entirety. Taken together, the components may complement each other and thus be worth more together than separately, or, alternatively, adding a component to a property may add less than its cost to the value of the whole [Wuensch, Kelly, and Hamilton 2000, p. 10].

4. **Substitution** – the principle of substitution says that such amenities are worth no more than the cost to acquire reasonable substitutes, e.g., replacement cost approach to valuation [Eckert 1990, p. 318]. In other words, a property's value is directly influenced by the cost of acquiring a similar asset with similar utility.
5. **Surplus productivity** – surplus productivity refers to the income earned by land. This is what remains after returns to labor, management, and capital are satisfied. Land value is dependent on the costs of these other productive elements.

These principles underlie the various approaches to land valuation, but the approaches place differing emphases on the individual principles.

Approaches to Land Valuation

For vacant land, the preferred approach to valuation is the sales comparison, or market data, approach. It is grounded in the substitution principle of valuation – land of similar utility will yield similar prices in a competitive, open marketplace [Wuensch, Kelly, and Hamilton 2000, p. 11]. This approach uses actual market transactions for vacant land with appropriate adjustments for size, shape, corner influence, location, and topography [Eckert 1990, pp. 190-95]. Depending on land type (residential, single family, multi-family, commercial, industrial, agricultural), each market place will use different measurement methods for valuing land – e.g., front-foot, square foot, acreage, site or lot. For example, downtown retail land might be valued on a front-foot basis because exposure is important to business. Alternatively, residential sites are typically valued on a lot or site basis while agricultural properties are valued on a per acre basis [Wuensch, Kelly, and Hamilton 2000, p. 12]. The lot, or site, approach to valuing residential lots ignores relatively minor differences among parcels – e.g., the difference between 12,000 square feet and 13,000 square feet – and places the same value on all parcels that are similarly situated.

In developed urban areas, however, there may not be sufficient vacant land sales to use the sales comparison approach to valuation, and alternative techniques must be used. These also depend on the principle of substitution, but it is applied in a somewhat different manner.

The most common approach to valuing land for tax purposes in urban areas with insufficient vacant land sales is the depreciated replacement cost approach to valuation – often referred to as the **abstraction, or extraction, method** of valuing land [Eckert 1990, pp. 195-96; Wuensch, Kelly, and Hamilton 2000, p. 16]. This technique starts with the market value of the entire property and subtracts the depreciated cost of replacing the improvements. This approach to valuation is grounded in the principle of substitution [Eckert 1990, p. 318; Wuensch, Kelly, and Hamilton 2000, p. 16]. In other words, a property's value is directly influenced by the cost of acquiring a similar asset with similar utility. The residual is then allocated to land.

This approach might work well for relatively new structures, but as time passes, economic obsolescence and depreciation increase. Adjustments for these are difficult to make, are to some extent subjective, and require informed judgments by the assessor [Eckert 1990, p. 196]. An additional caveat is necessary because of the finding that location affects the market, or contribution, value of both land and buildings, although in percentage terms the impact on land is much greater [Gloudemans 2002]. If the abstraction method – which depends on the depreciated cost approach to arrive at residual land values – does not make allowance for the effect of location on improvement value, the land value estimates may be in error in many instances.[12] Finally, we note that valuing land as a residual after subtracting the depreciated cost of improvements from a property's total value seems to move away from the notion of market value. The housing, or other, services provided by residential, or related, improvements may or not be related to the cost of constructing a substitute structure.

A second approach to valuing land when there is few land sales is the **allocation approach**, which attributes, or allocates, a percentage of total improved parcel value to land. This approach also seems to rest upon the substitution principle of value. The land percentage is derived from market evidence and applied to individual parcels. The approach implicitly says that if land typically accounts for 25 percent of total value, for example, then 25 percent is the likely land share of value for a given property. If you can get other properties providing a given level of utility for which land is 25 percent of value, why put more than that into land?

It may be more accurate to say that the allocation percentage is deemed a good starting point for setting land value in a particular instance. How the allocation percentage is determined is of obvious importance. In jurisdictions with few or no sales of vacant land, finding evidence of the value of land is difficult. One approach is to derive the average land share, using the abstraction method, and then use that percentage in the allocation approach. This manner of deriving a land allocation percentage depends upon the construction costs and depreciation percentages used in the abstraction process being properly calibrated to the geographic area in question. Alternatively, land sales data may be used that are not current sales in the subject area. Specifically, one approach is to use historic sales data for the locality, from a time when there were sufficient land sales. This runs the risk of missing a change in the relative value of land over time. A second approach is to use more contemporaneous land sales from another locality, where sufficient land sales exist. This approach also has its risks, because the "donor" sales area will differ from the one for which an allocation percentage is being calculated, and if appropriate adjustments are not made, erroneous land value estimates will result.

Market value of land may be estimated more accurately using the **contribution value approach**. Market values emerge from arm's-length transactions for a number of properties that are reasonable substitutes in terms of the utility they provide – e.g., in the case of residential properties, essentially the same housing services. An informed buyer might be willing to purchase any of several homes on the market at a given time. However, because no two properties are exactly alike (they will differ at least in their location, however slightly), the buyer may not be willing to pay the same for each property. Differences deemed important will translate into different prices that the buyer will be willing to offer. Some features of a property may add either more or less than their replacement costs, as evaluated by the typical buyer. An old, but still sound barn on a site in an area no longer used for farming may add less to value than

its replacement cost, in the eyes of buyers looking for only a residence. Alternatively, a garage might be added to a new house for less than the added amount the typical new-home buyer would be willing to pay to have a garage. Such considerations suggest that the abstraction method may err in its generation of land values, and the allocation method may not do better,

The notion of market value seems to be more closely aligned with the principle of contribution to value – that is, how much does each characteristic of site and improvements contribute to the market value of the particular parcel? The most appropriate analytical tool for addressing these questions is a statistical model that explains the sales price of individual properties as a function of the land and improvements attributes.

Mills expresses misgivings about this approach to land valuation. He asserts, "There is no prospect of a hedonic equation that would be adequate to assess site values of developed residential properties; much less a prospect of an equation that could assess site values of developed commercial property; and there is simply no other way to estimate site values of developed properties" [Mills 1998, p. 47]. Mills is too categorical in his conclusion. One must start, as Mills acknowledges [Mills 1998, p. 44], with the understanding that assessment of real property for tax purposes is still as much art as it is science. One must also acknowledge that assessments must be developed for tax purposes. The challenge is to inform the assessor's judgment as fully and as clearly as possible. The literature includes several examples of hedonic pricing models that seem to make a contribution.

Ashley, Plassmann, and Tideman address the question of how accurately developed commercial land can be assessed in an urban center where there are limited or no sales of such land. They use sales in downtown Portland, Oregon, to develop and test a combination of a simple hedonic model of the value of improvements to commercial property plus a quadratic smoothing technique. They conclude that while there are relatively few sales of downtown commercial land in Portland, the available information could be used in creative ways to develop reasonable estimates of land value for developed commercial properties. Their model predicted land value for improved downtown commercial land better than the model used by assessors in the city,[13] and they conclude that the performance of the method was good enough to warrant further study [Ashley, Plassmann, and Tideman 1999].

In a related effort, Gloudemans tests the ability of modern mass appraisal techniques to develop separate estimates of land and building values for urban residential properties. He uses data from three large North American metropolitan areas – Ada County, Idaho (Boise); Edmonton, Alberta; and Jefferson County, Colorado (suburban Denver) to test both a traditional "additive" multiple regression model typical of those used by assessment authorities and a "hybrid" model using nonlinear regression analysis. Results of the nonlinear models are tested on combined sales and separately on improved and vacant land sales. Based on his research findings, he concludes that modern mass appraisal methods can be adapted to estimate both vacant and improved residential land values with reasonable accuracy, even when there are no or few vacant land sales in certain areas [Gloudemans 2000].

In a separate research project Gloudemans, Handel, and Warwa test the efficacy of different models, based on different data sets, in estimating the value of vacant land in urban, built-up,

areas. Their concern is the fact that the appraisal of vacant residential land tends to be comparatively difficult and studies of assessment performance consistently show values to be far less accurate or reliable than for improved residential properties. They test three different models to estimate the value of land – a land model using only vacant land sales; an improved model using only improved sales; and a combined model using both vacant and improved sales. If the combined model could perform as well (or nearly as well) as the individual models in estimating land value, they should be able to perform even better in other, older, areas with fewer vacant land sales. They conclude that the combined model, using both vacant and improved sales, performs as well as the individual models. Thus, a combined model lends stability to vacant land values and provides much needed market benchmarks where vacant land sales are lacking [Gloudemans, Handel, and Warwa 2002].

We conclude that the contribution principle of value seems more consistent than either the abstraction or allocation principles with the notion of market value; that market data will capture the value represented by the anticipation principle better than a cost-based approach; and that there are adequate analytic tools available to estimate with reasonable accuracy independent land and improvement values.

Case Studies

We set out to conduct detailed case studies of land valuation procedures and evaluation in eight local areas – one urban area and one rural area within each of four states. It is desirable to include both rural and urban areas, because of the different mix of properties and valuation issues likely to arise in the two. Several states are included in this part of the research to get a better feel for the range of practice; budget and time considerations resulted in targeting only four states for the detailed case studies. The four states visited are Maryland, Ohio, Pennsylvania, and Virginia. We ended up with more than eight study areas because we have more than two in both Pennsylvania and Virginia. However, we have only one study area in Ohio because all the smaller counties are assessed by contract appraisal firms, and we did not succeed in getting time with one of them for this study.

Pennsylvania is included because of the existence of two-tier taxes there. Because the breakdown of total parcel value into its land and improvements components already is important to the determination of tax liability in many cities, the valuation approach and related experiences there will be of particular and obvious interest.

Ohio also requires separate valuation of land and improvements, although a court decision holds that “the tax is on the aggregate value of land and improvements” [Brunori and Carr 2002, p. 18]. Another reason for including Ohio is the use of modern technology in real property valuation in Lucas County (Toledo), as presented by the county’s Chief Assessor at a Lincoln Institute program in Washington, DC, in June 2004 [German 2004]. Imaginative, cutting-edge things are being done there in estimating land values, as well.

Maryland and Virginia are included principally because we thought we had identified, through some earlier work, a difference in these states’ approaches to determining the split between land