



THE HISTORY OF THE CONCEPT OF TRANSACTION COSTS: NEGLECTED ASPECTS

BY

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I. INTRODUCTION

According to the folk history of transaction costs, the concept is due to a seminal article by Ronald H. Coase, written in the 1930s. Failing to provide an operational framework, Coase's article was neglected for a long time, or so the story continues.¹ In the 1970s, after the limits of the Arrow-Debreu paradigm had become obvious, several authors, including Oliver E. Williamson, Kenneth J. Arrow, Armen A. Alchian, and Harold Demsetz, took up the notion of transaction costs and turned it into a useful analytical tool. Partly responsible for this sudden upsurge of interest was an article by Coase in which he allegedly proposed the now famous "Coase Theorem."

Does this informal account of the origin and diffusion of transaction costs stand up to historical scrutiny? It is now well established, for example, that Coase's concern was the practical irrelevance of anything resembling George J. Stigler's (1966, p. 113) "Coase Theorem" (cf. Medema 1996).¹ This article seeks to engage in a similar re-evaluation concerning the concept of transaction costs itself. A careful reading of Coase (1937) reveals that the notion of transaction costs, as such, is not due to Coase, who applied the term for the first time comparatively late (Coase 1974, p. 494).² Its history is more appropriately traced

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¹ Ironically, Stigler paraphrased the theorem in terms of the Pigouvian distinction between private and social costs, which Coase (1960) had attacked. Ekkehart Schlicht (1996) more aptly suggests that we speak of a "Coase mechanism," that being a mechanism of bilateral bargaining based on the assumption that parties are able to reach an efficient outcome. For a fine discussion of the theorem and the issues raised by it, see Medema (1999).

² See also Coase (1988, p. 6): "In order to explain why firms exist ... I found it necessary to introduce a concept which I termed in that article 'the cost of using the price mechanism' ... or simply 'marketing costs.' To express the same idea in my article on "The Problem of Social Cost," I used the phrase "the costs of market transactions." These have come to be known in the economic literature as 'transaction costs'."

back to Jacob Marschak's (1950) general equilibrium analysis of a monetary economy.

Quite independent from Coase's work on harmful side effects, transaction costs became a central topic in the neo-Keynesian literature of the 1950s and 1960s. Besides, mathematical economists of the early 1970s spent at least as much effort in incorporating transaction costs into general equilibrium models as Williamson did to set up his transaction cost economics in the new theory of the firm.³ Appreciating the considerable, and to some extent earlier, heritage of the orthodox transaction cost literature also helps correct the somewhat "heterodox" flavor surrounding transaction cost arguments. According to the picture drawn here, the notion of transaction costs did not enter economics from its fringes but from monetary theory and the literature on financial markets. Only at later stages was it taken up and did it prosper in other areas such as the new theory of the firm, the property rights literature, law and economics, and economic history.⁴ Moreover, the introduction of transaction costs can be seen as an attempt to rephrase the nineteenth-century notion of friction in terms of the economic concept of cost. It will be argued that this conceptual "endogenizing" was ultimately self-refuting, as the transaction cost concept developed the same characteristics that were originally criticized in the notion of friction.

Every historical analysis relies, tacitly or explicitly, on an underlying historiographical framework. It is worth stressing at the outset that the following study rests on a specific interpretation and application of "conceptual history." In place of following the genesis of "ideas," this approach remains close to the textual level when it comes to choosing the sources to be part of the historical narrative. Leaving it to intellectual historians to write a history of the idea of transaction costs, the corpus of the present study is defined to consist of all sources that employ the term "transaction costs" explicitly in the text.⁵ Its historical horizon is limited to the period after 1935. This is partly motivated by the first use of the notion of transaction costs, which is located in Marschak (1950).⁶ A second

³ While the existence of this "other" transaction cost literature is generally acknowledged in the industrial organization, property rights, and law and economics strands of research (cf. Dahlman 1979), it has not received the attention it deserves in the light of the considerable intellectual efforts that have gone into exploring the fundamental obstacles of incorporating transaction costs into conventional economic analysis.

⁴ More details of this story can be found in Klaes (1998).

⁵ The adopted historiography draws from the work of the German social historian Reinhart Koselleck (1979); cf. Klaes (1998) for a critical discussion. It forms part of the author's ongoing research into the social nature of scientific concepts. A full exposition and defense would need to spell out its close links to a "finitist" understanding of concept application on the philosophical level (cf. Mary Hesse 1974; David Bloor 1997), a task reaching beyond the present purposes, which are predominantly historical in nature. It should be noted that, apart from "transaction costs," one also finds "transactions costs" and other variations in the literature. Linguistically, these may be regarded as representing different forms of the word "transaction costs" (cf. John Lyons 1977, pp. 18–19). Terminologically, this article employs "notion" and "concept" interchangeably, while "term" or "expression" will be used if attention is focused on the linguistic level.

⁶ It is notoriously difficult, given the breadth of the literature in question, to state with certainty that Marschak (1950) was the first to introduce the concept of transaction costs in economics. It seems likely that the expression itself originated outside academic economics in the sphere of financial markets, where brokerage fees and market transactions are part of everyday discourse. This is difficult

motivation derives from the fact that the emergence of the concept in the 1950s takes place in the literature of monetary economics that grew from John R. Hicks's (1935) canonical article.⁷

The next section argues that the concept of transaction costs is the attempt of modern economics to come to grips with the nineteenth century way to address institutional issues in terms of "frictions." The notion of friction was criticized as a catch-all term, which an initiative by John Hicks sought to replace by invoking the economic concept of cost. Section III is devoted to the early transaction cost discourse in monetary economics that sprang from this initiative, focusing on the work of Jacob Marschak. The Baumol-Tobin inventory model, which helped transaction costs gain prominence in the literature, is discussed in section IV. Sections V and VI are devoted to some attempts to incorporate transaction costs into general equilibrium analysis. After this outline of the origin and diffusion of the concept in monetary economics, section VII investigates the first open controversy on its proper theoretical interpretation. In this controversy, a narrow interpretation closely related to the use in monetary economics became contrasted with the attempt to use transaction costs as a general category to address the relative efficiency of market and non-market institutions. This broadening, while contributing to enlarging the scope of economic analysis, at the same time posed problems on the level of analytical tractability, and the concept was in danger of falling back to the level of a "catch-all" term. Section VIII, which forms the conclusion, takes a step back to comment on the overall pattern of the observed development. Transaction costs emerged as an attempt to replace the nineteenth century notion of friction, only to gradually become regarded as its twentieth century equivalent.⁸

II. INSTITUTIONS AS "FRICTIONS"

The notion of transaction costs first emerged in the field of monetary economics. It grew out of attempts to provide more rigorous answers to the question why people would hold money if they could invest in interest-bearing assets instead.

to substantiate, however. There is no entry for "transaction costs" in standard etymological dictionaries. According to the *Barnhart Dictionary of Etymology* (cf. Robert K. Barnhart 1988, pp. 224, 1159), "transaction" is first recorded in the sense of a "piece of business" in 1647. "Cost" can be traced back to about 1200 (see also the respective entries in the *Oxford English Dictionary*).

⁷ Sources have been identified by two heuristics (apart from the conventional following up of cross-references). First, a search of the on-line *Periodicals Contents Index* for the occurrence of the notion of transaction costs in the title has been performed, supplemented by a title search in the *EconLit* database. In addition, a systematic browsing of title headings in the *Index of Economic Articles* was undertaken for the early part of the focus period (1935 to 1955), with the aim to identify sources which seemed likely to employ the notion of transaction costs in the main text. Secondly, citations to key transaction cost authors were traced and investigated. The main emphasis was placed on references to Coase (1937; 1959; 1960), given that Coase's work gradually assumed the status of a standard reference in the context of transaction costs. This search was performed on the basis of the *Social Sciences Citation Index*.

⁸ Contrary to a widespread view that this amounts in fact to a powerful criticism against the use of the concept, an argument can be made that its "umbrella" nature should not be regarded as a vice but as a virtue (cf. Klaes 1998, chapter VI).

One long-standing problem in monetary economics has been to account satisfactorily for the institution of money as a medium of exchange. In classical theory, the difficulties imposed by a barter economy were frequently described in terms of the mechanical analogy of frictions. Frictions were commonly used by economists to address the exchange difficulties imposed by a barter economy, the lack of synchronization between receipts and payments, and impediments to the transfer of assets. Some authors even compared money with a lubricant that ensures the smooth running of the economic machinery (Wicksell 1906, p. 5).

In a wider sense, frictions provided a residual category to account for extra-economic influences which were not addressed directly in economic terms. In R.H. Inglis Palgrave's late nineteenth century *Dictionary of Political Economy*, one finds under the entry "Frictions in Economics":

The disturbing effects of causes that are not economic, on the action of the causes that are strictly so called, may be regarded as an "economic friction." ... Not only the customs, but the vices, follies, and mistakes of men are accountable for economic friction ... Economic friction may further be described as the opposition encountered by the movements of capital and the inability of labour to meet readily the demand for work; and generally by all the circumstances which prevent economic forces from bringing about their natural effects the instant they come into operation (Davidson 1896, pp. 160–61).

In a classic article, Hicks (1935) attacked the use of the notion of friction for being an ad hoc device designed to keep difficult but important issues outside the realm of economic analysis. Instead of ignoring the explanatory problems involved, Hicks called on economists to confront them. Lionel Robbins (1932, pp. 14–15) had famously defined the realm of economics for the second-generation neoclassical economists as the science of choice. However, the development of the transactions and cash balance approaches of Irving Fisher and the Cambridge school in neoclassical monetary theory stood in sharp contrast to the analytical framework which had been applied to the demand for other goods. While the equation of exchange derived from classical monetary theory was formulated at the aggregate level of analysis, the theory of consumer demand was based on the marginal utility calculus of individual choice.

In an attempt to bridge this gulf, Hicks argued for an extension of the marginalist paradigm to monetary theory.⁹ He pointed out that the quantity theory failed to answer the question of why rational economic agents would decide to hold money in the first place:

Either we have to give an explanation of the fact that people do hold money when the rates of interest are positive, or we have to evade the difficulty somehow ... Of course, the great evaders would not have denied that there must be some explanation of the fact. But they would have put it down to "frictions," and since there was no adequate place for frictions in the rest of their economic theory, a theory of money based on frictions did not seem to them a promising field for economic analysis (Hicks 1935, pp. 5–6).

⁹ Hicks was not the first to call for this extension. The work of Ludwig von Mises (1912) in particular should be mentioned here.

Hicks rejected the use of the friction metaphor as being too vague. What was needed was an analysis of the choice of an individual economic agent between holding money or other assets. According to Hicks, this choice was not influenced only by attitudes toward risk and expectations regarding the future. One of the most important “frictions” consisted of the costs of transferring assets, or the “cost of investment”:

This [cost] is of exactly the same character as the cost of transfer which acts as a certain impediment to change in all parts of the economic system; it doubtless comprises subjective elements as well as directly priced. Thus a person is deterred from investing money for short periods, partly because of brokerage charges and stamp duties, partly because it is not worth the bother (Hicks 1935, p. 6).

Hicks assumed that the expected return increased with the amount invested and the length of the investment, while the costs of investment increased diminishingly with the amount and were independent of length. He concluded that for short periods and small quantities, the individual preferred to hold money instead of other assets.

Hicks’s made the important step of translating frictions into costs. Earlier references to frictions reduced institutional influences to a residual category that remained outside the scope of economic analysis. To describe frictions in terms of one of the basic economic categories, on the other hand, expanded the analytical focus to include institutional aspects previously neglected. In a sense, one can thus speak of Hicks as the originator of a program of the limited “endogenization” of frictions. The concept of transaction costs was to become one of the chief vehicles for this program.

III. THE ORIGIN OF THE NOTION OF TRANSACTION COSTS

Hicks’s call for a systematic translation of frictions into categories more amenable to economic analysis was readily taken up. Paul Rosenstein-Rodan (1936, p. 272), for example, was convinced that uncertainty formed an important element of an explanation for the holding of cash. But alongside this, he accepted the importance of Hicks’s investment costs: “In reality, besides uncertainty, “frictions” of two kinds account for the existence of cash balances: (i) costs of investment (banking charges) ... [and] (ii) [l]eisure lost by having to think and give orders about investing ...” The most important impetus to replace the notion of friction however, was, due to the work of Jacob Marschak. Together with Helen Makower (Makower and Marschak 1938), he aimed at taking Hicks’s line of inquiry one step further by approaching it systematically from the perspective of general equilibrium theory. In a companion paper, Marschak (1938) attempted a first formalization. Makower and Marschak regarded the question of cash holdings as a special case of the problem of holding “idle stocks” in general.¹⁰ The incorporation of these stocks into general

¹⁰ The same analogy was to provide the basis for Baumol and Tobin’s inventory approaches to the cash balance problem in the 1950s.

equilibrium theory would require its extension to take account of time, market imperfections, and uncertainty. The hope was that, with this being accomplished, perfect competition could be treated as a special case of imperfect competition.

Makower and Marschak (1938, p. 268) attributed the presence of market imperfections to small-number effects. If there are only a few buyers, price-taking behavior can no longer be taken for granted. However, "the market can be made more perfect, by advertising (in the wide sense of the word *including, e.g., brokerage*). Advertising will be pushed to the point where its cost equals the gain from perfecting the market" (Makower and Marschak 1938, p. 269; emphasis added). Makower and Marschak suggested that advertising would reduce market imperfection in attracting more individuals to the market.¹¹ Sellers would have an incentive to advertise in order to alleviate the oligopolistic situation on the demand side. This incentive provided Makower and Marschak with an answer to Hicks's problem of the choice between assets and idle cash, although they abstained from making the small-numbers condition plausible in that context. According to their argument, money is held because of imperfections in the market for bonds. Removing these imperfections via advertising is costly. One way to cover expenses consists in charging brokerage fees. Beyond a certain limit these fees will induce individuals to hold a minimum stock of cash even in the absence of uncertainty.

Technically, Marschak attempted to incorporate market imperfections and brokerage fees by a generalization of the budget line of today's basic consumer theory. The budget line defines the set of feasible consumer bundles, taking the market price as fixed. Marschak suggested that market imperfections be modeled by introducing non-linear budgeted "lines," which he called "market curves," to express that small-number situations and brokerage generally result in a price that varies with the quantity traded. He refrained from explicitly introducing additional assumptions to restrict the degrees of freedom of these curves. Instead, the precise nature of market imperfections was treated as an exogenous institutional factor: "The form of each *M*-function [market curve] is determined by other data than those enumerated and is loosely described as the individual's 'bargaining power,' his 'strategic position,' etc." (Marschak 1938, p. 319).

Marschak's 1938 article was ambitious. Not only did it propose a theory of imperfect markets, it also aimed at expanding it to include the elements of time and uncertainty. However, and not surprisingly, the article remained largely at the programmatic level, the mathematics merely applied to state some of the basic assumptions of the model without a formal attempt to solve it.¹² Twelve years later, Marschak (1950) was more explicit about the specific form of the market curves, building on his earlier model:

While the condition (4:1) [budget constraint] can be represented, in the space of the *z*'s [space of goods], by a hyperplane through the origin, the condition

¹¹ The discussion of imperfect competition and the emphasis on advertising doubtlessly reflects the influence of Edward H. Chamberlin (1933) and Joan Robinson (1933), although advertising plays a different role in these works.

¹² It would take general equilibrium theory more than thirty years to fill in the formal lacunae in Marschak's model (cf. Roy Radner 1972).

(4:2) [market curve] ... is represented by a hypersurface which contains the origin and which is convex if viewed from the negative orthant. This property reflects the existence of a “cost of transaction” (Marschak 1950, p. 88).

This cost is defined relative to the net acquisitions of individuals, independent of the number of individual transactions between pairs (or groups) of traders needed to arrive at the final allocation. In the following discussion of the properties of the “market curves,” Marschak uses the notion of transaction costs as a synonym for the new concept:

The convexity of (4:2) expresses then the fact that, whenever—as the net result of marketing—the individual has exchanged one commodity against another (say 1 against 2), he had to sacrifice, in addition, positive amounts of at least one of the N commodities: *the so called transaction cost* (in money paid to advertising agents or brokers, or in one’s own leisure, etc.). (Marschak 1950, p. 88; emphasis added).

After simplifying the market curves to the case of a constant spread between buying and selling price, Marschak proceeded to set up a dynamic model of a multi-period exchange economy with positive transaction costs. In this model, positive and continuously changing stocks of money are consistent with general equilibrium even without the assumption of uncertainty.

The cited passages suggest that Marschak consciously introduced new terminology (but see fn. 6 above). This conjecture is supported by a review article of Karl Brunner (1951) that provides further evidence that Marschak’s concept of transaction costs was new to his peers. On the invitation of the editors of *Econometrica*, Brunner reviewed the debate sparked by Don Patinkin’s (1948) suggestion to put money into the utility function in order to provide a rationale for cash holdings. He pointed out that Marschak (1950) provided an alternative to Patinkin’s approach which showed that it was possible to derive a positive demand for money without falling back on Patinkin’s controversial proposal:

The starting point was given by the important notion of the “cost of transaction.” This phenomenon was expressed by a very ingenious device. While keeping the assumption of perfectly competitive markets ... the net price is regarded as a decreasing function of the amount transacted (Brunner 1951, p. 169).

Brunner’s comments indicate that even for the informed reader Marschak’s transaction costs were a conceptual innovation, not just in terminology but also in the formal economic treatment. The introduction of the concept allowed him to move beyond the general statements made in his early work on market curves as institutional constraints. The new type of cost crystallized the earlier line of reasoning, which ran from market imperfections, via advertising costs, to brokerage fees, into a single concept. While Hicks justified the holding of money in the narrow context of financial markets, Marschak introduced transaction costs as a generalization of investment costs, based on the insight that exchange is a resource-consuming activity. Moreover, he defined the concept as an expression of market imperfections.

While in 1938 these imperfections were described in terms of small-number

phenomena, Marschak (1950) maintained the assumption of perfect competition. In his model, individuals take the market price as given but recognize that they face resource costs which depend on the quantities they trade. Marschak's transaction costs were thus less a feature of market structure than a property of the commodities exchanged. His coining of the term at this more basic level laid the basis for its later diffusion into discussions outside the realm of monetary economics, such as the new theory of the firm or the economics of property rights, while his formalization of transaction costs as a fee to be paid over and above the prevailing market price remained the most widely used approach to modeling transaction costs until the late 1970s.

IV. TRANSACTION COSTS AS BROKERAGE

Marschak's work on transaction costs had little immediate impact on the discussions of the 1950s and early 1960s. The opposite was true for the work of William J. Baumol (1952) and James Tobin (1956).¹³ Today, these two articles are seen as the origin of a long research tradition in monetary theory. Joseph M. Ostroy and Ross M. Starr (1990, p. 5) observe that the transactions role of money "has in the past been virtually synonymous with the work of Baumol (1952) and Tobin (1956)." Jürg Niehans (1987, p. 677) comments that "in the history of economic thought few quantitative models of comparable simplicity have inspired more widespread use."¹⁴ The work of Baumol and Tobin formed part of the post-war movement of neo-Keynesianism that tried to reconcile John Maynard Keynes's *General Theory* with neoclassical theory.¹⁵ With its central underlying aim to provide the microfoundations of the Keynesian framework, the inventory approach can be seen as a continuation of Hicks's (1935) call for establishing the micro-foundations of monetary theory.

In his article, "The Transactions Demand for Cash: An Inventory Theoretic Approach," Baumol used an elementary inventory model to formalize Hicks's idea that money is held because of the existence of investment costs. In the model an economic agent faces a perfectly foreseen steady payment stream. To meet this expenditure with cash, he foregoes interest earnings because he could have invested his money in bonds to earn interest. The resulting portfolio problem consists in finding the optimal amount of cash to be held, given that the cash withdrawals are to be spaced evenly within the period. Baumol defined the cost of holding cash as the sum of a fixed brokerage cost that has to be incurred for each withdrawal, plus interest opportunity costs calculated on the basis of

¹³ The *Social Science Citation Index* records not more than five citations of Marschak (1950) in the decade between 1956 and 1965. In the same period, Baumol (1952) attracts thirty-six citations, and twenty-two articles refer to Tobin (1956). Even taking into account that Marschak published his article in the second volume of a newly established journal, this difference reflects how much more welcoming the profession was of the two later works.

¹⁴ Maurice Allais (1947, p. 241) derived essentially the same results as Baumol and Tobin, albeit without employing the notion of transaction costs.

¹⁵ The earliest attempt at reconciliation goes back to Hicks (1937). For the movement of neo-Keynesianism, see Ernesto Screpanti and Stefano Zamagni (1993, pp. 297–307).

average cash holdings. The optimal amount of cash holdings can then be found by minimizing this total cost of foregoing investment.

Baumol introduced the direct cost of a cash withdrawal as a “broker’s fee.” He insisted, however, that this notion should be understood in a broad sense, comprising all non-interest costs of borrowing. Midway through his article, he applied the notion of transaction costs as a more suitable category with which to refer to these generalized broker’s fees. Patinkin (1948) had put forward that in a stationary world there would be no demand for cash because individuals would invest their earnings in such a way that the required amounts for payments would become available at precisely the time needed. Baumol disagreed: “Clearly, this argument neglects the transactions costs involved in making and collecting such loans (the ‘broker’s fee’)” (Baumol 1952, p. 550). Four years later, Tobin (1956) took a rather similar approach to the transactions demand for cash, again employing the notion of transaction costs as a more general term for brokerage: “[W]hen the yield disadvantage of cash is great, it is worth while to incur large transactions costs and keep average cash holdings low” (Tobin 1956, p. 242).¹⁶

Compared to the general equilibrium analysis of Marschak, the approach of Baumol and Tobin provided a justification for the holding of cash on the basis of a more limited scope of analysis. Their work was, nevertheless, crucial for the concept of transaction costs to find wider recognition. In this context it is particularly instructive to observe how the emphasis given to transaction costs differed between the first and second edition of Patinkin’s *Money, Interest, and Prices* (1956; 1965) as a result of the influence of the inventory model. In the first edition, Patinkin pointed out that the introduction of transaction costs as such did not solve Hicks’s problem of the holding of idle balances:

It might be noted that this coexistence [of cash and bonds] cannot be explained by the mere bother of constantly converting bonds into money and vice versa. For, as Hicks has so aptly emphasized, this bother is the *result* of illiquidity, and not the *cause* ... (Patinkin 1956, p. 85, n. 17).

If bonds were as liquid as money there would be no need to convert them into cash holdings. In consequence, costs of transfer or the bother of trading bonds played no significant role in the remainder of the first edition of Patinkin’s book. In striking contrast, the second edition contained a new chapter exclusively devoted to the work of Baumol and Tobin. Transaction costs were no longer addressed as subjective “bother” but as the “objective costs” of converting bonds into money (Patinkin 1965, p. 147). In a first step, Patinkin referred to these costs as brokerage fees, but subsequently he suggested that this notion, which he used interchangeably with “transactions costs,” should be extended to include the costs associated with the time needed to perform transactions (Patinkin 1965, p. 154). The more “philosophical” point on illiquidity being the cause, and not the result, of transaction costs received no further mention.

¹⁶ Tobin (1956, p. 241, n. 2) acknowledged the similarity of his analysis to Baumol’s earlier article, describing it as “a paper which I should have read before writing this one but did not.”

V. TRANSACTION COSTS IN GENERAL EQUILIBRIUM ANALYSIS: THE HICKS-SAMUELSON TRADITION

The general equilibrium approach of Marschak was taken up again by Jürg Niehans at the end of the 1960s. Distancing himself from the Arrow-Debreu tradition of general equilibrium theory, he proposed to use the conventional approach of Hicks, augmented by linear programming techniques. Niehans (1969, p. 706–707) acknowledged that economists had found one rationale for money in the inherent uncertainty of the economic system. In respect to money as a medium of exchange, however, he complained that less progress had been made. Instead of proper economic analysis, one would find metaphorical descriptions of money as the oil which lubricates exchange, or in terms of an obscure convenience it was supposed to offer in conducting exchange.

Niehans's aim was to replace these metaphors by thorough analysis. As a first step, he restricted himself to a static framework. In an approach similar to earlier ideas of Karl Brunner and Allan H. Meltzer (1964), he analyzed the network of transactions associated with the general equilibrium of an exchange economy. This network specified the flows of commodities between individuals needed to move from the initial position to the equilibrium allocation of resources. Niehans emphasized the following peculiarity of an exchange economy: on the level of individual transactions, the exchange system relies on the maintenance of bilateral balance. In every transaction there has to be a *quid pro quo*. On the other hand, the net flows of total resources will typically exhibit bilateral imbalance. For example, at the end of all trading, farmer *A* may have supplied fisherman *B* with wheat, *B* supplied lumberjack *C* with fish, and *C* provided *A* with timber. In spite of this imbalance on the level of ultimate flows, bilateral balance in individual transactions can be maintained with the help of intermediate transactions. Although fish, as such, provide no utility to *A*, he might still go ahead and trade his wheat with *B*. The fish he gets in return could then be offered to *C* to obtain the desired timber. Niehans (1969, p. 708) called a transactions network, in which intermediate flows provided bilateral balance, a payments system. For a given network of ultimate flows there will generally exist several possible payments systems. The task of economic analysis would be to find the best alternative and to explain whether this solution could be an outcome of the market mechanism.

Niehans emphasized that if transactions were costless, all possible alternative payments systems were equally viable from an economic point of view:

If, on the other hand, transactions cost something, we have a criterion which discriminates between various alternatives and thus a basis for optimization. In an equilibrium theory of money, transactions costs thus seem to play a crucial role (Niehans 1969, p. 708).

He defined transaction costs as follows:

The terms “transactions costs” or “transfer costs” shall be used for the costs associated with the transfer of ownership from one individual to another. They are a catchall term for a rather heterogeneous assortment of costs. The parties have to communicate; information will be exchanged; contracts are drawn up;

the goods must be inspected, weighed and measured; and accounts have to be kept. To a certain extent, transactions involve additional transportation in space over and above what is required to move goods from producer to consumer (Niehans 1969, p. 709).

Two points are noteworthy in this passage. On the one hand, transaction costs are defined in a very broad way. On the other hand, no distinction in kind is made between transaction costs and transport costs. From the perspective of economic modeling, this strategy facilitated the accommodation of the new cost category within the existing analytical framework. A more systematic inquiry into the relationship between transaction costs and property rights, for example, would have been confronted with what Armen Alchian (1965) could only diagnose as a complete absence of an investigation into the role of property in exchange within modern economics. Accordingly, Niehans modeled transaction costs as weightings in a linear program of resource allocation, assuming that these weights varied in proportion with the value of traded goods. Taking the network of ultimate flows as given, he introduced new variables into the standard Hicksian general equilibrium framework to represent the intermediate flows to be determined by the program. For these flows, the budget constraint must hold that for each commodity, the purchases of each trader exceed his sales by the amount he wants to consume.¹⁷ The requirement of bilateral balance, which demands that between any pair of traders the flows in each direction have to be equal, provides the second constraint. Total transaction costs are defined as a weighted sum of all bilateral flows and constitute the objective function to be minimized.

If the transaction costs of one particular good are sufficiently low compared to those associated with the other commodities, this good will be dominantly used in the optimal system of intermediate flows and thus constitute the common medium of exchange. While this solution could be directly implemented by a global planning authority, Niehans also sought to demonstrate that the same result could emerge in a decentralized way, drawing from the result that the shadow prices of a linear program work like equilibrium prices in an economy with perfect competition.¹⁸ Goods will be traded to achieve higher "place values," the latter consisting of the shadow prices introduced at the nodes of the transaction network, as long as the gain in place value exceeds the transaction costs involved (Niehans 1969, p. 714). The payments system that results from these intermediate flows would be the same as if the optimal flows were implemented directly. Individual traders, who maximize their gains in place values, just break even and the total gain in place value is equal to total

¹⁷ The model assumes that each trader produces one commodity, which he does not wish to consume. This implies that for this commodity, sales have to exceed purchases by the amount initially produced.

¹⁸ This equivalence, which does not extend to corner solutions, underlies the more general formulations of the first and second welfare theorems of general equilibrium theory. (See the early work of Tjalling C. Koopmans (1951) on the role of shadow prices in activity analysis.)

transaction costs (Niehans 1969, p. 716). Niehans concluded that a competitive economy will pick an optimal payments system:¹⁹

If any commodities are adopted as media of exchange, they will be the “right” ones. Under perfect competition, it turns out that money does indeed manage itself ... The adoption of money requires neither law nor convention, nor can it be attributed to an “invention”; it is simply the effect of market forces (Niehans 1969, p. 716).

This conclusion does not extend to the case of fixed transaction costs, however. Niehans modeled these costs by introducing binary variables into his linear program, equaling one if a transaction takes place and a fixed transaction cost is incurred, and zero otherwise. Instead of deriving a solution for the new problem, he referred to an article of Ralph E. Gomory and William Baumol (1960). Gomory and Baumol showed that in integer programming, shadow prices can no longer generally be interpreted as the marginal revenue product of a change in constraints, and may equal zero even for scarce resources. The reason is that a discrete shift in a constraint might push it beyond a corner of the simplex of feasible points. The authors also demonstrated that integer programming may result in optimal solutions that cannot be implemented by a competitive equilibrium (Niehans 1969, pp. 522–37). In particular, the existence of a hyperplane that separates feasible from preferred but not feasible points in a solution cannot be guaranteed.²⁰

Niehans concluded from this that if set-up costs form an important component of transaction costs, the market mechanism will generally fail to provide the optimal payments system. Instead of regarding money as an institution that manages itself, it would then be more appropriate to regard it as the result of public choice (Niehans 1969, p. 724). The only question left open relates to the actual significance of fixed transaction costs: “There seems to be little direct information on this point, but one can hardly help feeling that at least for the more advanced payment techniques, the fixed components are of considerable, perhaps often dominating importance” (Niehans 1969, p. 724).

In a comment on Niehans’s article, Emiel C.H. Veendorp (1972) pointed out that the presence of fixed transaction costs had the important implication that the initial distribution of resources mattered for the choice of an optimal payments system, whereas in the traditional model only the total level of endowments had any influence. Fixed transaction costs implied that transactions only became worthwhile beyond a certain volume of trade. The size and distribution of initial endowments defined to which extent these levels could be reached. Edi Karni (1973) added that even with purely variable transaction costs, initial endowments mattered because the more “distant” a preferred consumption bundle was from

¹⁹ Note that Niehans has taken the network of ultimate flows as given. His discussion of the equivalence of market equilibrium with the linear programming solution rests on treating the intermediate flows as the relevant commodities.

²⁰ Arrow’s (1951) proof of the welfare theorems relied on the existence of such a hyperplane (see also Arrow 1973, p. 214). The same difficulties apply, of course, to the context of transport costs (cf. Koopmans and Beckman 1957), with the important difference that the assumption of a dominance of the variable cost component seems to be less counterintuitive.

the initial endowment, the more expensive it would be to realize it—a restriction on demand not present in the standard framework. In a second article, Niehans (1971) presented a more general model of an economy with variable transaction costs, with which he illustrated that a further property of the standard Hicks-Samuelson framework, the coincidence of marginal rates of substitution and market prices, failed to carry over to an economy with transaction costs. Thus, Niehans's work on transaction costs can be seen as an expression of the conceptual resistance that even the incorporation of a relatively "conservative" interpretation of transaction costs into contemporary theory encountered.²¹

VI. TRANSACTION COSTS IN AN ARROW-DEBREU WORLD

At the beginning of the 1970s mathematical economists, too, became interested in the problem of how to incorporate transaction costs into the general equilibrium theory of Arrow and Debreu. Although held to be the "deepest scientific resource of economists" (Foley 1970, p. 276), the abstract nature of this theory was not questioned even by its defenders. One of its elements, the formation of a plethora of markets for contingent commodities which are differentiated not just in time and space but also in respect to the state of nature, was clearly not supported by either empirical evidence or common sense. However, authors like Duncan Foley claimed that it was the formal rigor with which the Arrow-Debreu model had been formulated which directed subsequent research to finding the weak links in the underlying assumptions. "One such weakness is the absence from the theory of any real costs in information gathering and processing, or in the operation of markets" (Foley 1970, p. 276).

Foley incorporated transaction costs into the conventional single-period Arrow-Debreu model by a modification of the price concept. Instead of a single price, he defined two prices per market, one for sellers and a higher one for buyers. The difference reflects the resources spent in the operation of markets. Consumers buy at the buying price and sell at the selling price. Producers, however, can decide to engage in costly marketing activities. If a firm spends real resources in marketing activities, it can buy inputs at the lower selling price and sell output at the higher buying price. It will only do so if the spread between buying and selling prices allows this to be profitable. Otherwise it restricts itself to conventional production, buying its inputs at buying prices and selling outputs at selling prices. Foley defined transaction costs as "the effort required to inform buyers or sellers of the existence of a supply or demand for a commodity, and of the price" (Foley 1970, p. 282). Ruling out fixed transaction costs, he approached proving the existence of an equilibrium along established lines by defining an economy formally equivalent to the economy with different buying and selling prices but in which there was only one price per market. This he achieved by introducing an artificial commodity for each original market to represent the resources used up in transacting, thus effectively doubling the

²¹ Within an Arrow-Debreu framework, the difficulties of fixed transaction costs can be overcome to some extent (see below).

number of markets.²² The thus extended economy is equivalent to an economy for which Gerard Debreu (1962) had provided an existence proof for a “quasi-equilibrium.”²³

Nevertheless, Foley was unable to state with the same level of generality that a true equilibrium existed (Foley 1970, pp. 284–85). Debreu (1962, p. 270) had specified conditions for which a quasi-equilibrium is a “true” equilibrium, but Foley did not manage to transfer these proofs fully to the extended economy. While suggesting a proof based on the assumptions of free disposal and the existence of at least some firms exclusively engaging in marketing, Foley (1970, p. 285) admitted that a stronger result was desirable. Turning to the question of whether an equilibrium in his transaction cost economy was efficient, Foley stated an important *caveat*. He pointed out that his model defined transaction costs within the context of the allocative mechanism of the market. The central aim of the incorporation of transaction costs should, however, consist in an analysis of the costs of resource allocation in general:

It is not obvious that radically different organizations of exchange would have the same type or magnitude of resource costs in the exchange process. A deeper and more satisfactory study of the core and Pareto optima would begin from a fundamental account of information costs of exchange without references to institutions and derive “markets” as one of a number of possible organizations of exchange (Foley 1970, p. 285).

A particular organization of exchange may well be efficient for a given level of transaction costs. Foley argued that this was a trivial conclusion as long as alternative institutional arrangements with different information costs were not considered. He also noted that his analysis called for a study of transaction costs in a dynamic framework. If transaction costs in a given futures market were high enough to preclude all trade, the possibility should be considered that the corresponding spot market opened at a future date. In the Arrow-Debreu world, all spot and futures contracts are made at time zero. Future spot markets are superfluous because all future transactions are already settled in the futures markets. The possibility of the later reopening of spot markets requires the Arrow-Debreu framework to be replaced by studying a sequence of markets that simultaneously govern individual plans.

Frank H. Hahn (1971; 1973) presented such an analysis. Efficiency, judged in

²² In the original markets, all trades take place at selling prices. In the new markets prices are defined as the difference between buying and selling price. For each buying transaction in the original market, a “retail commodity” has to be bought in the related new market. If the original economy has m costly traded commodities, the extended economy has $2m$ commodities.

²³ Debreu’s quasi-equilibrium is identical with a “true” equilibrium as long as consumer wealth is above the minimum compatible with the consumption set (i.e., there is still some smaller wealth for which consumption is possible under the wealth constraint). If wealth is allowed to actually reach this minimum, continuity of the budget correspondence, and hence upper semi-continuity of the demand correspondence, cannot be assured (cf. Debreu 1959, pp. 63, 72; Bryan Ellickson 1993, pp. 225–26). Upper semi-continuity of the demand correspondence is crucial for traditional existence proofs which make use of the Kakutani fixed point theorem (cf. Debreu 1959, p. 26; Ellickson 1993, p. 275).

the context of a given distribution of endowments and given marketing technology, could not be assured, however: "I did not expect this result when I started ... Considering that all expectational matters and all uncertainty have been neglected, this shows that the recognition of transactions as activities has non-negligible consequences as such" (Hahn 1971, p. 434). While Hahn had confined all resource-consuming marketing activities to a single firm through which all trade had to be conducted, Mordecai Kurz (1974b) pursued a second line of inquiry by modeling transaction costs as the resources spent by individuals on exchange activities. As a consequence, the global transaction technology of the Hahn model was replaced by technologies for each individual. Again, the existence of an equilibrium turned out to be far less a problem than the question of efficiency. Similar to Foley (1970), Kurz felt he had to raise the question of how to interpret efficiency in an economy with transaction costs:

[O]ne cannot assume that "money" and all the financial institutions needed to manage a monetary economy are costless. For this reason the notion of efficiency itself must be understood to be defined relative to a specific set of institutional arrangements. This is clearly not the place to open this broad subject; our comments here have been made in order to encourage caution in interpreting our discussion of efficiency in this paper (Kurz 1974a, p. 20).

While Niehans, working in the Hicks-Samuelson tradition of general equilibrium analysis, encountered formal problems in the context of efficiency, the difficulties of Foley, Hahn, and Kurz were less of a formal than a conceptual nature. Niehans's second difficulty, the case of set-up costs, even seemed to yield to formal rigor. For the traditional Arrow-Debreu model, set-up costs present a problem because they imply non-convexities in the production set. Non-convexities in the production set lead to non-convexities in the set defined by the supply correspondence, and hence in the excess demand function. The fixed point theorems used in traditional approaches to establish the existence of an equilibrium rely on a convex aggregate excess demand function (cf. Debreu 1959, p. 86). However, Ross Starr (1969) was able to show that non-convexities did not pose a threat to efficiency as long as they remained "small" compared to the size of the economy. Walter P. Heller (1972) generalized this result to an economy with transaction costs, starting from the model of Foley (1970).

The strategy of the proof is to define a "convexified" economy, for which a traditional equilibrium exists. Next, an approximate equilibrium is defined as one in which the deviation of actual production plans from the optimal plans specified in the convexified economy has an upper bound. The crucial step consists in defining the deviation such that its upper bound is independent of the size of the economy. In an approximate equilibrium, markets "almost" clear. Because the extent to which markets fail to clear is bounded, this becomes negligible compared to the total amount traded if the latter becomes very large. Using these results, Heller argued that if the economy is sufficiently large the detrimental effect of fixed transaction costs could be neglected.²⁴ Yet, the

²⁴ Heller and Starr (1976) presented a similar result for the Kurz model.

problem of fixed transaction costs is solved only on a superficial level. Substantively, Heller's results lead to the same impasse as the analysis of Niehans. The theorist has to defer the question of the practical relevance of fixed transaction costs either to empirical investigation or to intuitive judgement. If fixed transaction costs seem to be as important as Niehans suggests, it appears doubtful whether real-world economies can be large enough to justify the application of the concept of convexified economies.

One can conclude from this cursory study of the general equilibrium literature of the 1970s that, technically, the incorporation of a conservative interpretation of transaction costs in terms of brokerage or bid-ask spread into existing theory posed no insurmountable barriers. It led to technically more complicated models, but the tools of existing theory appeared to be adequate to deal with this challenge. Nevertheless, even such a comparatively narrow approach to transaction cost economics ultimately prompted questions which pointed beyond the framework in which they originated. In the mid-1970s it became clear to a number of authors that the early hopes of a new monetary theory based on general equilibrium models with transaction costs were more difficult to fulfill than early enthusiasm would have suggested. The first survey paper of the field (Ulph and Ulph 1975) suggested that the work done did not represent more than a beginning. Martin Shubik (1975) ended on a far more critical note. In a list of "the more important red herrings serving to misdirect research effort away from the key aspects of understanding an economy with money and financial institutions" (*ibid.*, p. 568), one finds the following entry:

- (7) "Real" transactions costs which divert one's attention from the more critical transactions costs which are due to information gathering, encoding and decoding. Transactions costs such as transportation costs provide us with a veritable mine of elegant and only tangentially relevant problems for our understanding of a monetary economy (Shubik 1975, pp. 569–70).

Given the underdeveloped state of the economics of information at the time, many theorists were reluctant to press general equilibrium models further in this direction. In addition, regarding the question of efficiency, the intuition behind the concept of transaction costs demanded a framework of comparative institutional assessment, a prospect of limited attractiveness to a profession that proudly emphasized the independence of the results of general equilibrium theory from any particular set of institutions. Regarding the practical relevance of fixed transaction costs, the difficult conceptual questions in relation to the actual measurement of transaction costs could be passed on to other precincts of the profession, beyond the temple of high theory.

VII. THE FIRST CONTROVERSY

An important attempt to part with the narrow definition of transaction costs criticized by Shubik can be found in the work of Kenneth Arrow. Arrow's research marks the beginnings of yet another strand of transaction cost discourse originating in general equilibrium theory. Contrary to the modeling of transaction costs in monetary economics, this strand emerged as a result of exploring the limitations of the general equilibrium approach in practical applications.

Alchian, Arrow, and William M. Capron (1958), for example, investigated the market for engineers and scientists, prompted by an alleged contemporary shortage in these professions. The study was motivated (and financed) by the Cold War fear that the command economy of the Soviet Union would be able to employ more scientists and engineers in military technology than the United States because young people could simply be ordered to take up the professions most needed for these purposes. The market incentives of Western economies, on the other hand, might direct young talent elsewhere.

According to one of the conclusions of Alchian *et al.*, private incentives to invest in research and development might indeed be weakened because of the particular nature of knowledge as a commodity (Alchian, *et al.* 1958, pp. 68–71). In this context, they also discussed the efficiency differences between fixed-payment and cost-plus contracting in state-financed research and development projects. Under a cost-plus contract, all risk is assumed by the state. The drawback of this form of contract is that if there are difficulties in reliably monitoring performance, the contractor can be expected to shirk. A lump-sum contract, on the other hand, provides strong financial incentives to fulfill the contract in the least costly way. This would shift the risk-burden to a possibly risk-averse contractor, though. The authors (Alchian, *et al.* 1958, pp. 72–76) proposed the concept of co-insurance as a possible solution. Under co-insurance, payment is split up into fixed and performance related components.

The questions of co-insurance and the status of knowledge and information as commodities were taken up again by Arrow (1962). In an Arrow-Debreu world a crucial condition for efficiency under uncertainty is the existence of markets for insurance against every conceivable event. But, according to Arrow, it was obvious that risks were traded only incompletely in real world markets. He identified moral hazard as one of the responsible factors. Turning to an empirical investigation of the market for medical care, his aim was to illustrate the inefficiency of insurance markets for certain risks. He argued that due to the risk-aversion of individuals and because of pooling of risks by the insurer, which reduced his exposure, complete insurance would result in a private and social welfare gain (Arrow 1963a, p. 960). However, Arrow noted that complete coverage was far from being realized, especially in the case of the unemployed and the elderly. He attributed this in part to the problem of moral hazard. Widespread medical insurance increased the demand for medical care. Because of the strong welfare case for insurance, Arrow argued that the government should offer insurance in those cases where markets did not form.

Government intervention did not represent the only remedy for inefficient insurance markets in Arrow's analysis. He suggested that a fundamental pressure in the economy towards efficiency might lead to the establishment of alternative allocative mechanisms:

I propose here the view that when the market fails to achieve an optimal state, society will, to some extent at least, recognize the gap, and nonmarket social institutions will arise attempting to bridge it. Certainly this process is not necessarily conscious; nor is it uniformly successful in approaching more closely to optimality when the entire range of consequences is considered (Arrow 1963a, p. 947).

According to Arrow, this explained the trust relationship between physician and patient, as well as the organization of the medical profession, which was characterized by a particular professional ethos, and high entry barriers and educational standards.

Dennis S. Lees and Robert G. Rice (1965) took exception to what they identified as an unequivocal call in Arrow's article for the government to provide medical insurance. Earlier work by Lees (1962) supplies us with the political background of this intervention. Lees was strongly opposed to the introduction of the National Health Service in Britain. His aim was to "unravel, once for all, the twisted logic that underlies the N.H.S ... Of all the post-1945 acts of nationalisation, only in the case of the N.H.S was every semblance of a spontaneously adjusting market destroyed and displaced by total socialist planning and administration" (Lees 1962, p. 111). In this judgement, Lees regarded the abolishment of prices to be the decisive factor, not the question of private or public ownership.

The attack of Lees and Rice (1965) focused on Arrow's (1963a) neglect of buyers' and sellers' costs in the market for medical insurance:²⁵

[I]n practice, insurance is not costless: sellers incur administrative, selling, and other expenses; buyers incur costs of time and trouble and expense for advice ... Our main purpose is to demonstrate that, when buyer's and seller's cost are taken systematically into account, *absence* of insurance policies for certain risks may be a requirement of optimality. Thus, an observed absence of policies in the presence of risk cannot be taken as a sufficient condition of market failure and, by itself, provides no guide for public policy (Lees and Rice 1965, p. 141).

Lees and Rice argued that a risk-averse individual was always ready to pay more than the net insurance premium or actuarial costs for the provision of insurance. The actuarial cost consists of the expected value of the potential future loss. Due to his risk aversion the individual is willing to pay for the service of insurance provision up to the difference V between his expected income in the absence of insurance and the certainty equivalent of this income. Assuming that there is a selling cost C associated with the provision of insurance, the individual will buy insurance as long as $V > C$. If C exceeds V , the individual prefers to bear the risk himself. The presence of buyers' costs has the same effect:

Specifically, the transactions cost to the individual of completing and filing applications and claims forms, paying premiums, keeping records, etc., as well as possible costs of obtaining information, may be of sufficient magnitude to make insurance policies against certain losses not worthwhile (Lees and Rice 1965, p. 143).

Drawing from Coase (1937), the authors set up an analogy between households and firms. Coase had argued that if transacting in the market proved too costly, transactions would take place within the confines of managerial control within the firm. Similarly, transaction costs in insurance markets would induce house-

²⁵ Arrow (1963a, pp. 960, 963) mentions sellers' costs, but they play no central part in his argument.

holds to self-insure a portion of their insurance needs. After deriving testable hypotheses from their formal treatment and supporting them empirically, they concluded that there were neither theoretical nor empirical grounds for the government to provide insurance schemes. For Arrow, the failure of the market to achieve complete insurance coverage indicated non-optimality. In contrast to this, Lees and Rice argued that taking transaction costs into account implied that less than complete coverage was in fact optimal.

In his reply, Arrow (1965, p. 155) accepted the results of the formal analysis of Lees and Rice. Indeed, he complimented them for drawing attention to transaction costs, which he described as a “difficult and neglected area” of economics. Two years earlier, Arrow (1963b) had discussed transaction costs in the context of Tobin’s (1956) inventory model of holding cash. Drawing from earlier work on the general inventory problem (Arrow, Theodore Harris, and Marschak 1951), he had suggested an extension of the cash holding model to incorporate uncertainty. He had also emphasized the relevance of fixed transaction costs, which would arise due to psychological decision costs and the costs of administrating orders. Nevertheless, this early interpretation of the concept keeps close to the narrow understanding encountered in the monetary literature in general. In his reply to Lees and Rice, however, he substantially broadened this interpretation.

Lees and Rice stressed the transaction costs associated with the market provision of insurance (of “completing and filing applications and claims forms, paying premiums, keeping records, etc.,” see above citation). This prompted Arrow to note ironically that “[u]nless one knew the context, he might be forgiven for supposing this was an argument *for* the British national health system, in which all these costs disappear” (Arrow 1965, p. 155; emphasis added). Accepting the charge of having neglected transaction costs in his analysis of medical insurance, his reply focused on the interpretation of the concept, thus shifting the debate away from the empirical realm:

It is somewhat surprising ... that the explicit recognition of the costs of private marketing should be regarded as an argument *against* alternative modes of resource allocation. What is clearly needed is a deeper analysis of the causes of transaction costs. It is not only their existence but their escapability under alternative institutional arrangements that is crucial to the normative discussion (Arrow 1965, p. 155).

This turned the impetus of Lees and Rice’s attack against them. Arrow did not accept the argument that risk-averse households provided self-insurance because they were more efficient in the “production” of insurance. He stood by his earlier line of reasoning. An insurance company with its ability to pool risks would be able to bear risks more efficiently than individuals. The only other justification for self-insurance was due to transaction costs:

The alternative explanation is that there is a gap between the price received by the producer and that paid by the household for the product, with the marginal cost of production to the household lying somewhere inbetween. It is this gap which constitutes the transaction costs (sum of seller’s and buyer’s costs), and which must be studied more closely (Arrow 1965, p. 155).

The force of Arrow's argument rested on introducing a subtle difference to the position of Lees and Rice. He agreed that the response of the household to self-insure was individually rational, given the presence of transaction costs. On the social level, however, it was inefficient because pooling would lead to a superior result. This failure of the market, or the "optimality gap" (*ibid.*, p. 156), might be exploited by non-market institutions. Furthermore, Arrow distinguished between two different meanings (or types) of transaction costs:²⁶ "The transaction cost may represent a real cost independent of the method of market organization, for example, transportation cost ... Alternatively, transaction costs may inhere in a particular mode of economic organization, and may be avoided by switching to a different system" (Arrow 1965, p. 155).

Applied to the case of health insurance, this implies that some of the administrative costs are unavoidable under any mode of organization and ownership structure. On the other hand, the operation of the NHS may require less recordkeeping than a system of individual reimbursement. Both types of transaction costs refer to the sacrifice of resources. But only the second category represents opportunity costs that can be avoided if the problem is how to best organize health insurance.

This debate sparked by Arrow's analysis of health insurance reveals the political potential inherent in the concept of transaction costs. It was fought on both the conceptual and the empirical level. Both sides agreed on the fact of less than complete insurance coverage. The policy implications of this datum differed, however, with the interpretation of transaction costs. Arrow used the concept creatively in an attempt to outmaneuver Lees' claim that the presence of transaction costs made some degree of private self-insurance optimal. On the individual level, the only way to avoid transaction costs consists in refraining from transactions. In broadening the concept to include all costs that are avoidable by switching to another mode of resource allocation, Arrow could reject self-insurance as the only alternative to the presence of transaction costs in the given allocative framework of the market.

One implication of Arrow's shift away from a market-centered perspective is that the traditional dichotomy between market and government intervention gives way to a general comparative assessment of institutions. It was precisely this step from which the other general equilibrium theorists had shied away. While market imperfections refer to the sub-optimality of the institution of the market, Arrow generalized transaction costs to an analytical category to assess the relative "imperfectness" of alternative allocative mechanisms. Due to his willingness to consider not only markets, firms, and state regulation but also traditions of trust and moral codes amongst the set of alternative institutions, Arrow's definition of transaction costs put the concept at the centre of an institutionally inspired economic theory. At the same time, however, transaction costs lost the straightforward formal tractability inherent in their interpretation as brokerage charges or bid-ask spreads. Short of the advent of a truly general theory of resource allocation that would include all feasible institutional alterna-

²⁶ It is not unambiguously possible to infer from the text whether Arrow wanted to draw attention to two different concepts or to sub-categories of the same concept.

tives and thus provide the grounds for consistently measuring transaction costs inter-institutionally, Arrow's broadening of the concept, with the attending analytical problems of sharply grasping it, paved the way for its gradual absorption in a metaphor closely resembling the old metaphor of "frictions."

VIII. CONCLUSIONS: FROM FRICTIONS TO COSTS TO FRICTIONS

The historical picture sketched so far consists of the following stages: in the late nineteenth century, the notion of friction was used in economic discourse to address in an indiscriminating and ad hoc way a broad range of factors which, in one way or another, referred to aspects of the institutional context not directly addressed in economic arguments and theories. In that sense, the physical metaphor worked as a residual category of economic enquiry that marked the boundaries of analytical curiosity. Next, Hicks (1935) called this boundary into question by "endogenizing" the notion of friction and replacing it with one of the central economic categories the notion of cost. Hicks was operating in the context of monetary economics and financial markets, thus he suggested the examination of the costs of investment and in particular of the brokerage fees investors have to incur. As Marschak, Baumol, and Tobin have shown, this cost, which is readily accessible empirically, lends itself to incorporation into existing theory without calling for fundamental conceptual revisions.

Yet, when general equilibrium theorists like Niehans, Foley, Hahn, and Kurz turned to the more fundamental implications of the general idea that exchange is costly, they soon found tensions between the narrow confines of brokerage and the underlying intuition of transaction costs. But they shied away from facing these tensions head on. Difficulties regarding the issue of fixed transaction costs were relegated to the empirical sphere, the impasse in the interpretation of efficiency was identified but not productively explored, and the crucial links from transaction costs to questions of information, property, and institutional issues in general were acknowledged but not taken up to refine the concept. In a review of the field, Niehans (1987, p. 679) came to the conclusion that it represented an area where, notwithstanding some initial advances in the 1970s, "rigour so far has been at the expense of substance." One of the main reasons for this stagnation lies in the continuing lack of a theory of exchange on the level of transactions. In the words of Martin F. Hellwig's 1992 Presidential Address to the European Economic Association:

[T]he problem is to find appropriate conceptual foundations for monetary economics. I believe that we do not, as yet, have a suitable theoretical framework for studying the functioning of a monetary system. The main obstacle to the development of such a framework is our habit of thinking in terms of frictionless, organized, i.e. Walrasian markets (Hellwig 1993, p. 215).

This reminds one of Ronald Coase's longstanding conviction that the incorporation of transaction costs into economic theory requires a fundamental reorientation of the discipline. In the meantime, however, the concept of transaction costs began to spread to other, more applied, areas of economics. The contro-

versy between Arrow, and Lees and Rice marks two turning points. First, the concept became actively employed in advocating a perspective that reaches beyond standard theory. Second, some authors began to broaden their interpretation of transaction costs beyond the narrow understandings of the monetary and financial literature. This broadening went hand in hand with the application of the concept to address institutional issues previously neglected.

Lacking an available theoretical framework with which to sharpen the concept in this “institutional turn,” authors increasingly used it in an open-ended metaphorical way. This phenomenon has been widely acknowledged in the literature and is commonly referred to as the loose nature or “vagueness” of the notion of transaction costs that makes it a catch-all term (cf. Miller 1965; Niehans 1969; Shapiro 1971; Krier and Montgomery 1973; and Cheung 1974 for early statements, Davies 1986; Allen 1991; and Dixit 1996 for more recent ones).²⁷

The work of Oliver Williamson provides an interesting illustration of this point. Toward the mid 1970s, Williamson increasingly emphasized the notion of the transaction in his analysis of governance structures, simultaneously starting to refer to his approach as the “transaction cost approach” (cf. Williamson 1973; 1974, pp. 1439–40, 1442). His contributions of the early 1970s brought the theory of industrial organization and the firm (back) to the level of transactions and served as a crucial input to bring this field to fruition in the 1980s. Yet, in spite of this central focus on transactions, the notion of transaction costs itself does not assume a major *substantive* role in his work. One of the central tenets of the transaction cost approach is that:

the costs of writing and executing complex contracts across a market vary with the characteristics of the human decisionmakers who are involved with the transaction on the one hand, and the objective properties of the market on the other ... (Williamson 1974, p. 1442).

This is the result of Williamson’s strategy to operationalize transaction costs, not by elaborating on the concept itself, but by replacing it with a detailed analysis of contractual and organization arrangements. As a result, his framework studies governance in terms of the transactional and human factors which determine whether a transaction takes place in the market or internally. The notion of transaction costs is largely used in an informal way to address the differences in performance that result from this analysis. Hence, Williamson’s transaction cost analysis takes place as an exploration of the causes which give rise to transaction costs.²⁸

It is not argued here that this broad use of the term amounts in any way to a deficiency. Quite to the contrary. Its eclipse was probably a precondition for

²⁷ The successive broadening of the concept of transaction costs during its diffusion through the economics literature in the period up to 1975 is explored in detail in Klaes (1998).

²⁸ In more recent formulations of transaction cost economics in terms of a “reduced form analysis,” the explanatory content of the theory is predominantly expressed in terms of different degrees of asset specificity (cf. Williamson 1991; 1996). In fact, Williamson (1985, pp. 21–22) sees fundamental obstacles to the quantification of transaction costs, which motivate his indirect approach via asset specificity. For a more detailed analysis of this point, including a comparison with the contrasting approach of Douglass C. North, see Klaes (1996).

the productive problem shift one witnesses in Williamson's transaction cost economics. What is important from the perspective of the present paper, however, is the observation that the notion of transaction costs itself became used synonymously with the notion of friction. It assumed the place of a general metaphor to describe the relative efficiency of alternative means of allocating resources: "Transaction cost analysis ... is appropriate for studying the frictions in the system which may prevent the implications of received microtheory from going through" (Williamson 1974, p. 1495).

Thus, taking a step back and contemplating the overall picture of the history of the concept of transaction costs reveals a certain irony. Hicks (1935) suggested that it was possible to get rid of the imprecision of the notion of friction by expressing it in terms of costs. In following this suggestion, Marschak (1950) arrived at the concept of transaction costs. The theoretical lines of development that originated from his work either forced authors to admit that even a narrow interpretation of transaction costs opened up fundamental questions regarding the orthodox framework of modern economics (Niehans 1969; Foley 1970; Hahn 1971), or called for the development of a comparative institutional theory in which the concept of transaction costs itself dissolved into the old notion of friction, notwithstanding the important advances on the explanatory level in at least part of this literature (Arrow 1969; Williamson 1975).²⁹

While the folk history of transaction costs is often told as a story of remarkable success, the historical sketch presented here, which focuses on the transaction cost notion itself, suggests a rather different picture. The study of the use of transaction costs in the literature of modern economics turns out to be the history of the quixotic struggle of the discipline to endogenize one of the most pervasive residual categories of the neoclassical heritage—the category of institutional friction.

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²⁹ It should be noted that in order to develop their fruitful perspectives, these authors had to break away from the neoclassical confines within which Hicks first formulated his attempt to subsume friction under the notion of cost.

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