TIME-TO-PLAN LAGS FOR COMMERCIAL CONSTRUCTION PROJECTS

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ABSTRACT

We use a large project-level dataset to estimate the length of the planning period for commercial construction projects in the United States. We find that these time-to-plan lags are long, averaging about 17 months when we aggregate the projects without regard to size and more than 28 months when we weight the projects by their construction cost. The full distribution of time-to-plan lags is very wide, and we relate this variation to the characteristics of the project and its location. In addition,we show that time-to-plan lags lengthened by 3 to 4 months, on average, over our sample period (1999 to 2010). Regulatory factors are associated with the variation in planning lags across locations, and we present anecdotal evidence that links at least some of the lengthening over time to heightened regulatory scrutiny.

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I. INTRODUCTION

The U.S. economy emerged from recession in mid-2009, but commercial construction activity did not hit bottom until nearly two years later and even now is up only slightly from its low. Although the recent weakness partly reflects the tight credit conditions induced by the global financial crisis, commercial construction also lagged behind the broader recovery in each of the three previous business cycles. Averaging across those recoveries, which date back to 1982, commercial construction reached its low about three quarters after the official business cycle trough determined by the National Bureau of Economic Research.[1] The cyclical dynamics of commercial construction matter for the macroeconomy because activity in this sector is quite volatile and contributes significantly to economic downturns.[2]

A plausible explanation for why commercial construction lags the business cycle is that these buildings require substantial planning before construction can begin, which delays the upturn in this sector. This explanation resonates with the use of gestation lags in some macroeconomic models, starting with Kydland and Prescott (1982). Two distinct types of gestation lags can be defined. The *time-to-plan* lag of a project represents the time elapsed between the initiation of planning and the start of construction, while its *time-to-build* lag represents the period from the start of construction until completion.

Although time-to-build lags have garnered most of the attention in the literature, time-to-plan lags are also important for understanding how economic fundamentals affect construction

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[1] This calculation is based on data in the National Income and Product Accounts for real investment in commercial and health care structures.

[2] From 1959:Q1 to 2012:Q4, the standard deviation of quarterly percent changes in real investment in commercial and health care structures was about five times that of real GDP. And, around the time of recessions, this sector typically makes a negative contribution to aggregate activity that far outstrips its small share of nominal GDP (1.2 percent on average from 1959:Q1 to 2012:Q4). For example, in the latest recession, which began at the end of 2007, real GDP dropped 4.7 percent, and the associated decline in real investment in commercial and health care structures reduced real GDP by about 0.5 percentage point. In each of the prior two recessions, which began in 1990 and 2001, the drop in this category amounted to an even larger share of the decline in real GDP.

and other types of investment activity. In particular, the decision to undertake a construction project will reflect information available during the planning period, including current and expected economic conditions as well as a host of regulatory and other factors specific to the locale of the project. Once construction has started, it typically becomes very costly to defer or abandon the project if circumstances change.[3] Thus, the planning period is the critical window for the formation of expectations and the perceptions of risk that drive construction spending.

Existing empirical work, however, provides very limited information about time-to-plan lags for investment projects. One strand of this literature incorporates gestation lags into the structure of a model and estimates the lags in conjunction with other parameters.[4] These studies generally point to time-to-build lags of one to two years for structures or broader aggregates of capital spending but are largely silent about the length of time-to-plan lags.[5] The second strand of the literature directly measures gestation lags. To our knowledge, only one study, Mayer (1960), provides direct measures of the time-to-plan lag. Using survey data on new industrial plants and additions to existing plants, he estimated a mean time-to-plan period of 7 months and a mean time-to-build period of 15 months. Other studies (Krainer 1968; Taylor 1982; Montgomery 1995; and Koeva 2000) measure either the time-to-build lag or a combination of that lag and part of the time-to-plan lag; these lags are estimated to be long ― about 1½ years or more. None of these studies, however, separately identifies the planning period.

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[3] For a discussion of investment under uncertainty and the role of irreversibility, see Dixit and Pyndyck (1994). For applications to commercial real estate, see Holland, Ott, and Riddiough (2000) and Sivitanidou and Sivitanides (2000).

[4] For estimates of gestation lags from investment models, see Oliner, Rudebusch, and Sichel (1995), Zhou (2000), Koeva (2001), Millar (2005a), and Del Boca *et al*. (2008); for estimates from dynamic factor demand models, see Palm, Peeters, and Pfann (1993) and Peeters (1998); and for estimates from business cycle models, see Altug (1989) and Christiano and Vigfusson (2003). Other business cycle models — including Kydland and Prescott (1982), Christiano and Todd (1996), Casares (2006), and Edge (2007) — have incorporated gestation lags that were calibrated using information outside the model.

[5] One exception is Millar (2005b), who found that it takes at least one year for shocks to total factor productivity to induce changes in spending on business fixed capital, a lag that was interpreted as the time-to-plan lag.

This paper begins to fill that void by providing comprehensive estimates of time-to-plan lags for commercial construction projects and by exploring the sources of variation in these lags. We estimate time-to-plan lags using a large project-level dataset from CBRE Economic Advisors/Dodge Pipeline, a commercial vendor of real estate data, supplemented with information about the project's locality from the Census Bureau and other governmental sources. The dataset covers more than 80,000 commercial construction projects in the United States from 1999 to 2010. Our goal is to present new stylized facts about time-to-plan lags from a rich and previously untapped dataset. We do not estimate structural models that could be used to identify causal relationships. As valuable as that would be, it is beyond the scope of this paper.

Our analysis generates four main results. First, time-to-plan lags are quite lengthy for commercial construction projects, averaging about 17 months across the projects in our dataset. Large projects — which account for a disproportionate share of total construction spending — tend to have even longer lags. Indeed, when we weight the projects by their construction cost, we find that the average time-to-plan lag associated with a given dollar of commercial construction spending is more than 28 months. Second, time-to-plan lags vary considerably around these averages depending on the characteristics of the building and its location. For example, as would be expected, time-to-plan lags are longer for larger, more complex projects; we also find that the metropolitan statistical areas (MSAs) with the longest time-to-plan lags are concentrated in California and the Northeast corridor. Third, time-to-plan lags lengthened significantly from 1999 to 2010, rising by an average of 3 to 4 months. This increase was widespread, occurring for all types of buildings, in MSAs across the population spectrum, and in most regions of the country. Finally, we find that the variation in planning lags across locations is associated with differences in land-use regulation, and we present anecdotal evidence that

links at least some of the lengthening in planning lags over time to heightened regulatory scrutiny.[6]

The rest of the paper is organized as follows. Section II describes our data, and section III presents the regression analysis. Section IV focuses on whether differences in land-use regulation can account for the variation we find in planning lags across MSAs and over time. Section V concludes.

II. DATA

We assembled our dataset using project-level data from the CBRE Economic Advisors/Dodge Pipeline database, supplemented with information about localities from the Census Bureau and other governmental sources. The Pipeline database includes more than 250,000 commercial construction projects planned in the United States from 1999 to 2010. Pipeline aims to include all office, hotel, retail, and warehouse projects started since 1999 with estimated construction costs — excluding land and design fees — that exceed $500,000 at the time of the start.[7] Pipeline also includes projects meeting these criteria that have been planned since 1999 but have not yet been started because they were abandoned, deferred, or are still in the planning process. After accounting for missing data and other exclusions, our regression sample consists of 82,303 projects — about 85 percent of which (69,723) were started before our cutoff date of December 2010.

The key information in Pipeline for this study is that on project timelines. After field representatives identify a potential new construction project, they track the dates at which the

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[6] We are not aware of other research on the effects of land-use regulation on the commercial real estate sector. On the residential side, recent papers that have examined the effects of land-use regulations on housing supply and home prices include Mayer and Somerville (2000), Ihlenfeldt (2007), Saks (2008), Glaeser and Ward (2009), Saiz (2010), and Huang and Tang (2012). For reviews of this literature, see Quigley and Rosenthal (2005) and Gyourko (2009).
[7] This cost threshold is not a hard lower bound, as nearly 5 percent of the projects in our sample had nominal construction costs below $500,000.

project transitions through its planning process. The planning timeline begins with the *preplanning phase*, when the developer has announced an intention to build but has not yet hired an architect, then transitions to the *planning phase*, when architects are hired to draw up schematics for the building, and to the *final planning phase*, when specific plans have been (or are about to be) finalized.[8] During these three phases, the developer also completes the many legal steps (such as holding public hearings and obtaining zoning approvals from local governments) needed to secure regulatory approval for the project. Once the planning phases are completed, Pipeline representatives record when construction on the project started. If the developer decides to defer the project or abandon it altogether at any time before completion, these dates are recorded as well.[9]

The Pipeline database shows the exact month and year during which construction on the project began, but the other dates on the project timeline are recorded with less precision. These other dates are less precise because the Pipeline field representatives are only required to check on each project once every six months during the planning period. Thus, the dates recorded for the beginning of each phase prior to the start represent the month and year during which the representative discovered the change of status, rather than the actual date of the change. For this reason, the reported dates for all changes in status before the start represent the end of a six-month interval in which the actual change occurred.[10] We account explicitly for this interval reporting in our empirical work.

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[8] In addition to these phases, Pipeline also documents when bids were solicited from general contractors, when a contractor was hired, when construction permits were obtained, and when the project was completed.
[9] Although a project could, in principle, be deferred or abandoned multiple times before completion, only the first instance of each of these events is recorded in Pipeline.
[10] In some cases, the interval containing the status change can be narrowed further by the constraint that planning cannot occur after the measured start date. For instance, if a measured planning date is three months after the listed start date, the actual planning date must have occurred within the three-month interval preceding the start, and so on.

For our analysis, we define the time-to-plan lag for *started projects* as the number of months between the beginning of the planning phase, subject to the interval reporting issue just noted, and the date of the construction start. The decision to exclude the earlier preplanning phase was dictated largely by data availability. Dates for the preplanning phase were available only for the small fraction of projects that could be identified at their inception through industry contacts.[11] These projects tended to be much larger and more costly than the median project in the dataset. All told, we were able to determine the beginning of the planning phase for nearly 90,000 projects that were started prior our cutoff in December 2010, compared to only about 12,000 projects based on the earlier preplanning date.[12]

Many of the projects in Pipeline had not yet been started by our cutoff date of December 2010. Excluding such records would cause our sample to underrepresent projects with longer planning durations, thereby exposing our results to truncation bias. To address this issue, we employ an estimation method that regards the time to plan for unstarted projects as being right-censored, with a true planning duration at least as long as the number of months between the planning date and the cutoff date. Although this approach deals with the potential for truncation bias, it can introduce a separate bias in the opposite direction. In particular, some unstarted projects may be very unlikely to move forward, yet remain in the Pipeline database because the developer has not formally declared the project abandoned. To deal with these potential "zombie" projects, we exclude from our sample any unstarted projects whose status at the December 2010 cutoff date had been listed as deferred for more than 60 consecutive months.

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[11] Field representatives attempt to identify projects as early as possible by canvassing neighborhoods, exploiting information from industry contacts (such as developers, architects, and contractors), and — as a last resort — through information from local permit offices.

[12] We observe both the planning and preplanning dates for about 5500 projects that were started before December 2010. The beginning of the preplanning phase for this limited set of projects was about 8 months earlier, on average, than the beginning of the planning phase, while the median difference between the two dates was 5 months.

We also excluded any projects that were listed as abandoned prior to the cutoff date, as abandoned projects very rarely are resumed at a later date.[13]

To account for the effects of project-specific factors on time-to-plan lags, we assembled data on a number of project characteristics. From the Pipeline database, we obtained the location of each project (including its MSA, county, and geocode), building type (office, hotel, retail, or warehouse), construction type (new buildings or additions, alterations, or conversions of existing structures), number of buildings, total number of floors, square footage, and dummy variables indicating whether the project had been deferred prior to groundbreaking. For each project, we calculated distance to the city center using geocodes for the project's location and the employment-weighted center (from the Department of Housing and Urban Development).[14] We also obtained Pipeline data for each project's construction costs in current dollars, which were converted to real terms using the price deflator for nonresidential buildings from the National Income and Product Accounts that prevailed at the planning date.

These project-specific variables were supplemented with MSA- and county-level controls from the 2000 Decennial Census. Specifically, we use MSA-level estimates of population, and county-level estimates of the average number of persons per household, the urban share of the population, the homeownership rate for occupied housing units, the median house price, median household income, and the share of the households who had high income (annual income above $100,000). These characteristics could influence land-use regulations across localities and thereby cause planning durations to differ across projects that are identical except for the jurisdictions in which they are located.

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[13] We used information from outside sources (such as company reports) to verify whether some exceptionally large deferred projects in Pipeline actually had been abandoned. This search eliminated one $5 billion project from our sample that would not have been excluded by other criteria.

[14] In a handful of instances for which geocodes for the MSA city center were unavailable from HUD, we used the location of city hall from Google Maps as the city center.

Table 1 reports the distribution of projects along several dimensions. As shown in the top part of the table, most of the projects in our sample had their primary property type listed as office or retail, with the remainder split between warehouse and hotel properties.[15] About 95 percent of the projects were for new buildings, with the remainder involving some combination of additions to existing buildings, alterations that do not affect square footage, or conversions of property type (such as transforming retail space to office). Geographically, the South Atlantic division, which stretches from Maryland to Florida, accounts for more than 20 percent of the projects, while New England contains about 5 percent, reflecting its much smaller population. The shares for the other divisions are all between 10 and 20 percent. About 90 percent of the projects were located in MSAs in the top population quartile; the 25 most populous MSAs alone contain nearly 40 percent of the observations in the dataset and account for roughly half of total construction cost.

As shown in table 2, the projects in our sample vary substantially by size, cost, proximity to city center, and characteristics of the surrounding county. Although the typical project in our sample involved the construction of a modest one-story building, the indicators of project size (number of buildings, number of floors, and construction cost) have pronounced right tails that push the mean values above the medians. In the location dimension, projects range from being nearly at the city center to more than 65 miles away. As can be seen in the lower panel of the table, the projects are located in counties with widely varying characteristics. The counties in the dataset tend to be somewhat more urban and to have higher housing density than the overall mean in the 2000 Census. However, the mean values for all the other county characteristics are similar to the national averages in that year.

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[15] The shares of construction cost are roughly consistent with those implied by Census Bureau estimates of aggregate nominal construction spending for these categories over the same period.

III. REGRESSION ANALYSIS

We use the project-level dataset described above to estimate how our control variables affect time-to-plan lags and to characterize the distribution of these lags. To estimate the regression, we employ a maximum likelihood procedure that accounts for both the interval reporting of the initial planning date and the right-censoring of the measured planning duration for unstarted projects, under the assumption that the true residuals are distributed normally.[16]

A. *Explanatory Variables*

The explanatory variables for the regression consist of characteristics of the project itself, characteristics of the county in which the project is located, and time and MSA fixed effects.[17] The project and county characteristics include all those shown in table 2; for each variable, the regression contains both linear and quadratic terms to allow for nonlinear effects. We also include dummy variables for the type of building (retail, warehouse, or hotel properties, with office buildings as the omitted category); type of construction (additions, alterations, or conversions, with new construction as the omitted category); and whether the project was ever deferred. We interact the deferral dummy with both linear and quadratic terms for the project's square footage to allow for the possibility that deferrals lengthen the planning period by differing amounts for small and large projects.

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[16]We use the *intreg* routine in Stata. The Pipeline database includes many projects that we omitted from the regression sample because of missing information for some variables, which raises the possibility of sample selection bias. Although the *intreg* routine does not accommodate the usual Heckman two-stage procedure to assess sample selection, we implemented the Heckman estimation in an OLS framework. We found both that the inverse Mills ratio was insignificant and that the coefficient estimates were quite similar to the OLS estimates without the Heckman correction. In light of these results, we did not pursue sample selection issues further. The results from the Heckman estimation are available from the authors on request.

[17] Variations in economic uncertainty — both over time and across MSAs — also could help to explain variation in time-to-plan lags. In particular, greater uncertainty could lead to the deferral of a project start, thereby extending the planning period. The role of uncertainty, however, extends beyond the scope of this paper; in research in progress, we use hazard models to investigate the effect of uncertainty and other factors on the decision to break ground on a commercial construction project.

The remaining variables in the regression are time and MSA fixed effects. We include a year fixed effect for the year in which project planning began (with 2004 as the omitted year) and a month fixed effect for the same event (with June as the omitted month). The regression also includes 362 MSA fixed effects (with Atlanta as the omitted MSA). One of the 362 fixed effects covers about 4900 projects located in MSAs with a population of less than 50,000 in the 2000 Census or for which the MSA could not be determined using location fields in Pipeline.[18]

For ease of interpretation, we specify our regression so that the constant term represents the planning lag for a baseline project. This baseline project is defined from the omitted categories for the dummy variables, the omitted fixed effects, median characteristics of projects in our sample, and county characteristics for Fulton County, Georgia (which contains the center of Atlanta, the omitted MSA). The constant captures median project characteristics because we normalize every non-dummy project variable (except distance to city center) prior to estimation by subtracting its median across all projects in the sample; similarly, we normalize every county characteristic by subtracting the value for Fulton County. With these conventions, the constant represents the fitted planning lag for a new office project with median characteristics, located in a city center with observed county characteristics akin to those of central Atlanta, for which planning began in June 2004 and proceeded without deferral or abandonment.

B. Baseline Planning Lag and Effects of Characteristics

Table 3 presents the estimates, along with bootstrap standard errors, of the constant term and the coefficients for all of the project and county characteristics. To begin, the constant term indicates that the baseline project has a planning period of 16¼ months; this baseline planning lag is estimated fairly precisely, with a 95 percent confidence band that runs from about

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[18] Note that we omitted dummy variables for the Census divisions and the MSA population groups shown in table 1. Both of these sets of dummy variables are perfectly collinear with the set of individual MSA dummies and thus cannot be identified separately from the MSA fixed effects.

15 months to 17½ months. This result confirms that the planning lags for a typical commercial

construction project is lengthy. The differences in the estimated planning lags for the various

types of buildings and types of construction are relatively small, though some of the differences

from the baseline are statistically significant. Among the significant results, the planning lags for

retail buildings and hotels are roughly one-half to a full month longer than for office buildings,

while the planning lag for additions to existing structures is a bit more than one month shorter

than for new construction.

Moving to the next block of the table, the dummy variable for project deferral has an

enormous effect on total planning time. Deferral adds about 25 months to the planning lag for a

project with median square footage.[19] The effect of deferral rises to about 29 months for the

largest projects in the dataset, those at the 99th percentile of the distribution of square footage.

Accordingly, projects that were ever deferred impart a long right-hand tail to the distribution of

planning lags for the full sample.

The variables measuring project size and complexity — the number of buildings, number

of floors, square footage, and cost per square foot — all have positive and significant coefficients

on the linear terms, combined with negative and mostly insignificant coefficients on the

quadratic terms. One county characteristic, the median home price, has the same pattern, with

significant coefficients on both the linear and quadratic terms. However, the coefficients on all

the other project and county characteristics are insignificant.

To assess the quantitative implications of these results, table 4 uses the linear and

quadratic coefficients to calculate the change in the time-to-plan lag as each project or county

characteristic increases from the 1st percentile value of its distribution to the 99th percentile value.

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[19]This effect is shown by the first deferral coefficient in the table because the square footage variable is defined as
the deviation from the median.

The table also shows the 95 percent confidence interval for the effect of the change in each variable.

Starting with the project characteristics, increasing the number of buildings in the project from the 1st to the 99th percentile value lengthens the planning period by 6.5 months, all else equal, with a 95 percent confidence band that runs from 5 months to 8 months. A parallel change in the number of floors adds 7.2 months to the planning lag, with a slightly narrower confidence band than for the number of buildings. Boosting the total square footage of a project with a fixed number of floors and buildings also lengthens the planning period but by less than those two variables. Thus, as would be expected, large projects take substantially longer to plan than small projects. In contrast, a higher cost per square foot has only a small effect on time to plan in the presence of our other regression controls, while the effect of distance from the city center is negligible.

Among the county characteristics, median home price strongly affects planning times. Moving from the 1st percentile to the 99th percentile of the home price distribution lengthens the planning period by nearly 10 months, all else equal, with a 95 percent confidence band that runs from about 6 months to 13½ months. This result is consistent with the notion that development plans receive heightened scrutiny when county homeowners have a lot at stake through the value of their homes.[20] The only other county characteristic with a substantial effect on the planning period is median income. Surprisingly, counties with the highest median income have considerably shorter planning lags than counties at the low end of the income distribution. The effects of all the other county characteristics — housing density, the urban share of population, the homeowner share, and the high-income share — are both small and statistically insignificant.

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[20] See Fischel (2001) and Saiz (2010).

We would caution, however, against interpreting the effects of these county characteristics too strictly. First, even though our regression sample is large, the amount of information used to estimate these effects is much more limited than for the project characteristics. Our dataset contains 1593 counties, compared with roughly 82,000 projects. Moreover, because our regression controls for MSA fixed effects and because the county characteristics do not vary across time, the county effects are identified solely by cross-sectional variations within the 362 MSAs in our sample. Second, the county characteristics could well be endogenous. In particular, the factors influencing the development process in a county likely affect both the length of the planning period and most, if not all, of the county characteristics in our regression. To address this potential endogeneity, we estimated an IV version of our regression with instruments for the county characteristics that included indicators of geographic constraints on buildable land in the spirit of Saiz (2010) and demographic characteristics — such as the age distribution of county residents — that should be much less affected by the regulatory environment. Although the instruments pass standard specification tests, some of the estimated county effects seemed implausible.[21] All in all, we would regard the county characteristics as useful controls in the regression but would not attach a strong causal interpretation to the specific results.

C. *Variation in Planning Lags Across MSAs and Over Time*

The "heat map" in figure 1 displays the estimated planning duration for the 362 MSAs in our sample for a project with the baseline set of characteristics. For each MSA, the planning

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[21] For example, the IV results imply that moving from the 1st percentile to the 99th percentile of the home price distribution would lengthen the time-to-plan period by roughly 40 months, four times the effect reported in table 4. In addition, median household income no longer had a significant effect on the planning lag, and the effect of the high-income share became negative and strongly significant. It is difficult to explain why counties with a large share of high-income residents would have substantially shorter planning lags than an otherwise identical county with relatively few such residents. Additional information about the IV regression is available from the authors on request.

duration equals the sum of the regression constant plus the coefficient on the MSA dummy. MSAs with longer planning times are represented by deeper shades of red. As shown, the MSAs with the longest planning times are concentrated in California and the Northeast corridor, while planning times generally are shorter in the interior of the country. We explore possible sources of this variation in section IV below.

Table 5 presents results for the month and year effects in the regression. Looking first at the monthly patterns, planning periods tend to be slightly longer — by about one-half to a full month — when the planning starts late in the year rather than in June, the omitted month. The reason for this minor seasonal pattern is not clear, though perhaps project planning gets a slow start when it begins shortly before the year-end holidays.

The year effects are much more pronounced. Planning lags have increased over time, with projects initiated in 2010 having planning periods that were roughly 3 months longer than projects undertaken in 1999, the first year of our sample. If we measure the change instead from 2000, the year with the smallest estimated year effect, the increase in planning lags through 2010 was about 4 months. An F-test overwhelmingly rejects the null hypothesis that the year fixed effects are equal in all years.[22]

An important question is whether the upward trend is pervasive or is concentrated in a particular set of observations, such as a single region of the country or just one type of construction. We address this question by augmenting the previous regression with variables formed by interacting the year effects with three other sets of factors: the building-type dummies defined above, MSA population dummies, and geographic dummies for the nine Census Bureau

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[22] To examine whether the year effects reflect macroeconomic conditions, we added two explanatory variables to the regression: the unemployment rate and the change in private payroll employment. Both variables are measured in the project's MSA in the month when project planning was initiated. Neither variable was statistically significant, and the year effects were little changed by adding these variables. In section IV below, we present some anecdotal evidence that the upward trend in the year effects could be related to increased regulatory scrutiny of commercial development projects.

divisions. To form the population dummies, we grouped the MSAs in our sample into the 25 most populous MSAs, the rest of the highest population quartile, the second quartile, and the combination of the third and fourth quartiles. One variable from each set of these dummies must be omitted to avoid perfect collinearity with the baseline year dummies. We omitted office buildings, the largest 25 MSAs, and the South Atlantic Census division (which contains Atlanta, the omitted MSA in the original regression). In this specification, the year dummies without any interactions represent the year effects for office buildings in the largest MSAs in the South Atlantic region. The interaction terms show the deviations from this baseline set of year effects for projects with different characteristics.

We summarize the results in table 6 and report the underlying coefficient estimates for the plan-year effects in the appendix.[23] The first column shows the change in the year effect between 1999 and 2010, the endpoint years for our sample. This comparison, however, may not adequately reflect the underlying trend in time-to-plan lags if the year effects for individual years are volatile. To address this possibility, the second column presents the difference between the average year effect in the first three years of the sample and that in the final three years.

As shown in the first column, planning lags rose for all four types of buildings over the sample period, with increases of about 7 months for hotel projects, slightly more than 4 months for office and warehouse projects, and 2½ months for retail stores. In addition, planning lags increased 3 to 5 months for each of the MSA population groups. All of these increases are statistically significant. Regionally, however, the results for the uptrend in planning lags are more varied. Planning lags rose more than 8 months on the Pacific coast and 4 to 5 months in the Mountain states and along the Middle and South Atlantic coast. These changes are all significant at the one-percent level. In contrast, the planning lag rose much less in the four

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[23] The complete results for this augmented regression can be obtained from the authors on request.

central regions and New England, and none of these changes is significant. When we average the three years at the beginning and end of the sample period, the increase in the year effects becomes significant in New England and two of the central regions, but otherwise the results do not change notably. All told, we find that the shift toward longer planning lags was concentrated in the Far West and on the East coast but encompassed all types of buildings and MSAs of all sizes.[24]

D. *Summing Up: The Full Distribution of Planning Times*

Thus far, we have explored a variety of factors that affect planning times, generally from the perspective of a standardized baseline project. Now we take a more comprehensive view and ask: "What is the full distribution of planning times across all the projects in our sample?" The construction of this distribution would be straightforward if we knew the true time to plan for each project. However, we do not observe this information because of the six-month interval reporting in the data and the right-censoring for projects still in the planning phase at the end of the sample period. Given both of these measurement issues, we can only place bounds on the true time to plan for a given project.

Despite this limitation at the project level, we can use results from our interval regression to construct an overall distribution that reflects the variation within these known bounds. Specifically, we form a notional planning lag for every project equal to the fitted value from the regression plus a random draw of the error term from a truncated normal distribution consistent with these measurement bounds, where the error variance is taken from the fitted regression. We then assemble an overall distribution from the notional planning lags.

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[24] One question is whether these results are driven by the severe 2007-09 recession and the subsequent weak recovery, which could have caused developers to delay the transition from the planning phase to the construction phase of their projects. If this were the case, the null hypothesis of equal year effects would not be rejected for tests that end in 2007. In fact, we found that the results from tests through 2007 were similar to those in table 6, showing that the uptrend in the year effects existed before the recession.

As shown in the top panel of figure 2, this distribution of planning times is extremely wide and sharply skewed to the right. The long right-hand tail reflects, in large part, the influence of projects that have had deferrals — recall from table 3 that deferral adds, on average, more than two years to the planning period. This figure also illustrates the importance of including censored projects in our sample. These projects, represented by the dark portion of the bars, are concentrated in the right-hand part of the distribution and account for the vast majority of projects with planning times of 60 months or more. Hence, excluding these cases would cause projects in the upper portion of the planning lag distribution to be substantially under-represented.

The distribution in the top panel counts the number of projects in each time-to-plan bucket and does not distinguish between small and large projects. The bottom panel, in contrast, weights each project by its share of the total cost of all projects in the sample. This cost-weighted distribution shows the planning time for each dollar of construction spending and thus is a more appropriate measure for assessing the macroeconomic consequences of planning lags. As shown, the cost-weighted distribution is skewed even more sharply to the right than the unweighted distribution. Given the long right tail, the mean cost-weighted time-to-plan lag is more than 28 months. Even the typical (i.e. median) cost-weighted project has a time-to-plan lag of 18 months. These statistics indicate that commercial buildings generally have a lengthy planning period before any construction dollars are spent.

Table 7 provides additional detail about mean time-to-plan lags along two dimensions: the influence of deferred projects and differences across types of buildings. First, the table shows that deferrals are an important factor behind the lengthy mean planning lags. Excluding projects with any period of deferral shortens the unweighted mean lag from about 17 months to about 14 months for the aggregation across all building types. The effect of excluding deferred

projects on the cost-weighted mean lag is even greater. Second, among the four types of

buildings, hotels have the longest mean planning periods — roughly 8 to 9 months longer than

office, retail, and warehouse projects on an unweighted basis and as much as 14 months longer

with cost weighting. Much of this difference owes to the differential effect of deferrals across

the four types of buildings. As can be seen, excluding deferred projects cuts the differential

about in half on an unweighted basis and eliminates most of the gap with cost weighting. The

differences that remain mostly reflect the relatively large scale of the typical hotel project.

IV. INTERPRETATION AND ADDITIONAL RESULTS

This section takes a closer look at two key results from section III: the wide variation in

planning times across MSAs for a baseline project and the upward trend in planning times over

our sample period. In particular, we explore whether differences in land-use regulations — as

measured by the Wharton survey on residential land-use regulation reported in Gyourko, Saiz,

and Summers (2008) — are associated with the variation in planning lags. We also summarize

what we learned from our own consultations with industry experts on changes in planning

periods over time.

A. Wharton Survey on Residential Land-Use Regulation

The Wharton survey asked officials in roughly 6900 municipalities across the country to

provide information about their process for regulating residential land use and about the

outcomes of that process.[25] The survey was mailed in June 2004, and responses were received

from about 2650 municipalities, which represent a finer level of geography — Census places —

than the MSA level. Gyourko, Saiz, and Summers (2008) used the results to create an overall

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[25] The Wharton survey did not collect information on land-use regulations for commercial property. In the absence of such information, we assume that the regulations for residential land use are a good proxy for the unobserved regulations on the commercial side. This assumption seems reasonable in that the rules governing each type of property likely would reflect general community preferences toward development.

index of the stringency of land-use regulation in each Census place, along with eleven separate component indexes.

Table 8 describes the eleven components of the aggregate index. The first four components pertain to the length or intensity of the project approval process. The next four components reflect the local rules that define permissible development activity. The final three components measure the extent of local political influence on development, state-level political involvement in local project decisions, and the tendency of the courts to uphold local land-use regulation. Both the overall index and all the components are defined so that higher values correspond to a tighter regulatory environment.

B. *Variation in Planning Periods across Localities*

To assess these regulatory effects, we re-ran the initial regression from section III using fixed effects for Census places rather than the MSA fixed effects. After accounting for missing or miscoded location information in the Pipeline database, the dataset for this regression included 74,409 projects and 5,984 places. However, most of these places had only a handful of projects, so we ran the regression with separate fixed effects for the 1,712 places that had at least ten projects and with a single catch-all fixed effect for all the other places. Recall that the fixed effect represents the estimated time-to-plan lag in a given locality for our baseline project. After setting aside the places that had no Wharton survey data and those in the catch-all group, we regressed the fixed effects in the remaining 666 places on either the overall Wharton index or the individual components of the index.[26] In each case, we estimated the second-stage regression in

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[26] We omit the local assembly index because that variable has no variation across the places with projects in our sample.

two ways — first without weights on the individual places and then by weighting the data for each place by its share of the total project cost in the sample.[27]

The results are reported in table 9. Regardless of whether we weight the data, the estimated coefficient on the aggregate Wharton index is insignificant and the regression R^2 is essentially zero. However, when we unpack the components of the aggregate index, the explanatory power of the regression increases, especially for the cost-weighted regression. In that regression, two components have significant positive coefficients and four have significant negative coefficients. Among these six components, we focus on the coefficient on the approval delay index (ADI) because we believe it is the only one with a straightforward interpretation. The ADI measures the length of the review process in a locality and thus can be compared to the fixed effects to see if both tend to be longer in the same places. The positive coefficient in the regression provides evidence of a link between the regulatory review process and planning timelines. Given the coefficient estimate, moving from the 1st percentile to the 99th percentile of the ADI distribution raises the planning time for a given place by 7 months, with a tight confidence interval. This result suggests that the length of the review process is associated with a substantial part of the cross-sectional variation in planning times.

Unlike the ADI, the other significant index components are not measures of the time required for planning review but instead characterize aspects of the regulatory environment that could influence planning times. Because of the reduced-form nature of the regression, their channels of influence are unclear. For these other index components, we can conclude only that the regulatory environment is correlated — in possibly complex ways — with planning timelines.

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[27] As shown in Saiz (2010), the stringency of land-use regulation, as measured by the Wharton index, reflects a variety of characteristics of each locality and thus is endogenously determined. Accordingly, the regressions estimated here have no structural interpretation and are intended only to assess whether project planning lags are correlated with regulatory variables.

C. *Planning Periods over Time*

Although most of the information collected from the Wharton survey is cross sectional, the survey includes a few questions about changes over time. In particular, one question asks: "Over the last 10 years, how did the length of time required to complete the review and approval of residential projects in your community change?" The possible responses are "no change," "somewhat longer," and "considerably longer," with separate responses for single-family and multifamily projects. The question did not allow respondents to indicate that review periods had become shorter. Because of this asymmetry, we cannot use the responses to examine our finding that planning times became longer, on average, for the nation as whole. However, by comparing the responses across Census divisions, we can assess whether the Wharton survey provides independent confirmation of our finding that the shift toward longer planning periods was concentrated on the East Coast and in the West.

To do this, we created an index of the Wharton responses at the Census division level. For each of the 666 places in the Wharton regression sample, we converted the responses of "no change," "somewhat longer," or "considerably longer" to values of zero, one, or two, respectively, and then averaged the values for single-family and multifamily projects. Next, we aggregated the results to the Census division level in two ways — first as an unweighted average of the included places and then by weighting each place by its share of the number of Pipeline projects in that division. The unweighted average captures the general perception among the survey respondents in each Census division, but it makes no allowance for differences in the importance of each Census place to overall activity. Weighting each place by its number of projects helps on the latter score, but a potential downside is that it emphasizes the views of some survey respondents more than others, even though this weighting does not reflect their

degree of expertise about the regulatory review and approval process. On *a priori* grounds, we could not see a clear case for one method over the other, so we tried both.

We regressed the 1999 to 2010 change in the plan-year effect by Census division on each of the two Wharton proxies for the change in review and approval times. The results differed across the two Wharton measures. The unweighted measure has a significant positive relationship across Census divisions with the change in the estimated plan-year effects. In contrast, the project-weighted measure shows a much looser and insignificant positive relationship. Overall, these results provide limited confirmation that the regional pattern of changes in planning lags is consistent with the regional pattern implied by the responses to the Wharton question about changes in the length of review and approval times.

To gain further perspective on the upward trend in planning durations, we consulted with firms that are directly involved in real estate development and with informed industry observers. Although some of the comments reflected conditions across the country, a substantial fraction of the real estate firms we contacted work primarily in the Washington, D.C. area, so the responses are skewed somewhat toward that market.

An overwhelming majority of these contacts indicated that planning timelines had lengthened over our sample period, consistent with our econometric results. In addition, several contacts noted that the trend toward longer planning periods had started a decade or more before the beginning of our sample period. Among the factors cited for this trend, by far the most common was that the regulatory process for the review and approval of construction projects had become more time-consuming. The specific features of the regulatory process seen as contributing to this trend included greater citizen involvement in project review, tougher environmental standards, and an increase in the number of government agencies whose approval is required. Of course, it is important to emphasize that, even if changes in land-use regulations

do account for the increase in planning lags over time, we are not able to assess whether these changes reflect a shift to over-regulation, a catch-up from too light regulation, or a change over time in the optimal amount of regulation.

V. CONCLUSION

Gestation lags have long been understood to be an important feature of the investment process. However, previous research has focused on the time-to-build part of the gestation period and has provided very little information on the earlier time-to-plan lag. In addition, most of what we know about gestation lags has come from indirect inference in structural models estimated with aggregate data. Only a handful of studies have estimated gestation lags using project-level information.

This paper addresses both of these limitations. We estimate time-to-plan lags for commercial construction projects using a rich project-level dataset that allows direct observation of these lags. Our analysis demonstrates that time-to-plan lags for commercial construction projects are long, averaging about 17 months when we aggregate all the projects in the dataset without regard to size. When we weight the projects by their construction cost — which is needed to measure the average planning time for a given dollar of commercial construction outlays — the average lag rises to more than 28 months.

Our results also show that the distribution of time-to-plan lags spans a wide range, with an especially long right-hand tail. The characteristics of the building to be constructed and its location account for part of this variation, while project deferrals also contribute importantly to the long tail. Another key result is that time-to-plan lags increased by several months, on average, over the 1999-2010 period that we study. This lengthening occurred for all types of buildings, in MSAs of all sizes, and in most regions of the country. Finally, we find that

differences in the regulatory environment across jurisdictions are associated with the cross-sectional variation in time-to-plan lags, and we present some anecdotal evidence that the upward trend in planning lags may be related as well to the regulatory review process. As noted, our results do not say whether the increase in time-to-plan lags reflects a move toward or away from the optimal amount of regulation.

These results contribute to the literature in both macroeconomics and urban/real estate economics. Macroeconomists can use the results to calibrate business cycle models and to help specify the lag structure in models of investment spending. For urban and real estate economists, our findings provide new information on the geographic variation in planning periods for commercial real estate projects and on the influence of the regulatory review process at the local level.

The Pipeline database is a valuable source of information about the planning process for commercial construction projects. We know of no similar data for other types of investment spending. Accordingly, the Pipeline data have the potential to provide new insights into the factors affecting firms' decisions to continue, defer, or abandon investment projects. In research in progress, we are using the Pipeline data to study the effect of uncertainty on these decisions in the commercial real estate sector.

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Table 1
Summary Statistics: Type of Building, Type of Construction, and Location

	Percent of observations	Percent of construction cost
Type of building		
Office	33.7	39.8
Retail	42.5	25.8
Warehouse	17.9	17.1
Hotel	5.9	17.3
Type of construction[1]		
New structure	95.1	93.1
Addition	7.1	7.3
Alteration	5.7	4.1
Conversion	1.0	0.5
Census Division		
New England	5.4	5.1
Middle Atlantic	10.2	15.0
South Atlantic	23.8	21.6
North Central[2]	17.9	16.7
South Central[3]	18.5	13.2
Mountain	11.5	11.6
Pacific	12.7	16.8
MSA population		
Top 25 MSAs	39.0	52.0
Rest of first quartile	49.6	40.1
Second quartile	7.0	4.6
Third and fourth quartiles	4.4	3.2

Note: Based on 82,303 projects with planning dates recorded between 1999 and 2010. See the text for details about the construction of the sample.
1. A given project may encompass multiple types of construction.
2. Combination of East North Central and West North Central.
3. Combination of East South Central and West South Central.

Table 2
Summary Statistics: Project and County Characteristics

Variable	Mean	Percentile of distribution		
		1st	50th	99th
Project characteristics				
Number of buildings	1.5	1	1	10
Number of floors	1.8	1	1	12
Construction cost (millions of 2005 dollars)	5.6	.2	1.5	64.4
Square footage (thousands)	59	2	18	600
Cost per square foot (2005 dollars)	110	21	85	466
Distance from city center (miles)	14	1	10	66
County characteristics (in year 2000)				
Housing density (units per square mile)	626	11	218	11,675
Urban share of population (percent)	86	33	93	100
Homeowner share of occupied units (percent)	67	27	67	85
Median household income (thou. of dollars)	46	28	43	74
Median home price (thou. of dollars)	129	58	115	361
High-income share (percent of households)[1]	13	4	12	35

Note: Based on 82,303 projects with planning dates recorded between 1999 and 2010. See the text for details about the construction of the sample.
1. Share of households with income above $100,000.

Table 3
Regression Results: Baseline Planning Lag and Effects of Characteristics

Variable	Linear effect	Quadratic effect
Constant (planning lag for baseline project)	16.21* (.68)	
Type of building (omitted: office)		
Retail	.58* (.14)	
Warehouse	-.18 (.20)	
Hotel	.85* (.31)	
Type of construction (omitted: new structure)		
Addition	-1.20* (.20)	
Alteration	-.09 (.30)	
Conversion	-.42 (.79)	
Other project characteristics		
Ever deferred	24.92* (.37)	
Ever deferred * square footage	.016* (.0041)	
Ever deferred * (square footage)^2	-1.58e-6 (1.96e-6)	
Number of buildings	.74* (.096)	-.0015 (.0012)
Number of floors	.89* (.084)	-.017* (.0024)
Square footage	.0071* (.0010)	-3.36e-8 (4.87e-7)
Cost per square foot	3.49* (.84)	-.120 (.133)
Distance from city center	-.0084 (.0096)	6.6e-5 (7.5e-5)
County characteristics		
Housing density	-1.03e-5 (2.22e-4)	-4.64e-9 (5.14e-9)
Urban share of population	1.62 (2.32)	-1.20 (1.83)

Table 3 (continued)
Regression Results: Baseline Planning Lag and Effects of Characteristics

Variable	Linear effect	Quadratic effect
Homeowner share of occupied units	-11.47 (11.52)	12.04 (8.28)
Median household income	-.095 (.12)	-4.26e-4 (1.35e-3)
Median home price	.063* (.014)	-7.35e-5* (2.61e-5)
High-income share	15.9 (10.4)	-25.4 (31.4)

Note**:** Estimated by a maximum likelihood procedure that accounts for right censoring and interval reporting of the time-to-plan data. Bootstrap standard errors are shown in parentheses. A total of 500 bootstrap replications were run; 495 drew samples in which all parameters could be identified. Asterisks indicate significance at the 5 percent level. The results for the month and year dummies are reported in table 5. The results for the MSA fixed effects are available from the authors upon request.

Table 4
Effects of Change in Characteristics on Planning Duration
(in months)

Variable	Total effect	95 percent confidence interval	
		Bottom	**Top**
Project characteristics			
Number of buildings	6.5	5.0	8.0
Number of floors	7.2	6.0	8.5
Square footage	4.2	3.2	5.3
Cost per square foot	1.5	0.8	2.2
Distance from city center	-0.3	-1.0	0.5
County characteristics			
Housing density	-0.7	-4.3	2.9
Urban share of population	0.0	-1.0	1.0
Homeowner share of occupied units	1.2	-2.1	4.4
Median household income	-6.4	-9.8	-2.9
Median home price	9.8	6.1	13.5
High-income share	1.8	-2.2	5.8

Note: The total effect represents the change in planning duration, using the results reported in table 3, when one explanatory variable at a time is adjusted from the 1st percentile of its distribution to the 99th percentile. The 95 percent confidence interval for each variable is calculated from the bootstrapped variance-covariance matrix of the coefficient estimates.

Table 5
Regression Results for Time Effects

Month (omitted: June)	Coefficient	Year (omitted: 2004)	Coefficient
January	.22 (.26)	1999	-.67 (.35)
February	.39 (.23)	2000	-1.77* (.31)
March	.32 (.23)	2001	-.32 (.32)
April	-.02 (.23)	2002	-.81* (.27)
May	.07 (.23)	2003	-.82* (.26)
July	.27 (.23)	2005	.74* (.24)
August	.62* (.23)	2006	1.12* (.27)
September	.37 (.23)	2007	.74* (.24)
October	.50* (.25)	2008	2.02* (.24)
November	.93* (.24)	2009	1.52* (.27)
December	.50* (.24)	2010	2.58* (.29)

Note**:** See table 3 for a description of the regression. The results for the constant term in the regression and for the project and county characteristics are reported in table 3. The results for the MSA fixed effects are available from the authors upon request.

Table 6
Change in Year-Effect Coefficients

	Change, in months	
	1999 to 2010	**1999-2001 to 2008-2010**
Type of building		
Office	4.2**	3.3**
Retail	2.5*	2.5**
Warehouse	4.2**	4.2**
Hotel	6.9**	5.8**
MSA population group		
Top 25	4.2**	3.3**
Rest of first quartile	4.3**	2.7**
Second quartile	3.1*	2.1**
Third and fourth quartiles	4.7**	2.8**
Census divisions		
Pacific	8.2**	7.0**
Mountain	4.8**	4.7**
West North Central	1.5	2.2*
West South Central	.2	.1
East North Central	.2	1.0
East South Central	1.7	2.9**
New England	1.7	2.6*
Middle Atlantic	4.6**	3.9**
South Atlantic	4.2**	3.3**

Note: ** and * indicate a significant difference at the one-percent and five-percent level, respectively. All results are obtained from the augmented regression described in the text. The results for office buildings, the top 25 population group, and the South Atlantic Census division are identical because these are the omitted categories in the year-effect interactions, so the year effects in each case are captured by the uninteracted year dummies.

Table 7
Mean Time to Plan
(in months)

	Unweighted		Cost-weighted	
	All projects	**Excl. deferred**	**All projects**	**Excl. deferred**
All building types	17.3	13.9	28.6	20.5
Office	17.2	13.6	29.3	21.7
Retail	16.5	13.8	24.6	20.1
Warehouse	16.9	13.5	23.4	17.0
Hotel	25.2	18.1	37.9	22.4

Note: Figures shown are means of the distribution of planning lags for projects within each building type with corrections for right-censoring and interval collection.

Table 8
Components of the Wharton Residential Land-Use Regulatory Index

Index Component	Description
Approval delay index	An index of the time required to complete the review of (i) residential construction projects, (ii) rezoning applications, and (iii) subdivision applications.
Local zoning approval index	The number of local entities required to approve zoning changes.
Local project approval index	The number of local entities required to approve new projects.
Local assembly index	Dummy variable. Equals one if town meetings are required to approve zoning changes.
Supply restrictions index	An index of limits on annual permit issuance and allowable construction activity.
Exactions index	Dummy variable. Equals one if developers are required to fund infrastructure improvements in order to build.
Density restrictions index	Dummy variable. Equals one if any area in the locality has a minimum lot-size requirement of at least one acre.
Open space index	Dummy variable. Equals one if developers are required to supply open space in order to build.
Local political pressure index	An index that measures (i) the degree to which various local entities are involved in development decisions and (ii) the importance of governmental and citizen opposition to growth.
State political involvement index	An index of the state-level involvement in local land-use regulations and the enactment of state-level land-use restrictions.
State court involvement index	An index for the tendency of appellate courts to uphold local land-use regulation.

Note: See Gyourko, Saiz, and Summers (2008) for details.

Table 9
Regression of Estimated Place Fixed Effects on the Wharton Residential Land Use
Regulatory Index and Components

Variable	Unweighted		Cost-weighted	
Constant	15.99* (.25)	16.07* (.34)	17.08* (.16)	16.52* (.24)
Aggregate index	.35 (.25)		-.07 (.18)	
Approval delay index		.17 (.18)		1.69* (.13)
Local zoning approval index		.41* (.21)		.85* (.19)
Local project approval index		.18 (.19)		-.06 (.16)
Supply restrictions index		-.04 (.23)		-.28 (.24)
Exactions index		-.13 (.20)		-.54* (.15)
Density restrictions index		-.25 (.15)		-.35* (.15)
Open space index		.06 (.18)		-.28 (.16)
Local political pressure index		-.15 (.15)		-.51* (.09)
State political involvement index		.65* (.29)		-.13 (.14)
State court involvement index		-.51* (.26)		-.52* (.16)
R^2	.006	.050	.0002	.356

Note: Each regression is estimated by OLS using the 666 places that have at least 10 projects. In the cost-weighted regressions, each place is weighted by its share of total construction cost in the 666 places. The local assembly index is excluded from the regressions because it takes the same value in every place. Robust standard errors are shown in parenthesis. An asterisk indicates significance at the five-percent level.

Figure 1: Estimated Planning Duration by Metropolitan Area
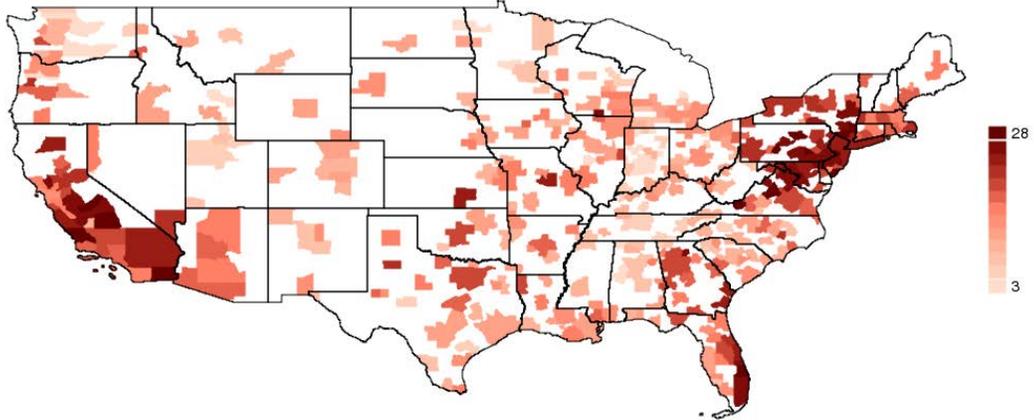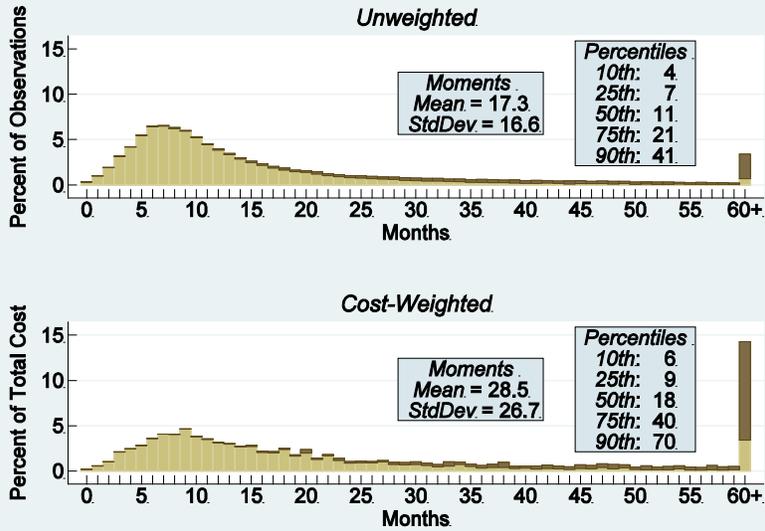*for Baseline Project, in months*

Figure 2: Distribution of Time to Plan

Note: Light bars show the distribution of corrected planning times for the 69,729 uncensored projects in our sample. Darker bars show the effect on the distribution of including corrected planning times for 12,574 additional projects whose planning durations were right censored. Of these right-censored projects, 5,925 were deferred at least once. Reported statistics were calculated using the combined sample.

APPENDIX: YEAR EFFECTS IN THE AUGMENTED REGRESSION

As described in section III, we estimated an augmented regression to assess whether the upward trend in the year fixed effects was widespread across the sample or was limited to specific locations or types of projects. The augmented regression includes all of the variables in the baseline regression plus interaction terms between the year dummy variables and three sets of other dummy variables: dummies for the type of building to be constructed by the project, dummies for MSA population size groups, and dummies for the nine Census Bureau geographic divisions. We estimated this augmented regression using the same maximum likelihood procedure with bootstrapped standard errors as for the baseline regression.
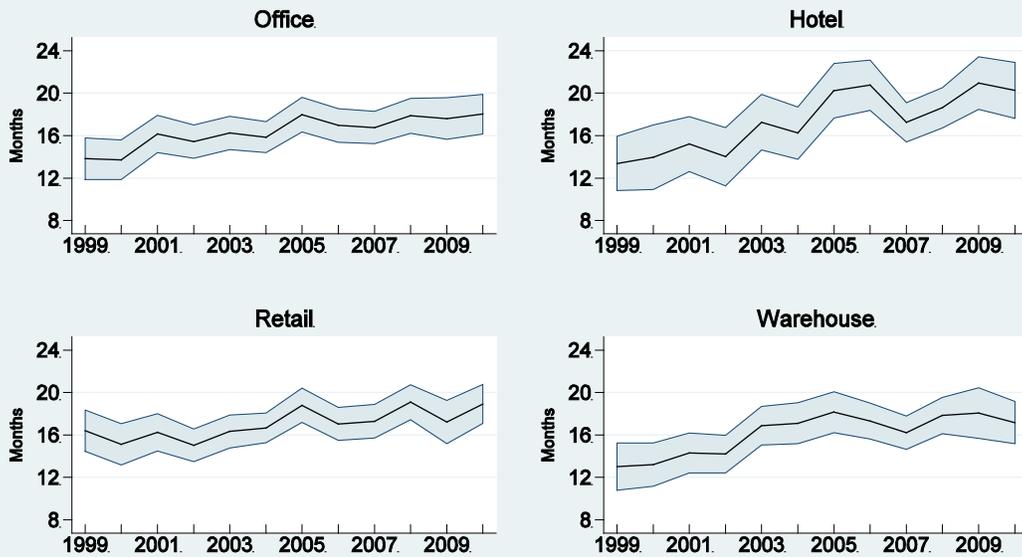
Table A1 presents all the estimated coefficients that involve the year dummy variables. Figures A1, A2, and A3 use these coefficients to plot the time series of year effects by building type, MSA population group, and Census division.

Table A1
Coefficients on Year Dummies in Augmented Regression

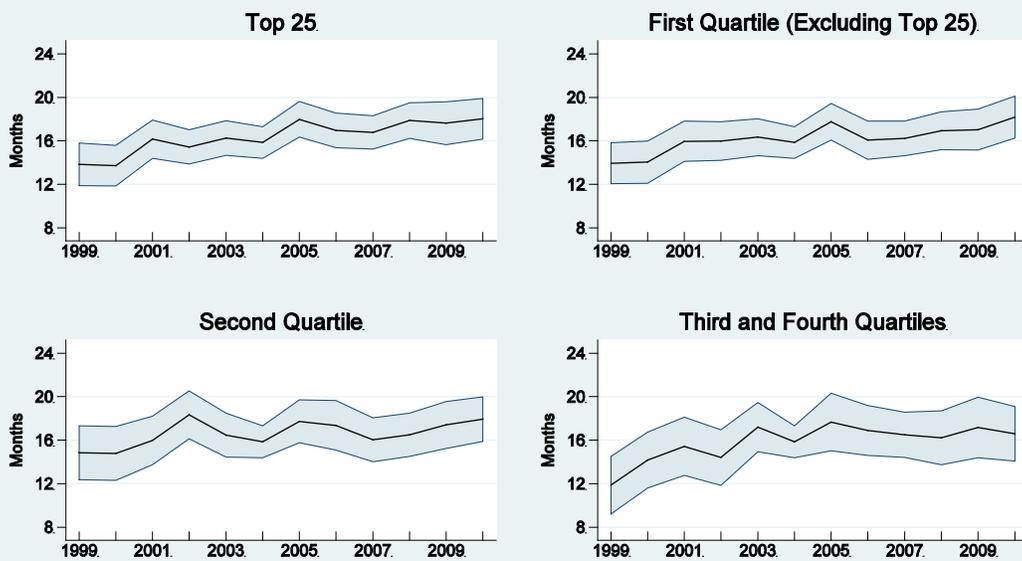| Variable	1999	2000	2001	2002	2003	2005	2006	2007	2008	2009	2010
Uninteracted year dummies	-2.02 (.97)	-2.13 (.86)	.30 (.85)	-.41 (.68)	.40 (.73)	2.14 (.74)	1.11 (.69)	.92 (.68)	2.02 (.72)	1.77 (.92)	2.18 (.84)
Interaction with:											
Building type (omitted: office)											
Retail	1.75 (.73)	.58 (.64)	-.72 (.67)	-1.24 (.58)	-.74 (.55)	-.02 (.50)	-.75 (.55)	-.30 (.53)	.40 (.56)	-1.21 (.63)	.08 (.59)
Warehouse	-2.08 (.99)	-1.77 (.89)	-3.11 (.90)	-2.50 (.87)	-.63 (.84)	-1.10 (.77)	-.90 (.88)	-1.83 (.75)	-1.29 (.83)	-.81 (.97)	-2.12 (.86)
Hotel	-.84 (1.46)	-.16 (1.62)	-1.33 (1.54)	-1.82 (1.55)	.62 (1.55)	1.85 (1.49)	3.40 (1.35)	.10 (1.21)	.37 (1.19)	2.95 (1.30)	1.84 (1.50)
MSA population group (omitted: top 25 MSAs)											
First quartile excluding top 25	.10 (.78)	.32 (.71)	-.19 (.76)	.53 (.65)	.09 (.62)	-.22 (.59)	-.90 (.60)	-.53 (.56)	-.94 (.58)	-.58 (.72)	.16 (.68)
Second quartile	1.01 (1.13)	1.05 (1.09)	-.17 (.94)	2.90 (.94)	.22 (.80)	-.25 (.81)	.41 (1.01)	-.74 (.81)	-1.38 (.84)	-.21 (.91)	-.09 (.84)
Third and fourth quartiles	-1.97 (1.14)	.45 (1.13)	-.72 (1.25)	-1.04 (1.09)	.95 (1.01)	-.32 (1.17)	-.07 (.96)	-.27 (.89)	-1.65 (1.11)	-.45 (1.21)	-1.44 (1.05)
Census Division (omitted: South Atlantic)											
Pacific	-.73 (1.00)	-.88 (.96)	-.31 (.99)	.44 (.96)	.47 (1.00)	-.40 (.93)	3.51 (1.00)	2.39 (.88)	2.65 (1.02)	3.43 (1.28)	3.24 (1.16)
Mountain	1.03 (1.13)	.65 (.93)	.09 (1.04)	.05 (.92)	-1.85 (.85)	-2.05 (.76)	.78 (.78)	1.05 (.79)	1.80 (.84)	2.63 (.96)	1.68 (1.02)
West North Central	3.26 (1.40)	1.25 (.94)	1.30 (1.28)	-.13 (.90)	-1.21 (.72)	-2.37 (.73)	.71 (1.09)	1.29 (.83)	2.03 (.97)	-.00 (1.29)	.58 (1.03)
West South Central	3.85 (1.18)	2.29 (1.11)	2.27 (.98)	1.22 (.87)	-1.19 (.84)	-2.71 (.78)	-.46 (.76)	-1.31 (.71)	-1.03 (.78)	.03 (.98)	-.11 (.79)
East North Central	2.48 (1.04)	.55 (.84)	.45 (.85)	-.55 (.69)	-2.43 (.64)	-2.38 (.69)	-1.07 (.61)	-.05 (.63)	-.09 (.69)	-1.62 (.83)	-1.55 (.77)
East South Central	2.28 (1.11)	-.75 (.96)	-1.10 (.83)	-.23 (.82)	-1.88 (.73)	-1.06 (.88)	.63 (.64)	1.02 (.70)	.35 (.74)	-.98 (.93)	-.20 (.89)
New England	4.38 (2.30)	1.11 (1.29)	1.57 (1.25)	-.16 (1.00)	-1.24 (.93)	-.98 (.98)	1.23 (.93)	.89 (.84)	1.01 (.92)	2.23 (1.20)	1.88 (1.09)
Middle Atlantic	2.16 (1.09)	1.49 (1.08)	1.26 (1.11)	1.49 (1.08)	-.08 (.83)	1.10 (.89)	3.20 (.87)	2.27 (.77)	2.44 (.79)	1.70 (.87)	2.58 (1.01)

Note**:** Estimated by a maximum likelihood procedure that accounts for right censoring and interval reporting of the time-to-plan data. Bootstrap standard errors are shown in parentheses. A total of 500 bootstrap replications were run; 492 drew samples in which all parameters could be identified. Shaded fields signify that the coefficient is significant at the 5 percent level, with blue for negative coefficients and yellow for positive coefficients. The explanatory variables omitted from this table include a constant, month-of-year dummy variables, MSA dummy variables, and the full set of project and county characteristics. Year dummies for 2004 are omitted from the regression to avoid perfect collinearity.

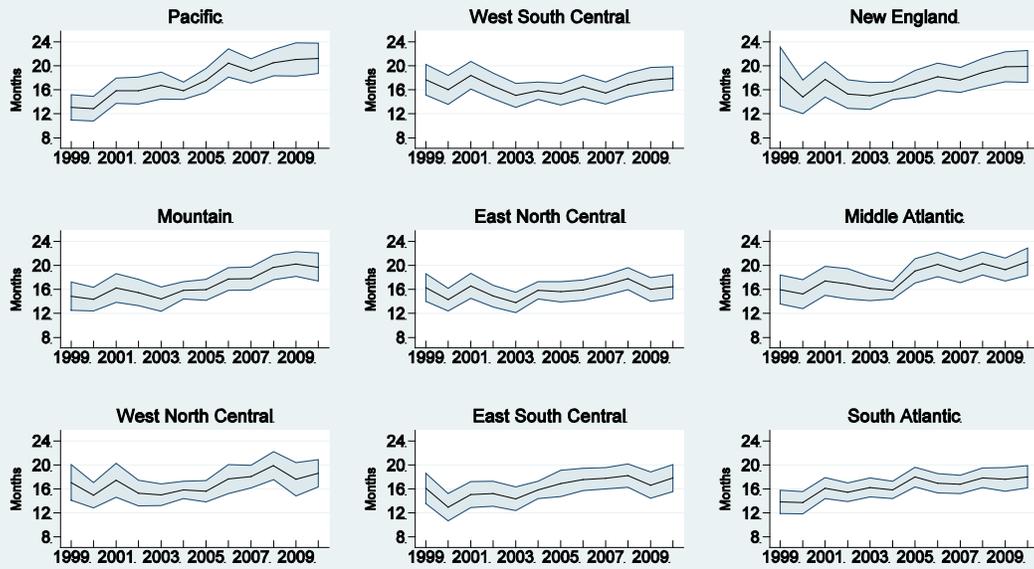# Figure A1: Estimated Plan-Year Effects
by Building Type

Note: Shading shows 95 percent confidence interval around the estimated plan-year effects. Regressions control for interactions of the plan-year effects with the Census Division, MSA population group, and building type.

Figure A2: Estimated Plan-Year Effects
by MSA Population Group

Note: Shading shows 95 percent confidence interval around the estimated plan-year effects. Regressions control for interactions of the plan-year effects with the Census Division, MSA population group, and building type.

Figure A3: Estimated Plan-Year Effects
by Census Division

Note: Shading shows 95 percent confidence interval around the estimated plan-year effects. Regressions control for interactions of the plan-year effects with the Census Division, MSA population group, and building type.