

Chapter 1

The Early Years

America is another name for opportunity.

—*Ralph Waldo Emerson*

I grew up in Brooklyn, New York, in the 1940s and 1950s, with a father who loved vaudeville and movies, and a mother whose memories of her wealthy upbringing in Europe dominated our home.

The House of Sandor and Mirner

My father, Henry R. Sandor, was dark-haired, olive-skinned, and heavy-set. A pharmacist by day, Henry worked six days a week from 10 in the morning until 10 at night, and came home well after I went to bed. The summer of 1950, when I was almost nine, he taught me how to make ice cream sodas and malted milkshakes at his store in Brighton Beach. The store was often filled with my father's friends from show business, and I loved going to work every day. He measured his ingredients with precision as he ground medicines in his mortar and pestle, readying them to be put into capsules. It was wonderful watching him. A side effect from my summer job was a

gain of 10 pounds, and it wasn't until my junior year in college that I stopped being overweight. My father used to say that I had personality, and that it was almost as important as brains when it came to success. I felt his love and respect.

My father often told stories about his own father and grandfather. His father, Maurice Sandor, was a dapper and handsome man. He was going to be hung for anarchy at the ripe old age of 16 for conspiring with Leon Trotsky to overthrow the Czar. Maurice's father, however, was the chief engineer for the Trans-Siberian Railroad, and through political connections at the court of the Czar, was able to arrange to have him leave for America that very day. Trotsky wrote letters to my grandfather, asking him to return to Russia, and came to the pharmacy to play chess when he visited New York. We never really knew what was fact or fable. Maurice, according to Ellis Island records, did not, in fact, sail to this country in steerage. He spoke no English when he landed in New York, survived by selling apples on Hester Street, and within 10 years earned a pharmacy degree from Columbia University and an MD degree from New York University. Before long, Dr. Maurice Sandor owned and ran a drugstore and practiced medicine. He met Frances Diamond, my grandmother, on the Atlantic crossing. Frances came from a family of performers—her cousin, Selma Diamond, was a comedienne.

While my father profoundly respected education and spoke proudly of his father's degrees, he was more of a Bohemian than an intellectual. He had two particular quirks. I have the fondest memories of the different hats he would wear on whim, ranging from berets to fedoras. He also had a passion for cars. Most cars on our streets were Buicks or Chevrolets, but not ours. Henry drove foreign cars—mostly Jaguars and Volvos. There was an occasional American car like the Nash Rambler.

Known as "Broadway Hank," my father was a quiet person unless he was standing before an audience. He had a giant personality when he performed. An entertainer at heart, he loved stand-up comedy, singing, and playing the guitar. He received an offer to play in a big band in the 1920s but had to turn it down. His father had died at an early age, and he had to help raise and support his brother and sisters. He worked as a pharmacist to accomplish this and put his career as an entertainer

on hold. His brother worked side by side with him at the drugstore. Two of his sisters went to Hunter College and became teachers, while his youngest sister became a housewife. My father's brothers and sisters led typical middle class lives, working hard and placing a strong emphasis on education. The next generation of Sandors, following my father's generation, produced two doctors, three dentists, one psychologist, one economist, and a teacher.

My memories of growing up were not dominated by my father's profession, but more by the Bohemian lives of the people who traipsed through our house from time to time. I remember the first time I saw my father entertain. My brother, Frank, and I hid behind a chair in our house as Broadway Hank charmed everybody at the party with his humor and songs. My mother kept on coming out with food, and my piano teacher played the piano and they all sang late into the night. Her father was the lead violinist in the Moscow Symphony, and she herself was an attractive woman with a sassy attitude—there were often many allusions to sex in the adults' conversations that I heard but never understood. I fell asleep that night to the sounds of song and laughter.

I loved Sundays. It was the only day of the week my father was home. He slept late and woke up to a sumptuous breakfast prepared by my mother. Sunday was also a day of rituals. We would all jump into a car and drive to Manhattan. We went to double features in one of the many movie theatres in and around Times Square. One memorable Sunday, we went to the RKO Palace for a double feature with 10 acts of vaudeville between two movies. Another wonderful memory is attending my first Broadway show starring Paul Muni, a famous movie actor of the day and a friend of my father's. Paul captivated audiences in *Scarface* and *The Story of Louis Pasteur*. I felt a surge of pride that there, standing on stage, was my father's friend. After movies, we frequented Chinatown. Henry had a great nose for restaurants and a small joint, Hong Fat Company at 69 Mott Street, became our regular stop. Unlike the many chop suey restaurants that dotted Brooklyn, that one was actually authentic.

On other Sundays, we frequented a Chinese restaurant owned by my father's friend Tom Kwan. The restaurant was on the second floor of a two-story building. We sat in the kitchen for hours and watched Tom

at work, tasting the pork and duck as he cut the meat and prepared the dishes with amazing precision. He often barked commands in Chinese to his Alaskan husky, whereupon the dog sat down or trotted away. It turned out that the dog understood not only Chinese, but also English. I was awed by that bilingual dog. I wondered, “How could a dog understand Chinese?”

My father first got to know Tom during the Roaring Twenties. Broadway Hank was performing in a speakeasy when Tom, a regular, stopped by one night wearing a lot of gold jewelry. My father noticed some local gangsters eyeing Tom, so he offered to store Tom’s valuables until the next time he came back. Tom did this without any sign of distrust or suspicion. My father also had him keep a small amount of cash handy, in case Tom needed to placate any thieves. Sure enough, Tom was mugged as he left. My father returned his valuables the next day and from then on, Tom visited our house every couple of years at some unexpected time during the Christmas season with bags of Chinese sausages, pork, and duck in tow. He sometimes even brought a large wok to cook food. I sat for hours watching him cook. The meal always ended with a big Christmas fruitcake.

At some point, Tom stopped showing up—in fact, he didn’t come for three consecutive years. He had always kept his personal life to himself, and my dad never knew where to contact him. I asked my father why we hadn’t seen him. My father said in a matter-of-fact way, “Tom always comes. He must have died.” It turned out that Tom had closed his restaurant and retired. Those wonderful days spent in Tom’s company taught me a lot about Chinese culture and loyalty—something that would prove invaluable later in life during my visits to China.

On the opposite side of Tom’s restaurant was Nathan’s Famous—the largest seller of hot dogs and hamburgers in Coney Island and a big threat to the smaller hot dog vendors. According to my father, competitors once spread word that Nathan’s food was unsafe. To recover his business, Nathan went to the local hospital and announced that any doctor or nurse who came in uniform would get a free meal. When locals and tourists saw so many white-uniformed professionals eating there, they stopped paying attention to the rumors of a dirty restaurant

with unsafe food. The importance of perception and promotion was a life lesson that stayed with me.

Just as my father was the patriarch of his family, my mother was the matriarch of her family. My mother, Luba Mirner Sandor, was born in Poland in a city that ultimately became Russian. Luba was a petite, shapely brunette quick to smile. Her father, David, had changed his name from Berenson to Mirner for some unknown reason, and then migrated to Antwerp, Belgium, to become a successful diamond merchant. Family lore was that he was a cousin to Bernard Berenson, the preeminent art critic. I personally never knew what was fact or fancy. David Mirner became a member of the Diamond Bourse. He was recognized in Belgium for his charity and was reportedly one of the great chess players in the country. He lost his fortune investing in a diamond mine in South Africa and from his frequent visits to Monte Carlo. He and my grandmother, Penya Mirner, along with my mother, her sister, and two brothers, came to the United States penniless. My mother's sister had Tourette's syndrome and could not work. Her brothers got married and were partners in a dry-cleaning business together. Education was a critical part of the Mirner family's values. The third generation of Mirners became chemists, musicians, and teachers.

All of the Mirners seemed to have settled into normal middle-class lives when things changed. My uncle Joe fell in love with a neighbor's wife and left home. He moved into my room shortly after my brother moved into our basement apartment. My dreams of finally having my own room were dashed. Joe was an elegant dresser and articulate man with a small moustache, whose dress and demeanor reflected his European upbringing. To avoid World War I, David Mirner moved the family to London. All the children were sent to boarding school there and in Switzerland. Joe's life in boarding school in England had left him adept at the art of conversation, and he was a wonderful companion. He also had a great sense of humor. His companion was a stylish woman many years his junior. Joe lived with us for a short time, only to have a fatal heart attack shortly after moving in with his companion.

My uncle Charlie, a kind man with boundless empathy for others, was the next to move into my room. He later dated Uncle Joe's companion, in what others would at best call an odd set of circumstances.

My mother, Luba, had absorbed all that a privileged lifestyle enabled. She was a woman of boundless energy, fluent in five languages. While my father was not talkative when not performing, my mother was naturally outgoing and gregarious. She was filled with strong beliefs and passionate about every activity she participated in. According to my brother and me, she was “America’s Sweetheart.” My mother shared her father’s business skills and later in life became manager of a chain of women’s clothing stores. Although frustrated by not being afforded the opportunity to go into business and somewhat bitter about not receiving the things in life she thought she richly deserved, she gradually came to terms with the circumstances and genuinely enjoyed life.

Five years older than me, my brother, Frank, had been difficult as a child with learning disabilities, so Luba hadn’t wanted any more children. As she later told me, “You were unplanned.” We didn’t know it at the time, but he was dyslexic. Frank was much too old to be a companion to me, and my mother was always helping him work through his learning challenges. As a result, she was often not available for me. Frank was deeply loved and grew up as a generous human always concerned with others. He had a red Radio Flyer wagon that he was happy to give up when he learned that the war effort required iron—certainly an incredible sacrifice for an eight-year-old child. I understood his nobility but sorely missed that wagon. Frank went to medical school and later became a hematologist. He was and is a caregiver.

Given my father’s work schedule, my mother’s justifiable attentiveness toward my brother, and the age difference between Frank and me, I grew up often feeling alone in my own home. My mother’s eyes lit up whenever my brother walked into a room. They never lit up for me, but I was determined to make that different outside of our home. For as long as I can remember, friends became an important part of my life. By the time I was six years old, my mother began giving me an allowance of 25 cents per week. I would use 15 cents for a movie and candy, and my mother often asked me about the movie when I came back. She and the neighbors used to listen attentively as I faithfully described the plot and the characters. Their positive feedback only increased my desire to see more movies and tell people about them. This was further enhanced by the Sunday ritual of my father taking us out to movies. Movies were not

only entertainment, but became a means to learn about life. I came to enjoy them as much as I did reading.

Bobby Fischer and My Days at School

Friendship helped combat the isolation I felt on most days. Public School 99 (“P.S. 99”) provided all that I needed in kindergarten through third grade. School was easy, and I had plenty of friends. My world was shattered when my mother announced that we had bought a house and were moving. I began fourth grade at a new school with a great deal of apprehension. I soon learned that I had been put in class 4-5, which in those days meant that I would be among the slowest students in the fourth grade as well as those who were troubled and had behavioral problems. 4-1 was reserved for the brightest students. As the year went by, I was forced to get along with classmates who were very different from those in my earlier grades, which actually turned out to be a wonderful learning experience. After several months, the teacher recognized how quickly I was learning and responded accordingly. She started to treat me more like an assistant than a student, and I helped her prepare lesson plans and pointed out how she could reach some of the other students. Teaching thrilled me. In some ways, these days turned out to be some of the happiest days of my childhood. At the end of the year, my teacher told me that I had “made her year” and recommended that I be transferred to 5-1. I came back later on to see her as I grew up, and it always thrilled us both to speak about my year there.

Meanwhile, I made friends with Robert Friedman, who was a year younger than me. We played stickball, softball, and cards together and ultimately taught ourselves how to play chess, another driver in my life. We met Raymond Sussman, who lived in the neighborhood. He easily beat both of us in chess. His father, Dr. Harold Sussman, a nationally ranked player and dentist from Brooklyn who played in the Manhattan Chess Club, taught us strategies such as sacrificing pieces for positions known as gambits and how to think about chess in terms of opening, middle, and end games. He emphasized the importance of controlling the central four squares on the board, a life lesson for business and politics.

One day, out of nowhere, a boy a year or two our junior passionately pleaded to be included in Dr. Sussman's classes. His name was Bobby Fischer. We played blitz chess—one second per move—and initially Bobby was rattled. He went away and came back more polished and in each game became harder to beat. The last time we played together, he came back to play in a tournament organized by Dr. Sussman. Robert had eliminated him in an early round, and we were faced off for the final match. I won a closely contested game. The next thing we heard from Dr. Sussman was that Bobby had been studying chess from five in the morning until school began and then from the time school ended until he went to sleep. He wanted a rematch with both of us. We declined. And that's how Robert Friedman and I managed to have a lifetime winning record against the one and only Bobby Fischer.

Fifth grade was harder. I was the new kid in class and had to make a new set of friends. As the next two years went by, I became bored and often misbehaved. My sixth-grade teacher was a martinet and berated me in public for my behavior until I became silent and refused to answer any of her questions. Eventually, she found a solution by assigning me to the principal's office to prepare tests and outlines for teachers. I learned how to type, a skill that proved invaluable, and relished the hours outside the classroom. Before long, I went to junior high at yet another new school. The experiences, feelings, and challenges resembled those I had gone through in grade school.

A friend of my father's found a job for my brother as a counselor in a summer camp in the Berkshire Mountains and I was sent along as a camper. As it turned out, one of my classmates from junior high school had poisoned the well for me and made it hard for me to make friends. I was miserable and wanted to go home after the first week. My parents told me that I had to stay.

To escape reality, I often listened to an old radio with static. The static annoyed the other campers and in an effort to placate them, I one day started screaming at the radio and shaking it. My fellow campers started to laugh as I went through a 10-minute routine about how bad the radio was and ultimately smashed it on the floor, creating an uproar of laughter. It was the beginning of my role as the camp comedian, and I became adept at finding humor wherever

it existed. We had variety nights when I was urged by all to do a standup routine for 15 minutes. Years of watching my father finally gave me a chance to learn how to deal with an audience. I was a good mimic, and while I had experimented with humor sporadically with friends, I had never performed onstage. Yet it all came together, and from then on I became accustomed to providing comic relief to campers and counselors alike. I did my standup routine for the next three years and at one time actually thought it might become my career. I was not the only comic at Camp Pontiac. Another camp comedian, Larry Brezner, and I spent time together sharing jokes. We lost touch over the years but I had fond memories of him. He later went on to Hollywood and co-produced the original version of the film *Arthur* and *Good Morning, Vietnam*.

After my first summer at camp, I advanced to the ninth grade at a new high school. My breakthrough with comedy at camp helped me win new friends even though I was short, fat, and at 14, a year younger than other sophomores. Midwood High School, also attended by Woody Allen, became a dream come true. I was elected president of the student council, which consisted of the presidents of the junior and senior classes. I loved the student government, although I ran for mayor and lost. I naively thought that good ideas and effective communication were all that was required, and didn't realize until too late that politics also required alliances and organization. Those days prepared me for a life that would often revolve around election politics at exchanges.

Classwork was moderately challenging, and I did reasonably well while maintaining an active social life. In fact, my parents constantly prodded me to do better. They thought me lazy as I spent most of my time with friends or in front of the television. While I frequented movies and played poker on weekends, Frank worked endlessly to overcome his learning challenges and set the standard for dedication and hard work. He performed well and followed my father and grandfather to study pharmacy at Columbia. My father wanted him to enter the pharmacy business but soon realized that it did not really suit him. Frank went on to study art and obtained a master's degree at New York University, all in preparation for medical school.

Discovering Economics in Brooklyn

By the time I had to attend college, my family's resources had already been depleted on Frank's education. I had the choice of going to Columbia to study pharmacy or one of the free public universities in New York City. At 16, I was deemed too young to go to college and live away from home. I didn't want to be a pharmacist, so my best choice came down to either the City College of New York, which had a reputation as the Harvard of New York City colleges, or Brooklyn College, another highly rated City college. I hated the 90-minute commute it took to reach CCNY by bus and subway, and ended up enrolling at Brooklyn College.

Like many college freshmen, I had no direction or focus. My highest priority was to find a group of friends and begin dating. I pledged Tao Alpha Omega, a local fraternity whose members liked to party and gamble. I loved the card games and trips to the racetracks. To meet women and endear myself to my newfound fraternity brothers, I organized a campus-wide beauty contest. *Esquire* was a popular magazine of the time and I called the girls in the pageant *Esquire* girls. Aside from being a hit, the pageants taught me how to organize an event, attract an audience, and the potency of being a convener. Classes were of secondary importance to me. I enrolled in a number of different liberal arts and science classes, trying to find a subject that ignited my passions. My grades were barely passing, as parties and gambling occupied most of my time.

Ellen Simon, a smart and pretty coed on campus, had a quirky and adventurous side to her. Like many women of her generation, she was preparing to be a teacher. Her mother was a social worker and her father was a history teacher who became the owner of a small business to better support his family. Ellen grew up sharing many of her parents' values—she was always a caregiver and a cheerleader for others. Like my father, Ellen loved to perform and possessed the heart and soul of an artist. She read voraciously about politics, contemporary culture, fashion, and art, all blind spots for me. In this respect, she was my eyes and ears into that world. Her art reflected her enthusiasm for all that was new as well as the clear and intelligent way she saw the world. Ellen thought in pictures while I thought in words, making us complementary.

Simply put, I was smitten with her. Ellen ignited my passions and ambitions after our first dance. We dated and fell in love. Although

I had dated before, I had never known what intimacy was. With Ellen, I could share my most secret thoughts, dreams, and fears. Ellen's grandfather, a deeply religious man, often said, "She was born under a special star," and she was. Ellen was responsible, hardworking, and passively ambitious, holding her ambitions and leadership skills in check for many years in order to help me advance mine. Because of her, I came to take my studies more seriously. She demanded it for herself and for me. Together, we shared a vision for a life that was different from that of our contemporaries. I realized that my academic success was necessary to achieve this dream.

Ellen's younger brother, Jeff, was only 11 years old when I met him. Ellen's father, Julius "Julie" Simon, died of an embolism in his early fifties and her mother, Mattie, had to raise him. Jeff became like a younger brother to me. He was bright, sensitive, and a competitive runner. Jeff went on to get a PhD with a specialty in terrorism well before it had the relevance it does today. It always puts a smile on my face when he appears on television to comment on some recent event. I helped raise him and am very proud of the man he has become.

Ellen had taken an economics course from a young professor, T. Bruce Birkenhead, and somehow knew that I should meet and study with him. Having done his master's thesis on the economics of the British sports car industry, Bruce was not your typical theocratical economist. Bruce and I had common interests, as my father at this point was in his Jaguar car phase. Bruce's PhD thesis had been on the economics of Broadway, another common interest. He made economics come alive, and made me realize that it was possible to bridge the gap between theory and practice. I decided to major in economics. Bruce told me that economics was the queen of the social sciences and encouraged me to go on to graduate school. He thought it would open up a whole new world to me. He was right. Finally, I had found something to be passionate about, and college academics became enjoyable. I got straight A's from then on and went on to win a prize from the department when I graduated.

Graduate school was the next step, a large departure from the expectations of my parents and my fellow students who were focusing on professional careers like medicine, dentistry, or law. Seeking

Bruce's advice, I applied to all of the leading economics departments around the country, as well as the London School of Economics. The University of Minnesota was not an obvious choice for somebody born and bred in Brooklyn, New York. However, Bruce pointed out that its economics department was ranked sixth in the country, and also had Walter Heller as a member of the faculty. Heller was then the head of the Council of Economic Advisers under President Kennedy. Economics had at the time attained a certain sort of glamour because it was embraced by the young and handsome president as a solid part of the New Frontier.¹ It was no longer a dismal science, and had begun to attract serious followers, even among college students.

Among the schools I was accepted into, the London School of Economics was my school of choice. Unfortunately, there was no financial aid for the first year. Ellen and I had become engaged, and wanted to get married at the end of my first year of graduate school. We had had some tumultuous years while dating. I had been the bad boy, rarely attending classes and either gambling or going to movies, according to her friends and family. While I had started to do well and wanted to become an economist, she still allegedly would have been better off marrying a professional. We broke up in the summer of 1961, after her sophomore year and my junior year. She ended up in Europe while I hitchhiked across the United States. After a separation of six long months, we got back together during one Christmas break.

The decision was not difficult. When it came down to it, the University of Minnesota offered me the most financial aid and provided the opportunity for us to get married. We had a plan: I would spend the first year there alone while she finished her studies and began teaching. She would then find a teaching job here in Minnesota, when I started my second year of graduate school. We would get married in June 1963.

¹The term New Frontier was coined by John F. Kennedy in 1960 to describe the program of his new administration. What was notable about the New Frontier was its advocacy of economics as a means of pushing the nation forward.

Bruce was not only a mentor but a friend. He arranged for me to teach at Brooklyn College the summer following my first year of graduate school. He went away that summer to manage a theater at Hyannis Port, and subletted his apartment to Ellen and me.

On to Minnesota

In September 1962, shortly after my twenty-first birthday, I boarded an airplane for the Twin Cities. My friends warmly joked that I needed a visa. I had never lived on my own, and decided to live in an international residence hall. It was completely different from attending a college in New York, which had been filled with commuters, which was not to say that the college experience in New York City had not been interesting. On the contrary, it had not only been filled with campus life, but had also given me the opportunity to take advantage of the city's great museums, theaters, and cultural events. These were the years of the beatniks,² and college life was inseparable from regular trips to Greenwich Village. Fine dining and ethnic food knew no boundaries in New York City. Saturday nights were spent in some of the city's best restaurants. I had a particularly good run at poker in college, which allowed us to visit a different restaurant almost every night during college breaks.

The University of Minnesota was a typical Big Ten school and had a completely different college culture from what I was used to. I met a lot of local students, and spent the first year going to football, basketball, and hockey games. Beer and pizza were the standard fare. I typically got up late in the mornings, went to classes, and taught, before hitting a bar called the Mixers with other graduate students. I made friends with students from diverse international backgrounds, as well as from across the United States.

One of them was Jon Goldstein, a lifelong friend who urged me to focus on environmental issues back during our days together in

²Beatnik was a media stereotype of the 1950s and early 1960s that caricatured the Beat Generation literary movement and violent film images. The term was coined by journalist Herb Caen in "Pocketful of Notes," SFGate.com Archive, April 2, 1958.

Minnesota, and continued to prod me for more than 40 years afterward. His advice would have a profound impact on my life and career.

After my first quarter of intermediate micro- and macroeconomic theory, I began to explore what the economics department had to offer. I took a microeconomic theory course from Leo Hurwicz, whose formulation of mechanism design challenged Adam Smith's basic formulation of the invisible hand. Hurwicz saw that Smith's model of perfect competition, which harnessed individual self-interest to optimize the allocation of scarce resources, did not really work. Markets were not always competitive, not to mention that people were not perfectly informed and could use private information to further self-interests. What Hurwicz tried to do was to design institutions—or mechanisms—that provided incentives for people to achieve social objectives. I was struck by Hurwicz's willingness to take on one of the gods and foundational tenets of the economics profession, and by his efforts to come up with a creative alternative.

In Hurwicz's course, I also came across the writings of Ronald Coase, then a lesser-known economist at the University of Chicago. At the time, I was impressed by the utter clarity with which he used pure, succinct prose to explain complex topics such as the theory of the firm, and found his style a refreshing change from the mathematical equations that were engulfing economics.

Ellen joined me in Minnesota as I started my second year, and began teaching fifth graders at a public school near our home. She helped support me throughout graduate school, putting her own desire to go on to graduate school on hold. She was a wonderful teacher and was widely praised in the school newspaper when we left the Twin Cities. We returned to New York for the summer of 1964 where I taught introductory economics at NYU and Ellen studied art. We met after our classes in Greenwich Village and visited many art galleries. It was during this time that we began collecting affordable lithographs.

Back in Minnesota, I added a minor in statistics and studied econometrics in addition to my majors in public finance and international trade. My real passion, however, became the economics of innovation. My interest took root in a graduate seminar on the economics of research and development taught by Jacob Schmookler, which exposed me to the relationship between invention and economic growth. A book

by Professor Schmookler, *Invention and Economic Growth*, published in 1966³ became the classic explanation of technological progress. Until then, economists had generally assumed that inventive activity was exogenous, or not subject to the forces of supply and demand. As a result of Schmookler's work, invention came to be viewed as endogenous, an activity responsive to incentives or demand.

The concept of innovation had fascinated me for many years. As a child, I loved hunting through my father's pharmacology library for tales of how ancient civilizations had developed cures for certain ailments. I also loved Paul de Kruif's book *Microbe Hunters*, which told of the quests of modern scientists like Louis Pasteur and Marie Curie. In economics, I found parallels in the descriptions of modern technological inventions like the transistor, the photocopy machine, and the Sidewinder missile, including details about the challenges that had to be overcome for these products to succeed. A British economist, John Jewkes, co-author of *Source of Invention*,⁴ was a favorite author of mine. I decided to write my doctoral dissertation on the economics of inventive activity. The topic was not in vogue in the economics profession, but fascinated me nonetheless. Throughout this process, Professor Schmookler encouraged and advised me.

Before I could start on my dissertation, I needed to pass a preliminary oral examination. I returned to New York to prepare. Fortunately, I had kept meticulous notes for all of my courses, as well as summaries for the written examinations in theory, public finance, and international trade. I then narrowed those summaries down further to focus on the highlights. This process of funneling complex ideas into their simplest forms would later serve me well in my career. Unnerved by the prospect of the two-hour examination that would determine my future, I came down with a severe case of shingles. Nonetheless, I took the exam in the early fall of 1965 and passed. The committee directed me to take more mathematics. "Real analysis" helped nurture my inductive

³Jacob Schmookler, *Invention and Economic Growth* (Cambridge, MA: Harvard University Press, 1966).

⁴John Jewkes, David Sawers, and Richard Stillerman, *Source of Invention: A Study of the Causes and Consequences of Industrial Innovation through the Inventions of the Nineteenth and Twentieth Centuries* (New York: St. Martin's Press, 1958).

reasoning, while the quantitative methods in economics turned out to be a course I was later asked to teach.

In my dissertation, “Size of Firm, Economies of Scale in Research and Development and the Use of Patented Inventions,”⁵ I explored the sources of inventive activity in industrial corporations and the commercial value of patented inventions. I hypothesized that investments in different projects by a company were tantamount to investments in a diversified portfolio of stocks of the sort described by Harry Markowitz, a finance professor at the University of California at San Diego and a pioneer of modern portfolio theory. If companies viewed their investments in various research and development projects as a portfolio of investments, it was reasonable for them to use fewer of their patented inventions. They only needed one or two successful inventions to achieve large payoffs.

I designed a survey to test my hypothesis and sent it to 365 companies. The research was expensive, but I managed to secure a grant from the National Science Foundation. The data I collected confirmed my hypothesis and found that large firms, which had larger, more diverse R&D portfolios, used smaller portions of their patents. This led to diminished output from non-R&D employees due to less communication and joint inventive activity between R&D and non-R&D staff. In addition, it led to less research geared toward specific firm needs. I later realized that my study of the value of patented inventions was really an attempt to standardize inventive activity. I managed to get a couple of articles about my research accepted into academic journals such as *The Copyright and Trademark Journal*⁶ and *The Journal of Business*.⁷ R&D diversification taught me another lesson I would use in my future career as financial innovator.

⁵Richard L. Sandor, “Size of Firm, Economies of Scale in Research and Development and the Use of Patented Inventions” (PhD diss., University of Minnesota, 1967).

⁶Richard L. Sandor, “A Note on the Commercial Value of Patented Inventions,” *The Patent, Trademark and Copyright Journal of Research and Education*, 1970.

⁷Richard L. Sandor, “Some Empirical Findings on the Legal Costs of Patenting,” *Journal of Business* (University of Chicago, 1972).

Berkeley Beckons

I began to search for an academic job. Every year, the American Economic Association held a meeting in January, where economists presented their research and job candidates interviewed for possible positions. I attended the 1966 AEA meeting, having applied for a post in applied economics at the University of California at Berkeley's School of Business. David Alhadeff, a Berkeley professor, spoke with me about the department, his research, and my dissertation. In his own soft-spoken way, David epitomized all that was professorial. Some academics focused only on the teaching and research of economics, while David's interests were more catholic. At the end of the conversation, David said encouragingly, "You remind me of my nephew. I know you'd like him." I enjoyed the interview and felt at ease, and thought I had a good shot at a job there. Ellen and I grew excited at the prospect of moving to San Francisco. I soon learned, however, that a fellow graduate student had been invited to Berkeley to give a lecture, while I had still heard nothing since my interview. Other job prospects were not as exciting, and Ellen and I resigned ourselves to spending another year in Minnesota.

Then, one morning, I received a letter from Berkeley offering me a job as an acting assistant professor at the business school. I would be paid \$8,600 per year and have a "step two" appointment, meaning a higher salary, with "acting" to be removed from the title once I successfully completed my dissertation. It was a prestigious job at a world-class university in a city that was the definition of change in America. I rushed to Ellen's school, and asked the principal if she could be called out of the classroom. We were ecstatic. The irony was that my supplementary mathematical training had been part of the reason I was hired. The first course I taught was for graduate students who needed sufficient mathematics to complete the program and obtain their MBA or PhD degrees.

While I continued my dissertation research, Ellen traveled to Berkeley to find us an apartment and begin a new job. I followed later with my classmate. He had strongly recommended me for the job and I believed he was instrumental in my getting the offer. Together, we climbed into the 1966 Toyota that Ellen and I had just bought. 1966 was the first year that Toyota began selling cars in the United States. Exotic cars still fascinated me, and I thought it would be fun to own

one of these supposedly lower quality Japanese imports. We made the journey in a day-and-a-half, and the car performed flawlessly.

Minneapolis and St. Paul were Midwestern cities with values that reflected the post-World War II period in America. In contrast, San Francisco and the neighboring town of Berkeley across the Bay represented America's frontier, the cutting edge of the free speech movement, the drug scene, and just about every other aspect of the country's 1960s counterculture.

We rented an apartment a block away from the storied Telegraph Avenue and less than a 10-minute walk to my office on campus. The streets were filled with a mix of students and other young people who had simply come to live in the hip university town and hang out. Long-haired men and braless women advocated for social and political change in Sproul Plaza, the heart of Berkeley's campus. A typical day found me walking up Telegraph Avenue and through the campus courtyard, lined with booths espousing everything from free love to protests against the war in Vietnam. They all had their own tables and their own literature: civil rights, women's rights, sexual freedom, anti-Vietnam War, pro-drugs. Even in the business school, there were hints of change. Dogs romped in the fountain, and long-haired hippies rallied against the "fascists" in the Alameda County Police Department. Students came to class high on marijuana and brought their dogs for company; their mood and demeanor reflected the time and place. Sometimes I felt the dogs were listening more than the students. The climate on the Berkeley campus reflected the enormous structural change that was occurring in the domestic and international arenas.

Another type of change was occurring across the Bay. South of San Francisco, Stanford University had spawned a flurry of new technology companies. In 1971, the southern San Francisco Bay area became known as Silicon Valley for the principal ingredient, silicon, used in semiconductor chips, which had become one of the area's hot industries, alongside computers.

This environment of frenetic change was a delicious cocktail for me. Although I looked more business school than hippie, I felt at home with these social and political outsiders. I wore a tweed sports jacket with leather elbow patches. It was a little out of place but seemed compatible with my vision of an academic. At the same time, the high-tech

companies provided a laboratory and classroom to learn about the inventive process—and to invest in stocks. There was a bull market at the time, so it was hard not to do well.

In June 1967, I returned to Minnesota to defend my thesis, and was granted my doctorate in July. I did not return to Minneapolis for graduation, which seemed anti-climactic. It was the Summer of Love in San Francisco, after all, the summer when journalist Herb Caen popularized the term *hippie*.⁸

Now that I had my doctorate, I faced a different type of pressure. Earning tenure required the publication of articles in well-regarded professional journals. Teaching quality was secondary. I would have to mine my thesis and try to write three or four articles that would be accepted in journals. Like many universities, Berkeley had a seven-year up or out policy. I would either be granted tenure within that time, or have to leave.

Another pressure came from my growing family. Ellen, who had started a job as an elementary school teacher, became pregnant in November 1967. We bought a house in the Berkeley Hills and prepared for the birth of our first child. Ellen gave me the lump sum she received from a retirement fund when she retired to buy the car of my dreams—a 1966 Austin Healey 3000, painted British racing green. I donned leather racing gloves for the short trip to work. Our first daughter, Julie Sarah Sandor, was born on August 10, 1968. All of the women we had grown up with had given birth in hospitals with painkillers, while we went with natural childbirth. It was Berkeley in the Sixties, and Ellen had started to become involved in the women's movement. My misgivings about natural childbirth were wrong. Words fail to describe the sense of wonderment and elation when watching your own child being born. Julie looked like Ellen. I remember how cheerful she was and her adorable laugh. She was a pretty and good-natured baby, well balanced even at three years old. One day, a colleague came to work with me on some research. Julie strolled into the room and started asking some intelligent questions. After about 10 minutes of back and forth, my colleague affectionately said to her, "Julie, would you marry me someday?" Without batting an eye, she explained, "Fred, we can't do that because you are much too old for me." She is a great observer and always makes me laugh.

⁸Herb Caen, "Small Thoughts at Large," SFGate.com Archive, June 25, 1967.

I had been on the Berkeley faculty for two years, but was still only 26. I took another position teaching “Price Theory and Resource Allocation” to graduate students in the Department of Engineering–Economic Systems and Operations Research at Stanford University. I needed the additional income to support my family, and the class provided me with the opportunity to meet with executives of companies located in Silicon Valley on my weekly trips to Palo Alto. I also used the money to invest in the stock market, which became a lifelong hobby.

My interest in the stock market helped cement a friendship with a new Berkeley colleague, Fred Arditti. Fred was very smart, had a great sense of humor, and shared my passion for movies. He also had a practical and intellectual interest in the stock market. When I described my own interest and my penchant for risk, he suggested that I trade commodities and pointed me to the literature. I started reading academic and practical articles about trading in commodity futures contracts, which fascinated me. I began trading.

Concerned with the ticking tenure clock and the pressure to publish, I reviewed the work I had done for my dissertation, refreshed myself on new developments in my field, and began searching for new ideas. Since I had always learned from teaching, I proposed teaching a new graduate seminar titled “Industrial Research and Technological Change.” To prepare, I reviewed my seminar with Jacob Schmookler and read all of the new literature on the economics of technological change that had been published since I had completed my thesis.

Ellen helped me transform the room next to the furnace in our small Berkeley home into a personal office. Every night at about eight or nine o’clock, I went into the office and turned on the television. With the images and sounds of old movies in the background, I read journal articles and books while making notes for the class. After about three months of work in “the cave,” I emerged with a course outline, a reading list of 18 articles and books, and over 60 pages of handwritten notes.

The course covered the definition and measurement of technological change, the microeconomics of technological change, the management and planning of research and development, the role of the public sector in technological change, and the impact of taxation and regulation. Rather than relying solely on academic work, I scheduled field trips to Silicon

Valley so the students could listen to real inventors speak. The highlight for many of us was a visit to the research and development facilities of Hewlett-Packard, where we were given presentations by scientists and the management team. Bill Hewlett, the co-founder himself, even personally addressed the class. What I saw exhilarated me and stirred my own appetite to become an inventor and entrepreneur. I didn't know it at the time, but the preparation and teaching behind the course would be great preparation for my future career as a financial innovator.

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