (133). He continued that such a king "fails to give what ought to be given and exacts what he cannot rightly take"; "indulges in wasteful expenditure and destroys profitable undertakings"; "fails to protect the people from thieves and robs them himself"; "does not recompense service done to him"; "does not carry out his part of what had been agreed upon"; and "by his indolence and negligence destroys the welfare of his people" (159). Moreover, he believed in the rule of law and the protection of private property,[15] which were considered essential for providing security and incentives to save and invest, and which also implied the exclusion of coercion as an instrument for accomplishing economic ends. He was concerned about the prevalence of shirking and corruption despite heavy emphasis on moral education. He realized that moral persuasion or reasoning alone was insufficient for making people behave honestly if they were lazy or opportunistic. He introduced the concept of material incentives to complement the moral incentives. The following figure may be used to explain his insights.

15. Sihag 2005b contains Kautilya's views on the importance of the rule of law.

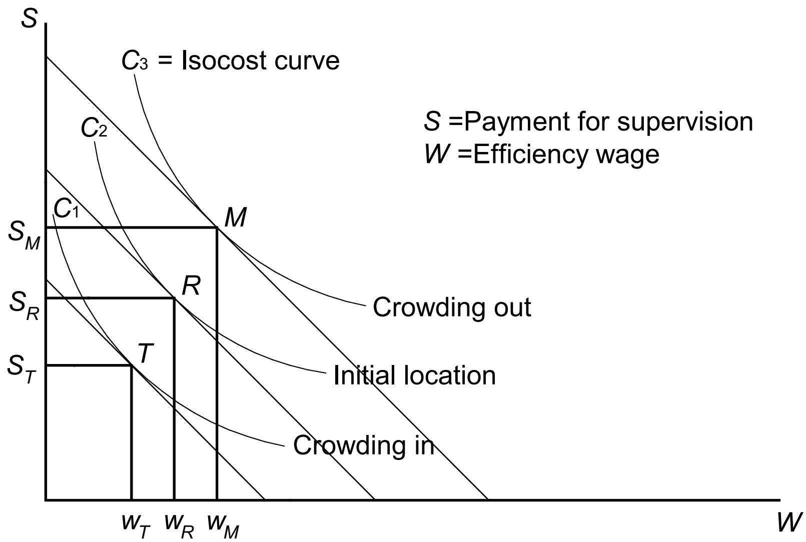

Figure 1 Isocost curves indicating the combinations of incentives for achieving a certain level of output

Each isocost curve indicates the various combinations of efficiency wages (W) and payment for supervision (S), monitoring, or auditing required for achieving a certain level of output.[16] For example, a cost function for a Cobb-Douglas technology may be written as $C\ (W, S, y) = BW^{\alpha}\ S^{(1-\alpha)}\ y/A$, where B is a constant, W = the wage to the worker, S = the payment to the supervisor, y = the level of output, and A = an efficiency parameter, which may depend, among other things (such as infrastructure and technology), on the ethics of both the worker and the supervisor. If the supervisor does not respect a worker's privacy, engages in sexual harassment, is controlling, or adopts a confrontational style, parameter A would be adversely affected and thus shift the cost curve upward.

Section 2 discusses his first insight, that material incentives should be used to complement moral incentives so that the isocost curve does not shift upward. The middle isocost curve may be used to explain Kautilya's other two insights: both efficiency wages and supervision are required to

16. Paul Osterman (1994) finds that standard economic models relating wages and supervision "provide strong support for the view that efficiency wages are an alternative to supervision and that the payment of efficiency wages enables employers to provide workers with more discretion."

elicit effort; and upper management might respond better to higher efficiency wages and less supervision (that is, points to the right of point R), whereas, for lower management, emphasis was on more supervision (that is, points to the left of R). Section 3 takes up those two insights.

2. Kautilya on Matching Incentive-Type to Agent-Type

> The miser should be won over by means of wealth, the proud man by offering respect, the fool by flattery, and the learned one by truthfulness.
> —Kautilya

Kautilya knew that incentives were a blunt instrument unless tailored to each person individually, that is, a matching of incentive-type to agent-type was critical for their effectiveness. He identified three types of agents: upright (moral), opportunistic (amoral), and wicked (immoral). Table 1 captures Kautilya's insights.

Several remarks are in order. First, Kautilya believed that moral and material incentives as well as persuasion were the three instruments needed to elicit optimum effort from an agent. However, he noted that in certain situations moral motivation and persuasion were the only appropriate ones. For example, according to Kautilya, a king was an agent of the public (a salaried public employee), and any suggestion of providing material incentives to a king would have disastrous consequences. Instead, Kautilya advised using moral incentives and arguments based on a king's self-interest to motivate him to uplift his people. Additionally, he insisted that a reigning king must hand over power only to an upright successor, since both persuasion and moral incentives were likely to fail in motivating an amoral (leisure-seeking) or immoral prince to undertake any initiative. "Sons are of three kinds," Kautilya ([4th century BCE] 1992, 168) stated. "A wise son is one who understands dharma and artha when taught and also practices these. A lazy son is one who understands what is taught but does not practice them. A wicked son is he who hates dharma and artha and [therefore] is full of evil."[17] He continued, "An only son, if he is wicked, shall not [under any circumstances] be installed on the throne." Kautilya would avoid handing over power to a lazy or evil prince.

17. The Sanskrit word *dharma* means ethics. Its literal meaning is something that holds the society together. It also stands for duty, spiritual health, uprightness, and good deeds. The Sanskrit word *artha* means economic prosperity; it also means to earn money in a righteous way. Incidentally, see Carroll and Buchholtz 2003, 186, for the rediscovery of the classification of individuals as moral, amoral, or immoral.

Table 1 Kautilya on the Role of Persuasion and Incentives

	Type of Agent					
	Upright (Moral)		Opportunistic (Amoral)		Wicked (Immoral)	
Type of Incentive	Persuasion	No Persuasion	Persuasion	No Persuasion	Persuasion	No Persuasion
None	Effort level: optimum (case I)	Effort level: less than optimum (case V)	Effort level: low (case IX)	Effort level: minimal (case XIII)	Effort level: minimal (case XVII)	Effort level: minimal (case XXI)
Moral	Effort level: optimum (case II)	Effort level: less than optimum (case VI)	Effort level: less than optimum (case X)	Effort level: low (case XIV)	Effort level: minimal (case XVIII)	Effort level: minimal (case XXII)
Material	Effort level: optimum (case III)	Effort level: less than optimum (case VII)	Effort level: less than optimum (case XI)	Effort level: low (case XV)	Effort level: low (case XIX)	Effort level: low (case XXIII)
Both moral and material	Effort level: optimum (case IV)	Effort level: less than optimum (case VIII)	Effort level: optimum (case XII)	Effort level: less than optimum (case XVI) low	Effort level: low (case XX)	Effort level: low (case XXIV)

Note: As an example of how to read the table, consider that an upright (moral) person will, with persuasion but with no incentive, put forth an optimum level of effort (case I). Similarly, an upright (moral) person will, with no persuasion and no incentive, put forth only a less-than-optimal level (case V).

Second, according to Kautilya, all three instruments were needed to move an amoral agent from case IX to case XII, that is, from a low level of effort to the optimum level of effort. With that in view, he introduced material incentives to complement moral incentives and persuasion (reasoning, consultation). That is, Kautilya was concerned with both kinds of moral hazard problems (dishonesty and shirking). However, almost all contemporary economists practice value-neutral economics, that is, they ignore moral incentives and consequently succeed in moving an agent from case IX only to case XI, which represents less than the optimum level of effort.[18] It means that modern economists also have the right perspective, which is incomplete but not wrong, that is, they correctly use two of the three instruments available to motivate an agent. The agents are believed to be rational and "thinking machines," implying that they have to be convinced of the fairness and benefits of the incentives (as well as the worthiness of the project). In fact, the economist's assumption that agents are "supra-rational" has come under severe criticism. Ruth Grant believes that in practice mainstream economic models use material incentives alone to motivate the agent. This observation regarding the practice of incentives is not disputed by economists. But to label incentives as the "perspective of economics," as Grant does, *is* disputed by Kautilya as well as by other economists, since economics is much more than materialism. Moreover, as anyone can observe, businesses, politicians, and parents do not follow economists' suggestions regarding the proper use of incentives (or other concepts) and instead do what seems to them simple or expedient.[19]

18. Kenneth Arrow (1968, 538) notes, "Because of the moral hazard, complete reliance on economic incentives does not lead to an optimal allocation of resources in general. In most societies alternative relationships are built up which to some extent serve to permit cooperation and risk sharing. The principal-agent relation is very pervasive in all economies and especially in modern ones; by definition the agent has been selected for his specialized knowledge and therefore the principal can never hope completely to check the agent's performance. You cannot therefore easily take out insurance against the failure of the agent to perform well. One of the characteristics of a successful economic system is that the relations of trust and confidence between principal and agent are sufficiently strong so that the agent will not cheat even though it may be 'rational economic behavior' to do so."

19. Charles F. Manski (1995, 8) relates an anecdote involving President Johnson in which an economist presented to the president "his forecast as a likely range of values for the quantity under consideration. Johnson is said to have replied, 'Ranges are for cattle. Give me a number.'" Similarly, President Truman preferred an economist with only one hand. We find the following in Faulhaber and Baumol 1988: "Let us next examine the case of marginal analysis, remarkable because this analysis is so fundamental for neoclassical economics, while its explicit use by business and government has apparently been very limited, at least until recently."

Third, only the wicked one, who did not care for persuasion, might respond to incentives and supervision. Kautilya ([4th century BCE] 2000b, 44, 126) believed that "the evil one harms, even if treated well. Between a serpent and an evil man, the serpent is preferable. The serpent bites occasionally, but the evil man at every step." Fourth, a moral agent needs only persuasion to motivate him. Grant is correct in saying that an offer only of material incentives without any persuasion to a moral person (cases V to VIII) might infuriate him. Fifth, Kautilya believed that material incentives alone without any regard to moral motivation might do more harm than good. His ideas may be expressed algebraically as follows. The principal offers a package (*w*) (of wages, of supervision, etc.), ensures fairness and participation in the designing of the package, and consults frequently during the execution of the task. Kautilya's ideas related to a worker's effort might be written as follows:[20]

$$E\ (w, F\ (w), M, EE),$$

where E denotes the agent's effort, which depends on the wage package but also on its fairness ($F\ (w)$), moral incentives (M), and the ethics of the employer (EE). All things being equal, as the incentive increases, the worker is expected to supply more effort (i.e., $(\delta E^*/\delta w) > 0$).

Kautilya on the Fairness of Incentives

Kautilya believed that any unfair material incentive might do more harm than good. On the other hand, if the agent considered the wage package to be fair, he would work harder ($((\delta E^*/\delta F)\ (\delta F/\delta w) > 0)$. According to

20. In fact, a much richer principal-agent model is implicit in *The Arthashastra*. The utility functions of the principal and agent may be specified as follows:

$$U^P\ (w, E^*\ (w, \mathrm{F}\ (w), M, EE))$$
$$U^A\ (w, E),$$

where E^* denotes the agent's effort, which depends on the wage package but also on its fairness, on moral incentives (M), and on the employer's ethics (EE). The principal offers a package (*w*) (of wage, and supervision, etc.) and ensures fairness and participation in the designing of the package and consults frequently during the execution of the task. For example, differentiating with respect to *w* gives

$$\delta U^P/\delta w + (\delta U^P/\delta E)\ (\delta E^*/\delta w) + (\delta U^P/\delta E)\ (\delta E^*/\delta F)\ (\delta F/\delta w).$$

The first term is the cost of the package to the principal and the second term captures its effect on the agent's effort if all other things are held constant. But the third term captures the effect of other attributes of the package. If the agent considers the package to be fair, and the principal to be ethical, it is positive, that is, he works harder.

Kautilya ([4th century BCE] 1992, 519), "The types of people who are likely to be angry with the king are: someone to whom a promised reward has not been given" and "of two people equally skilled or efficient, the one who is humiliated." Kautilya believed that violation of horizontal equity and reneging on a promised reward would result in a crowding-out effect.

Like Kautilya, the other ancient writer who discussed incentives, Xenophon, was also concerned with fairness. As S. Todd Lowry (1987, 67) observes, "According to Xenophon, a certain Chrysantas addressed the assembled nobles who were participating in an expedition, pointing out that 'some have come out with us who are of superior merit, others who are less deserving than we. Now, if we meet with success, these will all expect to have and share alike. And yet I do not believe that anything in the world is more unfair than for the bad and good to be awarded equal shares.'" Lowry concludes, "The most important aspect of the exposition is the clear presentation of the use of an incentive system rationalized in terms of the potential for and necessity of initiative and participation by the common soldiery to assure success" (68).

Moral Motivation

According to Indian moral philosophy, an ideal person seeks four things: *dharma* (spiritual health), *artha* (material health), *kama* (sensuous pleasures), and *moksha* (salvation). That is, the moral incentive to go to heaven (salvation) and an economic incentive to achieve material health are considered very powerful and as complementary to each other. According to Kautilya, a decline in moral motivation would shift the isocost curve (see figure 1 above) upward, requiring payment of higher wages and also incurring an extra expenditure on monitoring to achieve the same level of output. Nowadays this is called crowding out.[21] However, if material

21. B. Frey and R. Jegen (2001) provide a very illuminating survey on the possibilities of crowding out and crowding in resulting from material incentives. R. Benabou and J. Tirole (2003) offer a very rigorous and in-depth analysis of extrinsic incentives and their impact on intrinsic motivation. Benabou and Tirole use the concept of the "looking-glass self" in capturing the psychological effect of material incentives on an agent's self-esteem or self-confidence. Incidentally, Kautilya was aware of the concept but not the phrase "looking-glass self." For example, he advised a courtier "to watch carefully the king's gestures and expressions; a wise man will know the mind of another who is trying to reach a decision by looking out for the following: liking and hatred, joy and distress, resoluteness and fear. That the king is satisfied with a courtier is shown by the following: looking pleased at the sight of the courtier, returning his greeting, giving him a seat, . . . giving orders with a smile. That the king is dissatisfied with a courtier is shown by the following opposite indications: looking angry at the sight

incentives were designed properly, they would strengthen moral motivation, implying that the isocost curve would shift to the left, which currently is called a crowding-*in* effect. As Kautilya ([4th century BCE] 1992, 713) explained, the king should say to his troops, "I am as much a servant [of the State] as you are; we shall share the wealth of this state." Kautilya continued, "Bards and praise-singers shall describe the heaven that awaits the brave and the hell that shall be the lot of cowards. They shall extol the clan, group, family, deeds and conduct of the warriors." Kautilya emphasized three things: a common objective (service to the state), an economic incentive ("share the wealth"), and a moral incentive ("the heaven that awaits").

Kautilya on the Relationship between a Worker's Effort and an Employer's Ethics

According to Kautilya, an employer's ethical behavior had a positive effect on a worker's effort.[22] Kautilya stated, "A *rajarishi* [a king, wise like a sage] is one who . . . has self-control, having conquered the [inimical temptations] of the senses," "cultivates the intellect by association with elders," "is ever active in promoting the security and welfare of the people," "endears himself to his people by enriching them and doing good to them," and "avoid[s] daydreaming, capriciousness, falsehood and extravagance" (145). He continued, "A *rajarishi* shall always respect those councillors and *purohitas* [the royal chaplain] who warn him of the dangers of transgressing the limits of good conduct, reminding him sharply (as with a goad) of the times prescribed for various duties and caution him even when he errs in private." Kautilya wanted the king to be a role model and worthy of emulation. "If the king is energetic, his subjects will be equally energetic. If he is slack [and lazy in performing his duties] the subjects

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of the courtier, ignoring or not returning his greeting, neither giving a seat nor looking at him" ([4th century BCE] 1992, 205–6).

A. J. Marr (2005) challenges the distinction between intrinsic and extrinsic. He asserts, "The intrinsic vs. extrinsic motivation controversy is a sham because *distinctive intrinsic and extrinsic motivational processes* simply do not exist." He adds, "The unified principle of reinforcement that is emerging from neuroscience casts doubt on many widely accepted categories of motivation due to the simple fact that they have no distinctive neural correlates, and can be more parsimoniously explained as the emergent properties of very simple neural processes that underlie all behavior."

22. David B. Montgomery and Catherine A. Ramus (2003) explored whether MBAs were attracted to businesses that had high ethical standards, were environmentally friendly, and cared about their employees. They report, "Overall [MBAs] were willing to forego 11.9% of their mean expected income to work for an organization exhibiting all three characteristics."

will also be lax and, thereby, eat into his wealth. Besides, a lazy king will easily fall into the hands of his enemies. Hence, the king should himself always be energetic" (147). Kautilya stated, "A king endowed with the ideal personal qualities enriches the other elements when they are less than perfect" (121). He added, "Whatever character the king has, the other elements also come to have the same" (123). Thus, according to Kautilya, a king should be impartial, benevolent, farsighted, disciplined, and energetic and set an example for his employees and subjects.

Importance of Feedback and Consultations

Kautilya ([4th century BCE] 2000a, 34) suggested that the king "should look into the affairs with those who are present. With those who are not present he should hold consultations by sending out letters."

Kautilya preferred cases I through IV (see table 1), since a moral agent always worked hard whether material incentives were provided to him or not. However, according to Kautilya, it would be more effective if both moral and material incentives were provided to an amoral agent rather than just material or moral ones. It is not claimed by Kautilya that economic incentives transform a person from amoral to moral. In fact, Kautilya ([4th century BCE] 2000b, 58) believed that "it is difficult to change intrinsic nature." Rather, the claim is a very modest one: that carefully designed incentives are likely to make an amoral agent behave like a moral one.[23]

3. Kautilya on the Relationship between Material Incentives and the Agent's Hierarchical Position

Kautilya realized that the same material incentive might not work for the chief of defense and for an ordinary soldier. Accordingly, he considered many kinds of material incentives, such as efficiency wages, promotion, and job tenure, and the degree to which they matched the specific needs and position of an individual employee. He was perhaps the first economist

23. George Akerlof (1983) believes that it may be possible to move a child from being immoral to moral. As he remarks, "Values are not fixed, as in standard economics, but are a matter of choice. Economic theory, which is largely a theory of choice, then becomes a useful tool in analyzing how these values are chosen. Most parents attempt to choose values for their children (and perhaps for themselves) according to their economic opportunities that allow them to get along economically" (54). He adds, "It pays parents to teach honesty and class loyalty because the appearance of honesty and class loyalty are beneficial; the easiest way to achieve these appearances is to be honest and loyal, even though honesty and loyalty themselves involve sacrifices" (61).

who suggested the payment of efficiency wages. The credit for initiating the current literature on efficiency wages probably goes to Robert Solow (1979). According to the theory of efficiency wages, the employer pays a wage that is higher than the market wage, so that the worker is not tempted to shirk and thereby lose his job. As Prendergast (1999) notes, some payment mechanisms are designed to eliminate or reduce rent, whereas an efficiency wage is offered to create rent to induce effort.

Kautilya on Material Incentives, Inspection (Auditing), and Punishments (Fines)

Kautilya suggested matching material incentives to the specific rank of the employee to elicit the maximum possible effort. He suggested that the king should rely more on the payment of efficiency wages to upper-grade employees, such as the chief of the forces, councilors, the chancellor, the treasurer, the auditor, and ministers. On the other hand, the king should rely more on granting promotion and job tenure to the middle- and lower-grade employees, awarding prizes to soldiers, and giving gifts to piece-rate workers.

There are four possibilities for eliciting optimum effort from a worker: by using a combination of (1) efficiency wages and monitoring, (2) monitoring and investigation, (3) efficiency wages and investigation, and (4) all three, that is, a judicious mix of efficiency wages, monitoring, and investigation, since monitoring competes both with efficiency wages and investigation in eliciting effort.[24] Kautilya dealt with the third and fourth; however, only the third is discussed below and surprisingly so far has not been explored by any modern economist.

Kautilya on Combining Efficiency Wages and Auditing (Investigation) for Upper-Grade Employees

Kautilya advised the king to treat the councilors and ministers (about eighteen officials) with respect and dignity and compensate them hand-

24. Carl Shapiro and Joseph Stiglitz (1984) analyze the first possibility, the trade-off between monitoring (supervision) and paying an efficiency wage to reduce shirking. They find that “the critical wage, w, is higher the lower the probability of being caught shirking” (436). Dilip Mookherjee and I. P. L. Png (1992) explore the second possibility, the trade-off between monitoring and investigation. They assert, “To regulate employees’ effort, an employer could hire supervisors to monitor the workers or, instead, rely on reports from dissatisfied customers” (556).

somely, since their wisdom and intelligence were the most important resource for the survival and economic growth of the country. He stated,

> Some teachers hold might to be more important than the power of good counsel and judgment. [They argue:] however good a king's analysis and judgment, he thinks but empty thoughts if he has no power. Just as a drought dries out the planted seeds, good judgment without power produces no fruit.
>
> Kautilya disagrees. The power of good counsel, [good analysis and good judgment] is superior [to sheer military strength]. Intelligence and [knowledge of] the science of politics are the two eyes [of a king]. Using these, a king can, with a little effort, arrive at the best judgment on the means, [the four methods of conciliation, sowing dissention etc.] as well as the various tricks, stratagems, clandestine practices and occult means [described in this treatise] to overwhelm even kings who are mighty and energetic.
>
> Thus, the three components of power,—enthusiasm, military might and the power of counsel—are in ascending order of importance. Hence, a king who is superior, as compared to his enemy, in an item later in the list, outmanoeuvres his adversary. ([4th century BCE] 1992, 628)

Particularly the councilors were the most prized employees, and every effort was made—including the payment of a salary of 48,000 panas (a silver coin used as money)—to retain them.

Kautilya was also aware of the fact that sometimes an instrument might not be available or might be unnecessary. For example, he realized that it was physically not possible to supervise the chancellor and recommended efficiency wages and auditing to reduce cheating. The chancellor and the treasurer were the most important civil servants in charge of collecting and handling the revenue of the state. According to Kautilya, the chancellor was responsible for collecting revenue from the countryside, and the treasurer, in addition to his other duties, had a responsibility to "appoint trustworthy men to assist him in receiving and storing the revenue of the state" (217–18). He suggested that the chancellor and the treasurer be paid 24,000 panas annually, "enough to make them efficient in their work" (289).

Similarly, Kautilya recommended a handsome salary of 12,000 panas to a minister. It was 200 times the suggested minimum wage of 60 panas. As mentioned above, most capable individuals were appointed as councilors, whose role was to advise the king. But ministers were the actual executors of whatever had been decided by the king. Kautilya assigned a very important role to the ministers: "All state activities have their origin in the minister, whether these be the successful execution of works for [the benefit of] the territory and the population, maintenance of law and order, protection from enemies, tackling [natural] calamities, settlement of virgin lands, recruiting the army, revenue collection or rewarding the worthy" (123). Later in *The Arthashastra* he added the following:: "The ministers shall [constantly] think of all that concerns the king as well as those of the enemy. They shall start doing all that has not [yet] been done, continue implementing that which has been started, improve on works completed and, in general, ensure strict compliance with orders" (200). He further added, "In an emergency, the king shall call together both the group of councillors and the council of ministers and seek their advice. He shall follow whatever the majority advise or whatever is conducive to the success of the task in hand" (200–201).

Auditing (Investigation)

Kautilya stated, "High officials shall . . . render accounts in full for their respective activities, without contradicting themselves" (226). According to Kautilya, the chief comptroller-auditor (one person) reported directly to the king and was responsible for auditing all the officials, including the chancellor. It was physically impossible for the king to monitor the activities of various officials, the chancellor being one of them. In this situation, the king had only the instruments of efficiency wages and inspection (auditing) at his disposal. Thus Kautilya suggested payment of efficiency wages and auditing (investigation) to ensure the efficiency and honesty of the chancellor. However, the emphasis was on paying efficiency wages.

Kautilya on Combining Job Tenure, Promotion, and Inspection for Middle- and Lower-Grade Employees

Kautilya was aware that people were risk-averse and tended to shirk (to seek leisure). Therefore, middle- and lower-grade employees, who might be highly risk-averse, would appreciate job tenure. Kautilya recommended that this group of employees, who were honest, efficient, and loyal, be promoted to permanent positions. But he also advised inspection so that these employees did not slack after getting tenure. To get a flavor for Kautilya's thinking on these three policies, let us discuss one of them, inspection, in a bit more detail.

To ensure the quality of work, it seems that Kautilya considered both the direct inspection of the work of the officials and an indirect one through consumers' complaints. As he suggested, "The king shall have the work of Heads of Departments inspected daily, for men are, by nature, fickle and, like horses, change after being put to work. Therefore, the King shall acquaint himself with all the details [of each Department or undertaking, such as]—the officer responsible, the nature of the work, the place of work, the time taken to do it, the exact work to be done, the outlay and the profit" (283). He added, "The Chancellor, working through the magistrates, shall be responsible for inspecting Heads of Departments, judicial officers and their subordinates" (221). He again suggested that "the agents of the Chancellor shall report on the honesty or otherwise of village officials and heads of departments" (516).

Kautilya also recommended an indirect method of investigation. He wrote, "Any official who incurs the displeasure of the people shall either be removed from his post or transferred to a dangerous region" (724).[25] He believed that employees, if not inspected, might shirk. He was aware of the need for inspections and efficiency wages to elicit effort. However, it is not claimed here that Kautilya could trace the efficiency frontier between efficiency wages and the probability of inspection; moreover, *The Arthashastra* does not contain any theoretical models (as we know them) to determine their optimum levels. Usually, economists put too much emphasis on variability in an employee's pay, but according to Kautilya, a safe working environment was equally important.

Reward for Extra and Better Work by Piece-Rate Workers

Kautilya was aware that piece-rate workers paid less attention to quality. He recommended extra payments as an incentive to these workers so that they made products of better quality and also worked on holidays. As Kautilya suggested,

> For better work [or greater productivity] women who spin shall be given oil and myrobalan cakes as a special favour. They shall be induced to work on festive days [and holidays] by giving them gifts. (233)

25. This is identical to the statement "instead, rely on reports from dissatisfied customers" by Mookherjee and Png. See footnote 24.

> Weavers, specialising in weaving fabrics of flax, *dukula*, silk yarn, deer wool and [fine] cotton shall be given gifts of perfumes, flowers and similar presents of encouragement. (233)

Kautilya on Tournaments

Nowadays, the vice presidents in a corporation are supposed to compete hard with each other to reach the top of the ladder and enjoy the status, salary, leisure, and perks accompanying the promotion. The idea, of course, is not new: the idea of a tournament and the winner's being awarded a prize as an incentive to extract maximum effort was very much alive in Kautilya's day (the Olympics started around 776 BCE). Kautilya suggested that "the Chief of Defence shall make the troops happy with wealth and honours and announce the following rewards—a hundred thousand panas for killing the enemy king, fifty thousand for a prince or the Army Chief, ten thousand for a division chief, five thousand for an elephant or chariot warrior, thousand for a horse, one hundred for an infantry section leader, twenty for a soldier, as well as double normal wages and whatever booty they seize" (714). It may again be noted that both profit sharing and awarding a prize to the winner were common practices intended to induce effort. Usually, the king got the land and the soldiers got the loot. Clearly, the concept of the tournament originated in a different context, but the objective was the same: to make participants compete hard for a prize. However, as noted above, not only were material incentives offered but also equal attention was paid to moral incentives to maintain and strengthen motivation.

Kautilya on Reducing Distractions

There were enough distractions in Kautilya's time to warrant his attention to modes of reducing them.[26] Kautilya wrote, "There shall be no grounds or buildings intended for recreation [in the new settlements]. Actors, dancers, singers, musicians, professional story-tellers and minstrels shall

26. These conclusions are very similar to those reached by Robert Gibbons (1998). He concludes, "We have seen, for example, how it may be useful to impose job restrictions to reduce an agent's distractions, and that reducing the agent's outside interests (such as through changing asset ownership) can play a similar role. Once such distractions are reduced, the optimal incentive contract may well have a low bonus rate. In this sense, job restrictions, asset ownership, and low-powered incentives may be complementary" (129).

not obstruct the work [of the people], because in villages which provide no shelter [to outsiders], the people will be [fully] involved in the work of the fields. [Consequently] there will be an increase in the supply of labour, money, commodities, grains and liquid products" (180).

Kautilya on Punishments

Kautilya recommended severe and certain statutory punishments (normally monetary) for mismanagement and corruption. According to him, the magnitude of punishment should vary with the nature and severity of the mismanagement, whether it was due to ignorance, laziness, timidity, corruption, a short temper, arrogance, or greed on the part of the official. Kautilya observed, "Those officials who have amassed money [wrongfully] shall be made to pay it back; they shall [then] be transferred to other jobs where they will not be tempted to misappropriate and be made to disgorge again what they had eaten" (283). He continued: "An officer negligent or remiss in his work shall be fined double his wages and the expenses incurred" (284).

4. Kautilya on a Payment System Design to Alleviate Moral Hazard

Kautilya understood the importance of contract designs, which could eliminate the moral hazard problem in certain situations. Even in an agrarian economy, at least some moderately complex situations could arise, situations in which risk-sharing and hence the prospect of moral hazard play a large role.[27] Kautilya observed at least two such situations and provided some insights that may be relevant even for modern corporations. Kautilya emphasized the sanctity of contracts, recommending that

> the agreement between a labourer and the one hiring him shall be made in public.
>
> Labourers shall be paid wages as agreed upon. If there is no prior agreement, the labourer shall be paid in accordance with the nature of the work and the time spent on it [at customary rates]. (450)

27. On the other hand, Stiglitz (1974, 252), after undertaking an in-depth analysis of sharecropping, concludes, "Thus, it would appear that the main contribution of the model of risk sharing and incentives in agriculture may be more in extending our understanding of the operations of the closely held firm and the differences between it and the modern widely held corporation, than in its direct implications for the latter."

He believed that contracts made in public were verifiable and therefore enforceable. He indicated that the customary wage rate was one-tenth of the produce, but he modified this customary practice in two cases. Let us consider them in turn.

In the first case, he recommended that herdsmen, milkers, churners, and hunter-guards "shall be paid only in cash, because if they are paid in milk or ghee [butter oil], they will starve the calves to death [by milking the cows dry, leaving nothing for the calves]" (317). This may be made explicit as follows. Let X be the total milk output that a cow produces. Let a fraction, θ, be reserved for the calf. This means that the respective shares of the calf and the cow's owner (the principal) are θX and $(1 - \theta)X$. If the agent (a herdsman, milker, churner, or hunter-guard) is paid in kind a fraction, α, of the owner's share, his share would be $\alpha(1 - \theta)X$. The agent would try to maximize his utility V. Clearly θX, the calf's share, is under his control. He maximizes the following:

$$\text{Max } V(\alpha(1 - \theta)X), \text{ maximizing with respect to } \theta$$

$dV/d\theta = -V'\alpha X < 0$. That means the agent would set $\theta = 0$. That is, he would not leave anything for the calf and essentially his wage would be αX. The principal would not know how much milk the calf was getting. Certainly, he could look at the health of the calf and fire the agent if it did not look healthy. But the next agent would also starve the calf because there was a built-in incentive to do that. It implies that the agent had to be paid a cash wage equal to or higher than αX. The principal (the king) was interested in maximizing the total output, X, and also its efficient allocation between current consumption, $(1 - \theta)X$, and investment, θX (which was the calf's share), and Kautilya recommended that θ be decided by the principal and that the agent should have no stake in it.

Two observations are in order. First, in terms of a modern corporation, a determination of θ essentially amounts to the allocation of profit between retained earnings and dividends. At present, this decision is made by management (the agent) and not by the shareholders (principal). Accordingly the shareholders have to search for the stocks that match their preferences related to growth and income. According to Kautilya, the shareholders themselves should be allowed to decide θ. Particularly, the institutional investors perhaps would not mind making this decision. Anyhow, its feasibility and efficiency deserve exploration.

Second, this is, indeed, a very simple example like the one provided by Adam Smith on the division of labor. But the idea behind it is quite powerful: the need to recognize and resolve the moral hazard problem. The milker has an incentive to starve the calf and thus hurt the growth of livestock and subvert the objective of the principal. Similarly, the CEO of a modern corporation may resort to squeezing both the workers and the stockholders (with or without the provision of stock options) to advance his own interest. For example, stock options have made super magicians out of CEOs and CFOs, who have been producing eggs out of thin air and getting rich by hatching them. The point is that stock options alone, even if they are included in the expenses, cannot be the solution to the principal-agent problem.

In the second case in which Kautilya modified his customary practice, he stated that "if the [amount of actual cash in the] Treasury is inadequate, salaries may be paid [partly] in forest produce, cattle or land, supplemented by a little money. However, in the case of settlement of virgin lands, all salaries shall be paid in cash; no land shall be allotted [as a part of the salary] until the affairs of the [new] village are fully stabilised" (288). Obviously, supervising the settlement of virgin lands was a full-time job. If the officers were allowed to work on the land, they might spend very little time on their official duties and disproportionately more time working on the land, that is, ignore their primary responsibilities. This observation also has a direct implication for modern corporations. Modern corporations are too sophisticated to be run by only part-time directors, who, because of their part-time status, simply cannot develop the skills and savvy normally possessed by full-time CEOs and CFOs, some of whom practice complex and creative, but not necessarily legal, accounting.[28] It is obvious that the current system of corporate governance cannot guarantee either accountability or transparency.

Kautilya on Wage-Payment Systems versus Sharecropping

Recently, Robert Gibbons (1998) noted that the trade-off between insurance and incentives may be captured by the work of Lee Alston and Robert Higgs (1982) on sharecropping. According to Alston and Higgs, there are three kinds of contracts. If the output, y, depends on the effort of the

28. Cooking the books is an old practice. Sihag (2004) discusses Kautilya's concerns about "fraudulent accounting" during the fourth century BCE. Kautilya ([4th century BCE] 2000a, 86–87) mentioned forty ways of cooking the books.

agent and there is some uncertainty, ε, $y = a + \varepsilon$, and the agent is paid a wage w such that $w = s + by$. If $b = 0$, then the worker is paid a cash wage, s; if $0 < b < 1$, the worker shares the risk; and if $b = 1$, the worker assumes all the risk and pays rent to the landowner. Kautilya emphasized that land should belong to the tiller and thus the last of those three cases (in which $b = 1$) in general had no place in his scheme, that is, absentee landlords' contracting out their pieces of land for a rent was not recommended.

Private Ownership of Land and Sharecropping

According to Kautilya, some arable land should be owned privately whereas some should be public land. He asserted, "Arable land shall be allotted to tax-payers for their lifetime [only]. Unarable land, prepared for cultivation by any one [by their own efforts] shall not be taken away from them. Land allotted to those who do not cultivate it shall be confiscated and given to others" (179). He added, "A tax-payer shall sell or mortgage only to another tax-payer" and

> the owner of a field shall not neglect it at the time of sowing or abandon it for a neighbour to do so except in cases of some irremediable defect, an unforeseen calamity or intolerable conditions.
>
> If the owner of inalienable land does not cultivate it, another may do so for five years; when the land is returned, the cultivator is entitled to compensation for his efforts. (432)

Two points are worth noting: according to Kautilya, land must be cultivated, and only under unusual circumstances was it to be cultivated by someone other than the owner.

Irrigation and Sharecropping

Sharecropping implies sharing both the return and the risk. But the presence of risk creates a disincentive for a risk-averse agent.[29] However, if there is an input that reduces risk and also increases the expected return, a risk-averse agent is likely to be encouraged to use such an input even under a sharing arrangement (i.e., sharecropping or profit-sharing system). For example, irrigation leads to a higher yield, and a reduction in

29. Rajesh K. Aggarwal and Andrew A. Samwick (1999) find such evidence.

its variability and therefore sharecropping may be an efficient arrangement for both the supplier and the user of such an input. Kautilya recommended sharecropping if a farmer supplied water from his private waterworks to neighboring farmers. He stated, "Owners may give water to others (by dredging channels or building suitable structures), in return for a share of the produce grown in the fields, parks or gardens" (231). Such an arrangement offered incentives for a farmer and his neighbors, and since the farmer and his neighbors were, well, neighbors, the cost of ascertaining the level of output would be minimal.

Supervision and Wage-Payment System on Crown Lands

Crown lands were to be managed by the chief superintendent of crown lands. According to Kautilya, the chief superintendent "shall be conversant with the science of cultivation, water management and the proper care of plants" (313) and "shall employ such experts as are necessary in order to cultivate profitably Crown lands and supervise the following operations": "seed collection," "land preparation," "seed preparation and sowing," "manuring and protection," and "harvesting and threshing" (314). Kautilya added, "On Crown lands, he shall employ slaves, labourers and persons working off their fines" (315). These workers would be provided food according to their family sizes and a cash wage of one and a quarter panas per month.

It is obvious from the above statement that Kautilya recommended supervision when management had a better knowledge of production techniques than did the workers. He recommended a wage system when close supervision was required on efficiency grounds and sharecropping when wage labor was not available.[30]

30. The classic work of Stiglitz (1974) evaluates the efficiency of the sharecropping system in depth: as many as sixteen propositions are established. He concludes, "Since there is a natural nonconvexity associated with supervision, it was the larger farms which used the wage system" (251). He adds, "The landlord wants the best techniques to be used. Either he must provide a strong incentive to the worker to acquire these techniques or he must supervise the workers closely" (252). Akerlof (1976, 602) also analyzes wage and sharecropping systems and sums up his findings as follows: "Where supervision is needed for reasons other than determination of effort, the model predicts that wages rather than shares will be paid. In India, for example, as an excellent rule of thumb, capital-intensive plantation crops are grown on a wage-payment system. And these crops need supervision to insure proper cultivation." The works of Stiglitz and Akerlof provide theoretical justification for Kautilya's insights.

Sharecropping on Crown Lands

Kautilya suggested that

> the Chief Superintendent may lease out land that cannot be cultivated [directly].
>
> Those lessees who provide only labour [the seeds and implements being provided by the Crown] shall get one-fourth or one-fifth of the harvest.
>
> Those lessees who provide all the inputs shall get one-half of the harvest.
>
> Those who prepare new [Crown] land and bring it into cultivation for the first time shall pay an agreed amount. In times of distress, the payment may be foregone. (315)

Apparently, sharecropping was recommended when the state did not have the manpower to cultivate crown lands.

5. Conclusions

Kautilya was definitely aware of the principal-agent problem, which arises whenever institutional structures are created. He explored many types of incentives to mitigate the harmful effects of the agency problem. He recommended moral motivation along with a judicious mix of efficiency wages and investigation to elicit optimum effort, honesty, and loyalty. Kautilya's analysis provides several valuable insights. One is that, if possible, an attempt should be made to match the incentive to the agent. Another is that material incentives should be tailored to an employee's hierarchical position, and under certain special circumstances the imposition of some restrictions on him may be desirable. Most important of all, Kautilya demonstrated that material incentives should be designed in such a way that they are perceived as fair so that moral motivation is not undermined. Kautilya's insights are as relevant today as they were two thousand years ago.

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