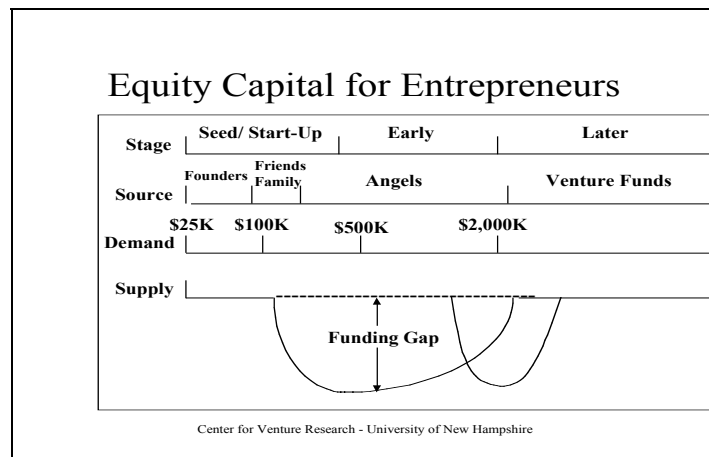


APPENDIX 4 - MARKETS

A. Market Size and Scale

As illustrated in Figure 1, founders equity provides the small amounts of capital to begin the early stages of the proof of concept. Friends and family may also provide some of this initial concept development capital. However, for the inventor and entrepreneur, the angel investment represents the first external validity test and detailed due diligence on the innovation and the potential commercial viability of the invention. Currently, there are approximately 400,00 angels that invest between \$30-\$40 billion annually in around 50,000 entrepreneurial ventures. As the venture matures and begins to develop into a viable business that is producing products or services, professional venture capital funds become the primary source of capital.

Figure 1



Institutional venture capital investments, as shown in Table 1, have expanded rapidly since 1994. As the table indicates, venture capital investments in entrepreneurial ventures in the first two quarters of 2000 have already exceeded total investments for the year 1999. Average deal size (the amount invested per company) has also increased. These angel and venture capital investments represent a vital component for the new economy. While the number of start-ups that qualify for angel and venture capital investments are relatively small (less than 60,000 companies per year) and represent less

than ten percent of all the start-ups in a given year, most of the new jobs attributable to small firms are created by these relatively few firms that start small and grow fast. Since 1979, over 75% of net new jobs were created by these high growth start-ups (Birch et al. 1993). Over the last several years, this translates into these entrepreneurial ventures adding close to 6 million jobs to an economy that added 7.7 million in total.

Table 1

Venture Capital Funds			
Year	Total Amount	Number of Companies	Amount per Deal
1994	\$2.7 billion	1,000	\$2.7 million
1995	\$3.8 billion	1,128	\$3.4 million
1996	\$10.1 billion	2,163	\$4.6 million
1997	\$12.2 billion	2,706	\$4.5 million
1998	\$16.0 billion	2,692	\$6.0 million
1999	\$35.6 billion	4,006	\$8.9 million
2000 (1,2)	\$37.0 billion	2,855	\$13 million

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The private investor and the institutional venture capitalist provide a range of markets through which an innovator or entrepreneur can seek to obtain financing to bring a product to market. It is how these markets function that determines the cost of capital to the innovator and entrepreneur. Markets provide a mechanism that strikes a price for a good or service. In some markets, especially in homogeneous commodities, the information needed to achieve this end is relatively straightforward. All market trading, however, involves taking a degree of risk. Most U.S. government bonds, although free of default risk, are not free of inflation risk. In other markets, a more complex valuation process may be required of individual market participants, who may not have full access to all information. At either extreme, individuals will make decisions based on their value estimates. In the stock market, this decision may be to continue to hold a particular stock, or to sell it, or to buy. In deciding whether to subscribe or lend money to enable the exploitation of a patent, investors would have to be satisfied, among many other matters, that their rights in relation to the patent will be protected.

It seems clear, however, that the existence of markets that are reasonably efficient, if not “perfect,” permits greater and low-cost access to the markets and stimulates interest, activity, and growth in those markets. Economic resources are allocated through the market mechanisms at prices that bring buyers and sellers together. Where there is a lack of information, and high transaction costs, the progress of the market is inhibited.

B. Scarcity, Choice and Efficiency in the Market

The discipline of economics, as noted earlier, is founded on the principle that goods and services are scarce relative to the need for them; and that scarcity demands a price. The relative scarcity of resources leads to the need to choose among competing uses. For example, assume that steel is used only in making washing machines and cars. The use of a ton of steel in car making deprives washing machine making of that ton of steel. The cost (the “opportunity cost”) of the ton of steel to car making is the cost of the steel in its next best alternative use, the manufacture of washing machines. Often, this opportunity cost will be reflected closely in the market price of steel; how closely, will depend on the efficiency of the market for steel.

Economists define efficiency as the absence of wasted resources, such that an economy maximizes its output from a given input and a given state of technology. In making the decisions to allocate scarce resources, therefore, the economy, or perhaps more appropriately society, must make three closely-related decisions:

1. How to allocate its resources efficiently.
2. What combination of goods and services to produce.
3. How much of each good and service to distribute to individual members of society.

Using resources efficiently means maximizing output from a given input, or minimizing input for a given output. It is necessary to long-term economic survival, however, to produce those goods and services that society requires. Who should receive the goods and services produced is a distribution decision that will be left aside for the present purposes.

The efficiency benefits of specialization within an economy was first formally identified by Adam Smith in his “Wealth of Nations,” in relation to the division of labor and using the example of pin-making:

“One man draws out the wire, another straightens it, a third cuts it, a

fourth points it, a fifth grinds it at the top for receiving the head; to make the head requires two or three distinct operations; to put it on is a peculiar business, to whiten the pins is another; it is even a trade by itself to put them into the paper; and the important business of making a pin is, in this manner, divided into about eighteen distinct operations, which, in some manufactories, are all performed by distinct hands, though in others the same man will sometimes perform two or three of them. I have seen a small manufactory of this kind where ten men only were employed, and where some of them consequently performed two or three distinct operation . . . Those ten persons . . . could make among them upwards of forty-eight thousand pins in a day. Each person, therefore, making a tenth part of forty-eight thousand pins, might be considered as making four thousand eight hundred pins in a day. But if they had all wrought separately and independently, and without any of them having been educated to this peculiar business, they certainly could not each of the have made twenty, perhaps not one pin a day; that is, certainly, not the two hundred and fortieth, perhaps not the four thousand eight hundredth part of what they are at present capable of performing, in consequence of a proper division and combination of their different operations.”¹

Smith, in the above passage, described *how* goods might be produced more efficiently, but did not discuss the fact that efficiency may be influenced also by *which* goods are produced. This aspect of efficiency may be studied by means of the “theory of comparative advantage.” People, firms and countries differ in their ability to produce particular goods and services efficiently, and thus may benefit by specializing where they have a comparative advantage, and then exchanging some or all of the fruits of their labors for other goods and services. For example, country A may be much more efficient at producing telephones and somewhat more efficient at producing trucks than country B. It will be more economically efficient for A to produce telephones and B to produce trucks, and for A and B to trade in these goods, than for country A to make both goods. Put another way, it will be economically efficient for B to make trucks because it is comparatively less inefficient than A in truck production than it is in telephone production as compared to A.

¹ Adam Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations*, 1776; Dent, London, 1910, p. 5.

C. *Exchange, Markets and Money*

Specialization gives rise to exchange. Smith introduced the concept of exchange in another well-known passage:

“Nobody ever saw a dog make a fair and deliberate exchange of one bone for another with another dog . . . But man has almost constant occasion for the help of his brethren, and it is vain for him to expect it from their benevolence only It is not from the benevolence of the butcher, the brewer, or the baker that we expect our dinner, but from their regard to their own interest. We address ourselves, not to their humanity but to their self-love, and never talk to them of our own necessities but of their advantages. Nobody but a beggar chooses to depend chiefly upon the benevolence of his fellow-citizens.”²

The institution of the market enables an exchange to occur, with one person exchanging goods or services for the goods or services offered by another. Negotiation between the two establishes a rate of exchange between the quantities of the goods and services to be traded or bartered. Such a bartering arrangement, however, requires a “double coincidence of wants,” such that, at a given moment in time, the first person has exactly what the second person wants, and *vice versa*. In practice, this is unlikely to occur, and so the “value” of goods and services began to be expressed in terms of a common standard or measure.

This measure, which we know as “money,” is the result of market negotiation that establishes rates of exchange between and among goods and services. This rate of exchange in money terms may disappear as soon as the particular exchange has been consummated. If, however, information about the exchange becomes widely known within the market for these goods and services, details of the exchange may be taken into account by other market participants, thus leading to the recognition of “market” prices for the goods and services traded.

In the extreme case, the so-called “perfect market,”³ no single seller is able to charge and obtain a higher price than any other; all must accept the market price. Further, one person may accept money in exchange for goods or services, and then use that money, now or later (in this case money becomes a “store of value”), to buy goods and services from one or more other persons. D.H. Robertson stated:

² *Idem*, pp.12-13.

³ See below for a more detailed explanation of the “perfect market” concept.

“The first great achievement of money is that it enables man as consumer to generalize his purchasing power, and to make claims on society in the form which suits him best The second great achievement of money is that it enables man as producer to concentrate his attention on his own job, and so to add more effectively to the general flow of goods and services which constitutes the real income of society . . . The third great achievement of money is closely allied to the second . . . [M]oney immensely facilitates the making of loans and payments in advance of all kinds.”⁴

D. Markets and Other Institutions

Markets occupy a pre-eminent place in economics. The “substitutes” theory in economics takes the view that markets and certain other institutions (notably governments, the law, households and firms) are necessary for economic activity, but that the market is the primary institution, and other institutions are secondary.⁵ Under the substitutes theory, “firms, government, and other forms of organized economic activity are deviations from and substitutes for competitive markets.”⁶ The sequence of arguments under the substitutes theory is that the market is the primary economic institution, because competitive markets are the “most efficient organizers of economic activity.”⁷ If the market fails, then an institution, often a government, will intervene to prevent or mitigate the effects of market failure, through such measures as welfare programs, fiscal policy, and the regulation of financial institutions and markets. If government intervention fails, then fundamental institutional change may be necessary to achieve a restructuring of the relationship between government and the economy. This restructuring may lead, for example, to deregulation, welfare reform, and policies designed to reduce the size of the government sector.

As noted earlier, however, markets and governments are not the only institutions involved in economic activity. Others include households, the law, and firms. Firms exist as institutional responses to the failure of

⁴ D.H. ROBERTSON, *MONEY*, Cambridge University Press, 1922, pp. 4-8.

⁵ For a much more complete discussion of these issues, see J.R. Wible, “*The Economic Organization of Science, the Firm, and the Marketplace*,” *PHILOSOPHY OF THE SOCIAL SCIENCES*, Vol. 25, No. 1, March 1995, pp. 35-68.

⁶ Wible, *idem*, p. 38.

⁷ Wible, *idem*, p. 40.

markets efficiently to organize economic resources⁸ for the purposes of creating, producing and distributing goods and services. R.H. Coase identified three principal transaction costs in a market:

1. Information costs, that is, the costs of acquiring of information about market prices and price movements.
2. Negotiating costs, concerned with the initiation and analysis of contracts.
3. Short-term risk costs, that may be reduced by creating a longer term organizational structure, that is, a firm.

Coase wrote:

“The operation of a market costs something and by forming an organization and allowing some authority (an “entrepreneur”) to direct the resources certain marketing costs are saved. The entrepreneur has to carry out his function at less cost . . . because it is always possible to revert to the open market.”⁹

⁸ Known to economists as “factors of production.” Originally, these were three: land, labor and capital. The “organization” factor of production, “entrepreneurship,” was added by Alfred Marshall about 100 years ago.

⁹ R.H. Coase, *The Nature of the Firm*, *ECONOMICA* (New Series) Vol.IV, 1937, pp. 386-405, reprinted in *Readings in Price Theory*, AMERICAN ECONOMIC ASSOCIATION, Allen & Unwin, London, 1953. Quotation from the AEA reprint, p. 338.