Government Actions Affecting Land and Property Values: An Empirical Review of Takings and Givings

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Abstract

This study demonstrates that despite widely varying methodologies, ample evidence exists that government action has a pervasive influence on land and property values. This influence is both positive and negative, and can be substantial, depending on the time, place and circumstances. The result is that the impacts of government action, while pervasive, are highly differentiated. We have reviewed a sizable share—but hardly all—of this evidence. In this study, we have focused especially on agricultural policies, local zoning and urban land use restrictions, transportation route location decisions by federal, state and local authorities, the location of amenities such as parks and disamenities such as hazardous waste sites, and briefly on national economic policies and their impacts on farmland values.

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Contents

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Overview

This study reviews the empirical evidence on changes in land values due to government action in the context of the current debate over "takings." Government actions may affect land values positively ("givings") or negatively ("takings"). They may affect these values over long periods of time, or quite suddenly. The range of government actions that may wield such impacts is broad. In this study, we consider five main categories of such action:

- Federal agricultural policies to support prices or impose conservation requirements.
- Local zoning and urban land use restrictions.
- Transportation route location decisions by federal, state and local authorities.
- Government decisions to locate amenities (e.g., parks) or disamenities (e.g., hazardous waste sites) on or near land parcels.
- National economic policies.

The study is organized as follows. First, land values are set in the context of the debate over takings. Second, the theory and history of land valuation in the United States is sketched. The third, and longest, section provides empirical evidence of government action and its influences on land values. The final section of the paper provides a summary and some conclusions.

I. Land Values and the Takings Debate

Individual rights to landed property are strongly held, with antecedents running deeply into English common law. Blackstone's Commentaries refer to such property rights as "that sole and despotic dominion which one man claims and exercises over the external things of the world."[1] Yet government, whether the town, state or nation, has historically taken myriad actions that raise or lower the value of this private property. Land and property, in this sense, is a register of value rather than a creator of value, a gauge of local, regional and national forces that affect its supply and demand. Government actions affect this market by inducing purchases or sales due to changes in agricultural policy, transportation routes, zoning, the location of amenities and disamenities, and national economic policy.

When the whole of landed property's value is literally taken away by government actions, as in the exercise of eminent domain for highway construction, a basis in law has existed for compensating the owner for his loss.[2] This, however, is an act at the limit of a wide continuum in which property values are affected—both positively and negatively—by government actions.

It is not our purpose to detail the recent legal history of the debate over the Just Compensation Clause of the 5th Amendment.[3] Such reviews have been published elsewhere.[4] However, it is important to note that this debate has been heavily influenced by those whose views of government cause them to see takings as extending beyond the full loss of property's value, to include regulatory incursions on the use of property which may diminish this value only in part. As Berlin notes:

> Activist conservative scholars have somewhat successfully advanced the view that property rights are sacrosanct, that balancing such rights against competing interests is inappropriate, and that government actions restricting property rights require compensation regardless of the beneficial impact of the regulation or the harmful impact on the community or the environment that the activity causes.... Under this theory, government regulation could be considered a taking which would result in required compensation even where the regulation in question only restricts an admitted nuisance. If this absolutist view of the Just Compensation Clause were accepted, it could make the cost of operating government so great that it would be difficult, if not impossible, to implement most economic, land use, and environmental regulations.[5]

On the other side of this debate are those, like Berlin, who fear that a doctrine of "partial takings," coupled with inattention to the public benefits of the challenged regulations, will undermine the whole edifice of government regulatory action. This view is often likened to the objections of the conservative Supreme Court of the early 20th Century, whose interpretation of the Fifth and Fourteenth amendments led to the use of "due process" requirements to declare many economic and social regulations unconstitutional. It was frustration over this situation that ultimately led President Roosevelt to his unsuccessful court packing efforts.[6]

The two most recent Supreme Court cases in this area are *Lucas v. South Carolina Coastal Council*,[7] and *Dolan v. City of Tigard, Oregon*.[8] In *Lucas*, a 1988 South Carolina statute prevented Lucas, who had invested in beachfront property in 1986, from building on it because of the property's proximity to the seashore. Lucas argued that as a result, the property had lost all value, and that the statute interfered with his reasonable, investment-backed expectations, thereby entitling him to compensation. Weighed against these private claims were the public interests protected by the Beachfront Management Act of South Carolina, including the role of undeveloped beachfront as a storm barrier, as habitat for plants and animals, and as protection from erosion and harm to property. The U.S. Supreme Court wrote five separate opinions in the case, which altogether did little to clarify takings law, but stopped short of acknowledging the possibility of compensation for "partial takings."[9]

In the 1994 case of *Dolan v. Tigard, Oregon*, however, the Supreme Court seemed to take another step in this direction. The city of Tigard, a suburb of Portland, had required Florence Dolan, the owner of a plumbing supply store situated in a flood plain, to make ten percent of her property available for a drainage area, bicycle path and green space as a condition for city approval to double the size of her store and pave the parking lot. Dolan appealed to the Land Use Board of Appeals and ultimately to the Oregon Supreme Court on the ground that the city's requirements were not related to the proposed development,

and therefore constituted an uncompensated taking under the 5th Amendment. The Supreme Court reversed the Oregon Supreme Court, and ruled by a 5-4 majority that the city is required to show a "rough proportionality" between the requirement (the ten percent set-aside) and the harm (of expanded building and paving the parking lot) and that in this case it did not.

The general significance of the case, according to one reporter,[10] is not only the requirement of specific determination of "rough proportionality," but that the Court shifted the burden from the landowner, who had previously been required to prove that the regulation would remove all or substantially all economic value from the property, to the government, which now must justify its restrictions with an "individualized determination." This decision was reached was held despite the city's claim that detailed studies had been undertaken, estimating that the enlarged business would generate 435 extra trips a day into the central business district. The Chief Justice, William Renquist, said that the city's assertion that a pathway requirement would offset some of this traffic was "conclusory," and offered "inadequate proof." In a strong dissent, Justice Stevens said the court had "stumbled badly" in placing new hurdles in the way of land use regulations which had "heretofore warranted a strong presumption of constitutional validity."[11]

Running through these cases and the debate over takings has been a search for a priori "tests" to determine if a threshold can be defined beyond which compensation is due the landowner. This debate has revolved around a variety of issues, including the level or degree of loss to property value, and the extent to which the "investment backed expectations" of the property owner were upset or disappointed.[12] Despite the legal and economic interest generated by this discussion, it has been singularly lacking in empirical content, apart from the line of cases cited as precedent.

The most recent salvo in this highly charged debate has been fired by Republican members of congress, who during the 1994 campaign promised to introduce legislation, the "Job Creation and Wage Enhancement Act," in which any regulatory actions leading to declines in property values greater than ten percent would be deemed as regulatory "takings."[13]

The purpose of this study is to review the empirical evidence of the impacts of government actions on land values. We will show that government actions both diminish, and substantially enhance, property values in different circumstances. In some cases these effects on value occur over long periods of time; in other cases they are quite sudden. In some cases they are directly attributable to government regulatory changes; in other cases the effect of government action, while profound, is more indirect (as in monetary and trade policy).

Two clear findings nonetheless stand out, and merit emphasis before the journey through the economic and historical data. First, government action at many levels is constantly rearranging the differential values attributed to private property. Thus, whether or not one considers the ***public*** benefits of regulatory action to be important counterweights to private losses, there is a deeper issue: ***why should private losses from regulation be compensated while private gains are granted free of taxation?*** The logical underpinnings of the argument for compensation for partial takings is lopsided, and contains the germs of a program of

widespread taxation. This argument should tend to drive the debate over takings back to the limiting cases in which the whole value of property is taken away, rather than into the murky question of partial takings.

Second, the ubiquity of government actions affecting property values suggests that, if partial takings are generally compensated, the court or its agents will be called upon constantly to estimate these losses in order to calibrate compensation due. Setting aside the question of taxing the gains or "givings" due to government action, estimating compensation for losses for partial takings would place heavy, if not intolerable, burdens on the courts or those charged with enforcing their orders. Perhaps this is the intention of some "takings" activists. Yet the consequence would be to create another layer of individual and bureaucratic interference with market-based valuations—precisely that which takings activists abhor.

II. What Makes Land Valuable?

Property in land has been the subject of economic and philosophical debate for millennia. In the modern period, much of this debate begins with John Locke, who argued that by "mixing one's labor" with the land, individuals acquired property rights to it.[14] This assertion, and Locke's larger role as a celebrant of possessive individualism, have been criticized for excluding the interests of community and the "commoners" who were so often deprived of customary use rights in the rush to enclosure.[15] Joseph Schumpeter, the conservative Austrian economist and historian, noted that Locke sought by such arguments to curry favor with interests seeking to expand their landed domains in the British Isles. "Without this practical connotation," Schumpeter wrote, "[such an argument] would have been beneath contempt."[16]

In the early 19th Century, David Ricardo sought to determine the forces underlying the value of land as a function of its use value, location, and other factors, giving rise to a differential structure of value, or "Ricardian rent."[17] In many subsequent treatments, the immobility of land led to assertions that it was unique among assets, and had a kind of inherent scarcity value. The assertion of inherent scarcity is difficult to sustain in the face of evidence, notably in the United States, that despite major efforts to grant lands effectively free of charge to railroads, homesteaders, and former soldiers, nearly one-third of the land area of the country remains in public hands. These, as one author put it, are the "lands nobody wanted."[18]

However, the fact that many actions taken in connection with a parcel of land tend to be reflected (or "capitalized") in its value, and that land is not always similarly situated so as to equalize returns to investments, provides the essential insight into "rent" as defined by Ricardo. "Ricardian rent," a concept which Ricardo himself attributed to Malthus, was most admirably summarized by James Mill:

> In applying capital, either to land of various degrees of fertility, or, in successive doses, to the same land, some portions of the capital so employed are attended with a greater produce, some with a less. That which yields the least yields all that is necessary for re-imbursing and rewarding the capitalist. The capitalist will receive no more than this

> remuneration for any portion of the capital which he employs, because the competition of others will prevent him. All that is yielded above this remuneration, the landlord will be able to appropriate. Rent, therefore, is the difference between the return made to the more productive portions, and that which is made to the least productive portion of capital employed upon the land.[19]

The fact that land value was a particularly accurate medium communicating capitalized investments suggested to some economists that land value was the most efficient, and in many ways most equitable, basis for general taxation. This proposition led Henry George, the late 19th Century reformer, to his argument for the "single tax" on landed property.[20]

Writing shortly before Ricardo, Jeremy Bentham emphasized that the demand for landed property was largely a function of what an individual expects, in several senses.[21] Expectations of own use are important, but so too are the expectations of others, and what one expects them to expect about the use and value of the land in question. This cycle of expectations implies a degree of speculation in land markets,[22] as parties seek to guess what future developments will bring, and what others also know or are guessing. As rumors over possible railroad routes into the Western U.S. spread in the late 19th Century, for example, land prices rose and fell dramatically based on speculation as to where the railroads would run.[23] Writing in the early 20th Century, the institutional economist, John R. Commons, sounded a similarly Benthamist theme in noting that "all value is expectancy."[24]

In the 19th Century, the German economist von Thünen elaborated the importance of location in relation to a center of demand, such as a city, in his spatial analysis of land value, The Isolated State.[25] In it, he argued that land falls in value the further from the center of demand, in proportion to the distance and travel costs necessary to transport goods to market. Moreover, the very nature of economic activity, from retail sales to extensive agriculture to forest products, will reflect the distance from market and "location rents." These insights were applied by many subsequent economists and geographers to describe differential values in relation to proximity to highways, shopping centers, and the like.

Taken as a whole, the historical treatment of land values, while emphasizing the primacy of individual rights to land, also demonstrates that the value of land as a productive asset is only narrowly within the landowner's control. Land is a reflection of value more than a creator of value. It may be degraded through intensive cultivation and use, or increased in value through careful attention to soil productivity, plantings, or buildings. But the larger forces affecting it, both positively and negatively, remain location in relation to markets, and the willingness of others to pay for certain inherent features such as type of site. The specific value attributed to these features is in turn powerfully influenced by expectations of government actions, especially in the modern period. Road construction, federal subsidies to agriculture and urban development, zoning, and the location of parks and other amenities (and disamenities) have all shown the highly visible hand of government action. More broadly, virtually all forms of economic policy will have some effects on property values.

In the United States, it is noteworthy that roughly one percent of all persons (including corporate individuals) own 75 percent of private land. This ownership is concentrated especially in extractive natural resources—agriculture, forestry, mining, oil and gas—and large real estate developments. Each of these sectors has received considerable government-sponsored assistance in the form of subsidies, tax exemptions or waivers, depletion allowances, and banking deregulation, to name a few. These givings by government to entire sectors of the economy are now joined by opposition, much of it arising from the same sectors, to environmental or health and safety regulations. Because these sectors account for such a large share of land ownership, they are likely to remain a battleground over property rights.

The contemporary analysis of the determinants of land values attempts, somewhat heroically, to distill these diverse elements into a formal mathematical model. The value of a productive asset such as land is usually considered to be determined by the capitalized value of its current and expected future stream of earnings.[26] Thus, factors that influence the current and expected future level of earnings generated by a particular unit area of land will be reflected in land prices. Bid and asking prices for a parcel of land will converge, according to theory, to a unique equilibrium price that reflects current and expected future returns to land holdings assuming symmetry between the opportunity cost for a seller and the returns for a buyer.[27]

Dynamics in the land market are reflected by changing expectations about variables that influence the returns to land in future periods. Such variables include information about future interest rates, production possibilities, and government policies.[28] In agriculture, for example, increases in expected yields, output prices, and government subsidy programs will increase the expected growth rate in real returns to agricultural land. Alternatively, changes that decrease the returns earned by land holders in the current period or at some point in the future will result in current land values falling. Such changes could include natural environmental factors such as erosion as well as government policies such as zoning regulations or other restrictions on the use of land and changes in government subsidy programs. In this case, growth in land values may be negative and land prices will become depressed. If policy changes are expected to be temporary, land values will not change by as much as if the shocks were known with certainty to be permanent.

Finally, uncertainty about future events may affect earnings. This uncertainty may alter land values as market participants build a risk premium (or discount) into their expectations of future events. For example, if uncertainty exists as to whether a government subsidy to farmers will endure, the expected future value of the subsidy will be significantly discounted and land prices will reflect this pessimistic expectation. In this way, a legislative debate over agricultural policy may depress land values even if no changes in the policy are immediately forthcoming. Price uncertainty may also influence land values. In this light, government programs that serve to stabilize producers' prices may increase land prices by lowering the variance of producers' returns.[29] Thus, as information about future returns becomes available, land values will respond according to the effect of the information on expected returns and their growth.[30]

As noted in the brief historical review above, the fact that land values represent agents' expectations of future returns means that agents' expectations play an important role in asset valuation. Some contemporary analyses of asset valuation appeal to the rational

expectations hypothesis (REH). Rational expectations imply that agents utilize all available information to arrive at their forecasts of future returns from holding land. Thus, variables influencing expectations about future returns to land, such as current land values, yields, government policies, and other variables will be reflected in land prices.[31]

The "rationality" of asset markets has been the topic of recent debate. Research has evaluated the possible presence of speculative "bubbles" in asset markets (see, for example, Alston, 1986; Falk, 1991; West, 1988; and Campbell and Shiller, 1988).[32] Such "bubbles" occur if an asset's price diverges from the value reflected in the fundamental determinants of expected returns as a result of some self-fulfilling belief on the part of agents that the price is related to some outside ("exogenous") variables. An example often cited in the present value literature is a supposed correlation between asset prices and sunspot activity. Most research on land market values has concluded against the existence of such bubbles (see, for example, Alston, 1986; Burt, 1986; Falk, 1988; and Tegene and Kuchler, 1990).[33] However, it should be acknowledged that alternative conclusions have been reached in other work (Featherstone and Baker, 1987; and Moore and Myers, 1986).[34] Falk (1988, 1991)[35] argues that speculative bubbles seem unlikely in U.S. farm land markets and that behavior that is commonly taken to indicate bubbles is likely attributable to a varying discount rate. Other outside factors may also affect land prices and thus may suggest the presence of speculative bubbles. The presence of such bubbles will not lessen the relevance of government action as a determinant of value.

III. Empirical Research on Land Prices

A. Agriculture and Agricultural Policies

Government has a pervasive set of programs that help create value in agricultural land. In addition to direct federal crop subsidies of various forms, government grazing permits, government-subsidized transportation, conservation infrastructure, and credit have all underwritten farm assets and land values. Farm asset values are also highly influenced by a number of government activities that are not explicitly directed at agriculture. For example, because many farmers carry high debt loads, changes in interest rates have a major impact on the farm economy. When the Federal Reserve sharply cut money supply growth in the early 1980s, for example, and sent interest rates skyrocketing, thousands of farmers went bankrupt. The resulting land glut contributed to plummeting land values.[36]

Although these pervasive programs have large influences on agricultural land values, the impact of those that work indirectly are extremely difficult to measure. A rich empirical literature has developed examining the determinants of agricultural land values,[37] but most analyses concentrate on programs that directly affect different land parcels differently. Examples include government subsidy programs, conservation easements, zoning restrictions, and the like. The literature overwhelmingly confirms the importance of the role of government policy in asset valuation, indicating that in agriculture, "givings" far exceed "takings." A number of specific policies have been empirically evaluated for their effect on land prices. The following discussion provides a brief review and summary of this research.

1. Agricultural Subsidies and Land Prices

In general, agricultural subsidies have functioned to support producer incomes above the levels that would be generated in an environment free of government intervention. Higher farm incomes are capitalized into the values of farm assets. Farm asset values also reflect the expectations of future returns to farming. If uncertainty over the continuation of producer-supporting policies exists, farm asset values adjust by reflecting this risk in lower prices. To this end, government subsidies will have a significant effect on the values of farm assets, especially the values of agricultural lands. A number of papers have considered the effects of agricultural subsidies on land values.

One group of studies examined subsidies to U.S. tobacco growers. In many countries, production and marketing quotas are an important farm program instrument used by governments to provide support to agriculture. The U.S. tobacco and peanut programs use mandatory marketing quotas as a means for limiting supply and providing support to producers through quota rents. Under the U.S. tobacco program, the quantity of tobacco that a producer can grow and market is limited to the amount allowed by his or her quota license. A producer without a quota cannot legally market tobacco. Quotas were initially granted to farmers who were producing tobacco in the 1930s. Sales and rental markets for tobacco and peanut quotas have developed at various times as changes to the legislation allowed for the rent and sale of quota rights.

The tobacco program provides an ideal example of the effects of government programs on farm asset values. Between 1934 and 1962, tobacco quota rights could only be transferred between farms through purchase of the land to which they were attached. In addition, transfer could occur only within a county. These restrictions made it possible to distinguish the value of lands which had quota attached from land which did not. In light of these restrictions, land prices included not only the capitalized value of land rents but also the capitalized value of quota rents.

Shuffett and Hoskins estimated the value of a government-granted tobacco allotment for Kentucky burley tobacco growers in 1969.[38] Analysis of sale prices of over 1,200 Kentucky farms indicated that an acre of burley tobacco allotment added approximately $6,015 (in 1967 dollars) to farm sale price. The quotas granted to burley growers, analyzed by Vantreese et al. in 1989 for 29 counties across Kentucky, accounted for as much as 38.9 percent of land values per acre in 1976, falling to 12.7 percent in 1982, and rising slightly thereafter.[39] A separate study of the other major type of tobacco, flue-cured, by James Seagraves,[40] showed that between 1934 and 1962, the capitalized value of allotments rose from 34.5 cents per pound of tobacco to $1.51 in the last decade in constant dollars, again significantly raising the value of farmland participating in the tobacco program.

A 1992 study by Herriges et al. of U.S. corn programs, in which subsidies are paid to corn farmers on a certain number of "base" acres, showed that the implicit value of corn base acreage in twelve Iowa counties was worth approximately $200 per acre.[41] A 1965 study by Floyd had estimated that such programs may increase land values from 5 percent to as much as 65 percent. In Floyd's study, the value of farmland was predicted to increase most if government programs did not control output, if certain marketing restrictions (such as tobacco quotas) were used, and if land taken out of production through government

acreage-idling programs was compensated by the government. Increases predicted for each of these cases, respectively, were 15-30 percent, 55-65 percent, and 50 percent.[42] The Herriges et al. study indicated increases at the lower end of this range, from 11 to 14 percent. In a 1993 study of the economic value of "base" acres granted by federal programs for cotton, Duffy et al. showed that cotton base was worth a premium of $60 to $108 per acre compared with a farm with no base.[43]

Featherstone and Baker (1988) also showed that an increase in commodity prices resulting from subsidies and other income supports would increase rents and thus raise agricultural land values.[44] However, their principal focus was on the other side of the coin: the potential declines in land values if these subsidies were taken away. Their analysis evaluated agricultural land values in Tippecanoe County, Indiana between 1960 and 1985, and considered a simulation of land values under a more market oriented (liberalized policy) environment compared with the 1985 U.S. Farm Bill.

The Featherstone and Baker results merit special emphasis since they attempt to capture the full impact of changes resulting from simulated shifts in government policies affecting two of the dominant Midwestern crops, corn and soybeans. In the table below, the consequence of shifts from the 1985 programs to market oriented (liberalized) policies ranged from an average decline of 3 percent in 1987 (from a mean price of $1,060 per acre to $1,029) to as great as 13 percent lower in 1990 (from a mean of $1,284 per acre to $1,118). Moreover, the range of possible impacts in 1990 is from a decline of 39 percent (from $1,086 per acre to $657) to a possible increase of less than one percent (from $1,793 per acre to $1,814). This range, or standard deviation, increases in every year following implementation of a more market oriented policy (as it does under the 1985 policy as well).

Runge and Halbach (1990) evaluated the determinants of land values by breaking revenues into those obtained from domestic sales, those obtained from export sales, and those provided by direct government payments in excess of marketings. Their results indicated that farm asset values were positively related to government payments as well as to domestic and export sales. It concluded that government programs intended to boost agricultural exports are likely to increase land values at least as much as domestic subsidies do, as the benefits of export growth are capitalized into asset values.[45]

Goodwin and Ortalo-Magné (1992) evaluated the extent to which wheat subsidies were capitalized into land values in six major wheat producing areas of the world. Overall, an elasticity of about .38 was obtained for government support to wheat producers, implying that land prices would rise by 38 percent if the level of support guaranteed in terms of producer prices were doubled. Goodwin and Ortalo-Magné also considered the simulated effects of the policy liberalization that would have resulted from the 1990 U.S. proposal to the General Agreement on Tariffs and Trade (GATT). Their results indicated that policy liberalization would lower land values in the highly subsidized regions of France and increase land values in the U.S. and Canada. However, the land value increases in the U.S. and Canada depended on price increases from more open trade large enough to offset the lower levels of agricultural support.[46]

In a closely related study, Clark, Klein and Thompson (1993)[47] evaluated the extent to which Canadian agricultural subsidies were capitalized into land values in Saskatchewan, Canada. Their empirical analysis differed from that of Goodwin and Ortalo-Magné in that

a longer time series of subsidies (1950-1989) was used. Their results indicated that farm income alone (exclusive of government subsidies) could not fully explain farm land values in Saskatchewan but that farm income plus subsidies did explain the long term growth in farm land values observed over the period of their study. The result confirmed that farm subsidies were indeed capitalized into farm asset values in Canada.

2. Public Land Grazing Permits and Ranch Land Values

Considerable controversy has arisen over permits assigned to ranches for grazing rights on public lands. The original grazing permits were issued (without charge) by state and federal agencies to allow private ranchers use of public lands. The original grazing fees were set artificially low in order to encourage private use and investment on these lands.[48] Grazing permits are principally managed by the U.S. Forest Service and the Bureau of Land Management as part of their multiple use programs. As Torell and Doll (1991) noted, the initial assignment of the grazing permits represented a capital gift or "giving" to permit recipients.

A comprehensive review of legislation governing the creation and maintenance of grazing permit policies is contained in Gardner (1963). In this discussion, Gardner notes that transfer of grazing permits is difficult unless they are transferred through the sale of the permittee's farm or ranch.[49] In this light, Roberts (1963) notes that the values of the permits are capitalized into the value of the farm or ranch to which the permits are assigned.[50] Martin and Jefferies (1966) empirically evaluated the effect of grazing permits on farm and ranch land values. Their results indicated that public-lands grazing permits significantly increased the sales prices of ranches. The support provided to producers in the form of grazing permits is thus capitalized into the value of ranch land.

In more recent work, the effect of public-lands grazing permits on ranch land values was investigated by Torell and Doll.[51] Their results confirmed that the presence of public-lands grazing permits significantly raises the sales prices of ranches in New Mexico. They further showed that increases in grazing fees decreased ranch land sales prices. This provided evidence that the policy benefits of grazing permits are capitalized into land values. They also noted that the U.S. Internal Revenue Service explicitly recognizes the capitalized value of grazing permits in their taxation of estates when leases transfer. This practice serves as further corroboration of the view that agricultural policies enhance land values.

3. Other Government Actions: Transportation Routes, Conservation Programs, Tax Relief

Most empirical studies have focused on the programs in which government subsidizes sales or provides above market returns because it is relatively easy to compare the artificial price set by the government with the market price that exists for assets that are not similarly subsidized. A few studies do exist, however, of other kinds of programs. For example, studies of farmland value have considered the impacts of conservation programs and government tax relief. Federal subsidies for conservation improvements are widely available to farmers, from federal agencies including the U.S. Department of Agriculture and the Fish and Wildlife Service of the U.S. Department of Interior. A particular focus of these programs, stretching back to the New Deal efforts to control the Dust Bowl, is soil

erosion and drainage. Palmquist and Danielson, in a 1989 article, showed that soils left undrained reduced farmland value by an average of 25 percent, or roughly $374 per acre in the area studied. Draining wet soils, often with government assistance, was worth an average 34 percent increase in land value. Erosion control, meanwhile, would be worth $3.06 per acre if a one ton per acre per year reduction were achieved.[52] In separate studies, Hertzler et al., (1985) estimated that soil erosion reduced land values by an average of $170 per acre in Tama County, Iowa.[53]

Chicoine et al., also estimated the impacts of local tax relief for farmers.[54] Because lower property taxes affect the financial condition of the farm operation, the price a buyer can bid for farmland will also be affected. When special agricultural "use value" assessments were compared to market based assessments for tax purposes, bid prices for land based on the capitalized value of net rent were raised from $10,731 with market-based assessments to $11,773, or by $1,000 per acre in the area of Illinois studied.

The effect of other government actions may be additive or even multiplicitive in relation to these specific subsidy programs. For example, if a government drainage program has increased yields by 10 percent in a corn field, and the corn subsidy program increases corn prices received, then the total increase in land value would be expected to be a joint consequence of the two government interventions.

4. Conclusion

Because land values are composed of many different components which are difficult to segregate, it is hard to define precisely dollar values associated with policy effects. However, much of the preceding research quantifies particular policy effects and thus permits rough estimates of the dollar value effects of individual policies on agricultural land values.[55] A summary of some of the estimated impacts discussed above are presented in Table 2. Goodwin and Ortalo-Magné's estimates suggest that land values in the Picardy region of France were increased through government subsidies by $2,123 per acre in 1979 and $785 per acre in 1989. This drop reflects the bottoming out of land values in the late 1980s. Likewise, Goodwin and Ortalo-Magné found that land values in Kansas affected by government subsidies were increased by $368 per acre in 1979 and $189 per acre in 1989. Their results also suggested that government policy accounted for $200 per acre and $114 per acre of land values in Manitoba, Canada in 1979 and 1989, respectively. Seagraves found that tobacco allotments raised land values in North Carolina by $3,137 per acre (for land with tobacco quota) in 1947. This value rose to an astounding $14,344 per acre of tobacco quota by 1960, reflecting increases in tobacco yields, allotments, and support prices and growing confidence in the sustainability of the program.

More recent research by Vantreese et al., suggests that tobacco allotments increased Kentucky land values by $498 per acre in 1973 but that this level had fallen to $125 per acre by 1985. This decrease reflects much lower levels of support for tobacco producers and decreased confidence in the sustainability of the tobacco program. Like any diminution in a previously capitalized level of subsidy, such a decrease can be through of as a "takings" in the same sense as the imposition of a regulatory constraint. Indeed, in the case of tobacco, declining subsidies are at least in part a reflection of growing regulatory concerns over tobacco-related health impacts.

Research by Torell and Doll[56] suggested that ranch land values in New Mexico were increased an average of $48.89 by public land grazing permits from 1979 to 1988. Martin and Jefferies' results suggested that range land values in Arizona were increased an average of $83 per acre by public land grazing permits during the 1959-63 period.

A final important point should be acknowledged. In light of the fact that policies such as tobacco quotas and grazing permits are capitalized into farm asset values, the extent to which they provide support to agricultural producers is limited to those individual producers who received the original endowments. If an asset price fully reflected the value of the agricultural program benefits (such as expected tobacco quota rents), new purchasers of the asset would pay the full (discounted) value of the benefits and thus would not be benefited from the initial "givings." This conclusion is important since many such programs were established fifty or more years ago.[57] Toussaint (1992) notes that, by 1991 in North Carolina, 1 of every 5 pounds of tobacco quota had been purchased since 1982.[58] The purchasers of the quota paid a price that reflected the expected future benefits of the program. Thus, the program rewards accrue in large part to the original recipient of the quota rights, which were received gratis, suggesting that those to whom the government has given value in land and assets varies over time and generations.

In summary, the capitalization of agricultural subsidies into land values has been confirmed by empirical work on a variety of agricultural programs. A review of this empirical work, including price supports for corn, wheat and cotton, tobacco quotas, grazing on public lands, and transportation, conservation and taxation preference shows strong statistical evidence that agents in land markets are cognizant of policy effects and thus incorporate current and expected future policy benefits into their bids and offers. To the extent that land values capture a one-time grant of government program benefits, such as tobacco quotas, the principal beneficiaries are those land owners (and their descendants) who received the original gifts of government largesse.

B. Zoning and Urban Land Use Restrictions

In contrast to agriculture, where "givings" appear to dominate "takings," zoning and land use restrictions in urban and suburban areas have been alleged to constitute important negative burdens on some landowners.[59] However, the wider empirical record suggests that zoning and urban land use restrictions confer a wide range of benefits and costs, differentially affecting land values positively, negatively, and sometimes not at all. In much of this literature, the impacts of government action fall not only on land values, but on housing. Separating the housing value impacts from land value impacts is problematical, since where housing or buildings are already constructed, the value of the property is a function of both land and buildings in situ. Vacant land, where the opportunity costs of construction have not yet been paid, is thus likely to be less sensitive in absolute dollar terms to changes due to zoning, but may actually depreciate or appreciate more in percentage terms.

1. Land Restrictions for Conservation, Historic and "Greenbelt" Uses

Numerous empirical studies have accompanied the growing use by government at all levels of conservation and greenbelt restrictions. Parsons, in a 1992 study, found that in Anne Arundel County, Maryland, Chesapeake Bay land use restrictions for all "critical

areas" within 1,000 feet of the bay caused considerable increases in housing prices.[60] These increases were over 50 percent for houses with bay frontage, between 14 and 27 percent for houses in the "critical area," and between 4 and 11 percent for houses as far as 3 miles away.

Knaap, in a 1985 study of urban growth boundaries (UGBs) in metropolitan Portland, Oregon, found that where such boundaries were strictly enforced, urban land values were higher than non-urban values, a result that diminished as enforcement slackened.[61] Nelson, in two studies (1985, 1988) of greenbelt policies and their effects on land markets, concluded that proximity to greenbelts increased urban land values, but diminished the value of land with agricultural uses outside the greenbelt.[62] In a study of Washington County, Oregon, demand shifts to land outside of greenbelts ("exurban land") occurred, indicating that greenbelts had effectively segmented the land market, preserving full-time agricultural activity within the greenbelt while inducing "hobby farmers" to locate in exurban areas. The difference in value attributable to this segmentation was about 25 percent of land value averages, or $1,800 on a base average land value of $7,300 in the period 1983-86. the closer exurban land was to the greenbelt, the greater the amenity value, equal to a 5 percent land value decline for each increment of distance away from the greenbelt.

An earlier study by Correll et al. (1978) in Boulder, Colorado, found that average values of properties adjacent to the city's designated Open Space Program greenbelt were 32 percent higher than those only 3,200 feet away. After controlling for other factors such as house size, the average value of a house 30 feet from the greenbelt was $54,379 in 1978, compared with $50,348 1,000 feet away, $46,192 2,000 feet away, and $41,206 3,200 feet away. Because of this effect, the aggregate property value for the neighborhood was approximately $5.4 million greater in 1975 than it would have been in the absence of the greenbelt, resulting in approximately $500,000 in additional potential neighborhood property tax revenues. The purchase price of the greenbelt parcel was $1.5 million, suggesting that property tax revenue alone would allow recovery of initial costs in only three years.[63] Not all of these benefits are captured by local tax authorities, however.

In a 1988 review of urban growth boundary (UGB) initiatives, Knaap and Nelson examined the overall experience of Oregon's land use program.[64] Based on accumulated empirical evidence, they concluded that UGB's take little time to affect land markets (less than two years) as well as to condition expectations of buyers and sellers. By providing information UGB's improve the dynamic efficiency of land markets by capitalizing this information and expectations in the value of various land parcels. UGB's result in windfalls to some landowners and losses to others. These partial givings and takings are similar to traditional zoning, although generally more open to public participation and review, so that wealth transfers are more explicit and accrue gradually over time.

Further evidence of the impact of urban growth management on land values was developed by Gleeson in a 1979 study of Brooklyn Park, a suburb of Minneapolis.[65] Lands designated by the management plan as "developable" were segmented from those designated as "undevelopable." When this information and a variety of other variables such as parcel size, soil type, sanitary sewers, etc. were compared, a sizable price difference existed between the developable and undevelopable areas. Farmlands designated as

developable in 1972 were valued at $3,257 versus $1,084 in the undevelopable category, accounting for two-thirds of the total difference in land values. In effect, value was transferred from lands designated as undevelopable to those designated as developable.

The role of historic district designation on property values has also been estimated. A 1991 study by Schaeffer and Millerick showed that in a Chicago neighborhood, National Historic District designation was highly beneficial to property values, helping to maintain them in the face of declining prices.[66] However, more restrictive and narrowly drawn Chicago Historic Designations did not provide the benefits of the more flexible National designation. National designation increased average housing values by from 29 to 38 percent. In addition, areas adjacent to the district, but not within it, appeared to derive positive benefits, increasing in value by 29 percent.

2. Residential and Commercial Zoning

Economic analysis of residential and commercial land values in urban areas generally attributes value to accessibility to economic activities, amenities, topography, and historical factors.[67] Distance from the center of market activity, in the tradition of von Thünen, has been one measure of accessibility. Downing, in a 1973 study of commercial land values in Milwaukee, Wisconsin, found that such distance variables alone were not significant.[68] However, zoning differences that allowed more intense (less restricted) development were significant.

A 1987 study by Peiser examined vacant land transactions in the Dallas, Texas metropolitan area.[69] It separated "macrolocation" variables, such as distance and employment, from "microlocation" variables, such as corner locations, population density, and the like. These variables were found to influence industrial, commercial, and office land values quite differently. Proximity to the central business district, for example, had a greater impact on office land value than on commercial land value.

When zoning decisions are made, they reflect existing spatial concentrations of activity and differences in value. Subsequently, they influence these differences. Separating zoning from other variables which span the pre-zoning/post-zoning period is thus problematical for empirical researchers, whose findings vary considerably. In a 1974 study of Rochester, New York, Maser et al., found no price differentials directly attributable to zoning, although residential land was not compared to commercial and industrial land.[70] Their general conclusion was that zoning was ineffective, and did not influence prices by altering total supply of land available for various uses.

In contrast, in a 1980 study of residential zoning in Charlotte, North Carolina, Jud concluded that residential zoning exerted a positive and very significant statistical effect on residential property values, adding 68 cents per square foot of housing stock, or $1,360 dollars for a 2,000 square-foot house, an increase of about 11 percent. Commercial activity in a neighborhood diminished property values up to the point that commercial land use equaled 8 to 9 percent of the total, after which it enhanced value.[71]

In a 1991 study of undeveloped land sales in Southern California, Brownstone and De Vany found that after controlling for other land attributes, there was little difference in value due to zoning categories, suggesting that zoning responds to market forces, rather than

affects market prices.[72] Two exceptions to this rule were lands zoned for public institutional and agricultural uses, which commanded lower prices.

One way of resolving these disparate findings is to treat zoning as endogenous (responsive to) land values, rather than an outside (exogenous) influence on them. In a 1991 study of Chicago, McMillen and McDonald analyzed the decentralization of the Chicago suburbs over the period 1961-81. Using econometric methods[73] designed to overcome the statistical biases of previous research, they found significant locational advantages to proximity to suburban centers and to O'Hare Airport rather than to Chicago's central business district, and to expressways. All of these transportation modes were the result of substantial government actions. Land values for apartments declined with distance from O'Hare Airport, for example, at a rate of 10.1 percent per mile, while distance from an expressway interchange led to declines in apartment land values at the rate of 25.5 percent per mile. All of these factors influenced the probability that land would be zoned for manufacturing if it is close to railways and expressways, away from the center of suburbs. Zoning, in short, appeared to respond to land use as much as to control it.

Emphasizing the same issues over so-called "selectivity bias" as defined by McMillen and McDonald, Wallace analyzed vacant land data from King County, Washington.[74] Zoning constraints resulted from the response by the Kind County Council to requests for land use designations. The subsequent impact of these zoning constraints on market prices was then estimated using methods designed to correct for statistical bias. The results provide "strong evidence that the King County zone allocations do affect the market price of land."[75] Specifically, parcels zoned to general uses had an average predicted value of 30 cents per square foot, compared to an average predicted value of $1.70 per square foot if at the margin the same parcels had been zoned to residential single family use, and $5.59 per square foot if zoned to commercial/manufacturing uses. Hence, in contrast to Maser et al., (1974) above, Wallace concluded that zoning does effectively control the supply and use of land, with benefits ("givings") channeled largely to the single family landowners of King County, Washington, and the costs ("takings") drawn away from properties zoned for non-residential uses.

If the gains to rezoning are regarded as a substantial form of "givings," often accompanied by the provision of additional public facilities and services, then an argument exists for taxing the gains from rezoning in order to pay for these services, and perhaps to compensate those whose property values are diminished in the process. Rose analyzes the impacts of such a tax,[76] suggesting the obvious linkage from "givings" to a program of more widespread taxation.

3. Regulation at the Urban Periphery: Farmland Preservation

The land market that grows at the edge of expanding urban areas often induces farmers to sell rather than continue in farming. A final category of government action, emerging in the 1970s and 1980s, is action at the edges of cities and towns designed to reduce the conversion of prime farmland to non-agricultural uses. These forces were analyzed by Clonts, who showed the impacts of urban expansion in Prince William Country, Virginia in the 1960s.[77] Relatively high values of lower productivity agricultural land ($312 per acre in the late 1960s) reflected land owners' expectations of continuing land use shifts. Thirty-nine percent of the variation in value was related to its potential for urban development.

In response to these trends, all 50 states have developed some kind of policy to preserve agricultural land. These policies generally involve rewards, such as tax-rebates, offered to farmers in return for commitments not to convert land to non-agricultural uses. A review of these and other government actions, together with a critique and reply, is contained in Nelson (1990) and Daniels (1990).[78] While these documents offer no specific quantitative estimates of the impact of such policies on land values, they support the contention that on the whole, these programs offer substantial benefits to landowners of agricultural property, and clearly influence property values, sometimes positively, and sometimes negatively (by restricting conversions).

In summary, zoning and urban land use restrictions are virtually ubiquitous. They include urban land use restrictions for conservation, historic preservation, and greenbelt uses; traditional residential and commercial zoning; and regulations at the urban fringe for farmland preservation. These actions have highly variable impacts, sometimes conferring major increases in land values, sometimes diminishing them, and sometimes influencing them little if at all. There is also substantial disagreement over what effects occur in a given circumstance, making the job of accurately estimating these effects highly problematical. If specific estimates of givings and takings were required in order to calibrate taxes or compensation due, it would represent a formidable task.

C. Transportation Route Locations

1. Historical Background

Transportation infrastructure, much of it financed or subsidized by federal, state and local governments, has long affected the value of land. While early transportation pikes, canals, toll roads and rail routes were often private ventures, the areas through which they passed were largely determined by government action, including outright grants of land.

By the early 1800s, national expansion occurred as roads were cut through the Appalachians. The Cumberland (or National) Road ran from Cumberland, West Virginia on the upper Potomac River, westward through Zanesville across Ohio, then though Indianapolis to Vandalia in central Illinois. The Wilderness Road extended through the Cumberland Gap to the Bluegrass Country of Kentucky. Each of the towns and agricultural regions touched by these roads faced expanded demand for land parcels since the roads led to markets for surplus produce and offered superior contact with the Eastern ports.[79]

As major eastern capitals pushed canals westward, all town sites with canal service saw their land values rise. Boston, New York, Philadelphia, and Baltimore were the most prominent of the seaboard canal builders, but they were matched by efforts in the Old Northwest, as entrepreneurs with local government support built a network of canals linking the Great Lakes with the Ohio-Mississippi River systems, thereby enhancing land values in Cleveland, Toledo, Columbus, Dayton, Cincinnati, Ft. Wayne and other centers served by such systems.[80]

In each of these cases, government and business interests cooperated to improve the relative location and accessibility of selected places so that they could enjoy lower cost transportation and reap higher profits. Part of this cost savings was capitalized into higher

land prices in and near the centers that were served. The agricultural land along the Erie Canal in the Mohawk Valley in Upper New York State was perhaps the most dramatic example once the canal opened in 1825, but less dramatic examples occurred throughout the Old Northwest territory.

The next major transportation improvement that differentially endowed locations with superior accessibility was the laying of iron railroads before the Civil War. The new rail lines generally reinforced the water-based systems then in use, and attempted to capture and monopolize trade areas for the cities that built them. Cities that captured large and prosperous settled agricultural areas prospered (e.g., New York), enhancing demand for land within the city itself, while expanding demand for products from their hinterlands, enhancing values for farm and forest lands connected to the metropolis by rail.[81] During the Civil War, the local and disjoint iron rail systems, each one focused on a separate urban center, were knit together into a unified national system to support the war efforts, especially in the North. At the end of the war, cities like Chicago that enjoyed superior accessibility on this new and unified network saw the value of their lands significantly enhanced.[82]

Federal statutes providing land grants to companies in exchanges for building transcontinental railroads provide still another example of governmental action enhancing land values. In older settled areas, selected preexisting towns and cities received transcontinental rail service, while other were bypassed.[83] Those receiving direct service saw demand for parcels of land within them rise, and land values rose accordingly. Bypassed towns were losers. Their land lost value or failed to gain as fast as places more fortunately located. In western areas not yet settled by European stock, railroad companies systematically designated sites for town development with full awareness of the value that would accrue to parcels on or near the rail stops and rail line intersections.[84]

The Panama Canal, begun in 1903-4, reduced the cost of shipping western grain to East Coast markets and thereby raised the value of grain lands in the western Dakotas, Montana, Washington and Oregon. Value of California farm land was enhanced by using cheap water routes through the canal to the East, instead of more expensive rail transport overland. Although the Port of Duluth-Superior had been a major Great Lakes port since 1871, like all other Great Lakes ports, it was engaged in shipping almost entirely to other lake ports until the opening of the federally-financed St. Lawrence Seaway at the start of the 1959 shipping season. Once the seaway opened, ocean-going ships could visit lake ports, and bulk commodities and manufactured goods could reach East Coast and foreign markets more cheaply. Adjustments in barge rates and rail rates followed the opening of the seaway, but in general the overall reduction in transportation costs for hitherto remote locations, such as grain sources in the eastern Dakotas and northwestern Minnesota meant enhanced land values for those areas as transportation cost savings were capitalized.[85]

2. Empirical Evidence: Local Railroad Routes

The beneficial impacts of railroads on land value have not been limited to long distance routes. In 1957, Hayes showed that suburban residential land values confirmed the "lobate" pattern of railroad expansion outward from the center of Chicago, originally described in 1933 by Hoyt and in 1945 by Mayer as like "beads on strings."[86] The

Chicago, Burlington and Quincy Railroad (C. B. and Q. R. R.) and its impact on the West Suburban urbanized area, from Cicero to Downers Grove, was the only public transportation serving the area. As Hayes noted using map demonstrations,

> It is obvious that the railroad rides a ridge of residential land values.... This evidence seems sufficient to assume that each line of public transport rides a residential land value crest of its own making" (p. 178).

Over time, what had been regarded an amenity in the early days of rail transport had become a disamenity, suggesting that givings and takings are subject to shifting valuations over time. In 1978, Poon examined the opposite effect of local rail routes: the negative impacts of noise, air and visual pollution on property values, arguing that property values rose with distance from the railway.[87] Data from London, Ontario, Canada, were used to estimate the reduction in the value of houses within 100 feet of the railway at $2,161, falling to zero reductions at distances of 850 feet or more.

3. Empirical Evidence: Highways

Since World War Two, the federal and state governments have invested hundreds of billions of dollars in highway construction. These highways have made commuting to work less time-consuming for many suburban areas, opening new areas to residential and commercial development. Economists have theorized three kinds of possible effects on land values. One, highways have increased land values in the areas made accessible by reducing travel time to work. Two, they have reduced land values elsewhere by opening up and diverting dwelling and commerce in preferred areas along the highways. Three, they have had an overall lowering effect on land values as more land becomes available throughout the community. Hence, in some places highways will increase land values, in other places they will decrease them. Separating the impacts, however, is analytically difficult. For example, rising populations will drive up demand for housing and therefore land values regardless of transportation impacts.[88] It is generally not feasible to separate the impact of this increasing demand for housing from the impact of more land becoming available in the community.

Another debate in the geography literature is whether highways "cause" increases in land values. As we discuss below, in come places land values rapidly escalate near highways. In other places, studies have found they do not. Like zoning, highways not only encourage new development, they also follow development. While highways may not be a sufficient cause of increasing development and land values, they (or some equivalent form of transportation) are generally a necessary condition for land value increases and a condition that only government can practically provide.

Numerous studies have documented these impacts empirically. In a study of land values in Atlanta, for example, Lemly (1958) found that a newly constructed freeway corridor within four years had caused enormous increases or decreases in land values depending on access to the highway. Between 1952 and 1956, some areas in outlying suburbs along the freeway increased in value by more than 750 percent, while adjacent areas without access lost 50 percent or more of their value in the same period. Similarly, land in a suburban area close to downtown but not near the freeway appreciated 63 percent, while parcels near the freeway's entry into the central business district rose more than 150 percent. In this

downtown sector, "a rapid change from residential to commercial and light industrial activity [was] extensively influenced by the presence of the North Expressway," and properties which were low in value had "increased dramatically."[89]

Other studies of the same great highway building period found similar effects (see Table 3). A 1964 study of the Shore Parkway in New York city found that land adjacent to the highway appreciated by 54 percent more over 14 years than land farther away. Land along a suburban portion of the North Central Expressway in Dallas Texas appreciated 106 percent more over 17 years than control lands. Land along the Gulf Freeway in Houston appreciated 65 percent over five years more than sites without access. Several sites studied in California, Georgia and Texas appreciated an average of eight percent per year more than other sites without access to highways. Table 3 lists these and other studies.[90]

A 1961 study by Mohring showed that in suburban Seattle, Washington, land values increased with decreases in travel time to downtown Seattle due to the existence of highways.[91] At 1947-49 prices, the result was to transfer benefits to those who gained in reduced travel time. However, Mohring argued that increased access to land should exercise a countervailing downward pressure as more was made available. These travel time benefits, estimated at $5.75-$6.50 per hour saved per year, when discounted by interest rates of 4 to 10 percent, yielded values of 30-65 cents per hour, or 50 cents to $1.00 in 1960 prices.[92] In further investigation of the impact of commuting time on land values, Waldo examined the impact of highway access to Los Angeles from the San Gabriel Valley during the period 1950-60.[93] Land values were used as the basis of the estimates of the opportunity costs of commuting.

Despite the suggestions that expanded access might depress land values while reducing travel time, much of the empirical evidence appears to contradict this argument. Land values have nearly always increased after a major transportation improvement, whether the investment was a barge canal in the 1830s or a new freeway bridge in the 1990s. A 1981 study by Chicoine of farmland values at the urban fringe of Chicago, Illinois, for example showed that sales prices increased 2 percent per mile for locations closer to freeway exchanges. An industrial/commercial zoning classification, granted by local authorities for land proximate to these exchanges resulted in a 28 percent increase in price compared with agriculturally zoned farmland.[94]

As in other transportation route studies, the specific relationship between transportation and land values is complicated by a variety of other factors—the most obvious being the population growth that sustains the demand for urban land.[95] The degree to which savings in travel time are capitalized into the price of the land will also depend on the type of land use, the relative concentration of employment, and the elasticity of demand for travel.[96]

4. Empirical Evidence: Post-Highway Improvements

While the root causes continued to be debated—do highways lead development, for instance, or follow it?—few would argue with planning scholar Peter Hall's maxim, "wherever the freeways went, the developers followed," bidding up land values in the speculative process of land conversion.[97] Yet, after the quantum leap in accessibility provided by the first links in the network, later additions generated incremental changes that

sustained only moderate, localized land value changes. Although highways tend to improve the value of properties, those that are too close suffer noise, parking overflow, and can lose value, analogous to railroads.[98]

By the 1970s, when automobile travel accounted for the vast majority—nearly nine-tenths—of all person-trips in urban areas, travel-time savings were only partially capitalized into properties near transit lines, while noise and parking overflow proved to be negative effects. For example, a study of the Washington Beltway on residential property values by Dvett et al. (1979), found that property values were both enhanced and diminished in different cases.[99] Highways may also divert economic activity away from certain areas. For example, a study of the impact of highway bypasses in 23 Texas towns by Andersen et al., (1993) found that bypasses generally brought small but statistically significant losses to bypassed cities.[100]

This brief review suggests that highway investments enhance land values in selected submarkets, but that these gains may be at the expense of values elsewhere in a metropolitan area. In this manner, public policy on transportation may be said to represent a spatial redistribution of capital appreciation, giving to some landowners while taking from others. The magnitude of these shifts varies considerably with local factors and historical circumstances.

D. Land Values and the Location of Amenities and Disamenities

A fourth category of government action with impacts on land values may be termed the location of amenities and disamenities. Amenities include parks and recreational facilities, wildlife and nature refuges, and infrastructure such as public sanitation and schools. Disamenities include air and water pollution, airport noise, nuclear faculties, and hazardous waste sites. Their location is generally the result of local, state or federal government action. When an urban park or recreational facility is located or upgraded, a nature refuge created, or a sewer line built, the action is almost always due to local, state or federal government intervention. Conversely, when air and water pollution are present, or airport noise, nuclear faculties, or hazardous waste facilities are sited, it is generally due either to public sector action or inaction. In nearly all such cases, government giveth or taketh away, thus affecting the value of adjacent lands.

Valuing amenities and disamenities and their impacts closely parallels the issue of public goods and public "bads." These goods and bads do not have precise "prices," but their impacts spill over to affect the value of commodities that are traded in markets, including land and property. The theoretical literature focuses on how to value the amenity; since the amenity influences land and other asset values in its vicinity, land and property values are often used as proxies for the value of the amenity itself.[101]

1. Parks, Recreation Facilities, and Wetlands

In a 1979 estimate of the property value impacts of urban water parks in California, Lake Merritt in Oakland, Lake Murrey in San Diego, and La Mesa and the Santee Lakes, two methods were used.[102] The property value model[103] attempted to define that portion of property value attributable to the park, using distance from the park and quality of the park as variables. Since this did not capture benefits to "outsiders," an interview method was

also used. Estimates (see Table 4) indicated that the Lake Merritt park in Oakland ranged from a low estimate (in 1973) of $9.3 million to a high estimate of $76 million with a midpoint of $41 million including impacts on vacant lots, single unit dwellings, two to four unit dwellings, and apartments. Lake Murray, a reserve reservoir for San Diego, was less developed, but showed a low estimate of $.14 million and a high of $2.8 million, with a midpoint of $1.4 million. Santee Lakes, five small ponds originally designed as filtration pits, then developed for recreation, showed a low value which was negative, a high value of $1.2 million, and a midpoint of $.22 million. In a 1975 comment, McMillan argued that these were likely underestimates, since the additional amounts people were willing to pay were reflected in higher taxes as well as rent.[104]

In an earlier study of the benefits of neighborhood parks, Weicher and Zeibst estimated the impact on land values of five parks in Columbus, Ohio in 1973.[105] Properties facing an adjacent park sold for an average of $1,130 more than similar properties one block away; properties backing onto the park were comparably priced; and those facing parks in which views are restricted by recreation facilities sold for $1,150 less. Overall, properties facing parks sold for an average of 23 percent more than similar properties elsewhere.

While many studies have been undertaken of the potential values of wetlands in both ecological and economic terms, to date few have estimated the impact of wetlands on adjacent or nearby property. In a 1993 study, Doss and Taff estimate such a relationship for Ramsey County, Minnesota.[106] Testing numerous models and specifications, they concluded that a clear amenity value existed for adjacent property, but that this value depended crucially on the type of wetland.

2. Air Quality

A second type of amenity with demonstrable empirical impacts on property values is air quality, which has been the object of substantial government regulation since the 1970s. In a study of air pollution impacts in the St. Louis Metropolitan area in 1960, Ridker and Henning estimated that property values would rise by between $83 and $245 for each reduction in sulfation levels of 0.25 mg/100 cm^2/day. Total increases in property values from such reductions, using these estimates, could have been as much as $82.7 million in the St. Louis area alone.[107] Yet in a following study, also of the St. Louis area, also using 1960 data, Weiand did not find sulfation levels to be significantly related to land values.[108]

A 1978 study of the housing premium paid for lower levels of pollution and other amenities by B. A. Smith found that estimates vary rather widely depending on the methodology used.[109] Using housing data from Chicago during 1971, Smith showed that the availability of public water and sewer facilities was worth $1,300 in per unit property price differentials, and reduced air pollution was worth $430 per property unit. Premiums nearing $5,000 were paid for property in some low pollution areas.[110] A similar study was undertaken in 1978 by Li and Brown (1978).

In 1978, Nelson applied similar theory designed to reveal the impact of air quality characteristics on residential choice in the Washington, D.C. area.[111] The paper showed air pollution to be a significant disamenity, with a discounted present value equal to a $70 reduction in average unit property values for each unit reduction in air quality measured by particulate concentrations.

In 1980, Diamond utilized mortgage data from savings and loan institutions in Chicago to estimate the impact of environmental and other amenities on land values.[112] On average, higher crime levels reduced marginal property values reflected in bid-prices for real estate by $1,758 in 1970 dollars, while particulate pollution lowered them by $200 per unit.

Using data from Boston, Harrison and Rubinfeld estimated a model of air quality characteristics (nitrogen oxides) to show that the change in median housing values for a one part-per-hundred million change in this pollutant is highly significant, equal to an average of $1,613.[113]

In 1987, Izraeli estimated the willingness to give up earned income for income in-kind in the form of environmental goods.[114] In a sample of 237 Standard Metropolitan Statistical Areas in 1970, a 10 percent decrease in air pollution was shown to raise housing prices by one percent.

3. Airport Noise, Hazardous Wastes, and Power Plants

If government-provided amenities generally enhance property values, government decisions to locate certain facilities, such as airports, waste disposal sites, and power plants, generally lower them. A separate group of studies has examined the impacts of these disamenities on land values. Gautrin, in a 1975 study of London's Heathrow airport, found no statistically significant "noise affect," because other advantages of proximity to the airport probably offset them. In total, airport noise appeared to account for less than 5 percent of variations in housing values.[115] A 1978 study by Mieszkowski and Saper of housing transactions in the Toronto area concluded that houses in high airport noise areas do sell at a discount, of as much as 15 percent, and suggested that these losses could be offset by a per passenger charge of $1.00 or less.[116] A 1985 study examined airport noise impacts on property values in Atlanta at two points in time: 1979-80 and 1970-72. A "noise discount" on property was found of between .52 and .67 percent per unit per decibel, a result consistent across time and several different data sets.[117]

Similar methods have been applied to other disamenities, such as hazardous waste sites. In a 1990 study, Michaels and Smith proposed an approach which defined the property market in terms of a sample drawn from the views of realtors' appraisals, in this case in suburban Boston between 1977 and 1981.[118] Estimates of marginal willingness to pay to remove a hazardous waste site were made for several market segments, ranging from $124 per property unit for the full sample to $1,799 per unit in a "premier" housing district near Cambridge. Removal was equivalent in the model to an increase in the distance from the site.

Electric utility plants have also been the subject of study. In a 1974 article, Blomquist analyzed the Winnetka, Illinois, power plant, concluding that within 11,150 feet of the plant, a typical property loses 0.9 percent of its value for each 10 percent move closer to the plant. The total disamenity value of the plant was estimated at from $202,804 if no damage to non-residential property is assumed, to $17.7 million if all area property, residential and non-residential, is negatively affected.[119]

Nuclear power plants have also been studied. Gamble and Downing, in a 1982 study, using 540 single family properties in the Northeast, found no adverse impacts on property

values before the Three Mile Accident in March, 1979. However, immediately following the accident, a sharp decline in sales occurred within 10 miles of the plant. Within 9 months, the market recovered, and no significant impacts on capitalized land and housing variables were observed.[120]

A 1991 study of such power plants and their impacts on agricultural land values in a cross section of 494 market area regions in the U.S. found significant negative impacts, with land values 10 percent lower than similar areas without a reactor. This sample average reduction was about $100 per acre, compared with a sample average land value of $992.[121]

In a 1992 study, Bartik et al., observed that when households changed dwellings, the decision was conditional on having preferred the original location.[122] This factor complicates estimates, leading to the use of a "maximum score estimation" to determine the factors leading to such moves. The result is to estimate the value to households of "staying put." Using data from the Department of Housing and Urban Development from 1973-76, the impact of school quality, crime reduction, and neighborhood physical condition were shown to have a significant impact on willingness to pay for housing.[123]

E. National Economic Policies

The pervasive influence of government economic policy on market forces, from fiscal and interest rate policy to trade and exchange rate policy, makes the potential number of influences on land values almost countless. However, certain examples are illustrative of the link from these government actions to land values. Consider, for example, the impact of interest rate adjustments in the early 1980s on U.S. farmland.[124] Farmland values in the Midwest escalated at unprecedented rates in the 1970s. In Minnesota, for example, farmland prices rose 459 percent between 1973 and 1981, then fell 59 percent from 1982-1987, before recovering by 68 percent in 1988-92.[125] A major part of the explanation was that beginning in the late 1970s, the deterioration of export markets and the accumulation of heavy debt burdens left the farm sector highly vulnerable to interest rate shocks. When Federal Reserve Chairman Volcker administered this shock, the result was an extraordinary turn-around in real interest rates. These rates, which had actually been negative in 1979, at the height of the Carter inflation, were allowed to rise by 1983 into double digits, and actually exceeded 20 percent for a time, as the Fed hit the money supply brakes.

The farm sector was caught in a pincer: falling export demand resulted in declining overall farm prices and incomes, while rising real rates made large investments in farmland and equipment, which had boomed in the 1970s, suddenly appear to have been grave mistakes in judgment. Farmland and asset values, which had appreciated by over 400 percent in many rural areas, suddenly began a downward spiral that would not end until the middle to late 1980s. As farmland fell in price, loans taken out in the boom days of the 1970s started going bad, and highly leveraged farmers were seriously threatened with total losses.

This pincer caught many of the most sophisticated and highly capitalized farmers by surprise. In large part, this was because agriculture had ceased to be controllable through domestic farm legislation alone. While high target prices appeared to guarantee farm incomes, the reliance of the sector on export demand, and borrowed capital, made both exchange rates and interest rates of equal or greater importance than commodity price

supports to farmers' fortunes. To close this vicious circle, real interest rates increasingly drove export demand itself: as real interest rates rose, international money managers and foreign exchange dealers responsible for billions of dollars of financial flows looked to the United States in the early 1980s as a source of very attractive and safe returns on Treasury bills and bonds. To acquire these securities they needed dollars, leading to rapidly increasing demands for the U.S. currency. Because the anti-inflationary Federal Reserve was loathe to print more dollars, the exchange rate climbed dramatically between 1981 and 1985, reaching its apex in February 1985. This appreciation of the currency choked off the demand for U.S. farm exports which were also priced in dollars.

Hence, the Federal Reserve's decision to tame inflation not only drove down the value of holding real assets, such as farmland; it also contributed significantly to reduced export demand for what this land could produce. The growing integration of global capital and commodity markets made farmers hostages to exchange rate and interest rate policy as never before.[126] Finally, the huge budget deficits that resulted from the failure of the Reagan administration to reduce spending proportionately with their "supply side" tax reductions made the government's need to borrow on international capital markets nearly insatiable, locking in a reliance on high returns to Treasury securities in order to finance continued government spending.

IV. Summary and Conclusions

The preceding sections have demonstrated that, despite widely varying methodologies, ample evidence exists that government action has a pervasive influence on land and property values. This influence is both positive and negative, and can be substantial, depending on the time, place and circumstances. The result is that the impacts of government action, while pervasive, are highly differentiated. We have reviewed a sizable share—but hardly all—of this evidence. In this study, we have focused especially on agricultural policies, local zoning and urban land use restrictions, transportation route location decisions by federal, state and local authorities, the location of amenities such as parks and disamenities such as hazardous waste sites, and briefly on national economic policies and their impacts on farmland values. This review could easily be expanded to include other government actions not considered here.

However, the evidence addressed is sufficient, in our view, to draw some important conclusions. First, and most obviously, government actions affect land and property values every day, in myriad ways, both positively and negatively. Government at the national, state and local level is so much a "player" in the land and property market that it is difficult to conceive of a land parcel that is not, in some way, affected by its actions.

Given governments' ubiquitous role in the determination of value, the second major conclusion is that purchasers of land and property are inherently, and often explicitly, making judgments and forming expectations of government behavior (and the behavior of other buyers and sellers) in the course of their own real estate transactions. It is therefore unreasonable, except in the most egregious or remarkable of cases, to imagine that any such transaction on which government action has impinged is worthy of compensation for

"partial takings." The idea of takings is more properly reserved for instances in which government actions truly remove the whole value of land or property, situations at the limit of the wide range of influence over value.

Third, if it is argued that a wider range of takings deserves compensation, then it also seems reasonable to tax away some of the benefits that go serendipitously to those to whom government action has "given" value in property. This would correct the lopsided notion that government can affect the value of property only negatively, and not positively. Of course, if such policies were systematically implemented, the reaction among those newly taxed would likely be unfavorable. However, it is important to emphasize that widespread compensation for "takings" and taxation of "givings," are simply two sides of the same coin.

Fourth, if such policies are actually undertaken by the courts or their agents, the empirical review above shows how difficult it will be, even on the basis of disinterested economic research, to reach a consensus on the actual effect of government action on land and property values, and to calibrate this effect accurately. In all likelihood, compensation for takings or taxation for givings would not accurately reflect the marginal private and social costs and benefits of government action, and would instead introduce yet another layer of government interference and uncertainty to cloud the valuations given in the market. This further incursion of public or judicial judgment on market processes is, ironically, precisely what advocates of wider compensation for takings seem most to abhor.

Endnotes

[1]William Blackstone, cited in Kenneth Berlin, "Just Compensation Doctrine and the Workings of Government: The Threat from the Supreme Court and Possible Responses." *The Harvard Environmental Law Review* 17:1 (1993), p. 103.

[2]The Fifth Amendment states: "No person shall . . . be deprived of life, liberty, or property, without due process of law; nor shall private property be taken for public use, without just compensation."

[3]See Philip M. Raup. *Evolutionary Trends in Land Use Control in the United States.* Paper presented at the Third Conference on Agricultural Policy and the Environment. University of Padova (Italy) and University of Minnesota. Motta di Livenza (TV) Italy, June 22-26, 1992.

[4]See Berlin (1993); Richard A. Epstein, *Takings: Private Property and the Power of Eminent Domain.* Cambridge, MA: Harvard University Press, 1985; and R. A. Epstein, "Richard Epstein on the Foundations of Takings Jurisprudence." *Harvard Law Review* 99 (1986): 791, 799; and R. A. Epstein, "An Outline of Takings." *Miami Law Review* 41:1 (1986): 1, 19.

[5]Berlin (1993), pp. 98-99. The leading proponent of the conservative position is Richard A. Epstein (1985; 1986), who maintains that private property as a concept is "inconsistent with the idea that property owners have affirmative obligations to others" (1986, p. 799). This sentiment itself seems inconsistent with that of Blackstone, who noted that "every man when he enters into society gives up part of his natural liberty, as the price of so valuable a purchase... obliges himself to conform to those laws when the community has thought to establish."

[6]Berlin (1993), pp. 99-100. Laurence H. Tribe estimates that the Supreme Court invalidated state or federal law at least partly on due process grounds in 197 cases between 1899 and 1937 (Tribe, 1988, p. 567, footnote 2).

[7]112 S.Ct. 2886, 2892 (1992).

[8]No. 93-518.

[9]Berlin (1993).

[10]L. Greenhouse. "High Court limits the Public Power on Private Land." *New York Times.* June 25, 1994, pp. A-1; A-8.

[11]L. Greenhouse, 1994, pp. A-8; A-1.

[12]See C. F. Runge, "Economic Implications of Wider Compensation for `Takings' or, What if Agricultural Policies Ruled the World?" *Vermont Law Review* 71:3 (Spring 1993): 723-739; D. R. Mandelker, "Investment-Backed Expectations: Is There a Taking?" *Journal of Urban and Contemporary Law* 31:3 (1987): 3-43.

[13]Anthony Lewis. "The One and the Many." *New York Times*. December 30, 1994, p. A-15.

[14]See Alan Ryan. *Property and Political Theory*. New York: Basil Blackwell. 1984.

[15]C. B. Macpherson, *Democratic Theory: Essays in Retrieval*. Oxford, Oxfordshire: Clarendon Press. 1973; and C. B. Macpherson, The Political Theory of Possessive Individualism: Hobbes to Locke. Oxford: Oxford University Press. 1962.

[16]Joseph A. Schumpeter. *Capitalism, Socialism and Democracy*. London: Unwin University Books, 13th imp., 1974, p. 248, n. 18.

[17]David Ricardo. *On the Principles of Political Economy and Taxation*. London: J. Murray. 1817.

[18]Vernon Rosco Carstensen, *The Public Lands: Studies in the History of the Public Domain*. Madison: University of Wisconsin Press. 1963; Paul J. Culhane. *Public Lands Politics: Interest Group Influence on the Forest Service and the Bureau of Land Management*. Baltimore: Published for Resources for the Future by Johns Hopkins University Press. 1981.

[19]James Mill, quoted in J. M. Currie, *The Economic Theory of Agricultural Land Tenure*. Cambridge: Cambridge University Press (1981). Quotation appears at pp. 15-16.

[20]Henry George. *Progress and Poverty: An Inquiry into the Cause of Industrial Depressions and the Increase of Want with Increase of Wealth . . . The Remedy*. New York: Random House, 1879 (Reprinted 1919). George's argument had been proposed over a century earlier by the French Physiocrat Quesnay in the form of a l'impôt unique. See J. M. Currie (1981), pp. 8-9.

[21]Frank Michelman. "Property, Utility and Fairness: Comments on the Ethical Foundation of `Just Compensation' Law." *Harvard Law Review* 80:1165 (1967): 1229-34.

[22]See John Maynard Keynes, *The General Theory of Employment, Interest and Money*. London: MacMillan, 1936, Chapter 16; and Theodore Graham-Tomasi, C. Ford Runge and William F. Hyde. "Foresight and Expectations in Models of Natural Resource Markets." *Land Economics* 62:3 (August, 1986): 234-249.

[23]W. Cronon. *Nature's Metropolis: Chicago and the Great West*. New York: W. W. Norton & Company, 1991.

[24]John R. Commons. *Legal Foundations of Capitalism*. Madison, WI: The University of Wisconsin Press. 1968.

[25]J. H. von Thünen. *The Isolated State*. Hamburg. 1826.

[26]O. R. Burt, "Econometric Modeling of the Capitalization Formula for Farmland Prices." *American Journal of Agricultural Economics* 68 (1986): 10-26; A. M. Featherstone and T. Baker, "An Examination of Farm Sector Real Asset Dynamics." *American Journal of Agricultural Economics* 69 (1987): 532-46; L. D. Robison, D. A. Lins, and R. Venkataraman,"Cash Rents and Land Values in U.S. Agriculture." *American Journal of Agricultural Economics* 67 (1985): 794-805. This approach to the determination of long-term asset prices has as its foundation the present value model. The present value framework asserts that an asset's price is given by the present value of the (discounted) expected future returns (rents) earned over the life of the asset. Alternative views (see, for example, E. Castle and I. Hoch, "Farm Real Estate Price Components, 1920-78." *American Journal of Agricultural Economics* 64 (1982): 8-18) allow for ***ad-hoc*** "capital gains" to also influence land prices. However, the conventional belief is that such capital gains are directly tied to expected returns and thus should not be considered separately. As E. Melichar, "Capital Gains versus Current Income in the Farming Sector." *American Journal of Agricultural Economics* 61 (1979): 1085-1092 notes, capital gains result from a growing stream of rents.

[27]Equilibrium land values can thus be represented by the following capitalization formula:

$$\int_0^{\infty} E_t R_{t+k} e^{-kr} dk ,$$

where E_t is the conditional expectations operator, R_t represents returns to the parcel of land in time t, k represents a subsequent period, and r is a continuous real discount rate. Note that the real discount rate is assumed to be constant. No loss of generality occurs if the real discount rate is allowed to vary. In this case, agents must also form expectations regarding future discount rates. See Robison, et. al., 1985.

[28]The expectations of future returns can be represented by a growth function from a base return (R):

$$E_t R_{t+k} = R e^{gk} ,$$

where g is the expected growth rate in real returns to land. See A. M. Featherstone and T. Baker, "An Examination of Farm Sector Real Asset Dynamics." *American Journal of Agricultural Economics* 69 (1987): 532-46.

[29]The capitalization formula for equilibrium land values, represented by equation (1), can be combined with the growth function to yield an expression for the equilibrium value of land in time t (LV_t):

$$\int_0^{\infty} R e^{k(g-r)} dk = R(r-g)^{-1} = LV .$$

The relationship between revenues, rents, and land values is discussed in detail by Robison, et al. (1985).

[30]A. M. Featherstone and T. Baker. "Effects of Reduced Price and Income Supports on Farmland Rent and Value." *North Central Journal of Agricultural Economics* 10 (1988): 177-90.

[31]See C. F. Runge. 1993, "Economic Implications of Wider Compensation for 'Takings' or, What if Agricultural Policies Ruled the World?" *Vermont Law Review* 71:3 (Spring 1993): 723-739.

[32]J. M. Alston, "An Analysis of Growth of U.S. Farmland Prices, 1963-82." *American Journal of Agricultural Economics* 68 (1986): 1-9; B. Falk, "Formally Testing the Present Value Model of Farmland Prices." *American Journal of Agricultural Economics* 73 (1991): 1-10; K. West, "Bubbles, Fads, and Stock Price Volatility." Econometrica 56(1988): 37-62; J. Campbell and R. Shiller, "The Dividend-Price Ration and Expectations of Future Dividends and Discount Factors." *Review of Financial Studies* 1 (1988): 195-228.

[33]J. M. Alston, "An Analysis of Growth of U.S. Farmland Prices, 1963-82." *American Journal of Agricultural Economics* 68 (1986): 1-9; O. R. Burt, "Econometric Modeling of the Capitalization Formula for Farmland Prices." *American Journal of Agricultural Economics* 68(1986): 10-26; B. Falk, *A Search for Speculative Bubbles in Farmland Prices*. Mimeo, Department of Economics, Iowa State University, July 1988; A. Tegene and F. Kuchler, "The Contribution of Speculative Bubbles to Farmland Prices." *U.S.D.A., Economic Research Service, Technical Bulletin No. 1782*, July 1990.

[34]A. M. Featherstone and T. Baker, "An Examination of Farm Sector Real Asset Dynamics." *American Journal of Agricultural Economics* 69(1987): 532-46; K. C. Moore and W. H. Myers, "Predictive Econometric Modeling of the U.S. Farmland Market: An Empirical Test of the Rational Expectations Hypothesis." *CARD Report No.* 133, 1986.

[35]B. Falk. *A Search for Speculative Bubbles in Farmland Prices*. Mimeo, Department of Economics, Iowa State University, July 1988; and B. Falk, "Formally Testing the Present Value Model of Farmland Prices." *American Journal of Agricultural Economics* 73 (1991): 1-10.

[36]Willard W. Cochrane and C. Ford Runge. *Reforming Farm Policy: Toward a National Agenda*. Ames: Iowa State University Press, 1992. This issues is discussed in greater detail in Section E. below.

[37]For a recent review, see Richard E. Just and John A. Miranowski, "Understanding Farmland Price Changes," *American Journal of Agricultural Economics* 75 (Feb. 1993): 156-168; Raymond B. Palmquist, "Land as a Differentiated Factor of Production: A Hedonic Model and Its Implications for Welfare Measurements," *Land Economics* 65:1 (Feb. 1989): 23-28; and Lindon J. Robison, David A. Lins and Ravi Venkataraman,

"Cash Rents and Land Values in U.S. Agriculture," *American Journal of Agricultural Economics* (Nov. 1985): 794-805.

[38]M. Shuffett and J. Hoskins. "Capitalization of Burley Tobacco Allotment Rights into Farmland Values." *American Journal of Agricultural Economics* 51 (1969): 471-74.

[39]V. L. Vantreese, M. R. Reed and J. R. Skees. "Mandatory Production Controls and Asset Values: A Case Study of Burley Tobacco Quotas." *American Journal of Agricultural Economics* 70 (1989): 319-25.

[40]J. A. Seagraves. "Capitalized Values of Tobacco Allotments and the Rate of Return to Allotment Holders." *American Journal of Agricultural Economics* 51 (1969): 320-34.

[41]Joseph A. Herriges, Nancy E. Barickman and Jason F. Shogren. "The Implicit Value of Corn Base Acreage," *American Journal of Agricultural Economics*, (February 1992): 50-58. It should be noted that base acres are an accounting unit, not a separate category of land. A farm of 300 acres may have 100 acres in corn base as recorded by the county offices of the U.S. Department of Agriculture, but the acres planted to corn in any given year could be any acres on the farm. Thus, the value of base inheres in the value of the entire farm unit. See Willard W. Cochrane and C. Ford Runge, *Reforming Farm Policy: Toward a National Agenda*. Ames: Iowa State University Press (1992), Chapter 3.

[42]John E. Floyd. "The Effects of Farm Price Supports on the Returns to Land and Labor in Agriculture," *Journal of Political Economy* 73 (1965): 148-58.

[43]P. A. Duffy, C. R. Taylor, D. Cain and G. J. Young. "The Economic Value of Farm Program Base." *Land Economics* 70:3 (August, 1994): 318-329.

[44]A. M. Featherstone and T. Baker. "Effects of Reduced Price and Income Supports on Farmland Rent and Value." *North Central Journal of Agricultural Economics* 10 (1988): 177-90.

[45]C. F. Runge and D. Halbach. "Export Demand, U.S. Farm Income, and Land Prices: 1949-85." *Land Economics* 66 (1990): 150-162.

[46]B. K. Goodwin and F. Ortalo-Magné. "The Capitalization of Wheat Subsidies into Agricultural Land Values." *Canadian Journal of Agricultural Economics* 40 (1992): 37-54.

[47]J. Stephen Clark, K. K. Klein and S. J. Thompson. "Are Subsidies Capitalized into Land Values? Some Time Series Evidence from Saskatchewan." *Canadian Journal of Agricultural Economics* 41:2 (July 1993): 155-168.

[48]W. E. Martin and G. L. Jefferies. "Relating Ranch Prices and Grazing Permit Values to Ranch Productivity." *Journal of Farm Economics* 48 (1966): 233-42, noted that fees were set such that the marginal value product offered by grazing on public lands far exceeded the marginal factor cost imposed by the low fees.

[49]B. D. Gardner. "A Proposal to Reduce Misallocation of Livestock Grazing Permits." *Journal of Farm Economics* 45 (1963): 109-20.

[50]N. K. Roberts. "Economic Foundations for Grazing Use Fees on Public Lands." *Journal of Farm Economics* 45 (1963): 721-31.

[51]L. A. Torell and J. P. Doll. "Public Land Policy and the Value of Grazing Permits." *Western Journal of Agricultural Economics* 16 (1991): 174-84.

[52]Raymond B. Palmquist and Leon E. Danielson. "A Hedonic Study of the Effects of Erosion Control and Drainage on Farmland Values." *American Journal of Agricultural Economics* 71 (February 1989): 55-62.

[53]G. Hertzler, C. A. Ibanez-Meier and R. W. Jolly. "User Costs of Soil Erosion and their Effect on Agricultural Land Prices: Costate Variables and Capitalized Hamiltonians." *American Journal of Agricultural Economics* 67:5 (December 1985): 948-953.

[54]David L. Chicoine, Steven T. Sonka, and Robert D. Doty. "The Effects of Farm Property Tax Relief Programs on Farm Financial Conditions." *Land Economics* 58:4 (November 1982): 512-523.

[55]Most of these empirical examples evaluate small (local) changes in policy-generated levels of protection. Separating out total policy effects on land values is analogous to evaluating what land values would be if policies were totally eliminated. Local approximations may not be accurate for evaluating such large policy changes. In this light, the following policy effects should be viewed as conservative estimates of government-led price impacts on land and farm assets.

[56]L. A. Torell and J. P. Doll. "Public Land Policy and the Value of Grazing Permits." *Western Journal of Agricultural Economics* 16 (1991): 174-84.

[57]Most U.S. farm programs have their origins in the Agricultural Adjustment Act of 1933, as amended in 1938.

[58]W. D. Toussaint. "The Flue-Cured Tobacco Program." *North Carolina Cooperative Extension Service Report*, September 1992.

[59]See W. A. Fischel (1985). *The Economics of Zoning Laws: An Approach to American Land Use Controls*. Baltimore: Johns Hopkins University Press; and Robert C. Ellickson, "Suburban Land Use Controls: An Economic and Legal Analysis." Yale Law Journal 86:3(1977): 385-511.

[60]G. R. Parsons. "The Effect of Coastal Land Use Restrictions on Housing Prices: A Repeat Sale Analysis." *Journal of Environmental Economics and Management* 22 (1992): 25-37.

[61]Gerrit J. Knaap. "The Price Effects of Urban Growth Boundaries (UGBS) in Metropolitan Portland, Oregon." *Land Economics* 61:1 (February 1985): 26-35.

[62]A. C. Nelson. "An Empirical Note on How Regional Urban Containment Policy Influences an International between Greenbelt and Exurban Land Markets." *American Planning Association Journal* (Spring 1988): 179-184; A. C. Nelson, "A Unifying View of Greenbelt Influences on Regional Land Values and Implications for Regional Planning Policy." *Growth and Change* (April 1985): 43-48.

[63]M. R. Correll, J. H. Lillydahl and L. D. Singell. "The Effects of Greenbelts on Residential Property Values: Some Findings on the Political Economy of Open Space." *Land Economics* 54:2 (May 1978): 207-217.

[64]G. J. Knaap and A. C. Nelson. "The Effects of Regional Land Use Control in Oregon: A Theoretical and Empirical Review." *The Review of Regional Studies* 18 (1988): 37-46.

[65]M. E. Gleeson. "Effects of an Urban Growth Management System on Land Values." *Land Economics* 55:3 (August 1979): 350-365.

[66]P. V. Schaeffer and C. A. Millerick. "The Impact of Historic District Designation on Property Values: An Empirical Study." *Economic Development Quarterly* 5:4 (November 1991): 301-312.

[67]E. F. Brigham. "The Determinants of Residential Land Values." *Land Economics* 41 (August 1965): 325-334.

[68]P. B. Downing. "Factors Affecting Commercial Land Values: An Empirical Study of Milwaukee, Wisconsin." *Land Economics* 49 (1973): 44-56.

[69]R. B. Peiser. "The Determinants of Nonresidential Urban Land Uses." *Journal of Urban Economics* 22 (1987): 340-360.

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[71]G. D. Jud. "The Effects of Zoning on Single-Family Residential Property Values: Charlotte, North Carolina." *Land Economics* 56:2 (May 1980): 144-154.

[72]D. Brownstone and A. De Vany. "Zoning, Returns to Scale, and the Value of Undeveloped Land." *The Review of Economics and Statistics* (1991): 699-704.

[73]Lung-Fei Lee. "Some Approaches to the Correction of Selectivity Bias." *Review of Economic Studies* 49 (1982): 355-372.

[74]N. E. Wallace. "The Consistency Doctrine and the Market Effects of Zoning Undeveloped Land." *Research in Law and Economics* 10 (1987): 27-52.

[75]Ibid., p. 46.

[76]L. A. Rose. *Taxation of Land Value Increments Attributable to Rezoning.* Economic Research Center. University of Hawaii (December, 1971).

[77]H. A. Clonts, Jr. "Influence of Urbanization on Land Values at the Urban Periphery." *Land Economics* 46 (November 1970): 489-497.

[78]A. C. Nelson. "Economic Critique of U.S. Prime Farmland Preservation Policies." *Journal of Rural Studies* 6:2 (1990): 119-142; T. L. Daniels, "Policies to Preserve Prime Farmland in the U.S.A.: A Comment," *Journal of Rural Studies* 6:3 (1990): 331-336; A. C. Nelson, "The Analytical Basis for an Effective Prime Farmland Landscape Preservation Scheme in the U.S.A." *Journal of Rural Studies* 6:3 (1990): 337-346.

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[81]Albert Fishlow. *American Railroads and the Transformation of the Antebellum Economy.* Cambridge: Harvard University Press. 1965.

[82]See W. Cronon. *Nature's Metropolis: Chicago and the Great West.* New York: W. W. Norton & Company, 1991.

[83]William F. Huneke. *The Heavy Hand: The Government and the Union Pacific.* New York. Garland Publishers. 1985.

[84]John R. Borchert. *America's Northern Heartland.* Minneapolis: University of Minnesota Press, 1987.

[85]William H. Becker. *From the Atlantic to the Great Lakes: A History of the U.S. Army Corps of Engineers and the St. Lawrence Seaway.* Washington, D.C. Historical Division. Office of Administrative Services. Office of the Chief of Engineers. 1983.

[86]C. R. Hayes. "Suburban Residential Land Values along the C. B. and Q. Railroad." *Land Economics* 33 (May 1957): 177-181. H. Hoyt, One Hundred Years of Land Values in Chicago. Chicago: University of Chicago Press. 1933. H. M. Mayer, "Moving People and Goods in Tomorrow's Cities." *Annals of the American Academy of Political and Social Science* (November 1945): 116-128.

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[102]A. H. Darling. "Measuring Benefits Generated by Urban Water Parks." *Land Economics* (February 1973): 22-34.

[103]One of the first uses of this model was J. Knetsch, "Land Values and Parks in Urban Fringe Areas." *Journal of Farm Economics* (December 1962): 1718-1729. See also J. W. Kitchen and W. S. Henden, "Land Values Adjacent to an Urban Neighborhood Park." *Land Economics* (August 1967): 357-360.

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[124]See Willard W. Cochrane and C. Ford Runge, *Reforming Farm Policy: Toward a National Agenda*. Ames: Iowa State University Press, 1992; J. D. Sutton and A. J. Webb, "Trade Policies and the Use and Value of Natural Resources." Chapter 8 in *Agricultural Trade and Natural Resources: Discovering the Critical Linkages*. Edited by John D. Sutton, Boulder, CO: Lynne Rienner Publishers, 1988; and C. F. Runge and D. W. Halbach, "Export Demand, U.S. Farm Income, and Land Prices: 1949-85." *Land Economics* 66:2 (May 1990): 150-162.

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Table 1
Simulated Land Price for 1987-1990
Under the 1985 Programs and the Market Scenarios

	Mean	Minimum	Maximum	Standard Deviation
	January 1, 1986, Dollars per Acre			
	1985 Programs			
1987	1060	1048	1080	2
1988	1142	1101	1237	37
1989	1226	1125	1492	78
1990	1284	1086	1793	134
	Market			
1987	1029	997	1070	26
1988	1065	938	1225	81
1989	1099	822	1485	157
1990	1118	657	1814	245

Source: Featherstone and Baker, 1988, p. 186.

Table 2
Selected Empirical Examples of Policy Effects on Land Values[a]

Authors	Policy	Year	Region	Dollars/Acre Effect or "Givings"
Goodwin and Ortalo-Magné	Wheat Subsidies	1979 1989	Picardie (France	$2,123.16 784.65
		1979 1989	Kansas	$368.49 188.79
		1979 1989	Manitoba (Canada)	$200.38 113.58
Seagraves	Flue-cured Tobacco Allotments	1947 1960	North Carolina	$ 3,137.52 14,344.29
Vantreese, Reed and Skees	Burley Tobacco Allotments	1973 1985	Kentucky	$497.63 125.26
Torell and Doll	Public Land Grazing Permits	1979- 1988	New Mexico	$48.89
Martin and Jefferies	Public Land Grazing Permits	1959-	Arizona	$82.65

[a]Values converted to 1992 equivalent dollars by deflating with the consumer price index.

Table 3
Property Values as an Indicator of Highway Accessibility Effects.

Highway	Source or Author	Apparent Effect of Highway on Land Values (Appreciation in Comparison to Control Area)
I-80, Bogota, NJ; I-95, Rosedale, MD; I-695 and I-83, Towson, MD; I-495, North Springfield, VA	*Community Effects of Highways* Pennsylvania State University, 1973.	+9 percent[a]
Connecticut Turnpike	*The Connecticut Turnpike: Ribbon of Hope* University of Connecticut, 1965.	+5 percent[a]
Several sites in CA, GA, and TX	*Highways and Economic and Social Changes* Bureau of Public Roads, 1964.	+8 percent per year
Lake Washington Floating Bridge	*Highways and Economic and Social Changes* Bureau of Public Roads, 1964.	
Shore Parkway, NYC	*Highways and Economic and Social Changes* Bureau of Public roads, 1964.	+54 percent over 14 years (4 percent per year)
I-45, Dallas, TX	*Some Economic Effects of the Suburban Portion of the North Central Expressway* Texas Highway Department, 1961.	+106 percent over 17 years[b] (6 percent per year)
Gulf Freeway, Houston, TX	*A 15-Year Study of Land Values and Land Use Along the Gulf Freeway* Norris and Elder, Inc., and Texas Highway Dept., 1956.	+65 percent over 5 years

Source: Adapted from U.S. Department of Transportation (1974). Social and Economic Effects of Highways. Washington, DC: U.S. Government Printing Office, Table 17, p. 70.
[a]One-time boost to market value.
[b]Unimproved land only.

Table 4
Value of Adjacent Property Attributable to Urban Water Parks

	Low	Estimated	High
		(Millions)	
Lake Merritt	$9.3	$41	$76
Lake Murray	$.14	$1.4	$2.8
Santee Lakes	(–)	$.22	$1.2

Source: A. H. Darling, "Measuring Benefits Generated by Urban Water Parks." Land Economics (February 1973): 22-34.