



THE GIANNINI FOUNDATION AND THE WELFARE OF CALIFORNIA AGRICULTURISTS IN A CHANGING STATE, NATION, AND WORLD

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This paper benefited immensely from input from other members of the committee established for the symposium's Theme III, in particular Rachael Goodhue, Richard Howitt, Larry Karp, Brian Wright, and David Zilberman.

The committee collectively selected the eleven watershed events that arose over the first seventy-five years of the Giannini Foundation that are presented in this paper. The committee also collectively decided to avoid chronicling which specific members of the Foundation did what and when and what in our subjective views were the merits of individual contributions. The final draft of this paper benefited from the helpful comments and suggestions of Warren E. Johnston and Alex F. McCalla.

The assignment for this paper and the associated presentation at the Giannini Foundation 75TH ANNIVERSARY SYMPOSIUM was to assess the Giannini Foundation's contributions to one of the mandates specified in its original mission, namely to evaluate "the relations between conditions existing in the farming industry and the general economic conditions prevailing in the nation and internationally," or, as the organizers for the conference noted, "California farmers in a global context" focusing on the welfare of California agriculturalists. There is little doubt that, when A.P. Giannini established the Giannini Foundation in 1928, he sought to improve the welfare of California agriculturalists. In keeping with his charge, over the past seventy-five years Giannini Foundation members have focused on real-world problems, analyzing and designing policies and programs that manage the response to positive as well as negative external events. Giannini Foundation researchers have measured and helped California agriculturalists address positive external effects in market structure (e.g., improvements in commercial growth and profitability) as well as negative external effects (e.g., environmental externalities related to pesticides, water, air quality, and waste disposal). Significantly, A.P. Giannini anticipated the extension of agricultural economics and the welfare implications of *resource scarcity*, especially the competition for land and water. A.P. Giannini's insight about the future of agricultural economics heralded the path of the field's expansion; over the years the Berkeley and Davis departments changed their names from Agricultural Economics to Agricultural and *Resource Economics*, incorporating faculty members with expertise in such fields, *inter alia*, as environmental economics, economic development, international trade, and public policy.

In addition to being a forward thinker, A.P. Giannini was also a generous man. Development of a Department of Agricultural and Resource Economics at UC Berkeley and later at UC Davis reflects the generosity and tradition of both the Giannini Foundation and the land grant university in California. A quote from John Kenneth Galbraith, a Ph.D. student from the Berkeley department and an instructor at the university's College of Agriculture campus at Davis, aptly portrays the culture that existed shortly after A.P. Giannini's gift:¹

At Berkeley I suddenly encountered professors who knew their subject and, paradoxically, invited debate on what they knew. They also had time to talk at length with graduate students and even come up to the International House to continue the conversation. I first discovered at Berkeley—from Henry Erdman, who had until recently



been the head of the agricultural economics department, and Howard Tolley—that a professor might like to be informed on some subject by a graduate student. And that he would be not just polite but pleased. So profound was that impression that I never stopped informing people thereafter.

This early spirit of mentorship and intellectual flexibility has served the Giannini Foundation well, as we shall see. The Departments of Agricultural and Resource Economics (ARE) at UC Berkeley and UC Davis now rank in the top three in the world, not just in the United States. Furthermore, while the other top-ranked department, University of Maryland, achieved its status through extraordinary faculty compensation, frequently to faculty members holding a Ph.D. from one of the UC departments, the UC Berkeley and Davis ARE departments achieved their rankings through embracing the Giannini tradition of solving important, real-world problems.

After briefly discussing what distinguishes the origins of agricultural economics from other fields of economics, the paper presents examples of research by Giannini Foundation members who anticipated or responded to a series of watershed events affecting California agriculturalists over the past seventy-five years. With these key historical episodes in mind, the paper assesses how the immense intellectual capital of the Giannini Foundation today will play an integral role in shaping the future of California agriculture for many decades to come.

DISTINGUISHING CHARACTERISTICS OF AGRICULTURAL ECONOMICS

From its origins, agricultural economics, in contrast to many other fields of economics, formed its analytical lens as part of a larger, coordinated social-natural system emphasizing the integration of economics and basic science. Agricultural economic research has generally sought to answer real-world questions and to emphasize testing economic theory against the available evidence. Combining the insights of the economic discipline with the practical and scientific knowledge of agriculture allowed the Giannini Foundation during its first twenty years to distinguish itself among its land grant university competitors. The agricultural economics approach may be summarized in terms of the following types of questions: Since markets aren't perfect, what are the effects of identified imperfections? Which imperfections are important? How might they be mitigated or eliminated? In pursuit of answers to these questions, agricultural economics has contributed to econometrics and economic theory and has furthered our understanding of how markets and economic actors actually operate as opposed to how they are presumed to operate in theory.

In essence, agricultural economic contributions have been heavily influenced by the discipline's research culture and, as a result, by fundamental methodology. In addition to the two distinguishing characteristics previously noted that tend to differentiate agricultural economics' analytical frameworks from economics as a whole (namely, the tendency to view economics and economic analysis as part of a larger, coordinated, social-natural system and an emphasis on integrating economic and scientific modeling), three other factors are important: (1) the emphasis on the importance of time and space for understanding economic phenomena; (2) the emphasis on identifying the flexibility or inflexibility of factors of production and economic agents; and (3) the emphasis on the importance of institutions.



Historically, these crucial distinguishing characteristics can be partially traced back to the pragmatic land grant university tradition of agricultural economics research at the University of California. Much of the early success is largely due to contributions by Giannini Foundation members who were among the first to apply statistical and econometric methodology to facts originating from market outcomes and institutions, along with basic science. Perhaps most importantly, Giannini Foundation agricultural economics contributions focused on relevance to those outside the economics profession, especially the direct and indirect users of economic analysis.

HISTORICAL WATERSHED EVENTS

To structure a sweeping overview of the last seventy-five years, our committee selected eleven watershed events and assessed how research by Giannini Foundation members added value to California agriculturalists before, during, or after these significant occurrences.² Our lens for these watershed events, of course, historically follows the 1928 establishment of the Giannini Foundation.

THE GREAT DEPRESSION

Financial problems in California agriculture preceded the Great Depression of the 1930s.³ As the president of the Bank of Italy, which loaned fully half of its funds to agriculture by the 1920s and faced significant exposure to the agricultural crisis, A.P. Giannini was in a good position to appreciate these risks. In the 1920s, a 43% increase in California acreage devoted to fruit and vegetable crops coincided with a dramatic decline in acreage allocated to field crops. Prices of fruits and vegetables fell during the late 1920s, plunging many farmers into financial difficulty. These financial problems increased during the Depression years, a period when 20% of the state's population relied on some form of public assistance. By the early 1930s, California farm income had fallen by 50% since 1925. By 1934, more than 4% of California farms were in default or under involuntary sale. Surprisingly, the number of farms continued to climb during the early 1930s, as many small farmers entered the sector. In 1935, there were 150,000 farms, the largest number in California history. However, with increased defaults the number of farms began falling and a wave of consolidation began.

Beginning in the late 1920s, California experienced one of its periodic droughts lasting through the early years of the Depression. California farmers responded by pumping more ground water, thus increasing pressure on limited supplies. Irrigation was already widely used in California, but the irrigation projects were scattered and not coordinated. Water shortages led to an intensification of efforts to develop a state plan to store and transport water from the north and west to inland valleys. In 1933, the state legislature authorized the Central Valley Project but was unable to secure financing. The project was finally adopted by the U.S. Bureau of Reclamation as a public works project and construction began in 1937. As a later Giannini Foundation director remembered, "Much work has been done by engineers and geophysicists on ground water. But the economic and social aspects have been neglected or have been dealt with inadequately."⁴ Foundation researchers thus appraised the physical, economic, social, and legal aspects of ground water, assessing such regional ground



water basins as the Santa Clara Valley, the South Coastal Basin, and the southern San Joaquin Valley.

Prior to the Depression there had been little labor unrest in California. The few exceptions included a riot in 1913 when the International Workers of the World (the “Wobblies”) attempted to organize hop pickers and in 1928 when Mexican workers in the Imperial Valley struck for higher wages. Labor unrest became endemic during the Depression. In 1934, a general strike precipitated by longshoremen closed down San Francisco. Agricultural workers attempted to unionize and held strikes but were countered by growers who joined forces as Associated Farmers.

In response to complaints, a federal commission found that in some cases worker rights had been violated. Governor Young then appointed an independent investigating commission that included prominent UC officials such as the dean of the College of Agriculture and the Giannini Foundation’s first director, Claude B. Hutchison. This commission emphasized the role of communist agitators in the labor unrest and published its findings, drawing criticism from the California Department of Commerce and other groups. In response to this criticism, President Robert Gordon Sproul stated that Hutchison was serving as an “interested individual,” not as a representative of the University of California.

During the remainder of the Depression, the College of Agriculture kept a low profile in rural labor issues. A 1939 senate committee determined that agricultural worker rights to organize had been violated, but the labor question dissipated with the onset of the war. Yet, also in 1939, Levi Varden Fuller wrote an extraordinarily insightful dissertation at UC Berkeley looking at the welfare of California agriculturists as a result of the events that took place during the Great Depression entitled “The Supply of Agricultural Labor as a Factor in the Evolution of Farm Organization in California.” This was one of the earliest empirical studies of agricultural labor that demonstrated the importance of a supply of cheap (often immigrant) labor to the agricultural sector.

Throughout the Depression, Giannini Foundation appointments strengthened the Department of Agricultural and Resource Economic’s quantitative analytical approach that had begun with Henry Erdman and Harry Wellman, who regarded economic theory and quantitative analysis as basic tools for applied work in agricultural economics. Key hires included George Peterson, who taught production economics and statistics along with Howard Tolley, a mathematician hired from the USDA. Along with James Tinley (who specialized in dairy marketing), Sidney Hoos (who studied commodity economics and price analysis), Carl Alsberg, and George Kuznets, these early Foundation members helped facilitate a major change in agricultural economics research by applying statistical procedures for data analysis. This new econometric approach was applied to a range of topics, including studies on milk marketing, cooperative organizational structures, land economics, and the conservation of natural resources. In the long term, the skills practiced and taught by the early generation of Giannini Foundation members have paid huge dividends to California agriculturists as UC-trained graduates and professors built up enormous intellectual capital through the post-World-War-II era. The most direct response to the Depression, however, was by Wellman and Tolley, both of whom temporarily left Berkeley in the



mid-1930s to work for the Agricultural Adjustment Administration and helped to craft the Roosevelt administration's implementation of the early New Deal agricultural programs.

WORLD WAR II

Without question, a second watershed event over the last seventy-five years was the economic disruption that took place during World War II. The disruption caused food and labor shortages throughout the United States, necessitating research on price control and self-sufficiency. Even before Pearl Harbor, Hoos, Wellman, and others in the Foundation had worked on quantifying the demand effects for California products so they were well-positioned to provide expert counsel. In 1942, Tinley and Erdman began to seriously examine price control prospects and the relevance of pre-existing interventions using World War I as a guide. Wellman worked with the War Food Administration and the Office of Price Administration on price ceilings for fruits and vegetables, Benedict and Hoos joined war-related federal departments, and Tolley became the director of the Bureau of Agricultural Economics. But perhaps the most lasting legacy of the Foundation on the war-time issue of price controls was by John Kenneth Galbraith.

While never formally a member of the Foundation, Galbraith credited his time at both Berkeley and Davis with the basic themes and ideas behind his extraordinary books, *American Capitalism: The Concept of Countervailing Power* (1952) and *The Affluent Society* (1958)⁵ and his war-time management of the Office of Price Administration (OPA). His unprecedented, comprehensive price interventions as deputy head of the OPA met with unanticipated success, contradicting prewar economic consensus that such interventions were “unwise and impossible.” There was effective control without rationing and inflation was held at bay for several years. His insights on the relevance of market structure include the concept that “modern markets lend themselves to price regulation to a far greater extent than had previously been supposed.”⁶ He characterized the prevalence of markets with few sellers as experienced at fixing prices, coining the phrase “It is relatively easy to fix prices that are already fixed.”⁷ His strategic insight on decentralized enforcement revealed that competitive customers naturally coordinate their influence to police price control of oligopolies on the sell side of the market and vice versa. These insights drew significantly from his agricultural economics training and his intellectual relationship with Giannini Foundation members.

Galbraith based *American Capitalism: The Concept of Countervailing Power* on the formation of cooperatives trying to rebalance the concentration that existed on the buy side of a number of commodity markets for crops produced in California and the marketing order experience for fresh fruits and vegetables. He generalized this experience in the hypothesis underlying his book on countervailing power and it also became a core theme in *The Affluent Society*. After he finished as head of OPA, Galbraith made a wonderful comment about a book he wrote on price controls. He said he believed it was the best piece of work he had ever done but that none of his fellow economists read the book. As a result, he decided “to hell with them.” He would start writing for the intelligent layperson and the first result was *The Affluent Society*, one of the most widely influential works of economics in the twentieth



century. Here, as with much of Giannini Foundation agricultural economics research, the focus was also on direct and indirect users of economic analysis.

INTERSTATE COMPETITION

Turning to the decade of the 1950s, competition intensified among various states involved in supplying the major metropolitan eastern markets. This was especially true in the markets for fresh fruits and vegetables. As the competition from other western states, southeastern states, and various geographic locations within the Midwest accelerated, Foundation members assisted California agriculturalists with timely research. Giannini Foundation researchers provided practical advice and counsel on establishing a competitive advantage for California producers in their pursuit of growing markets. From the 1950s through the mid-1960s, the increase in interstate competition in the agricultural product and food sectors prompted Giannini Foundation members to study food packing and processing efficiencies, leading to development of several important operational models focused on spatial equilibrium, plant location, and optimal raw product assembly. Increasing interstate competition also prompted Giannini Foundation researchers to analyze the optimal distribution of California food products (form, time, and space) under unregulated and regulated conditions.

During this period, Foundation members contributed most significantly by integrating economics and engineering science through the application of time and motion studies. Work by professors Ben French, Loy Sammet, and Ray Bressler on time and motion and the inclusion of time in production and cost functions anticipated a later development by Nobel Prize winner Gary Becker on the theory of time allocation.

Giannini Foundation members also contributed a huge amount of work on spatial equilibrium models that focused on positioning California to compete with other agricultural producing states. They also did significant work on plant location models to determine the optimal location given the trade-off of balancing the cost of distribution with the cost of raw product assembly. Both at Berkeley and at Davis, Giannini Foundation researchers worked on the optimal distribution of California food products. At the end of this period, economists within the Foundation started measuring demand elasticities and the implications of such measures on pricing and the welfare of California agriculturists. The econometric focus of Giannini Foundation members was especially useful in estimating differences in elasticities between different time periods and across space, as well as how agriculturists in California should allocate available supply to maximize commercial profits.

THE BRACERO PROGRAM AND TOMATO HARVESTING

Given the current active debate on Mexican immigration to the United States, the Bracero Program is a historical watershed event with particular contemporary relevance.⁸ As the labor-intensive fruit and vegetable sectors in California agriculture grew during the 1920s and 1930s, so did the importance of migrant labor. When it became clear that U.S. involvement in World War II would lead to domestic labor shortages, the United States and Mexico negotiated the Bracero (farm hand) Program



to bring in temporary immigrants to work in the agricultural sector. After the war, agricultural interests succeeded in obtaining repeated extensions of the program until President Johnson ended it in 1965. Throughout its existence, however, opposition to the program grew from people who claimed that the migrants forced down agricultural wages for U.S. citizens and increased rural poverty.

In particular, University of California agricultural economists were central in analyzing the impact of the role of migrants in the agricultural labor pool in the processing tomato industry, where the end of the Bracero Program threatened the labor-intensive harvesting. Representatives of tomato farmers claimed that the loss of reasonably priced and available workers would cause the processing tomato industry to move to Mexico where there was no shortage of labor. Instead of disappearing, the value of the industry grew as mechanical tomato harvesters began to replace manual labor. Tomato harvesters had been under development at the University of California for twenty years, but the state legislature allocated money to speed up this research in anticipation of the end of the Bracero Program. The technology was introduced shortly before the program ended; by the end of the decade, 100% of the tomato harvest was mechanical.

The substitution of capital for labor precipitated by the loss of cheap labor has occurred throughout the history of agriculture (and in many other sectors), but seldom has it been as abrupt and obvious as in the case of the tomato harvester and the Bracero Program. The change had profound social effects. The tomato industry thrived but employment fell by nearly 50%. Many tomato farmers, unable to afford the expensive technology, left the sector; the number of tomato farmers dropped to less than 25% of the level in the late 1950s.

The experience with the tomato harvester was expected to usher in a wave of mechanization. However, cheap labor remained plentiful and the costs of mechanization were larger than anticipated. Total employment in agriculture remained stable during the 1960s and increased during the 1990s. This stability resulted from a shift from family labor to hired labor, an increased demand for (and production of) fruits and vegetables, and the reorganization of processing.

Social activists claimed that state support (via UC research) of the tomato harvesting technology handed a windfall to tomato farmers at a great cost to farmworkers and rural communities. Giannini Foundation economists emphasized that this state-funded research had generated an enormous economic return. However, they also recognized that private cost-benefit analysis neglects social costs, particularly those arising from a short-term adjustment of displaced and subsequently unemployed labor.

The fact that the university had financed the research led to more than a decade of litigation over the issue of whether the expenditure of Hatch Act monies required taking into account the likely social consequences of the supported research. On appeal, the state Supreme Court ruled that it was not practical to determine the effect of university-sponsored research *ex ante* and that it would be an infringement of academic freedom to require that research be vetted for its social consequences.

Although the judicial decision was unambiguous, it was followed by many years of public controversy. This controversy continues today as questions about



public-private partnerships become increasingly important in university research.⁹ One of the effects of this controversy is the wide acknowledgment of the public's legitimate interest in university research. Public interest in university research may seem self-evident but actually represents a major shift in perception. During the first sixty years of the twentieth century, the general consensus was that increases in agricultural productivity made possible by university research automatically contributed to the public good. The advent of the tomato harvester and other technological developments made it evident that "progress" creates winners and losers. Two Giannini Foundation professors wrote one of the best empirical papers ever published on welfare analysis, examining the effects of the tomato harvester and plant breeding innovation on producer welfare, consumer welfare, and social costs resulting from displaced labor—"Mechanized Agriculture and Social Welfare: The Case of the Tomato Harvester."¹⁰ Identifying the distribution of gains and losses is an increasingly important part of the social and economic research undertaken by the Giannini Foundation.

THE RISE OF THE UNITED FARM WORKERS

The social activism behind the political decision to terminate the Bracero Program and the concomitant technological developments that weakened labor's bargaining power were important parts of the social environment that nurtured the United Farm Workers (UFW). This union, formed by Cesar Chavez and Dolores Huerta, began as a worker-rights organization to enable workers to collect unemployment insurance. After a well-publicized five-year boycott of table grapes that led to union recognition by most major growers and a 40% increase in wages, the UFW went on to organize workers in lettuce fields in Salinas and the Imperial Valley and orange groves in Florida.

The Teamsters challenged UFW domination by signing contracts with orange growers that had previously dealt with the UFW. In response, the UFW conducted strikes and secondary boycotts. In an effort to eliminate increasing violence that had led to several deaths, the state passed farm labor legislation requiring that employers bargain with the union selected by workers. This legislation also created the Agricultural Labor Relations Board, which was modeled on the National Labor Relations Board.

During the rise of the UFW and its conflict with the Teamsters, Giannini Foundation members did a number of labor productivity studies on California agriculture. They analyzed migrant labor contributions to the agricultural sector and the relative poverty levels of migrant versus domestic laborers. Foundation researchers also analyzed the effect of legal migrants and the role of the UFW on various socio-economic status measures, including housing, wages, and other forms of compensation. Finally, they conducted a number of studies sponsored by the governor's office on the welfare of California agricultural labor. A review reveals that there were many Giannini Foundation members who were not only actively engaged in designing the mission statement for the studies but were also doing much of the analysis that informed the California legislature and the governor's office.



THE CALIFORNIA WATER PLAN AND FEDERAL PROJECTS

In California resource economics, management of water and water rights that commenced with the California Water Plan has been of fundamental importance. There is no question that water rights, allocations, and supporting institutions have a material impact on the welfare of California agriculturalists. Initially, plans for water carriers were introduced throughout the first half of the twentieth century in the California Water Plan. Members of the Giannini Foundation contributed to the evaluation and design of financial contracts of these state projects. They also provided the economic rationale for conjunctive use of ground and surface water to overcome droughts and instability. Moreover, they introduced pricing and trading schemes that made it possible to capture more value from existing water resources—studies that were viewed as irrelevant at the time but proved valuable later. Among the most significant of these contributions was the first major theoretical and empirical application of conjunctive water use, namely, the joint management of both conjunctive and surface water done by a Ph.D. student at UC Berkeley¹¹ who was subsequently hired on the faculty of UC Davis.

Over the years, a number of crisis events and institutional changes have emerged from California water resource systems, including the Kesterson Wildlife Refuge, the drainage crisis, water banks, and the CVPIA (Central Valley Project Improvement Act). In 1985, there was a major drainage problem in California that could not be resolved by the creation of a wetland. Access to federal water was threatened if solutions were not introduced but the initial proposals were capital intensive and simply too expensive. The crisis came about very quickly and was a total surprise to California agriculturalists and all other interested parties. In response, Giannini Foundation economists looked at restructuring the kinds of incentives that existed for conservation, changes in land use, and, moreover, implementation of the fundamental notion of option value and the flexibility to wait before making commitments on capital investments. Specifically, Foundation economists proposed a management solution that included incentives for conservation, changes in land use, and evaporation. This research allowed policy-makers additional time to select superior solutions. Subsequently, environmental interests pressured the CVPIA to divert water from agriculture to the environment. Giannini Foundation research showed that the costs of diversions would be much smaller if they were combined with water trading, a key component of the CVPIA-motivated Giannini Foundation research. Members of the Foundation helped establish an electronic water system, a mechanism that allowed increased efficiency and water security. More recent Giannini Foundation research has focused on the welfare consequences of reallocating water among urban, agricultural, and environmental uses, particularly the San Diego – Imperial Valley water-transfer transaction.

ESTABLISHMENT OF THE ENVIRONMENTAL PROTECTION AGENCY

Another major event was establishment of the Environmental Protection Agency (EPA). In the early 1970s when the EPA was organized, the agency's founders looked around the country to find the expertise to deal with spatial pollution, air pollution, and land and ground water pollution and found that agricultural economists were the best equipped to address these critical externality questions. Moreover, a review of all



the major grants given by the EPA to academic researchers during the agency's early years would find that almost all were held by people with formal training in agricultural economics.

The best work on pesticide externalities in the world has been done by Giannini Foundation members. Furthermore, all the work on contingent valuation to determine how society values such resources as Yosemite National Park or Lake Tahoe remaining pristine emerged from some conceptual lenses that were developed long ago by a Giannini Foundation faculty member.¹² There are a number of people who were or currently are at the Giannini Foundation who are intellectual leaders in applying these basic concepts of contingent valuation to determine a particular population's willingness to pay.

The Giannini Foundation also contributed to environmental economics with work¹³ on environmental preservation, uncertainty, and irreversibility and on positive quadratic programming, a widely used tool for assessment of the impacts of water and climate change policies. More importantly, Foundation members do not typically accept the conventional wisdom that trade-offs exist between environmental quality and economic growth but rather search for the complementarities that might exist and what institutional governance structures might be required to capture such complementarities.

The Giannini Foundation also conducted breakthrough research on pest control, including (a) the introduction of modern integrated pest management (IPM) and biological control; (b) the use of modern economics to evaluate health risk and trade-offs with agricultural productivity; and (c) pesticides as damage-control agents, their potential human health effects, and their substitutability with transgenic seeds. When the "Big Green" pesticide ban proposal was discussed by legislators in 1991, Giannini Foundation members conducted a study that showed that it would negatively affect low-income consumers. As a result, Giannini Foundation members offered remedies, including taxation and pollution regulations. The general public supported these alternative remedies by rejecting "Big Green" initiative at the polls.

With respect to the proposed phase-out and ban of methyl-bromide, Foundation researchers showed how a total ban would be costly and counter-productive since scaling back to 25% of historical use would preserve 80% of the benefits. In the case of invasive species and plant diseases, Foundation research demonstrated how medflies, Pierce's disease, and white flies may cost billions in damages and how distributional effects are more significant than the aggregate impact. Once again, Foundation researchers have offered practical solutions emphasizing the use of monitoring, prevention, and rapid and targeted responses rather than heavy-handed public policies.

FARM FINANCIAL CRISIS

The farm financial crisis of the 1980s began in the Midwest but slowly made its way to California, affecting U.S. agriculture as a whole. Giannini Foundation researchers demonstrated that the major causal forces underlying this financial crisis were sourced with monetary policy, federal fiscal policy, trade flow, and exchange rates. In essence, the monetary policy of the Federal Reserve in the early 1980s forced interest



rates and the relative value of the U.S. dollar to overshoot. The latter phenomenon reduced the export market for agricultural products across the United States, including California, and helped contribute to a dramatic downward spiral in commodity prices. These causal phenomena were almost a complete reversal of what took place over much of the 1970s. The rapid expansion in available debt capital to agriculturalists in the 1970s was asset-collateralization-based. Hence, as inflation began to recede and export markets turned upside down, the market value of underlying collateralized assets fell dramatically. Debt-service-based finance was relatively uncommon compared to the asset-based financing that took place during much of the 1970s. As a result, the agricultural sector throughout the United States was indeed vulnerable to the effect of reversal of external factors (trade, monetary policy, exchange rates, interest rates) on final market pricing traced all the way upstream to input pricing, particularly land prices.

Although A.P. Giannini had earlier advised that “we should look the other way” when facing temporary displacements or the inability to service loans, approximately two million acres of land defaulted to Bank of America during this period. The crisis was much worse in the rest of the United States, in part because major external events fostered imbalances in the early 1970s, such as rampant inflation when prices for commodities such as soybeans were temporarily at \$13 a bushel. Moreover, there were rapid increases in the price of energy. Such imbalances reversed course in the early 1980s and the pendulum swung dramatically, resulting in a real recession in the agricultural sector throughout the United States.

Giannini Foundation members helped to explain this phenomenon when a number of econometric models were at sea with regard to trying to explain the major price bubbles that were taking place in the early 1970s. Foundation members were able to explain the difference between the 1970s and 1980s and the implications for the farm financial crisis of the mid-1980s. This crisis resulted in a bankrupt farm credit system that was resolved by a government bailout. Foundation members helped design the bailout to achieve sustainability and avoid moral hazard.

Along similar lines, during the design of decoupled policies and compensation of growers for policy reform in the 1990s, as well as planting flexibility in the late 1980s and the related protection of California growers (motivated by political forces), Giannini Foundation members played integral roles when such decisions were being made at the federal level. In fact, they served on executive working group committees charged with the responsibility to design and implement these public policies affecting the welfare of California and other state agriculturalists.

BAYH-DOLE ACT AND THE ESTABLISHMENT OF PRIVATE INTELLECTUAL PROPERTY

At the beginning of the genetic engineering era, the Bayh-Dole Act gave universities the rights to any discoveries financed by federal grants (1980). Intellectual property rights (IPR) covered new life forms and patents for plants during this period of growing private spending and stagnant public spending on agricultural research and development. At the end of the day, the Bayh-Dole Act is about intellectual property rights and how universities have slowly been pulled into the commercial sector. The act assigns property rights to research discoveries and their commercial value, if any,



accrues to universities. Universities are generally not in this business of capturing, let alone understanding, commercial value. Nevertheless, there were given incentives to search for opportunities to capture the commercial value of the research discoveries that resulted from their scientists' research. This has led to numerous university/private research partnerships that Foundation members have helped to design. Moreover, Foundation members have been actively involved in structuring patent pooling arrangements to facilitate access by both the private and the public sector.

The landscape for agricultural production at the time of the Bayh-Dole Act was much different than it is today. In the case of agricultural inputs, Foundation members have explained the forces influencing industry consolidation, the evolving market structure, and the role of university technology transfer offices. Thus, Foundation research has made the new reality transparent and assisted in navigating new innovations by analyzing the growing industrial-educational complex. Foundation members took part in the evolution of agricultural research by assessing the emerging agricultural information sector and identifying when the use of each type of IPR is preferred, i.e., patent, prize, or trade secret. The Foundation designed mechanisms to access IPR for breeders of crops underserved by the private sector, such as specialty crops in California and crops grown by the poor in developing countries. Foundation researchers have also proposed IPR licensing to enhance innovation and availability of drugs for the poor.

THE GREEN REVOLUTION

From the 1970s through the 1990s, the Green Revolution and subsequent increase in productivity in developing countries provided the opportunity to evaluate income versus substitution effects on the global demand for agricultural products produced in California. The indirect effects of the Green Revolution, marked by a notable increase in food production in the Third World because of improved strains of maize, wheat, and rice, not only helped prevent large-scale famine but also made the fundamental study of substitution and income effects possible. The economists of the Giannini Foundation have been actively engaged in demonstrating to California agriculturalists the benefits they derive from the growth of the developing agricultural sectors in developing countries because of income effects. To be sure, there may be competitive suffering in the short run due to substitution effects. For example, Chile and Mexico have become more effective competitors for a number of different products sourced in California, but in the long run there are major benefits to be had by California agriculturalists as a result of economic growth in these countries.

The Green Revolution was orchestrated in part by the Consultative Group on International Agricultural Research (CGIAR). Various Giannini Foundation members have been actively engaged in the work of CGIAR and the various research institutions that comprise this global institution, serving on its board and as its chair. Perhaps more important, however, are the studies and analyses that have been conducted to analyze the economic consequences of new research discoveries and increase productivity of a number of basic crops. For California agriculturalists, much of this research has implications for the short-run substitution effects vs. the long-run income effects on export demand for California's higher-quality food products. Of recent interest is the



Giannini Foundation analysis of private sector discoveries vs. nonprofit public-good research initiatives and discoveries.

TRADE LIBERALIZATION AND THE GLOBALIZATION OF MARKETS

There has been a large amount of research work done on trade liberalization by Giannini Foundation members. The GATT-Uruguay round that engaged and brought agriculture into trade negotiations was kicked off in 1986. Giannini Foundation members were at that meeting in Punta del Este when the process began. The focus of this research has been on who wins, who loses, and what the environmental consequences might be from trade liberalization and/or globalization. This research includes an evaluation of the GATT-Uruguay round, the North American Free Trade Agreement (NAFTA), and the Doha World Trade Organization (WTO) round; assessment of effects of California being the nation's largest exporter of agricultural products; income growth, especially in the Pacific Rim, driving an increased demand for higher-quality food and fiber; international agreements opening more foreign markets to California exports; better access of foreign products to U.S. markets due to the fall in U.S. import barriers; improved assessment of technical trade barriers that must be based on scientific evidence; and investments by multinational firms and joint ventures in highly processed products that are changing the form and shape of agricultural trade.

The Giannini Foundation is uniquely well-equipped to formally evaluate the impacts of trade liberalization and globalization on California's agriculturalists based on the distinguishable intellectual capital of its members. Foundation research has assessed the impact of imperfectly competitive markets and state traders on national and California agricultural food exports. A few Foundation members orchestrated the formation of the International Agricultural Trade Research Consortium (IATRC). Giannini Foundation members have also been involved in trade policy and international trade disputes over invasive species, as well as in leadership of the Agricultural Issues Center. They have analyzed crop-specific effects of trade agreements on segments of California agriculture, such as wine trade and the associated industrial organization of the domestic and international wine markets. What we do know about the international effects of U.S. farm policy has been largely quantified by a few Giannini Foundation members. Finally, Foundation members have conducted analysis and frequently measured the environmental consequences of globalization.

With the end of the Cold War and the unraveling of the Soviet Union, there has been increased interest in emerging markets of developing countries. This is especially true in the assessment of foreign capital investments but also as a potential source of demand for higher-quality agricultural products produced here in California. In this context, members of the Foundation were instrumental in establishing the Institute for Policy Reform in Washington, D.C. As the name suggests, the focus of the institute's research was on reform of distortionary policies that would facilitate trade and global integration of many less developed countries. Much of the research analyzed the existing governmental policies in emerging markets and how many of these policies were obstacles to economic growth. Research conducted at this institute and by various members of the Giannini Foundation has demonstrated that California's



comparative advantage in the production of high-quality food products is propelled by sustainable economic growth in such emerging markets.

POTENTIAL FUTURE WATERSHED EVENTS

What watershed events are going to be the focus for the immense intellectual capital of the Giannini Foundation over the next seventy-five years? Among the likely candidates are knowledge and technology, competition for scarce resources and increasing scarcity of resources in California, global warming, bioterrorism, product differentiation and value-added products both domestically and globally, and opportunities for economic and financial innovation.

The ongoing processes related to knowledge and technology are globalization, the industrialization of agriculture, privatization, environmentalism, and consumerism. Biotechnology and information technologies are here to stay and intellectual property rights will become even more important. California's agriculture is evolving to become not only the producer of high-quality differentiated products but also a supplier of intellectual property, including production and marketing skills. Knowledge and technology will also be critical in facilitating the California resource base to enhance quality of life, recreation, and valued environmental services. The Giannini Foundation will logically be able to help guide and take part in such unfolding transitions.

California can no longer grow by taking advantage of its scarce resources, including land, water, and air. So long as our economy continues to grow, the urban, affluent population will demand ever more environmental quality: clean air, open space, and restored habitats, including fisheries. This demand places additional pressure on available natural resources. Environmental interests apply even greater pressure on restricting the use of land and water resources. Faced with ill-defined property rights, especially in water and forestry systems, Giannini Foundation members should be in the forefront of objective research on the consequences of increasing demand for environmental quality and the changing nature of demand for resources. Foundation members should also be increasingly engaged in conflict resolution of disputes about resource allocation.

California's water system is close to "tapped out." There are already more than 5,000 dams in California, 1,400 of which are "large." In the Central Valley alone, more than half of all flows are already diverted. There are many interests whose incentives are not aligned, including commercial and real estate land developers, municipalities, agriculture, fish resources (endangered species), hydroelectric power, Native American tribes, industrial process water users, and urban dwellers. Giannini Foundation intellectual capital should certainly continue to promote balance among these water resource interests by designing solutions to California's water shortage, which will intensify as population growth continues or as temporary droughts emerge.

The Giannini Foundation must also address conflicts among urban, agricultural, and forestry sectors over land use, ecological and community preservation values, and the remediation and reuse of contaminated sites, as well as the financing and redevelopment of economically obsolete city cores. Foundation research is already



under way to develop solutions as competition for land use intensifies. In the case of forest resources, Foundation researchers will continue to assess the public interest and the current stock of harvestable timber in conjunction with water resources. The Giannini Foundation will certainly also be involved in disputes over minerals, fossil fuels, and fisheries.

Regulation of air resources will require the active participation of Giannini Foundation members. We expect Foundation members to continue to contribute to the legislative foundation for federal and state clean air acts and regulations as they have done in the past. They should work with manufacturers and users of mobile air emission sources and evaluate trade-offs among air quality, water quality, and energy costs. Foundation researchers are likely to continue to examine stationary emission sources, health impacts of air pollution, the consumption of fossil fuels, and generation of greenhouse gases.

Five Giannini Foundation scholars are already investigating the effects of global warming on California agriculture. One such study has found air pollution to be a major concern for the future of the Central Valley. Global warming will have varying impacts on regions and possible dire geopolitical consequences. As energy markets tighten, there is an increasing need to transition away from fossil fuel. Biofuels are a source of hope, but they must become more productive and efficient as they, too, require land and other resources. These new challenges for California agriculture should result in future Giannini Foundation research to design policies and institutions that will enhance the welfare of California agriculturalists.

The potential harm of bioterrorism is on the rise in America's complex agrofood system. Giannini Foundation members are currently pursuing two major grants that examine different regulatory structures. For these grants, Foundation researchers are evaluating the economic value of specific food-safety measures, conducting risk assessments, and designing systems approaches for the management of bioterrorism risks. Methodologies have already been identified for prioritization of food-safety measures that could well be adopted based on sound economic criteria for multiple control steps at different stages of production and distribution that reduce bioterrorism risk.

Fragmented consumer demand and biotechnology will be the foundation for the creation of new differentiated products to capture markets such as nutraceuticals and metabolism-specific foodstuffs and diets. Here, Giannini Foundation research could be significant. For example, members could contribute to the assessment of *ex ante* consumer demand for green products, identify consumers' willingness to pay for specific characteristics even when a product does not yet exist, determine the welfare effects of specific products, evaluate the factors driving consumer demand for specialized products, integrate approaches from business school marketing paradigms with cutting-edge demand analysis, contribute to interdisciplinary research in product development, analyze who benefits from specialized products, develop methods of authenticating organic products (e.g., required spatial intervals and practices for organic crops), and create programs for perceived food quality or safety (e.g., eggs from cage-free production).



Finally, the future offers many opportunities for economic and financial innovation. Key areas include environmental finance, land use and critical habitat designation, major agricultural/urban water transfers, and the structure of public/private partnerships. Future Giannini Foundation researchers will need to analyze cooperative versus noncooperative solutions and the gains from the exchange of public goods for zoning variances, adjustment compensation for industries facing increased international competition, and compensation for the reallocation of property rights. Other implications of new approaches to environmental finance require core competencies in collective decision-making, access, and stakeholder representation, as well as political bargaining and negotiation.

We also expect the Giannini Foundation to play an integral role in the institutions that manage conflicts as the growing demand for natural resources in the West is increasingly at odds with historical use patterns. There is much value added from institutions that can effectively manage these conflicts and keep natural resource constraints from becoming limits to growth. Given evolving scarcity, more creative market institutions must be designed and implemented.

Whatever challenges to California agriculturalists arise in the future, looking back over the Giannini Foundation's legacy of methodological innovation and pragmatic, real-world problem solving, there will continue to be major contributions by Giannini Foundation research over the next seventy-five years. As previously noted, the Foundation is comprised of two of the very best faculties of agriculture and resource economics in the world and, when combined, they simply have no equal. Over the last fifty years, members of the Giannini Foundation have been the recipients of more outstanding publication awards from the American Agricultural Economics Association (now the Agricultural and Applied Economics Association) than any other land grant university in the country. The collective intellectual capital of the Foundation has steadily increased over its long history and is well poised to meet whatever intellectual challenges that may be faced by A.P. Giannini's California agriculturalists over the next century.

NOTES

1. "John Kenneth Galbraith: The Early Years" by Gordon Rausser with Susan Stratton. First Galbraith Forum/Lecture of the Galbraith Commemorative Project, 2003 Annual Meeting, American Agricultural Economics Association Foundation, Keynote Speaker for Tribute to John Kenneth Galbraith, Montreal, Quebec, 28-30 July 2003.
2. Given the sheer volume of work produced over the last seventy-five years by Giannini Foundation members, in general this survey will not cite specific authors and publications but will emphasize the contributions of Foundation members as a group. Readers interested in a more exhaustive listing of authors of publications are encouraged to review the *Annals of the Giannini Foundation of Agricultural Economics*, which can be found at http://giannini.ucop.edu/GFAE_Annals.pdf or one of the Giannini Foundation libraries, which house one of the most comprehensive collections in the field of agricultural economics anywhere in the world.
3. This section draws on the excellent history of agriculture in the UC system, *Science and Society*, by A.F. Scheuring with C. McCorkle and J. Lyons, DANR Publications, University of California, 1995.



4. Harry Wellman, "Economic Research of Interest to Agriculture," *Economic Research of Interest to Agriculture*, The Giannini Foundation of Agricultural Economics and the Division of Agricultural Economics, University of California, Berkeley, California, 1951.
5. J.K. Galbraith, *American Capitalism: The Concept of Countervailing Power*, Houghton Mifflin Company, New York NY, 1952; *The Affluent Society*, Houghton Mifflin Company, New York NY, 1958.
6. J.K. Galbraith, *A Theory of Price Control*, Harvard University Press, 1952, 10-11.
7. J.K. Galbraith, *A Theory of Price Control*, Harvard University Press, 1952, 17.
8. Some facts presented in this section were taken from "For California Farmworkers, Future Holds Little Prospect for Change" by P.L. Martin and J.E. Taylor in *California Agriculture* (2000) and "Hired Workers on California Farms" by P. Martin and B. Mason, chapter 8 in *California Agriculture: Dimensions and Issues* (2000).
9. Gordon C. Rausser, "Public/Private Research: Knowledge Assets and Future Scenarios," *American Journal of Agricultural Economics*, 81 (1999):1011-1027.
10. A. Schmitz and D. Seckler, "Mechanized Agriculture and Social Welfare: The Case of the Tomato Harvester," *American Journal of Agricultural Economics*, 52 (1970):569-577.
11. Oscar Burt.
12. Siegfried von Ciriacy-Wantrup, *Resource Conservation Economics and Policies*, University of California Division of Agricultural Sciences, Berkeley, California, 1963, revised English edition.
13. By Richard Howitt.

