Response to "Environmental Regulations and the Housing Market: A Review of the Literature" by Katherine A. Kiel

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Environmental regulation is a significant hurdle in the development process, as well as a major part of national efforts to protect biodiversity, environmental amenities, and other landscape features, such as wetlands. Governments at all levels routinely conduct environmental reviews of proposed projects to ensure that development is compatible with environmental protection or, at least, that economic and environmental objectives are balanced in some fashion. Interestingly, federal environmental agencies have assumed an increasingly important role in oversight of land use changes, an area traditionally reserved for local governments.

Professor Kiel does a good job at surveying an area that has, by all accounts, received inadequate attention by economists. I do not disagree with many of her conclusions. In this discussion, however, I would like to add some additional information that bears on several of the points raised in her article and also suggest ways of considering how environmental regulation impacts housing projects and who bears the cost of protecting environmental amenities.

The case of wetlands regulation is a good illustration of how environmental regulation affects housing projects. The discharge of material into wetlands is regulated by the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act. Federal regulations provide that the Corps must examine the following main issues in its review of proposed projects:

- Does the applicant have no practicable alternative that would avoid impacts to wetlands, and has the applicant minimized unavoidable impacts?
- Does the mitigation proposal adequately compensate for any adverse impacts of the project?
- Does the project contribute to significant degradation of the aquatic ecosystem?

- Is the state where the activity is to take place satisfied that the project is consistent with state water quality standards and coastal zone management plans?
- Is the project contrary to the public interest?

The first two issues are handled according to a process called "sequencing," in which the applicant must establish that all practicable steps have been taken to avoid and minimize adverse impacts before the Corps and other agencies will consider the mitigation proposal. Accordingly, the end result of environmental review is often a combination of avoidance and mitigation. Avoidance often leads to a reduction in the overall output of the project (that is, a reduction in the number of new homes constructed), and mitigation becomes one component of the transaction costs of regulation. Other out-of-pocket costs include the need to hire outside experts, such as attorneys and biological consultants, to navigate the permitting process, and the need to redesign the project based on the outcome of the review process.

Another impact of environmental regulation is the delay it causes in completing projects. Sunding and Zilberman (2002) offer some direct evidence on the length of time needed to obtain a wetland permit. Based on a nationwide analysis of individual wetland permit applications, they concluded that the average permit took a total of 788 days to prepare and negotiate. Of this amount, 383 days were required for preparation (from initiation of the process until submission), and the remaining 405 days elapsed between submission and receipt of a decision from the Corps.[1] Environmental review often is the pacing item in a housing development project, especially because local environmental reviews can be impacted by federal decisions about mitigation and avoidance. Project delay causes losses to consumers who must live in a suboptimal location for some period of time, and also to developers and landowners who must wait for receipt of project revenues.

This discussion suggests that environmental regulation has three basic types of impacts on housing projects: (1) increase in development costs, (2) reduced project output to avoid onsite impacts, and (3) delayed completion of the project. To understand how environmental regulation affects the welfare of landowners, developers, and consumers, understanding the process of price determination in the housing market is also necessary.

Housing market equilibrium can be explained with two basic theories, and each can best explain the data in particular circumstances. The most common approach is to assume that the price of housing reflects the marginal cost of construction and development. For example, housing is expensive because land (an input to housing) is expensive. In this view, commonly called the neoclassical approach to housing market equilibrium and taught to every graduate student in urban economics, density will adjust to equate the price of land with its marginal value to consumers. This view also holds that developers do not earn excess profits from their activities.

An alternative approach stresses the importance of regulation, such as zoning and density controls, that limits the supply of housing. In this approach, the marginal cost of construction and development can be far below the market price of a house, because houses are rationed among a number of consumers, and their prices are bid up accordingly. Thus, in the regulation-focused approach, housing prices reflect scarcity more than costs of production. In this view, the value of land with a house on it can be far above the willingness of consumers to pay for an additional unit of lot size.

This distinction between the neoclassical and regulation-focused explanations of the price of housing is important to the impact of environmental regulation on the housing industry. As discussed above, such regulation perturbs the housing market by increasing the cost of development, reducing the output of the project, and delaying completion and delivery of

the housing units. In markets where housing prices reflect marginal costs, the impact of environmental regulation on costs of construction and development and on completion time will be of most importance; the marginal welfare costs of output restrictions are negligible because marginal cost equals marginal utility in the pre-regulation equilibrium.

When housing supply is limited, and houses are rationed as a result, the supply-reducing effect of environmental regulation takes on major significance. By further restricting supply, environmental regulation imposes costs on consumers and results in losses to landowners and developers undertaking projects on conserved land.

Recently, Aaron Swoboda and I implemented a statistical test to identify regulation-constrained housing markets (Sunding and Swoboda, 2004). The approach exploits the fact that in regulation-constrained markets, the price of housing is above the costs of construction and development. In such situations, the value of land with a house on it (called the "extensive margin" value) will exceed the marginal willingness of consumers to pay for an additional unit of land (the "intensive margin" value). This line of reasoning suggests a statistical test of price formation: if the intensive and extensive margin values of land are equal, the neoclassical model best describes the housing market. If, however, the extensive margin value exceeds the intensive margin value, the market is constrained by prior regulation, and these distortions must be accounted for when calculating the cost of additional regulations.

The main difficulty in executing the test to categorize housing markets is how to measure consumers' willingness to pay for land. Mr. Swoboda and I collected information on more than 18,000 new home sales in the "Inland Empire" region of Southern California, one of the nation's fastest growing areas. The study area was divided into 14 subregions along lines used by the regional metropolitan planning agencies. Controlling for other factors, they estimated the contribution of a unit of lot size to the sales price of a home separately for each subregion. In 11 of the 14 areas considered, the extensive margin value of land was above the intensive margin value at a high level of statistical significance. The neoclassical model held only in the most remote, least politically organized areas. Thus, in the study area, housing rationed by prior regulation and imposition of further regulation can cause large increases in the price of housing.

Nationwide, the work of other economists suggests that housing is rationed by regulation in a number of regions. In a less formal study, Glaeser and Gyorko (2002) found that supply appears to be limited in many of the nation's housing markets because they exhibit extensive margin values of land that are far above intensive margin values. Setting aside land for habitat protection in these markets (largely on the West and East Coasts) is likely to have the largest welfare impact and the largest impact on housing affordability.

Taking all this information together, exhibit 1 is an illustration of the welfare costs and equilibrium impacts of environmental regulation. In this exhibit, I have assumed that prior regulation, such as density restrictions and growth controls, effectively ration the number of new houses built at a particular location. In a neoclassical equilibrium, marginal cost would equal demand, and no supply limitation would exist.

In previous work, I have developed simulation models to measure the total economic effects of environmental regulation of housing projects, as well as its impact on particular groups (Sunding, 2004; Sunding, Swoboda, and Zilberman, 2004). A typical simulation scenario envisions a 1,000-unit housing project that is reduced to 800 units as a result of environmental regulation. The demand for the project's units has an implied elasticity of 1.67, evaluated at the initial price and quantity. The pre-regulation cost of development and construction is $200,000 per unit, and regulation adds $10,000 to the price of each unit. The rate of interest is 10 percent, and the permitting process is assumed to delay completion of the project by 1 year.

Before regulation, the equilibrium price of each house in the development is $250,000, and 1,000 units are sold. Regulation increases the price of a house to $280,000 and decreases output by 200 units. The increase in price and the reduction in the number of homes built cause a loss to consumers with a present value of $27 million. The effects on producers are subtler. Although producers lose from the reduction in quantity and the increase in development and construction costs, they also gain from the increase in selling price.

This surplus loss is a present-value loss from a *permanent* reduction in consumption and production. The effects of delay are *temporary*. Although social surplus loss stems largely from a reduction in output, delay cost stems from postponing construction of the units that do get built, plus regional and indirect costs. Thus, delay costs are equal to post-construction consumer and producer surplus, plus external costs, multiplied by the interest rate for each period of delay.

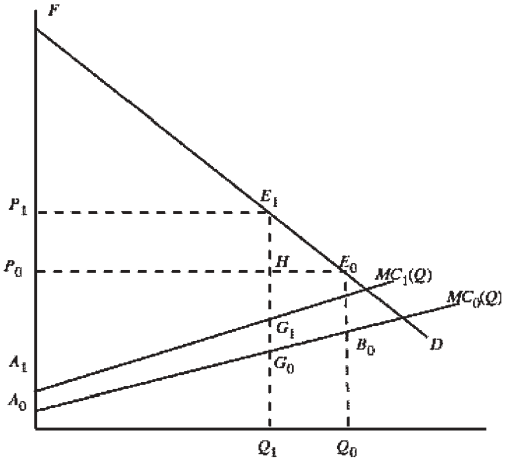
Taking short- and long-run effects together, the total economic impact of environmental regulation is $33 million for this hypothetical project. As a group, consumers bear most of the costs of regulation in this scenario. This finding is quite robust to permutations of market conditions.

An important lesson from the simulation analysis is that permitting costs and land price decreases are a poor guide to the total impacts of regulation. These indicators underestimate true costs and give a biased impression with respect to the incidence of regulatory costs. In cases in which land is scarce and housing is rationed by prior regulation, considering the market effects is important; in all cases, recognizing the costs of delay is also important.

Although not many economists have connected the dots between housing markets and environmental regulation, recognizing that many of the themes and models discussed in the articles on land use, impact fees, and building codes apply to the problem of environmental regulation is comforting. The present challenge is to extend these concepts to gain a better sense of who ultimately pays for the protection of environmental amenities and whether the benefits of regulation exceed the costs.

Exhibit 1

Impact of Regulation on the Local Housing Market



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Note

1. These figures are in contrast to the Corps' assertion that it takes only 127 days on average to obtain an individual permit. The discrepancy is largely explained by the "completion game," in which months or years can pass before the Corps deems an application to be complete and, therefore, ready for review.

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