

Kautilya on Public Goods and Taxation

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In times of trouble, the fort provides a haven to
the people and the king himself.

—Kautilya, *The Arthashastra*, 7.14.20 (4th century BCE)

Joseph Schumpeter (1954) offered a very unflattering view of the contributions of ancient Chinese and Greek thinkers to economic analysis. It is apparent by now that he committed many errors of omission and commission. For example, Young Back Choi (1989) points out that Schumpeter discussed the contributions only of Chinese moral philosophers and omitted the contributions of the legalist Han Feitzu (280–233 BCE), who advanced many modern ideas related to “public choice variety.” Similarly, the pioneering work of S. Todd Lowry (1987) has refuted the judgments of Schumpeter regarding the contributions of the Greeks and also has challenged his views on the methodology and scope of economics, such as his exclusion of ethical and administrative issues from economics.¹

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1. Jacob Viner (1954, 332) reviewed Schumpeter’s *History of Economic Analysis* and noted the following: “The fact remains that in the case of some authors he emphasizes their defects as analysts and admits their merits only grudgingly whereas with others he draws attention only to their strong points and leaves unmentioned or strains himself to find some sort of defense for the weak points in their analysis.”

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I note in this article that Schumpeter also omitted the pioneering contributions of Vishnugupta Chanakya Kautilya, who wrote *The Arthashastra* (*The Science of Wealth and Welfare*) during the fourth century BCE. The originality and importance of *The Arthashastra* may be gauged by a long list of commentaries on it.² In fact, A. K. Sen (1987, 4) points out that *The Arthashastra* is the first book on the origin of the “engineering approach” to economics: “The ‘engineering’ approach . . . connects with those studies of economics which developed from the technique-oriented analyses of statecraft. Indeed, in what was almost certainly the first book ever written with anything like the title ‘Economics,’ namely, Kautilya’s *Arthashastra* (translated from Sanskrit, this would stand for something like ‘instructions on material prosperity’), the logistic approach to statecraft, including economic policy, is prominent.”

Recently, Lowry (2001) provided a fascinating discussion of the “mirror for princes” literature (see Louis Baeck’s definition of this literature later in this paragraph). He discusses in vivid detail the dialogue between Socrates and Alcibiades on the importance of self-control and the training needed to be a good ruler. Kautilya’s *Arthashastra* also contains discussion on the critical importance of self-control and its acquisition through a rigorous education in vedas and philosophy.³ Actually, more than forty years ago, Charles Drekmeier (1962, 207) put *The Arthashastra* under this classification of books on the proper education for a king. While comparing the works of Kautilya and Machiavelli, he remarked, “Both are concerned with the leader (*dux*), who establishes the authoritative role. Both (and this would follow) write from the vantage point of the ruler, and their treatises belong to the ‘mirror of princes’ category of political literature.” More recently, Louis Baeck (1994, 108) remarks, “The ‘mirror for princes’ literature produces discourse on the delicate

2. For example, see Basham 1959, Drekmeier 1962, Kangle [1969] 2000, and Parmar 1987.

3. *Education of a Prince*: Kautilya ([4th century BCE] 1992, 144) writes, “The sole aim of all branches of knowledge is to inculcate restraint over the senses (1.6).” He suggests, “A prince [who is likely to become a king] should learn the alphabet and arithmetic as soon as the tonsure ceremony is performed [in the third year after birth]” (142). He suggests that the prince “learn philosophy and the three Vedas from authoritative teachers, economics from the heads of [government] departments, and the science of government from [not only] theoretical exponents of political science [but also] from practicing politicians.” He adds, “For, a [trained] intellect is the result of learning [by hearing]; from intellect ensues yoga [successful application]; from yoga comes self-possession. This is what is meant by efficiency in acquiring knowledge (1.5)” (143). He concludes, “Only a king who is wise, disciplined, devoted to a just governing of his subjects and [ever] conscious of the welfare of all beings will enjoy the earth unopposed” (143).

combination of authoritarian rule with a Machiavellian ear for the public interest, enriched by the utilitarian ethics of Khurasanian rulers. This Persian form of enlightened despotism, tempered by ethical standards, conforms to an operational and logistic approach towards economics, formulated in the Arthashastra tradition of neighbouring ancient India.” It should be noted that according to Baeck, the “logistic approach” and the “mirror of princes” category are not mutually exclusive.

I provide a brief introduction to Kautilya and his *Arthashastra* and a historical background in section 1 of this article, as well as a few remarks on methodological issues. In this short article I explore only a few of Kautilya’s insights,⁴ and only those related to the “dismal science”⁵—that is, to the “engineering” approach or what Baeck calls the “logistic approach” to this science. I claim that Kautilya shows some understanding of the distinction between public and private goods. Kautilya invariably applied cost-benefit analysis to every undertaking, including waging a war. But he was against applying the usual cost-benefit analysis to the provision of national security, which he argued was too fundamental to be decided by such calculations. According to him, a nation had to match or exceed the power of her potential adversary, since national security depended only on relative power. Section 2 contains an explicit representation of these ideas, which are implicit in his *Arthashastra*.

4. *Kautilya’s Insights*: Drekmeier lists many more insights contained in Kautilya’s *Arthashastra*. Only two are listed here.

Role of Organization: According to Drekmeier (1962, 290), Kautilya offered a totally new perspective by linking a man’s greatness to his organizing abilities. He writes: “We may surmise that men began to conclude that remaking the world was within the realm of possibility. The ancient belief in the cyclical periodicity of time, the eternal return, was modified or displaced altogether by a sense of continuity and development approximating a historical attitude. Accumulated wealth and the military power and administrative efficiency it made possible could now be used for achieving ambitious, long-range political and social goals. The great man is, in fact, the great organizer. He creates the very conditions that make the hero obsolete, for he imposes an order that limits the unpredictable contingencies against which the hero struggles. The hero was made by his age; the organizer is the maker of his age. Men can now do things that earlier could be accomplished only by the gods.”

Role of Justice: Kautilya devoted almost one-third of his *Arthashastra* to issues related to the administration of justice. Drekmeier believes that Kautilya understood that “justice is what transforms power into ‘authority’” (254).

5. *Kautilya’s Arthashastra as a dismal science*: G. D. Karwal (1966, 393) quotes Bana, a dramatist well known for his romantic play *Kadambari* during the seventh century CE. Bana asks, “Is there anything that is righteous for those, for whom the science of Kautilya, merciless in its precepts, rich in cruelty, is an authority, whose desire is always for the goddess of wealth that has been cast away by thousands of kings?” It is obvious that Bana considered economics, long before Thomas Carlyle, a dismal science.

Kautilya advances the hypothesis that the maintenance of law and order and the protection of private property rights are prerequisites to the acquisition of knowledge and capital formation. He argues that good governance raises the rate of return and reduces the risk on private investments. Section 3 contains these ideas on the role of good governance.

Kautilya offers a unique perspective on the method of financing public goods. Although he was unaware of the concept of deadweight loss of income taxation, it appears that he believed that such taxation was fairer than a lump-sum tax. He considered fairness essential for political stability. This insight makes it obvious that the choice between an income tax and a lump-sum tax may boil down to comparing the economic losses due to the distortions created by an income tax to the potential losses due to disruptions of a lump-sum tax caused by resentment. These ideas are presented in section 4.

I have made a sincere and serious attempt to confine all the interpretations in this article to what, as A. M. C. Waterman (1999) says, “can be found—or read into” Kautilya’s *Arthashastra*. To a large extent my discussions are based on L. N. Rangarajan’s translation of *The Arthashastra* (Kautilya [4th century BCE] 1992), but in a few cases they are based on R. P. Kangle’s translation (Kautilya [4th century BCE] 2000a).

1. An Introduction to Kautilya, His *Arthashastra*, and His Times

Vishnugupta Chanakya Kautilya has been called a “king-maker.” He devised stratagems to defeat the Dhana-Nanda and succeeded in installing Chandragupta Maurya (321–297 BCE) as the King of Magadha (in northern India). He wrote *The Arthashastra* sometime during the latter half of the fourth century BCE. It consists of 150 chapters, which are distributed among fifteen books. Book 15 has just one chapter, but surprisingly is titled “Methodology of Science.” Kautilya has two other, less-known works: *Chanakya-Sutras (Rules of Science)* and *Chanakya-Rajanitisastra (Science of Government Policies)*. Although Western scholars know the thinker by the name of Kautilya, in India he is known popularly as Chanakya (son of Chanaka).

1.1. Renaissance of Ancient India

According to A. L. Basham (1959, 9), “India was a cheerful land, whose people, each finding a niche in a complex and slowly evolving social

system, reached a higher level of kindness and gentleness in their mutual relationships than any other nation of antiquity.” He also says, “The humane regulations of the *Arthashastra*, probably unique in the records of any ancient civilization, are perhaps survivals of Mauryan laws, and it is therefore not surprising that Megasthenes declared that there was no slavery in India” (153). Similarly, Drekeimer (1962, 35) writes, “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.”

1.2. Economic Conditions during the Pre-Kautilya Period

Drekeimer (1962, 105) notes two special features in ancient India—the existence of an economic surplus to create and foster a rich culture and an emerging capitalism:

With the coming of an agricultural economy, there came also the promise of economic surplus—the production of goods and services in excess of what was needed for survival. This is the condition of civilization: the possibility of supporting a culture-creating class of professionals. It may have seemed to many in the sixth and fifth centuries that instead of yearning for a golden yesterday, men might confidently anticipate a bountiful age yet to come. The Ganges valley in the seventh century was the home of a nascent capitalism as well. These new sources of wealth were to make possible the fulfillment of imperial ambitions. Empire had not been economically feasible until this development.

Romila Thapar ([1961] 1998, 142) also writes, “The Mauryan period was the culminating epoch of a few centuries of rational inquiry and cultural advance.”

1.3. International Trade

Certainly, international trade was not an engine of economic growth. But perhaps it was not that insignificant either. John Noble Wilford (2002)

reports, “So robust was the India trade 2000 years ago that Emperor Tiberius, concerned over Rome’s increasingly adverse balance of payments, complained that ‘the ladies and their baubles are transferring our money to foreigners.’” Fortunately, the emperor did not take any action to curtail imports. Wilford adds, “Also, it was not an overwhelmingly Roman enterprise, as had been generally assumed. The researchers said artifacts at the site indicated that the ships might have been built in India and were probably crewed by Indians.” He describes the archaeological trove at Berenike seaport in Egypt as a “‘mind-boggling’ find: teak and metal, beads and gems, batik and peppercorns.”

There is other evidence also of an active trade between Mesopotamia and Mohenjo-daro (a fully developed city with modern amenities) from the era of the Harappan culture, which flourished on the Indus River between 2500 and 1800 BCE. A. K. Majumdar (1980, 274) notes: “About two dozen seals, some actual Harappan, others being copying Harappan, have been discovered from Susa and Mesopotamian cities. Actual exports from Mohenjo-daro to these cities, as revealed by exploration, were carnelian beads, and shell and bone inlays, but it is possible that the volume of trade consisted of such perishable material as cotton or cotton textiles, spices, or timber.” He continues:

There is another evidence which, though not positive, is now practically accepted by all scholars as indicative of trade between Indus cities and Mesopotamia. Summerian and Akkadian documents record that in the time of Sargon of Agade (c. 2350 BC) and during the succeeding centuries merchants of Mesopotamia, particularly of Ur, carried brisk trade with various countries including Dilmun or Tilmun, Magan and Meluhha, which are now usually identified with Bahrain, Oman or Mahran and India respectively, though some scholars are inclined to identify Dilmun itself with India.

Majumdar later says, “In the ancient world, Bactria was an important center where the trade routes from India, China, Central Asia and the Mediterranean world joined” (364).

1.4. Methodologies of Historical Interpretation

Baek (1994, 15–17) discusses various competing approaches adopted by different researchers to interpret and evaluate past writings. The market in ideas is imperfect and it is no surprise that economists are tempted

to offer differentiated products. However, one may wonder how researchers in other disciplines choose their interpretations. Recently, mathematician Ivor Grattan-Guinness (2004) made a distinction between “history” and “heritage” and notes that both are useful. According to him, history deals with questions like “What happened in the past?” and “Why did it happen?” whereas heritage deals with “How did we get here?” He states, “The claim put forward here is that both history and heritage are legitimate ways of handling the mathematics of the past; but muddling the two together, or asserting one is subordinate to the other, is not” (1). He also assumes that knowledge accumulates over time (the Whiggish view is implicit in this distinction).

1.5. History as History of Heritages

Lowry (1987) makes a basic point, which is not fully appreciated, that ancient civilizations have had strong direct or indirect influences (irrespective of any explicit acknowledgment) on later-day developments in economic thought. He argues quite convincingly, for example, that the Greeks benefited from ideas developed by the Egyptians. He also observes, “It would be strange indeed if the great river basin civilizations of antiquity had not had a significant and persistent effect on any people within their sphere of influence” (16). Similarly, he shows that modern economics owes many of its ideas to the Greeks. In a later work he states, “This type of thorough correlation of the ancient classics with modern thought is an area in which modern classical scholars have reneged on their disciplinary potential. Even worse, in the field of economics, leading classical scholars have emphatically denied any economic relevance in the classics, as they insist that modern economic thought is limited to formal market analysis” (Lowry 2003, 789).

Most probably, there was not only exchange of goods but also of ideas among the ancient and medieval civilizations. For example, Drekmeier (1962, 213 n) speculates, “There is at least the possibility that Kautilya borrowed the design for his espionage (and also administrative) organization from the empire that flourished for more than two centuries under the Achaemenid rulers of Persia.” It may be pure speculation that it took only two hundred years for the dissemination of ideas to India and their full absorption by Kautilya, but it is more than a possibility that Kautilya’s ideas would have spread throughout Europe in the following two thousand years. Thapar ([1961] 1998, 41–42) discusses the

sending of envoys by King Ashoka between 256 and 255 BCE to four Greek kings and to many other foreign countries. It is almost a certainty that the Muslims brought the Indian numerals as well as other ideas to the West. Georges Ifrah (2000, 363) notes, “Between 1020 and 1030, in his autobiography, Al Husayn ibn Sina (Avicenna) tells of how, when he was very young, he heard conversations between his father and his brother which were often about Indian philosophy, geometry and calculations.”⁶ In Grattan-Guinness’s (2004) terms this may be described as a “history of heritages.”

Peter Groenewegen (2002, 319) is rightly concerned about the practice of “making the interpretation of the author’s views dependent on current views on the subject,” that is, about the incorporation of hindsight in interpreting earlier works. However, one needs to be careful in distinguishing a mere perception of such misinterpretation from actual misinterpretation. Two points deserve consideration. First, the use of mathematical, statistical tools or graphs for expressing ideas of earlier writers is as legitimate as it is to express current ideas in mathematical terms. Additionally, if the goal is to discuss heritage, a common terminology has to be used. As Grattan-Guinness (2004) quotes I. G. Bashmakova and I. M. Vandaloukis (1994, 251), “First the text should be ‘translated’ into contemporary mathematical language, i.e. an adequate model for it should be constructed. This is absolutely necessary in order to understand the text, to reveal its mathematical content.” Actually this kind of “translation” is already practiced in economics. For example, Ricardo never used any graphs and did not have a clue about the production possibility frontier and indifference curves, but these are routinely used to present his heritage regarding the theory of comparative advantage. Therefore, one should be careful in making negative judgments, since some modeling is required to express ideas of earlier writers. I use some graphs in this article (and, in its appendix, elementary calculus) to express Kautilya’s ideas. Moreover, the usual nontechnical analysis may not do justice to his ideas. As Drekmeier (1962, 283) observes, “The centuries that culminated in the imperial state of the Mauryas are of interest precisely because they were productive of so many ideals, life-styles, and elaborations of symbolism—the study of which

6. Ifrah (2000, 529) writes, “This is indeed, Ibn Khaldun’s explanation, who says in his *Prolegomena* that the Arabs received science from the Indians, as well as their numerals and calculation methods, when a group of erudite Indian scholars came to the court of the caliph al-Mansur in year 156 of the Hegira (=776 CE).” Apparently, it took about 300 years from the innovation of numbers in about 458 CE in India to their introduction to the Arabs in 776 CE.

calls for techniques that go beyond the traditional textual dissection and chronicling of institutions.”

Second, if a researcher reports finding some ideas of a more recent writer in ancient writings, such findings are likely to be described as “correlations” (for example between ideas of Aristotle and of Adam Smith) and usually are considered suspect and exaggerated. The word *correlation* is often used in a derogatory sense, and the later writer gets unduly protected. The real question should be whose fault is it if a later writer, due to ignorance or otherwise, did not acknowledge his debt to an earlier writer?

Finally, one should always keep in mind the insightful words of Henry William Spiegel, as quoted by Medema and Samuels (2001, 299): “There are only a few ideas in the history of economics that emerged immediately in the form of a comprehensive and consistent theory. Often they first emerge as fragments, replete with contradictions, and loaded with policy implications.” One should be a little charitable in evaluating older writings.

2. Kautilya’s Ideas on the Provision of Public Goods

Harassment by the enemy’s army not only affects the whole country but also ruins it by plunder, slaughter, burning and destruction.
—Kautilya, *The Arthashastra*, 8.4 (4th century BCE)

2.1. Kautilya Argues for an Expanded Role of Government

Kautilya highlighted the importance of national security, maintenance of law and order, protection of private property rights, and provision of public physical infrastructure in enhancing productivity and production. Drekmeier (1962, 260) writes:

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.

Drekmeier also says, “Now the king must concern himself directly with the common good, an idea anticipated in the *Arthashastra*” (175–76).

2.2. Kautilya on the Definition of a Public Good

Although Kautilya did not have a complete or formal definition of public goods, his insights relating to their role are quite modern. Kautilya ([4th century BCE] 1992, 658) recommended that if the king “lacks [physical] protection, he shall build an impregnable fort (7.14.14).” He added, “In times of trouble, the fort provides a haven to the people and the king himself (7.14.20)” (658). It is obvious from the above statements that at the time, forts were a major part of national security, and the phrase “haven to the people and the king himself” truly describes the “nonrivalry” nature of national security, a pure public good.

2.3. Kautilya on the Interdependence of National Security and Economic Development

Kautilya understood that national security was a prerequisite for economic development, which in turn promoted national security. He argued, “A foreign king . . . is one who has seized the kingdom from a legitimate king still alive; because it does not belong to him, he impoverishes it by extravagance, carries off its wealth or sells it. If the country becomes too difficult for him to handle, he abandons it and goes away (8.2)” (175). He also said, “Harassment by the enemy’s army not only affects the whole country but also ruins it by plunder, slaughter, burning and destruction (8.4)” (132).⁷ It is clear from the above statements

7. Surprisingly, Adam Smith had very similar views on foreign rule. J. M. Letiche (1960, 72) states, “The Government of India, Smith wrote, was composed of a council of foreign merchants. ‘The plunderers of India,’ he called them in one passage; ‘military and despotical,’ in another.”

that Kautilya had a strong belief that economic prosperity and foreign rule were incompatible with each other. He invariably applied the cost-benefit analysis before undertaking any project, including waging a war. Drekeimer (1962, 157) observes, “By the age of empire (and implicit in the *Arthashastra* of Kautilya), war had ceased to be regarded as an aristocratic pastime having as its main objective military glory, and had come to be conceived as an instrument for strengthening the state and enriching its treasury. War is now a serious business, not to be undertaken lightly and without weighing carefully the probabilities of success and defeat.” But Kautilya was against applying any cost-benefit analysis to the provision of national security. He asserted, “An enemy’s destruction shall be brought about even at the cost of great losses in men, material and wealth (7.13)” (Kautilya [4th century BCE] 1992, 541).

Kautilya understood the complexity of the provision of national security. He believed that national security (that is, independence) depended on the relative power of a king to that of his potential adversary. He considered public support and military strength as the sources of power. He argued that public support depended on economic prosperity and fairness. According to him, military power consisted of three components: power of good counsel (good analysis and good judgment), power of a mighty army and a rich treasury, and the power of enthusiasm and energy. He believed that knowledge was a supreme power. L. N. Rangarajan, in his translation of *The Arthashastra*, arranges some of Kautilya’s ([4th century BCE] 1992, 627–28) commentary on these issues as follows (interpolations in square brackets are those of Rangarajan):

Some teachers hold enthusiasm to be more important than might. [They argue:] so long as a king is himself brave, strong, healthy and expert in the use of weapons, he can defeat, with only the army to help him, even a mightier king.

Kautilya disagrees. A mighty king, by his very might, can overpower an energetic one; for, a mighty army, richly endowed with horses, elephants, chariots and instruments of war, can move unhindered anywhere. Further, a mighty king can get the help of another energetic one or he can hire or buy heroic fighters. [It is known that] even women, children, the lame and the blind have conquered the world after winning over or buying heroic fighters with their might.

Some teachers hold might to be more important than 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 dissension 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 (9.1).

It is obvious that Kautilya believed that the relative weight for good counsel, w_c , was much higher than the relative weight for might, and w_m was higher than the relative weight for enthusiasm w_e . It might seem very tempting to construct a power index such as $P = \sum w_i x_i$, where w_i is the relative weight and x_i is the magnitude of the various kinds of powers. However, despite our knowledge of how to construct indices, neither Kautilya nor we could construct such an index: We still do not know how to measure “good counsel, good analysis, and good judgment.” The fact is that we cannot measure accurately even the contribution of knowledge-based industries to GDP.

Kautilya adopted an alternative, intuitive approach to compare the relative powers of two kings. Most likely, he compared the relative strengths of their armies and their enthusiasm levels, the number of advisers and their qualifications, and public support. For example, he stated, “When, among a group of allies, many give equal help in terms of manpower, it is specially advantageous to get the troops from one whose troops are valourous, able to tolerate hardship, loyal and versatile (7.9)” (Kautilya [4th century BCE] 1992, 609). Kautilya understood that these three powers were complementary.

2.4. Public Support to a King Linked to Economic Development

Kautilya ([4th century BCE] 1992, 159) argued, “When a people are impoverished, they become greedy; when they are greedy, they become

disaffected; when disaffected, they either go to the enemy or kill their ruler themselves (7.5).” He suggested, “Therefore, the king shall not act in such a manner as would cause impoverishment, greed or disaffection among the people; if however, they do appear, he shall immediately take remedial measures (7.5).” He strongly believed that a king could win public support only by raising people’s standard of living.

Kautilya reasoned that the recruitment of soldiers and their enthusiasm and the manufacturing of arms were related to the tax revenue, which was directly dependent on the level of income. He devised a comprehensive package of economic policies to stimulate economic growth. He noted, “Hence the king shall be ever active in the management of the economy. The root of wealth is economic activity and lack of it brings material distress. In the absence of fruitful economic activity, both current prosperity and future growth are in danger of destruction. A king can achieve the desired objectives and abundance of riches by undertaking productive economic activity (1.19)” (149).

Ideas as such were not considered as an engine of economic growth, since there was no scope for carrying out any research and development to generate product or process innovations. However, Kautilya believed that the aim of economic knowledge was to “create and preserve” *artha* (material well-being). Alfred Marshall (1920, 757) was not aware of Kautilya’s *Arthashastra* and gave credit instead to the physiocrats for assigning such a role to economic knowledge and asserted, “They thus gave to economics its modern aim of seeking after such knowledge as may help to raise the quality of human life.”

Formally, Kautilya’s model may be specified (see the appendix for a generalization of the traditional specification) as follows:

$$P = A(J, H)(K)^\lambda (EL_m)^{(1-\lambda)} \quad (1)$$

$$NS_1 = P_1/P_2, \quad (2)$$

where P_1 and P_2 = powers of king one and king two respectively; H = knowledge, experience, and analytical skills of the advisers; K = armaments; E = enthusiasm; L_m = military strength; J = level of public support for a just and kind-hearted king; and NS_1 is national security. Kautilya believed that λ was far greater than $(1 - \lambda)$.

2.5. Kautilya on the Advantage of Asymmetric Information

Clearly, if adversaries have full information and behave in the same

manner, then there would be an arms race.⁸ However, Kautilya's ([4th century BCE] 1992, 177) advice to a king was: "No enemy shall know his secrets. He shall, however, know all his enemy's weaknesses. Like a tortoise, he shall draw in any limb of his that is exposed (1.15)." Accordingly, Kautilya suggested, "A king shall have his agents in the courts of the enemy, the ally, the Middle and the Neutral kings to spy on the kings as well as their eighteen types of high officials (1.12)" (498). He added, "He shall always station envoys and clandestine agents in all states of the circle. These shall cultivate those acting against the interests of the conqueror and, while maintaining their own secrecy, destroy repeatedly such inimical persons (7.13)" (562).

3. Kautilya on the Need for Good Governance

Wealth should be protected from robbers and ruling officials.
—Kautilya, *Chanakya-Sutras* (4th century BCE)

3.1. Human Capital and Good Government

According to Kautilya ([4th century BCE] 1992, 142), a good government is a prerequisite for growth in knowledge. He asserted, "The three sciences [philosophy, the three Vedas and economics] are dependent [for their development] on the science of government. [For, without a just administration, no pursuit of learning or avocation would be possible.]"

3.2. Economic Knowledge and Public Policy

Sound analysis and knowledge were considered key ingredients in formulating economic policies. For example, regarding the aim of *The Arthashastra*, Kautilya wrote, "By following [the principles set out in] this treatise one can not only create and preserve dharma [spiritual good],

8. Alternatively this may be specified as:

$$DE_1 = \alpha_0 + \alpha_1 Y_1 + \alpha_2 DE_2 \quad (1)$$

$$DE_2 = \beta_0 + \beta_1 Y_2 + \beta_2 DE_1, \quad (2)$$

where DE_1 and DE_2 are respective expenditures on defense, and Y_1 and Y_2 are the respective incomes of the two countries. According to Kautilya, national security depends not just on how much a nation spends on her defense, but also on how much a potential adversary spends on defense.

artha [material well-being] and kama [aesthetic pleasures] but also destroy [their opposites, i.e.,] unrighteousness, material loss and hatred. It is a guide not only for the acquisition of this world but also the next (15.1)” (100).

3.3. Kautilya on the Protection of Private Property Rights and Encouragement to Physical and Human Capital Formation

According to Kautilya, a king should not appropriate property of private individuals. He wrote, “The wealth of the state shall be one acquired lawfully either by inheritance or by the king’s efforts (6.10)” (121). He also said, “Water works such as reservoirs, embankments and tanks can be privately owned and the owner shall be free to sell or mortgage them (3.9)” (231). Kautilya believed in the protection of private property rights as a prerequisite to capital formation. Similarly, he argued the establishment of law and order and a just government as essential to the acquisition of knowledge.

3.4. Kautilya Argued against Extortion by Officials

Kautilya wrote, “He who produces double the [anticipated] revenue eats up the janapada [the countryside and its people, by leaving inadequate resources for survival and future production] (2.9)” (284). He suggested that the king “shall protect agriculture from being harassed by [onerous] fines, taxes and demands of labor (2.1)” (181).

3.5. Compensation for Loss Caused by Government Officials

Kautilya stated, “A proclamation shall then be issued calling on all those who had suffered at the hands of the dishonest official to inform the investigating officer. All those who respond to the proclamation shall be compensated according to their loss (2.8)” (297).

3.6. Compensation for a Loss from Theft

No private insurance against theft or fire was available at the time. However, Kautilya suggested, “If a King is unable to apprehend a thief or

recover stolen property, the victim of the theft shall be reimbursed from the Treasury (i.e. the king's own resources). Property [unjustly] appropriated shall be recovered and returned to the owner; otherwise, the victim shall be paid its value (3.16)" (437).

3.7. Kautilya on Law and Order and Economic Development

Kautilya observed, "By maintaining order, the king can preserve what he already has, acquire new possessions, augment his wealth and power, and share the benefits of improvement with those worthy of such gifts. The progress of this world depends on the maintenance of order and the [proper functioning of] government (1.4)" (108).

3.8. Kautilya on Law and Order and Investment Risk

Kautilya understood the concept of risk premium. He suggested different interest rates for different types of loans, depending on the level of risk. For example, he suggested a rate of 15 percent on normal transactions, a rate of 60 percent on normal commercial transactions, a rate of 120 percent if risky travel through forests was involved, and a rate of 240 percent if the travel was by sea. He added, "No one shall charge or cause to be charged a rate higher than the above, except in regions where the King is unable to guarantee security; in such a case, the judges shall take into account the customary practices among debtors and creditors (3.11)" (426). The suggestion that the interest rate could be higher "where the King is unable to guarantee security" is quite significant, implying the importance of law and order in reducing risk and promoting commerce.

3.9. Kautilya Believed That the Provision of Good Governance Improved the Risk-Return Trade-Off

The above statements (and many more in the next section) by Kautilya imply that the establishment of law and order and protection of private property rights reduce risk on private investment. Additionally, according to Kautilya, the provision of public goods contributes in two ways

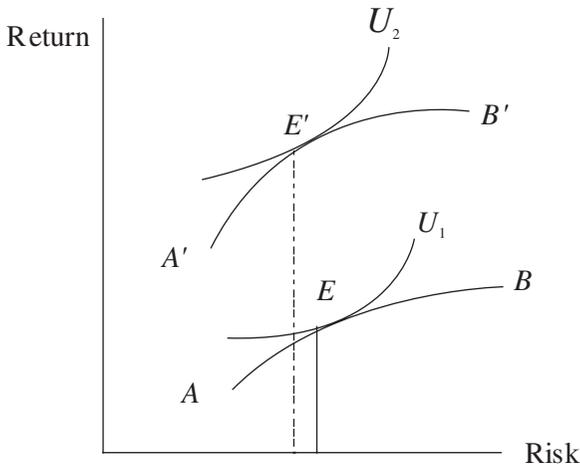


Figure 1 AB and $A'B'$ are the risk-return feasibility frontiers. Based on Kautilya's analysis, provision of good governance raises the rate of return and lowers the risk. The risk-return efficiency frontier shifts from AB to $A'B'$ and its curvature increases, making it possible for an investor to move from point E to point E' . U_1 and U_2 are the indifference curves.

to the raising of the rate of return on private investment: (1) by reducing plunder by the bandits and the expropriation by government officials such that individuals can retain more of what they have earned and (2) by raising the rate of return through sound economic policies—removing “all obstructions to economic activity” and productive investment. Only recently have these insights been fully appreciated.⁹ Kautilya was way ahead of his time, since he was concerned about these factors more than two millennia ago.

Kautilya's ideas, if expressed in today's language, imply that the risk-return feasibility (Markowitz-Sharpe efficiency) frontier shifts upwards as well as becomes more concave. This may be captured by figure 1.

AB and $A'B'$ are the risk-return feasibility frontiers. Based on Kautilya's analysis, the provision of good governance raises the rate of return

9. For example, Robert Hall and Charles Jones (1999, 97–98) note, “Two of these categories relate to the government's role in protecting against private diversion: (i) law and order, and (ii) bureaucratic quality. Three categories relate to the government's possible role as a diverter: (i) corruption, (ii) risk of expropriation, and (iii) government repudiation of contracts.”

and lowers the risk, the risk-return efficiency frontier shifts from AB to $A'B'$, and also its curvature increases, making it possible for an investor to move from point E to point E' . U_1 and U_2 are the indifference curves.

Two points may be noted. Kautilya's insights may be expressed not only as a shift in the feasibility frontier but also as a change in its curvature.¹⁰ Second, Kautilya preferred an income tax (as discussed below) to a lump-sum tax to raise revenue to provide for the public goods, since a lump-sum tax may appear unfair, generate resentment, and create political instability—and thus may deny the benefits of a reduction in risk.

4. Kautilya in Defense of an Income Tax for Financing of Public Goods

4.1. Kautilya on the Inappropriateness of Using an Imaginary Lump-Sum Tax as a Standard

There are two questions regarding any direct tax: is it feasible, and what is the magnitude of deadweight loss created by it? A lump-sum tax does not produce any substitution effect—that is, it does not affect economic behavior and therefore does not create any deadweight loss. Although poll taxes were imposed in ancient Greece, Rome, and some European colonies, women, paupers, the handicapped, and war veterans were exempted from it, so it could not be called a true lump-sum tax. Income and service in the army were the underlying factors that determined who would pay the tax, implying that the tax could have affected economic behavior. In that vein, Seligman (2001, 159–60) notes, “In some countries they have developed this poll tax according to classes, as the head of a workman is worth more than the head of a beggar and the head of a duke worth more than that of a workman, etc.” The hard fact remains that no society has ever implemented a true lump-sum tax. Clearly, if deadweight loss were the only consideration, a lump-sum tax would have been preferred. Surprisingly, this historical fact is ignored and an income tax, which creates a deadweight loss because of the distortions caused by the substitution effect, is invariably compared to an imaginary lump-sum tax. Kautilya has been the only thinker who made an attempt to explore the possibility that there might be some other types

10. According to McGuire and Olson, public goods such as law and order and public infrastructure essentially shift the feasibility frontier upwards.

of cost associated with a lump-sum tax. According to Kautilya, political stability was a prerequisite for economic development, and fairness was essential for political stability. He believed that a lump-sum tax might be considered unfair by the public, and therefore was likely to create resentment and political unrest and impose heavy cost on the economy. Therefore, as discussed below, he suggested measures such as an income tax and administration of justice to ensure fairness in all walks of life.

4.2. Kautilya on the Origin of the Income Tax

Apparently, humanity has been concerned with fairness since antiquity. For example, Kautilya recommended an income tax when a lump-sum tax might have been feasible. He linked the origin of the income tax to the benefit principle. He explained it as follows:

When there was no order in society and only the law of the jungle prevailed, people [were unhappy and being desirous of order] made Manu, the son of Vivasvat, their king; and they assigned to the king one-sixth part of the grains grown by them, one-tenth of other commodities and money. The king then used these to safeguard the welfare of his subjects. Those who do not pay fines and taxes take on themselves the sins of kings, while kings who do not look after the welfare of the people take on themselves the sins of their subjects (1.13). (Kautilya [4th century BCE] 1992, 820)

Kautilya accepted the customary income tax on agricultural income. Nonagricultural income other than that of prostitutes was taxed only during emergencies. He believed that merchants dealing with gold and silver made more money than those dealing with wood, and accordingly he recommended a graduated tax. See table 1 for the taxation categories and amounts Kautilya suggested (271).

Similarly, Kautilya suggested a graduated tax (although only during an emergency but on top of the existing income tax, which was one-sixteenth of the produce) on land holdings according to the yield from them. He suggested that the king “should demand a third or a fourth part of the grains from a region, whether big or small in size, that is not dependent on rains and yields abundant crops; from a middling or inferior one, according to yield (5.2)” (Kautilya [4th century BCE] 2000a, 296).

Table 1 Special Taxes Kautilya Recommended on Merchants, Workers, and Craftsmen

Type of merchant or worker	Recommended tax
Merchant in gold, silver, and gems	50 panas
Merchant in copper, brass, and perfumes	40 panas
Merchant in grain and liquids	30 panas
Worker in glass, or other highly skilled craftsmen	20 panas
Other craftsmen	10 panas
Workers in wood, bamboo, stoneware, and earthenware	5 panas

Note: A *pana* was a square silver coin used as a unit of account and a medium of exchange.

4.3. Public Support of a King Is Tied to His Being Just

Kautilya emphasized repeatedly that a king's survival depended on fair treatment of his subjects in all judicial and economic matters. Besides, it was a king's moral duty to be fair. A few quotes from *The Arthashastra* are provided to support this assertion. Kautilya ([4th century BCE] 1992, 573) pointed out, "When a strong but unjust king is attacked, his subjects will not come to his help but will either topple him or go over to the attacker. On the other hand, when a weak but just king is attacked, his subjects will not only come to his help but also follow him until death (7.5)." A clear implication is that a king had to be fair to his subjects if he wanted their support, which was essential for political stability.

4.4. Kautilya Linked Political Stability to Fairness

Kautilya stated:

Whoever imposes just and deserved punishment is respected and honored. A well-considered and just punishment makes the people devoted to dharma, artha and kama [righteousness, wealth and enjoyment]. Unjust punishment, whether awarded in greed, anger or ignorance, excites the fury of even [those who have renounced all worldly attachments like] forest recluses and ascetics, not to speak of householders. When, [conversely,] no punishment is awarded [through misplaced leniency and no law prevails], then there is only the law of fish [i.e., the law of the jungle] (1.4). (108)

He added, “Unprotected, the small fish will be swallowed up by the big fish. In the presence of a king maintaining just law, the weak can resist the powerful (1.4).” He continued, “Government by Rule of Law, which alone can guarantee security of life and welfare of the people, is, in turn, dependent on the self-discipline of the king (1.5)” (142).

Kautilya wrote, “A king who observes his duty of protecting his people justly and according to law will go to heaven, whereas one who does not protect them or inflicts unjust punishment will not. It is the power of punishment alone, when exercised impartially in proportion to the guilt, and irrespective of whether the person punished is the King’s son or an enemy, that protects this world and the next (3.1)” (377).

Kautilya accepted an income tax partly because he was unaware of the concept of deadweight loss but primarily, perhaps, because of the possible disruptive effects of a lump-sum tax. Although he did not say explicitly that a lump-sum tax was unfair, could create resentment, and could lead to political instability and disruptions, that interpretation could fall into Waterman’s category of what can be “read into” *The Arthashastra*. That is, given his views on the absolute need to be fair in all aspects of human activity, it seems quite plausible that he understood the cost of disruptions of a lump-sum tax. That means that the current approach ignores the possible disruptive effects of a lump-sum tax. Kautilya’s ideas essentially amount to comparing the impact of a lump-sum tax to that of an income tax on earnings and risk. Suppose more revenue can be collected by a lump-sum tax (it does not have a deadweight loss), which permits a higher level of public infrastructure, which helps in raising the earnings of an individual more than does an income tax. However, according to Kautilya, the probability of someone’s retaining those higher earnings rose more under an income tax than under a lump-sum tax. Figure 2 may be used to capture these ideas.

Let $\pi_0 E_0$ be the initial possibility frontier. E_0 and π_0 represent an individual’s earnings and the probability of retaining the earnings, respectively. That is, an individual allocates his time between working to earn money and taking protective measures to retain it. Suppose taxes are imposed to provide protection of private property rights and for establishing law and order. A lump-sum tax is likely to shift the possibility frontier to $\pi' E'$ and an income tax to $\pi'' E''$. It would be difficult to say a priori whether a society prefers any point to the left of R or to the right of R —that is, whether it prefers an income tax or a lump-sum tax. However, as noted above, the choice has been definitely in favor of an income tax.

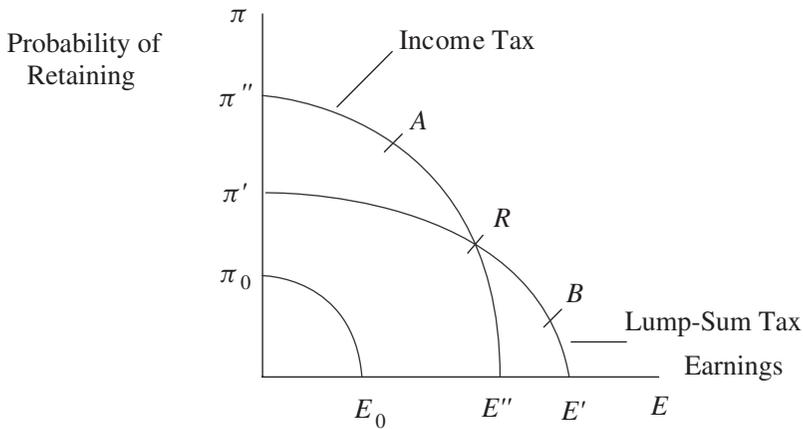


Figure 2 Possibility frontier (initially, $\pi_0 E_0$) as influenced by lump-sum tax ($\pi' E'$) and as influenced by income tax ($\pi'' E''$). The increase in π is smaller under a lump-sum tax than under an income tax. Income is higher under a lump-sum tax than under an income tax.

The current approach compares point E'' to point E' , since it assumes that the law-and-order situation is unaffected by the type of tax. Unsurprisingly, as figure 2 reveals, a head tax creates no distortion, unlike an income tax, and the equity-efficiency trade-off is confined essentially to the segment $E'' E'$, whose length depends on the specifications of the income tax. However, Kautilya wanted to exclude any possibility of disruptive effects caused by a lump-sum tax, since maintenance of law and order was considered critical for survival and economic progress. It is obvious that Kautilya's ideas complement the current approach, which focuses only on the deadweight loss of an income tax and ignores the possibility of negative consequences of a lump-sum tax.

Kautilya had two additional reasons for adopting an income tax. By definition, a lump-sum tax has to be uniform. Kautilya ([4th century BCE] 1992, 182) was concerned about the well-being of the poor, who couldn't pay any tax and needed help. The king, he suggested, "shall maintain, at state expense, children, the old, the destitute, those suffering from adversity, childless women and the children of the destitute women (2.1)."

Kautilya's *Arthashastra* may be described as a treatise on the imperative of economic growth. As mentioned above, tax revenue was necessary in providing infrastructure, army, and armament. Kautilya stated,

“All state activities depend first on the Treasury. Therefore, a King shall devote his best attention to it. A King with a depleted Treasury eats into the very vitality of the citizens and the country” (252). He linked tax revenue to economic prosperity. He suggested, “In the interests of the prosperity of the country, a king should be diligent in foreseeing the possibility of calamities, try to avert them before they arise, overcome those which happen, remove all obstructions to economic activity and prevent loss of revenue to the state (8.4)” (116). A lump-sum tax could not raise the desired revenue, since its magnitude would be constrained by the paying capacity of the poorest in the society. There is some evidence on this. For example, Seligman (2001, 159–60) mentions that some southern states in the United States imposed a poll tax with the clear intent to deny poor blacks from exercising their right to vote, since they would not be able to pay the tax.

It may be noted that there would be no shift in the possibility frontier if the revenue is siphoned off by corrupt politicians and bureaucrats. That is why Kautilya was so much concerned about corruption. For example, 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 (2.9)” (281). He devised various ways to reduce such misappropriation.

5. Conclusions

It is not claimed here that Kautilya understood the vertical summation of individual demand curves or the concept of deadweight loss, or that he developed demand-revealing mechanisms. However, he appears to understand the nonrivalry nature of public goods. He implicitly identifies the contributions of good governance as (1) increasing the return and reducing risk on private investments and (2) encouraging capital formation and acquisition of knowledge by establishing law and order, protecting private property rights, and providing national security. The current debate on financing public goods ignores the expenditure side and is unduly focused on figuring out the deadweight loss of income taxation, making a lump-sum tax appear more desirable than it actually is. Kautilya’s insights offer a reasonable explanation as to why the lump-sum tax has not been imposed by any society: it is perceived as unfair and might create disruptions. Kautilya’s insights are easy to incorporate and could significantly enrich economic analysis in the twenty-first century.

Appendix:
Kautilya's General Model of Public Goods

Kautilya on the Provision of Roads to
 Enhance National Security

Kautilya considers roads as essential for national security as well as for promoting commercial activities, whereas at present public goods are modeled as benefiting only the consumers or only the producers—not both. National security is usually offered as an example of a pure public good, but it is not specified how it is achieved—that is, by building roads, tanks, or fighter jets. Kautilya ([4th century BCE] 2000a, 368) identifies roads as one of the important providers of national security. He states, “A trade-route is the means of over-reaching the enemy. For, along the trade-route is made the carrying over of troops and secret agents (into enemy territory) and the purchase of weapons, armours, carriages and vehicles, as well as bringing in and taking out (7.14.23–24).” I believe the national highways in the United States were funded out of the defense budget.

Kautilya on Roads as an Input to
 Commercial Activities

Kautilya believes that roads promote commerce by opening up new markets for both domestic and imported products. He is the only economist who recommends the promotion of imports and the construction of roads to facilitate importation. He states, “Imports shall be sold in as many places as possible [in order to make them readily available to people in the towns and the countryside]” (Kautilya [4th century BCE] 1992, 236). With that in view, he writes, “Many inferior routes are preferable to a few important ones (7.12)” (623). He explains the benefits of wider roads, and the following statement implies that he understands the concept of the economies of scale. He writes, “A route usable by carts is preferable to a foot path for men and animals only because of the larger quantities that can be transported on carts (7.12)” (623).

Kautilya recommends the construction of highways as well as secondary roads to promote commerce and production. He states:

Not only shall the King keep in good repair productive forests, elephant forests, reservoirs and mines created in the past, but also set up new mines, factories, forests [for timber and other produce], elephant

forests and cattle herds [and shall promote trade and commerce by setting up] market towns, ports and trade routes, both by land and water.

He shall build storage reservoirs, [filling them] either from natural springs or water brought from elsewhere; or, he may provide help to those who build reservoirs by giving them land, building roads and channels or giving grants of timber and implements (2.1. 19, 39). (181)

He also says, “A king makes progress by building forts, irrigation works or trade routes, creating new settlements, elephant forests or productive forests, or opening new mines (7.1)” (553).

He even suggests the width of the roads, depending on their uses. He writes:

The following roads shall be fifty four feet wide: Royal Highways, roads leading to a divisional or a provincial headquarters, roads in the countryside and pasture lands, roads in port towns and cantonments and roads leading to a village or to a cremation ground. Forest roads, roads on reservoir embankments and roads within the city shall be twenty-seven feet wide. Roads in elephant forests shall be thirteen and a half feet. The width of chariot roads shall be seven and a half feet, that of cattle paths three and three quarter and that of footpaths and paths for small animals half of that (2.4.3–5). (183)

A Simple Model of Kautilya's Informal Analysis of Public Goods

Suppose there are two individuals; two private goods, y and z ; one private input (labor), x ; and one public good, e —such as a highway that is used both as a consumer good and as an input to the production of the private goods. The output levels of the private goods depend on the private input x and the public input e . However, the production of the public good is assumed to depend only on labor (x). That is, $e = f_3(x^3)$; $y = f_1(x^1, e)$; and $z = f_2(x^2, e)$. Algebraically, this may be expressed as follows:

$$\begin{aligned} \text{Max } S = & U^1(y_1, z_1, e, x^0_1 - x_1) + U^2(y_2, z_2, e, x^0_2 - x_2) \\ & + \theta_1(f_1(x^1, e) - y) + \theta_2(f_2(x^2, e) - z) \\ & + \theta_3(f_3(x^3) - e) + \delta(x_1 + x_2 - (x^1 + x^2 + x^3)) \\ & + \sigma_1(y - y_1 - y_2) + \sigma_2(z - z_1 - z_2). \end{aligned} \quad (1)$$

Maximization leads to

$$\sigma_1/\sigma_2 = \partial U^i/\partial y_i/\partial U^i/\partial z_i \quad (2)$$

$$\sigma_i/\delta = \partial U^i/\partial y_i/\partial U^i/\partial (x^0_i - x_i) \quad (3)$$

$$\theta_i/\theta_j = \partial f_i/\partial x^i/\partial f_j/\partial x^j \quad (4)$$

$$\partial U^1/\partial e + \partial U^2/\partial e + \theta_1\partial f_1/\partial e + \theta_2\partial f_2/\partial e = \theta_3, \quad (5)$$

where $y = y_1 + y_2$, $z = z_1 + z_2$, $\Sigma x_i =$ supply of labor, and $\Sigma x^j =$ demand for labor.

Equation (2) indicates that the marginal rate of substitution between good y and good z be equal for both consumers. Equation (3) is the marginal rate of substitution between good y and an input x . Equation (4) represents the marginal rate of technical substitution, that is, input x should be allocated such that the marginal revenue products among different industries are the same. Equation (5) may be written as

$$\Sigma MU + \Sigma MRP = MC, \quad (6)$$

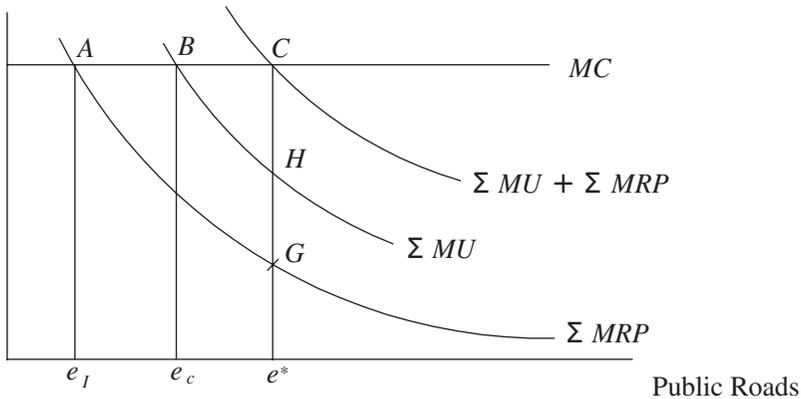
where $\Sigma MU (= \partial U^1/\partial e + \partial U^2/\partial e) =$ sum of marginal benefits to the consumers, and $\Sigma MRP (= \theta_1\partial f_1/\partial e + \theta_2\partial f_2/\partial e) =$ sum of the marginal revenue products.

Appendix figure 1 illustrates Kautilya's ideas on roads as providers of national security and promoters of commerce.

The level of the public good would be e_I if only the marginal revenue products are added, e_C if only the marginal benefits to the consumers are added, and e^* if all the benefits are added. Unsurprisingly, the level of the public good is a lot larger when all the benefits are added.

Subcase (a): Lindahl-Samuelson's Model

Samuelson (1954, 1955) defined the special characteristics of a pure public good: its consumption by an individual does not reduce its availability to others, and no one could be excluded from consuming it. The vertical summation of the individual demand curves for calculating the benefits of a public good has become a permanent fixture of textbooks on microeconomics. In fact, since Samuelson's work was published, a small cottage industry has sprung up dealing with some of the concerns raised by Samuelson. For example, he noted that private provision of public goods could be problematic if individuals do not reveal their true



Appendix figure 1 Effect of public roads on public and private productivity. The optimum length of public roads is determined where the sum of the marginal benefits of public roads to consumers and private businesses equals the marginal cost of building the roads.

preferences. Numerous attempts have been made to develop demand-revealing mechanisms for an efficient provision of public goods. On the other hand, according to Charles Tiebout (1956), individuals do reveal their true preferences by “voting with their feet,” and private provision of local public goods could be efficient if certain assumptions are satisfied. Similarly, a considerable amount of intellectual energy has been devoted to modifying Samuelson’s optimization conditions if the nondistortionary lump-sum tax is not available to finance public goods.

Anthony Atkinson and N. H. Stern (1974, 122) state:

If increased government expenditure leads to a greater consumption of taxed private goods, this reduces the revenue which has to be raised and hence increases the benefit measure. An example of this would be if the provision of a further television channel increased demand for television sets and these were subject to an indirect tax. This point, which was brought out by Diamond and Mirrlees, is however a straightforward one and is not central to this paper, and in what follows it will be assumed that $\partial X/\partial e = 0$ [in my notation $X = y$ and z].

Essentially, the Atkinson and Stern discussion is confined to the consumption side.

This model (Samuelson 1955) concentrates on the consumption side only. Samuelson derives the optimization condition, $\Sigma MU = MC$, under the assumption that only a lump-sum tax is used to finance the public good. However, this choice may not always be available or desirable. A considerable amount of effort has been devoted to studying the dead-weight loss created by taxes other than a lump-sum tax to finance the public goods. Charles Ballard and Don Fullerton (1992) provide an insightful review of the existing literature. They make a distinction between the Pigou-Harberger-Browning approach and the Stiglitz-Dasgupta-Atkinson-Stern approach. They use the following equation:

$$\Sigma MRS = MCF \cdot MRT,$$

where MRS = marginal rate of substitution between the public good and the private good, and MRT = marginal rate of transformation between the public good and the private good. The prevailing view seems to be that the MCF (marginal cost of public funds) is likely to be higher than one, but Ballard and Fullerton provide several situations where it may be less than one. They note, "The MCF ultimately depends not just on the tax, but also on the nature of the government expenditure under consideration" (125). They correctly point out the importance of the government expenditure, but their analysis does not fully incorporate it, since they essentially confine their discussion to the "revenue effect" and ignore the productivity effect of government expenditure on public infrastructure. They use two figures to explain the differences between the two approaches, but the before-tax budget constraint stays the same in both of them because the availability of the public good is assumed not to affect labor productivity. However, as discussed above, according to Kautilya, public infrastructure improves productivity in the private sector, and therefore the before-tax budget constraint is likely to rotate to the right.

Subcase (b): Contribution of Public Infrastructure

Although Samuelson concentrated on the benefits of a pure public good to the consumers, his approach could also be applied to the calculation of benefits to the producers. Infrastructure opens up new markets for existing products, helps in the development of new products, creates potential for division of labor and specialization, integrates segmented markets, and breaks up local monopolies. In recent years, attempts have

been made to measure the contribution of public infrastructure. Catherine Morrison and Amy Schwartz (1996) measure the direct and indirect effects of infrastructure on cost savings (or productivity) in the production of private goods. John Fernald (1999) attempts to estimate the contribution of infrastructure to the production of private goods. Edward Gramlich (1994) provides a review of the existing studies on infrastructure investment. Lately, a concerted effort has been made to analyze and measure the benefits of public goods, such as law and order and the protection of private property rights, on productivity. For example, Robert Hall and Charles Jones (1999) measure the contribution of social infrastructure on productivity. Similarly, Martin McGuire and Mancur Olson (1996) and Olson (2000) discuss the effect of law and order and the protection of private property rights on production. Fernald (1999, 624–25) measures the effect of public infrastructure, K_e , on the production of private goods. He defines the rate of return from infrastructure investment as “the sum of the real value of the marginal products across sectors,” and according to his equation (13), $(\Sigma(P_i/p)\partial F^i/\partial R = \varphi\bar{s}_v(Y/G))$, the implied rate of return on government roads is about 6 percent. However, it is obvious from the above specification that this equation represents only a partial measure of the benefits of infrastructure, since the other components are not included in this estimation. Similarly, Hall and Jones (1999) essentially attempt to measure the influence of public goods on A , K_P , and L . It is not clear, however, as to how they measure the effect of public physical infrastructure (K_e) on productivity.

The component ΣMRP captures the contribution of public infrastructure to the production of private goods. In fact, according to Kautilya, public goods (e) benefit the economy in at least six ways, and the component ΣMRP is only one of them. The other benefits of public goods may be described as follows:

1. They reduce the risk of private investments.
2. They provide utility to individuals.
3. They encourage private capital formation (K_P).
4. They encourage education, E , which increases labor efficiency.
5. They encourage work-effort, L .

The following specification may be used to capture some of Kautilya’s insights:

$$Q = A(e)F[K_e, K_P(e), (E(e)L(e))].$$

Kautilya offers a very comprehensive approach to measuring the benefits of public goods.

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