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CODES AND STANDARDS WHITE PAPER

Report – New Home Cost v. Price Study

Residential Standards

CALIFORNIA BUILDING ENERGY EFFICIENCY STANDARDS

April 2015

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1. EXECUTIVE SUMMARY

It is widely accepted that increasing building code requirements increases the cost of building new homes in California. Some have further argued that these increased construction costs have resulted in increased new home prices. The extension of that contention is that advances in the State's Building Energy Efficiency Standards – Title 24, Part 6 ("Energy Standards") have contributed to making homes less affordable to Californians. This belief has been offered as a reason to temper the pace of advancing the Energy Standards. Others contend that new home prices are driven almost exclusively by demand; that while the cost of code compliance may impact developers' profits, it has almost no bearing on home prices and therefore housing affordability in California.

The purpose of this study is to explore how strong the relationship is between the ***cost*** of home construction and the ***prices*** for which new homes sell. The study compared trends in the cost of inputs (e.g., labor, lumber, cement, windows) over time to the trends in new home sale prices. The intent was not to enumerate all of the costs, nor to determine how much the cost changes for individual inputs affected the total cost of construction. It was instead to determine how much, or even if, the ***price*** of new homes is determined by the ***cost*** of construction.

After a careful examination of several indices of construction costs and data on home prices, the UCLA Anderson Forecast came to two conclusions.

(1) *We find that construction cost growth is only marginally associated with home value growth across the metros. We cannot find evidence that structure (construction) cost increase will cause higher home price in either coastal or inland California*.

(2) *We find Metros' construction costs are highly correlated to the national cost of inputs. We cannot find statistically significant evidence that California's energy efficiency code Title 24 is associated with home construction costs in 8 Metros in California, in which 2 Metros are in inland California.*

1. INTRODUCTION

It is widely accepted that increasing building code requirements increases the cost of building new homes in California. The further contention that increased construction costs have led to, and are leading to increased new home prices that effectively make homes less affordable to Californians has been offered as a reason to temper making advances in the State's Building Energy Efficiency Standards – Title 24, Part 6 ("Energy Standards"). An opposing contention is that new home prices are driven almost exclusively by demand, and that while the cost of code compliance may impact developers' profits, it has almost no bearing on home prices and therefore housing affordability in California.

The purpose of this study is to explore how strong the relationship is between the cost of inputs to new home construction (e.g., labor, lumber, cement, windows) and the prices for which new homes sell. The intent is to compare trends in the cost of inputs over time to the trends in new home sale prices. The intent is not to enumerate all of the costs, nor to determine how much the cost changes for any inputs affected the total cost of building the new home. It is instead to determine how much, or even if, the ***price*** of new homes is determined by the ***cost*** of construction.

It is probably equally important to clarify what this study is not intended to cover. First, it is not meant to answer the cost vs. price question as it relates to the full range of building codes, but rather with a focus on the Energy Standards, Title 24, Part 6. For example, if seismic or structural codes have caused construction practices to shift to more expensive, larger dimension lumber and more costly hardware (e.g., Simpson ties and straps), by isolating price differences at the time those impacts happened, the study shows the effect of those design changes as opposed to the effect of market changes in the costs of inputs. The same is true for changes in costs associated with complying with the State Fire Code and the Accessibility Code.

The second point is that the research explored the costs of construction, isolated from other costs. Specifically, increases in land costs, interest rates, environmental reporting and mitigation, and most permitting costs are not relevant to the question of "construction" costs, and construction costs were the focus of this research.

To the extent that *some* permit-related costs could be relevant, the study addressed them as part of construction costs. For example, the Energy Standards have progressively moved toward increased verification by certified third parties. This relieves building departments from direct responsibility for testing that they have neither the time, equipment, or expertise for. To the extent the increased reliance on third party verification resulted in a real increase in the cost of code compliance, it is assumed to be part of the cost of construction.

Since there are a multitude of inputs to building a new home, it was important to identify the largest cost categories, because if changes in those costs do not affect changes in home prices, it is reasonable to assume that much smaller cost categories (e.g., paint, gutters) wouldn't either. Prior to the UCLA Anderson Forecast ("UCLA") analyzing the relationship between trends in the cost of construction and trends in home prices, Benningfield Group surveyed ten builders who build or have built in the California market. The survey was intended to determine what production builders identify as their four or five largest cost categories in new home construction. This survey provided assurance that the Anderson Forecast researchers would be looking at the most relevant costs. The builders surveyed built over 20,000 homes, primarily in California, in the three year period of 2012-2014. They included some of the biggest names in production home building.

In the phone survey, Benningfield Group asked production builders the following four questions:

1. How many homes did your company build in California in 2012 - 2014?
2. In what regions does your company build?
3. If you had to list the largest five inputs to new home construction by cost, what would they be? (Examples: lumber, labor, cost of construction money, concrete, windows, lighting.)
4. How do these costs compare to the costs of planning and building permits, and to land costs?

The most frequently mentioned input categories included: lumber, labor, concrete, plumbing, sheetrock and windows.

A couple respondents did not know the scale of land costs, because they are not involved in land acquisition in their companies. However among those who did know land costs, they stated that land costs ranged from a low of "about 25% of all costs" to "orders of magnitude" larger than any other costs. Benningfield Group provided the survey responses to UCLA as raw data, to inform their choice of costs to analyze.

The remainder of this report was provided by the UCLA Anderson Forecast.

2. HOME CONSTRUCTION COSTS VERSUS HOME PRICES - ANALYSIS

UCLA Anderson FORECAST

An Analysis of the Relationship Between Construction Costs and Home Prices for Metropolitan Areas in California and the United States

As conducted by the terms in the UCLA Service Agreement for

Pacific Gas and Electric Company

Report
February 18, 2015

THINK IN THE NEXT

An Analysis of the Relationship Between Construction Costs and Home Prices for Metropolitan Areas in California and the United States

William Yu, Economist
Jerry Nickelsburg, Senior Economist

UCLA Anderson Forecast
February 2015

Executive Summary

In this report, we present an analysis of the relationship between construction costs and home prices for metropolitan areas (Metros) in California and the rest of the Nation. In particular, we analyze the impact of the construction costs induced by California Energy Code Title 24 on home prices in Metros in California. By comparing other Metros in the Nation, we have three findings: (1) Based on quarterly time series data for 46 Metros from 1984 to 2014, we cannot find evidence that construction cost increases caused higher home prices in California nor in inland portions of California. (2) We find that a Metro's construction cost is highly correlated to the national cost of construction inputs. (3) We cannot find statistically significant evidence that California's energy efficiency code was associated with home construction costs in 8 Metros in California as well as in two Metros in inland portions of California.

Housing Prices and Construction Costs

Figure 1 displays the nominal single-family house prices[1] of 46 metropolitan areas in the U.S. from 1984Q4 to 2014Q1. We highlight 8 California Metros in red. Among the 46 Metros represented, six California Metros rank highest in home prices: San Francisco, San Jose, Santa Ana, Oakland, Los Angeles, and San Diego. In addition, we can see the home price bubble and bust cycle in 1990 and 2006.

Figure 2 shows the nominal construction costs for these Metros. California Metros are highlighted in the dark color. Note that Washington DC and New York have higher construction costs than San Jose, San Francisco and other Metros. By and large, the construction costs are more smooth and stable compared to home prices in Figure 1. The growth rate of construction costs accelerated in 2004 for most of the Metros.

Figure 3 presents the ratios of construction costs to housing prices for each Metro. First, we can see a wide range of the ratios from 0.21 (San Francisco) to 0.95 (St. Louis). Second, combining Figures 1 to 3, we can see the ratios are mostly driven by land prices (home price minus construction cost) because the construction cost growth is rather stable. Third, the six California Metros which have the highest home prices also have the lowest construction cost-to-home price ratios.

Table 1 lists home prices and construction costs in 1984Q4 and 2014Q1 and their growth rate during that period, as well as the ratios of cost to price. Figure 4 display a scatter chart, in which each point represent each metro's construction cost growth rate (in horizontal axis) and home price growth rate (in vertical axis). Figure 4 indicates some correlation between the growth rates of construction costs and home prices. That is, Metros with high construction cost growth also have high home price growth over the past three decades. Note that this is simply a cross-section correlation. It does not suggest that high construction cost growth causes high home price growth. In particular the opposite might be true; higher costs of living might induce higher wages for those involved in the building trades.

Repeat-Sales Housing Prices and New Housing Prices

The housing price data we use here are repeat-sales housing prices which means that they are not housing prices for new homes in the market per se. There are three major reasons to use repeat-sales housing prices rather than single-sale new housing prices. First, houses are a product with various qualities, (*e.g.* square footage, amenities and land size) which vary across regions and over time. It is reasonable and necessary to control the quality in order to understand the price dynamics

[1] The data is from Lincoln Institute of Land Policy using the paper, "The Price of Residential Land in Large US Cities," by Davis and Palumbo (2007) in *Journal of Urban Economics*. The house prices and construction costs are derived using micro data from the Metropolitan American Housing Survey in a benchmark year. House values are reported directly in that survey, and construction costs are based on the age and square footage of that house. House prices are extrapolated forwards and backwards from the benchmark year using metro-area CMHPI and Case-Shiller-Weiss (when available) house price indexes. Construction costs are extrapolated forwards and backwards from the benchmark year indexes using construction cost indexes published by the R.S. Means Corporation.

and differences across regions and over time. If we used new home price data, we would not have controlled the quality difference of homes. For instance, over the years, contractors have been building bigger and bigger houses. Thus, the new home price increase might either come from the increase in size or from the increase of price per square foot. In other words, using repeat sale home price is a correct way to analyze the housing market research.

The second reason is the fact that there are not two distinct markets for homes, new and used. Buyers consider both together when looking at a new home and sellers/developers look at all home sales and prices to judge whether or not their construction will be profitable. Thus, the value of two homes, identical in every way except for age, ought to differ only by the value of the age differential. A quality-controlled price index over time coming from repeat sales of homes will track this except in extraordinary circumstances when home prices are falling dramatically. In the exceptional case (such as in the housing bust of the last recession) uncertainty about home prices as well as an excess supply in the market would break whatever relationship between building costs and home prices exists in normal markets, whether new or existing.

The third is simply practical: there is much more data in quality-controlled housing prices than in new home prices. That permits a more in depth analysis of the topic studied here. Additionally, quality-controlled construction cost data were employed in this report and therefore correspond to the home price data we employed.

To understand in more detail the relationship between construction costs and home prices, we run a panel regression[2] of Equation 1 with a rich dataset of 5,152 observations:

Eq 1 $$Y_t = \alpha + a_1Y_{t-1} + a_2Y_{t-2} + a_3Y_{t-3} + a_4Y_{t-4} + a_5Y_{t-5} + b_0X_t + b_1X_{t-1} + b_2X_{t-2} + b_3X_{t-3} + b_4X_{t-4} + b_5X_{t-5}$$

Here Y_t, so called left-hand-side variable, or dependent variable, is the quarterly home price growth rate in the current quarter; and Y_{t-1}, right-hand-side variable or independent variable, is the quarterly home price growth rate in the previous quarter, and so on. X_t is the quarterly construction cost growth rate in the current quarter. The complete regression results are shown in Appendix A. All of the coefficients a_1 to a_5 and b_0, b_1, and b_4 are statistically significant at the 5% level[3] for which $b_0 = 0.29$, $b_1 = -0.42$, and $b_4 = 0.11$. That said, a one percentage point increase of exogenous construction cost growth rate in the current quarter will predict a 0.29% increase of home price growth rate in the current quarter. A 1% increase of construction cost growth rate in the previous quarter will predict a 0.42 % decrease of home price growth rate in the current quarter, and a 1% increase of construction cost growth rate a year ago (- 4 quarters) will predict a 0.11 % increase of

[2] The panel regression is a useful econometrics tool which considers both time series and cross section range of the dataset.

[3] When the coefficient is statistically significant, say b_0, then we suggest that changes of X_t, the current quarter construction cost growth rate, will predict changes of Y_t, the current quarter home price growth rate. The 5% significance level is a standard way to determine that threshold of the tolerance of making error. The 5% level means that there is a 5% chance that conclusion is wrong.

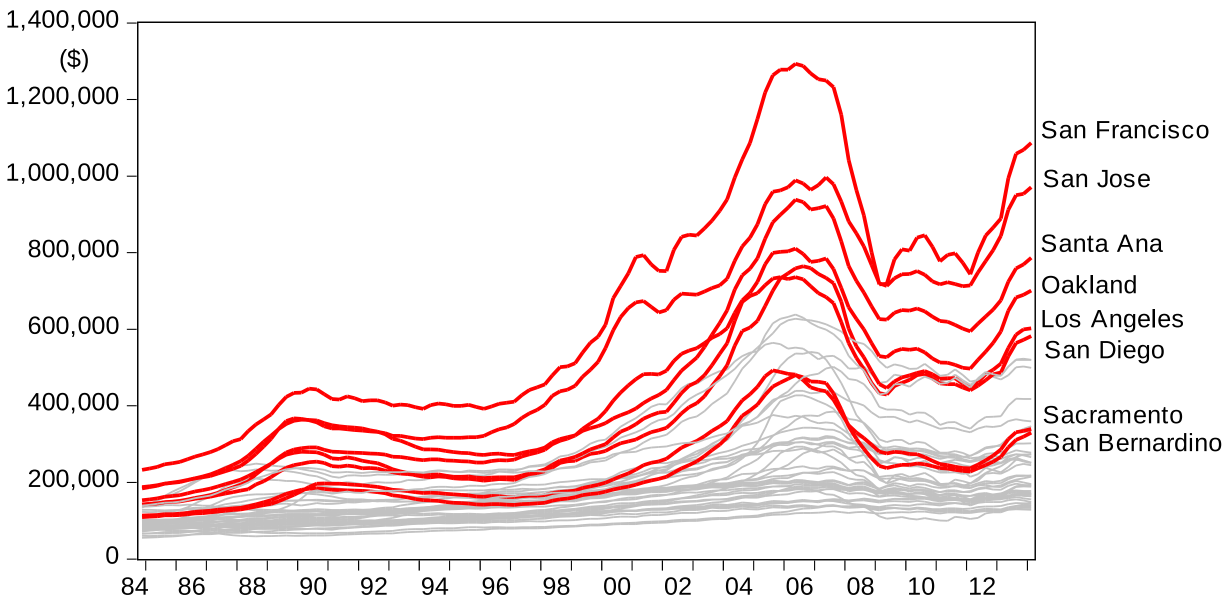
home price growth rate in the current quarter. Coefficients b_2, b_3, and b_5 are not statistically significant.

By summing all these coefficients, we will get almost net zero impact on current-quarter home value growth from past construction cost growth. Next, we run Equation 2 where there are no construction cost growth variables on the right hand side:

Eq 2 $Y_t = \alpha + a_1Y_{t-1} + a_2Y_{t-2} + a_3Y_{t-3} + a_4Y_{t-4} + a_5Y_{t-5}$

By comparing the difference of R-squared[4] in Equations 1 and 2, we can see the limited explanatory power of predicting home value growth by adding structural cost growth. The R-squared in Equation 1 is 0.73 while the R-squared in Equation 2 is 0.722. That is, the construction cost growth as a whole helps very little in explaining the home price growth for these 46 Metros over the past three decades. The evidence confirms the intuitive impression of the weak relationship between Figures 1 and 2.

Figure 1. Nominal Home Prices of 46 Metropolitan Areas from 1984Q4 to 2014Q1



Source: Lincoln Institute of Land Policy (http://www.lincolninst.edu/subcenters/land-values/metro-area-land-prices.asp)

[4] R-squared is a statistical number to determine how much variation of all the right hand side variables in the regression equation will be able to explain the variation of the left-hand-side variable.

Figure 2. Nominal Construction Costs of 46 Metropolitan Areas from 1984Q4 to 2014Q1
Source: Lincoln Institute of Land Policy

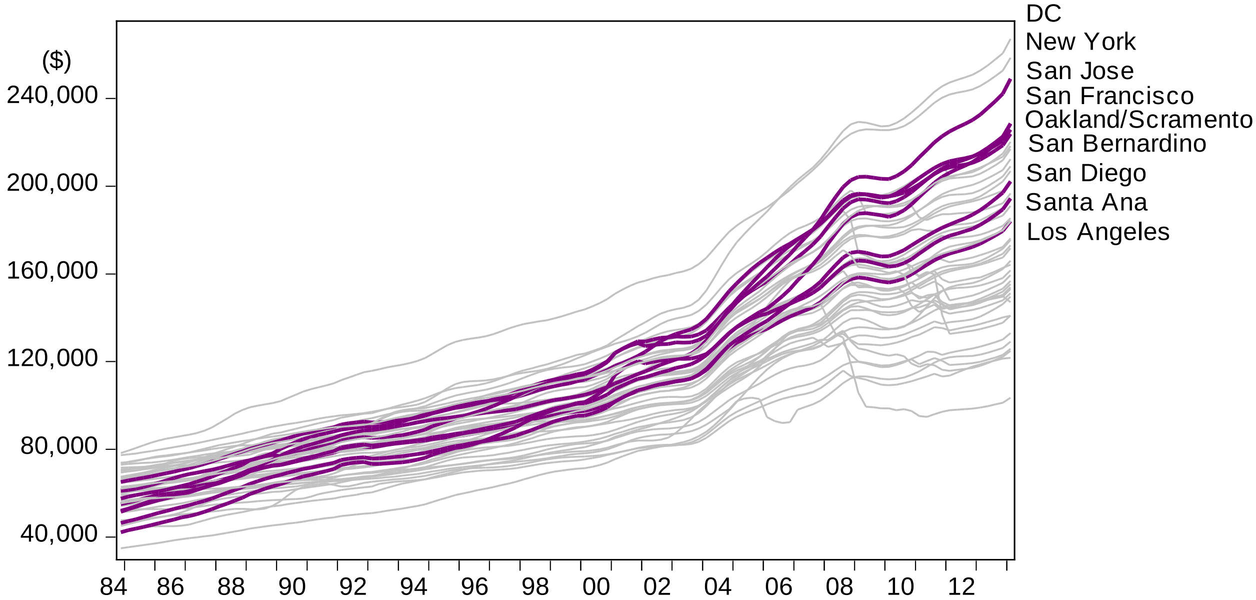
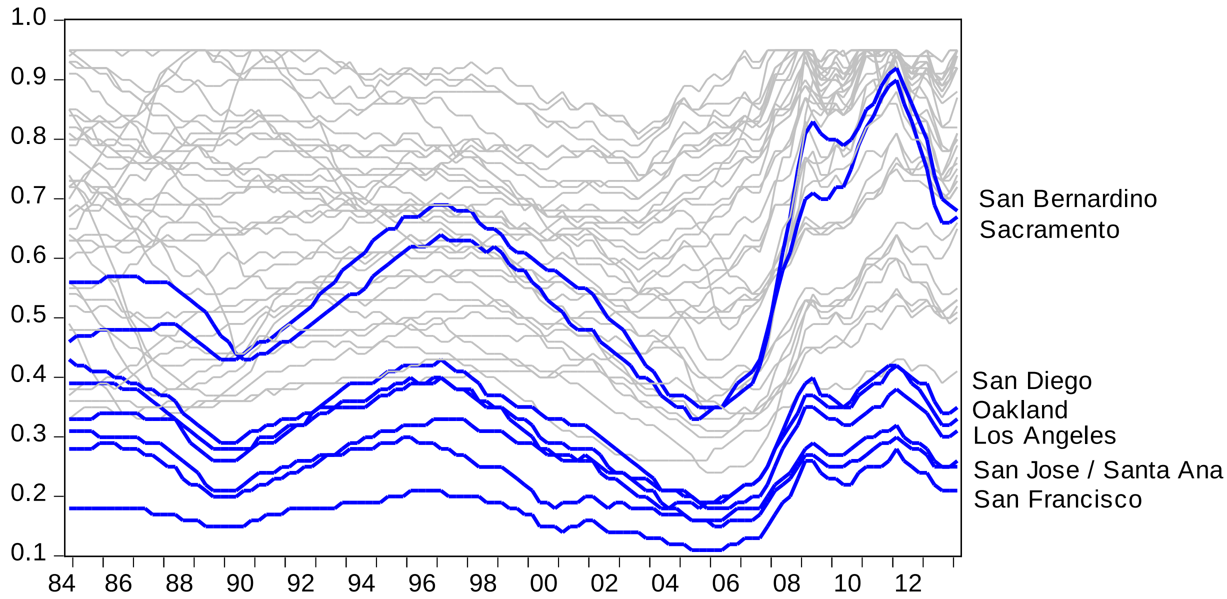
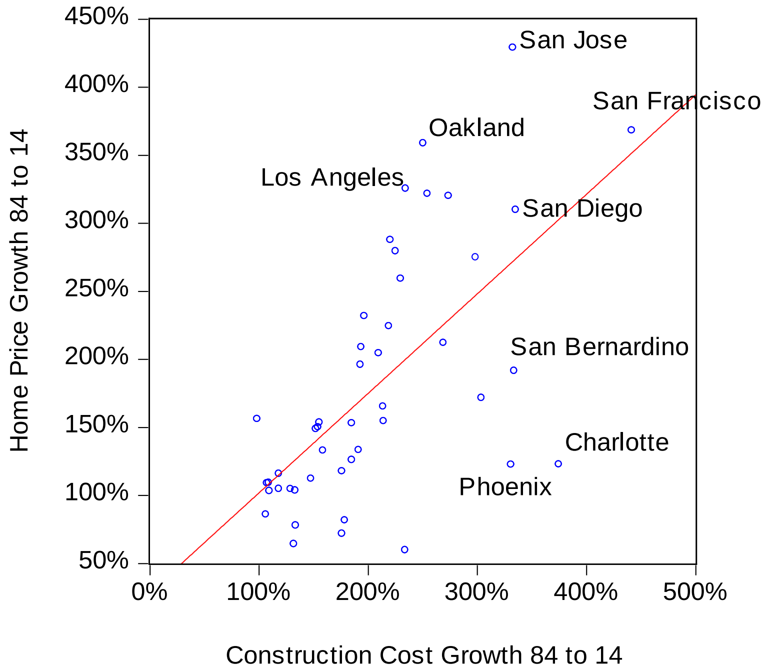


Figure 3. The Ratio of Construction Costs to Home Prices of 46 Metropolitan Areas from 1984Q4 to 2014Q1



Source: Lincoln Institute of Land Policy

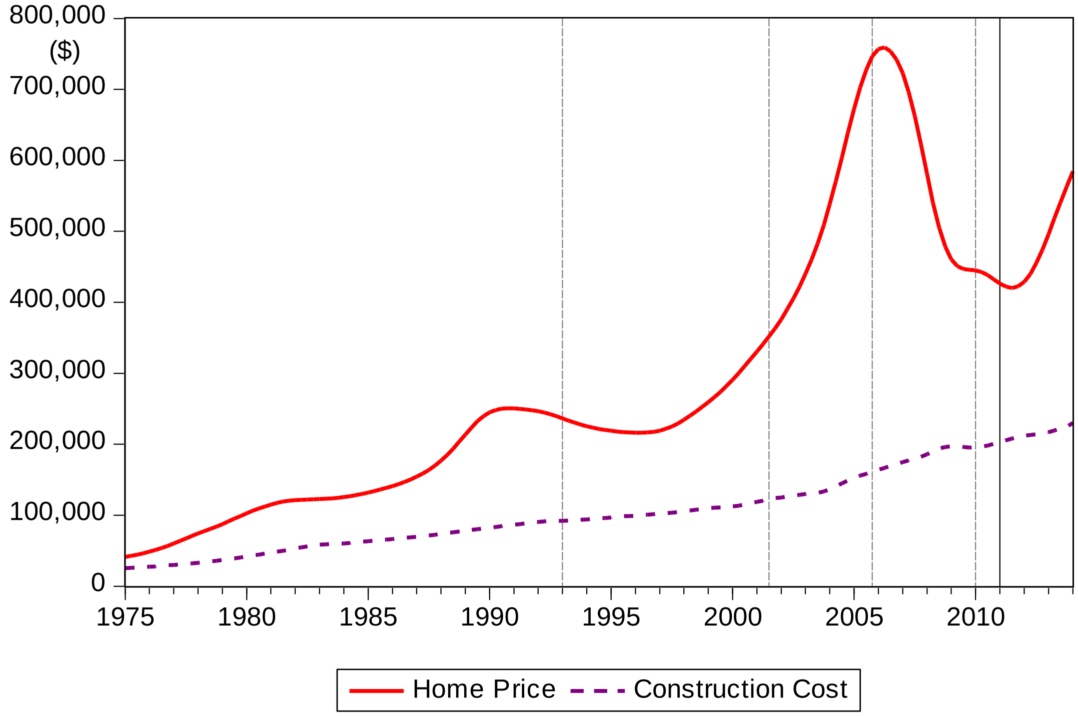
Figure 4. The Correlation Between the Growth of Construction Cost and Home Prices from 1984 to 2014 for 46 Metropolitan Areas



Housing Prices and Construction Costs in California

Figure 5 shows nominal home prices and construction costs for California as a whole from 1975Q1. By and large, we can see that home prices in California have a greater slope of trend and larger swings than construction costs. There are 5 vertical lines in Figure 5. The four dashed lines indicate the incremental implementation of California Energy Code Title 24 Part 6 (Energy Efficient Code) in 1993Q1, 2001Q3, 2005Q4, and 2010Q1. The solid line represents the implementation of a significant non-energy California code change: a regulation requiring fire sprinklers enacted in 2011Q1. From the graph, we cannot see a clear pattern that implementation of these building codes caused a significant rise of construction cost.

Figure 5. Nominal Home Price and Construction Cost of California from 1975Q1 to 2014Q1



Source: Lincoln Institute of Land Policy

Using the same idea of the regression as Equation 1, we run a simple regression Equation 3, as shown in Appendix A, instead of the 46 cross-sectional panel regression:

Eq 3 $Y_t = \alpha + a_1Y_{t-1} + a_2Y_{t-2} + a_3Y_{t-3} + a_4Y_{t-4} + a_5Y_{t-5} + b_0X_t + b_1X_{t-1} + b_2X_{t-2} + b_3X_{t-3} + b_4X_{t-4} + b_5X_{t-5}$

The result shows that none of the coefficients b_0 to b_5 is statistically significant. This is reasonable because in California, as shown in Figures 1 and 2, the ratio of structure cost to home price is much lower than in the rest of the nation. Therefore, we can expect that the structure cost growth would have less, if any, influence on home price growth.

Cost of Inputs and Construction Cost

In this section, we explore the association between the cost of inputs of the whole Nation and construction costs in specific Metros. We use six variables as the cost of inputs in the Nation. (1) The Turner Building Cost Index (Turner) measures costs in the non-residential building construction market in the U.S. Although it is the non-residential building construction cost, it is closely related to residential construction costs because both sectors employ similar though not identical kinds of labor and materials for construction. If we remove this variable, all the conclusions we made in this report will remain the same. (2) Construction worker's wage index (Wage). (3) Producer Price Index for lumber (Lumber). (4) Producer Price Index for metal (Metal). (5) Producer Price Index for nonmetal minerals such as concrete and cement (Mineral). (6) Producer Price Index for crude materials (Crude). We run the panel regression Equation 4 in which all the variables are growth rates:

Eq 4 $X_t = \alpha + a_1X_{t-1} + a_2X_{t-2} + a_3X_{t-3} + a_4X_{t-4} + a_5X_{t-5} + b_1\text{Turner}_t + b_2\text{Wage}_t + b_3\text{Lumber}_t + b_4\text{Metal}_t + b_5\text{Mineral}_t + b_6\text{Crude}_t$

Here X_t is the quarterly construction cost growth rate in the current quarter. The complete results are shown in Appendix A. The Turner Building Cost Index and construction worker wage index have the most impact on the construction cost in terms of their statistical significance and economic magnitude. All the coefficients are statistically significant except one variable: lumber prices. If we remove the variable Turner, then lumber prices will become statistically significant to predict the construction cost growth as shown in Equation 5.

Eq 5 $X_t = \alpha + a_1X_{t-1} + a_2X_{t-2} + a_3X_{t-3} + a_4X_{t-4} + a_5X_{t-5} + b_1\text{Wage}_t + b_2\text{Lumber}_t + b_3\text{Metal}_t + b_4\text{Mineral}_t + b_5\text{Crude}_t$

California Energy Code: Title 24 Part 6

We extend Equation 4 by adding a fixed effect variable[5] in the panel regression to see how the implementation of California Energy Code (CEC) Title 24 Part 6 affects the construction costs as shown in Equation 6:

Eq 6 to 9 $X_t = \alpha + a_1X_{t-1} + a_2X_{t-2} + a_3X_{t-3} + a_4X_{t-4} + a_5X_{t-5} + b_1\text{Turner}_t + b_2\text{Wage}_t + b_3\text{Lumber}_t + b_4\text{Metal}_t + b_5\text{Mineral}_t + b_6\text{Crude}_t + c_1\text{CEC}_t$

All the other variables are the same as those in Equation 4. If c_1 is statistically significant and positive, it might suggest that the implementation of CEC caused construction cost to be

[5] A fixed effect variable is a useful way to tell whether the existence of the variable plays a role to explain the variation of left-hand-side variable. When the variable is in existence (true characteristic), we assign it as 1. When the variable is not (false characteristic), we assign it as 0. Therefore, unlike other variables which contain data ranges in their numerical number. There is only 0 and 1 for a fixed effect variable.

significantly higher in California Metros. Since the implementation of Title 24 was incremental over time, we adopted different versions of the fixed effect variable for those California Metros based on the major changes of the regulation in 1993, 2001, 2005, and 2010: (1) CEC93: starting from 1993Q1, meaning that the variable is zero before 1993Q1 and one after 1993Q1 for 8 California metros and zero for all other metros all the time. (2) CEC: starting from 2001Q3 as one in Equation 7. (3) CEC05: starting from 2005Q4 as one in Equation 8. (4) CEC10: starting from 2010Q1 as one in Equation 9.

Equation 6 (CEC93) result shows that c_1 is statistically significant (despite the coefficient's tiny magnitude) but it is negative. The first possible explanation is that California was in a deep recession in the 1990s compared to other states, which contributed to its lower cost. Second, its coastal ports might make imported materials cheaper than in other parts of the nation. Third, the result may mask other effects that lowered construction costs during the period of the data.

Equations 7 to 9 show a consistent result: during these periods (after 2001, after 2005, and after 2010), the California Metros do not have different dynamics in their construction costs compared to other Metros in the nation, (*i.e.* Title 24 Part 6 induced differentials).

Cost of Inputs and Home Prices

As a robustness check, we combine Equations 1, and Equations 6 to 9 with which we can analyze how local construction costs, national input costs, and various versions of CEC affect home prices directly as shown in Equations 10 to 13:

Eq 10 to 13 $$Y_t = \alpha + a_1Y_{t-1} + a_2Y_{t-2} + a_3Y_{t-3} + a_4Y_{t-4} + a_5Y_{t-5} + b_1X_{t-1} + b_2X_{t-2} + b_3X_{t-3} + b_4X_{t-4} + b_5X_{t-5} + c_1\text{Turner}_t + c_2\text{Wage}_t + c_3\text{Lumber}_t + c_4\text{Metal}_t + c_5\text{Mineral}_t + c_6\text{Crude}_t + d_1\text{CEC}_t$$

Here Y_t is the quarterly home price growth rate in the current quarter. All the other variables are the same as those in Equation 6. The results are consistent and tell us the same thing: in using different versions of CECs we cannot find evidence that the implementation of Title 24 Part 6 caused higher home price appreciation in California Metros.

Housing Price and Construction Cost in Inland California

As shown in Figures 1 to 3, we find that coastal California Metros (*i.e.* Los Angeles, Oakland, San Diego, San Francisco, San Jose, and Santa Ana) have higher home prices due to high land prices and therefore lower ratios of construction cost to home prices. In contrast, inland California Metros (*i.e.* Sacramento and San Bernardino/Riverside) have lower home prices and therefore higher ratios of cost to price. It is possible that the evidence presented above which suggests that construction cost increases and/or the implementation of changes to the Californian Energy Code did not impact home price increases may only apply to coastal California Metros but not to inland California Metros.

To determine if this is the case, we rerun regression Equations 3 and Equations 5 to 8, by Equation 13, and Equations 14 to 17 with the detailed statistical output shown in Appendix A:

Eq 14 $Y_t = \alpha + a_1Y_{t-1} + a_2Y_{t-2} + a_3Y_{t-3} + a_4Y_{t-4} + a_5Y_{t-5} + b_0X_t + b_1X_{t-1} + b_2X_{t-2} + b_3X_{t-3} + b_4X_{t-4} + b_5X_{t-5}$

Here Y_t is the quarterly home price growth rate and X_t is the quarterly construction cost growth rate. The sample is only for two inland California Metros: Sacramento and San Bernardino/Riverside. Coefficients b_0 and b_1 are statistically significant at the 5% level for which $b_0 = 0.96$, $b_1 = -1.58$, while other coefficients are not individually significant. That is, the net effect of construction cost on home price growth is negative. Considering the entire lag effect, b_0 to b_5, we get a net positive effect of 0.22.

Eq 15 to 18 $X_t = \alpha + a_1X_{t-1} + a_2X_{t-2} + a_3X_{t-3} + a_4X_{t-4} + a_5X_{t-5} + b_1\text{Turner}_t + b_2\text{Wage}_t + b_3\text{Lumber}_t + b_4\text{Metal}_t + b_5\text{Mineral}_t + b_6\text{Crude}_t + c_1\text{INCEC}_t$

Here X_t is the quarterly construction cost growth rate for 46 Metros. Other national variables are the same. In Equations 5 to 8, the fixed effect variable, CEC, is for all 8 Metros in California with the four different time settings. Here, INCEC is the fixed effect variable for the two inland California Metros, Sacramento and San Bernardino/Riverside, and for the four different time settings, which again represent various stages of implementation of energy efficient codes: 1993Q1, 2001Q3, 2005Q4, and 2010Q1.

Similar to Equations 5 to 8, there is only one equation showing a significant result, Equation 15 (INCEC93). In this equation c_1 is statistically significant (despite the coefficient's tiny magnitude) and it is negative. That is to say, there is a special factor affecting these two California Metros since 1993 that contributed to lower construction cost growth during this period.

In summary, as with the entire State of California, we cannot find evidence which suggests that the implementation of the California Energy Efficient Code changes caused a higher home price appreciation for those inland California cities where construction costs are larger relative to home prices than those in coastal California.

Learning Costs of Construction Workers

An important aspect of changes to regulatory requirements for builders is the development of a skilled workforce to implement the changes. This is not unique to construction. In the production of goods, from automobiles, to computers, to airplanes the implementation of new models, new technologies and new safety regulations engenders development and training costs. It is standard practice to spread those costs over a number of production units and to smooth out the spike in first-article costs.

Were this the case one would not expect to see a spike in prices at the time of the implementation of the regulatory change. Rather there would be an overall increase which could be observed over time in the statistical analysis herein. When the number of production units is large, long-term increase in prices could be insignificant. In our data, what is observed is no spike nor long-term increase in prices as a result of the regulatory changes.

Conclusions

(1) We find that construction cost growth is only marginally associated with home value growth across the metros. We cannot find evidence that structure cost increase will cause higher home price in either coastal or inland California.

(2) We find Metros' construction costs are highly correlated to the national cost of inputs. We cannot find statistically significant evidence that California's energy efficiency code Title 24 is associated with home construction costs in 8 Metros in California, in which 2 Metros are in inland California.

Table 1. Home Values, Structure Costs, and Its Ratios of 46 Metropolitan Areas

	Home Value			Structure Cost			Ratio	
Metropolitan Areas	1984Q4	2014Q1	Growth	1984Q4	2014Q1	Growth	1984Q4	2014Q1
San Francisco	$232,048	$1,085,891	368%	$42,197	$228,610	442%	0.18	0.21
San Jose	$183,357	$969,661	429%	$57,534	$248,954	333%	0.31	0.26
Santa Ana	$187,050	$785,423	320%	$52,009	$194,405	274%	0.28	0.25
Oakland	$152,743	$700,542	359%	$65,151	$228,426	251%	0.43	0.33
Los Angeles	$141,508	$601,832	325%	$55,011	$184,152	235%	0.39	0.31
San Diego	$141,768	$580,929	310%	$46,403	$202,126	336%	0.33	0.35
Boston	$134,217	$520,134	288%	$66,228	$212,332	221%	0.49	0.41
Washington DC	$138,426	$518,915	275%	$67,008	$267,150	299%	0.48	0.51
New York	$138,807	$498,454	259%	$78,379	$258,623	230%	0.56	0.52
Seattle	$98,843	$416,567	321%	$62,115	$220,266	255%	0.63	0.53
Baltimore	$110,872	$359,444	224%	$59,844	$191,034	219%	0.54	0.53
Miami	$127,622	$346,482	171%	$42,497	$171,748	304%	0.33	0.50
Sacramento	$108,611	$338,797	212%	$61,152	$225,822	269%	0.56	0.67
Portland	$87,629	$332,326	279%	$56,660	$184,336	225%	0.65	0.55
San Bernardino	$112,777	$328,672	191%	$51,573	$223,886	334%	0.46	0.68
Denver	$102,007	$301,790	196%	$73,972	$216,909	193%	0.73	0.72
Providence	$83,537	$276,962	232%	$62,018	$183,975	197%	0.74	0.66
Salt Lake City	$88,067	$271,936	209%	$70,330	$206,837	194%	0.80	0.76
Phoenix	$122,228	$271,857	122%	$45,134	$194,608	331%	0.37	0.72
Philadelphia	$87,083	$265,029	204%	$67,497	$209,123	210%	0.78	0.79
Chicago	$94,797	$251,255	165%	$69,522	$218,258	214%	0.73	0.87
Hartford	$107,713	$251,206	133%	$69,428	$202,394	192%	0.64	0.81
Norfolk	$98,276	$250,051	154%	$51,406	$161,687	215%	0.52	0.65
Minneapolis	$97,633	$244,071	150%	$77,350	$196,673	154%	0.79	0.81
Dallas	$136,413	$217,722	60%	$51,816	$173,114	234%	0.38	0.80
Charlotte	$97,430	$216,912	123%	$34,944	$166,000	375%	0.36	0.77
Houston	$101,105	$214,374	112%	$70,819	$175,511	148%	0.70	0.82
Milwaukee	$77,191	$195,144	153%	$65,012	$185,387	185%	0.84	0.95
Columbus	$85,109	$192,285	126%	$61,805	$176,258	185%	0.73	0.92
Tampa	$87,841	$191,176	118%	$55,444	$153,150	176%	0.63	0.80
Atlanta	$92,946	$188,739	103%	$67,197	$140,980	110%	0.72	0.75
New Orleans	$86,602	$177,290	105%	$59,171	$129,210	118%	0.68	0.73
Cincinnati	$84,539	$172,878	104%	$71,643	$164,234	129%	0.85	0.95
Birmingham	$73,427	$170,900	133%	$60,563	$156,789	159%	0.82	0.92
Cleveland	$78,799	$170,001	116%	$73,037	$159,504	118%	0.93	0.94
Fort Worth	$98,566	$169,273	72%	$54,164	$149,634	176%	0.55	0.88
Buffalo	$66,551	$168,607	153%	$60,847	$155,402	155%	0.91	0.92
Kansas City	$80,487	$163,743	103%	$64,839	$151,253	133%	0.81	0.92
St Louis	$77,838	$162,811	109%	$73,569	$153,937	109%	0.95	0.95
Rochester	$87,140	$154,868	78%	$62,935	$147,124	134%	0.72	0.95
Pittsburgh	$59,618	$148,297	149%	$55,811	$140,883	152%	0.94	0.95
San Antonio	$79,690	$144,652	82%	$47,702	$133,022	179%	0.60	0.92
Detroit	$54,922	$140,580	156%	$52,175	$103,536	98%	0.95	0.74
Indianapolis	$65,471	$136,630	109%	$60,657	$125,837	107%	0.93	0.92
Memphis	$71,491	$132,794	86%	$60,514	$124,956	106%	0.85	0.94
Oklahoma City	$78,099	$128,189	64%	$52,446	$121,780	132%	0.67	0.95

Appendix A. Regression Results

Equation 1

Dependent Variable: DLOG(HOME_VALUE)
Method: Panel Least Squares
Sample (adjusted): 1986Q2 2014Q1
Periods included: 112
Cross-sections included: 46
Total panel (balanced) observations: 5152

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001096	0.000328	3.340830	0.0008
DLOG(HOME_VALUE(-1))	0.844041	0.012506	67.48885	0.0000
DLOG(HOME_VALUE(-2))	-0.311259	0.015805	-19.69386	0.0000
DLOG(HOME_VALUE(-3))	0.242086	0.016117	15.02078	0.0000
DLOG(HOME_VALUE(-4))	0.479091	0.016193	29.58583	0.0000
DLOG(HOME_VALUE(-5))	-0.472842	0.013073	-36.16837	0.0000
DLOG(STRUCTURE_COST)	0.292315	0.031990	9.137771	0.0000
DLOG(STRUCTURE_COST(-1))	-0.417684	0.042761	-9.767960	0.0000
DLOG(STRUCTURE_COST(-2))	0.041255	0.043955	0.938576	0.3480
DLOG(STRUCTURE_COST(-3))	0.020312	0.043862	0.463098	0.6433
DLOG(STRUCTURE_COST(-4))	0.109494	0.043482	2.518151	0.0118
DLOG(STRUCTURE_COST(-5))	0.024713	0.032668	0.756501	0.4494

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.730124	Mean dependent var	0.008249
Adjusted R-squared	0.727158	S.D. dependent var	0.023552
S.E. of regression	0.012302	Akaike info criterion	-5.947107
Sum squared resid	0.771074	Schwarz criterion	-5.874671
Log likelihood	15376.75	Hannan-Quinn criter.	-5.921758
F-statistic	246.1436	Durbin-Watson stat	1.980922
Prob(F-statistic)	0.000000		

Equation 2

Dependent Variable: DLOG(HOME_VALUE)
Method: Panel Least Squares
Sample (adjusted): 1986Q2 2014Q1
Periods included: 112
Cross-sections included: 46
Total panel (balanced) observations: 5152

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001761	0.000191	9.236456	0.0000
DLOG(HOME_VALUE(-1))	0.841886	0.012411	67.83607	0.0000
DLOG(HOME_VALUE(-2))	-0.326845	0.015738	-20.76851	0.0000
DLOG(HOME_VALUE(-3))	0.257413	0.016034	16.05390	0.0000
DLOG(HOME_VALUE(-4))	0.490686	0.016120	30.43975	0.0000
DLOG(HOME_VALUE(-5))	-0.479358	0.012784	-37.49811	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.721866	Mean dependent var	0.008249
Adjusted R-squared	0.719140	S.D. dependent var	0.023552
S.E. of regression	0.012481	Akaike info criterion	-5.919295
Sum squared resid	0.794669	Schwarz criterion	-5.854484
Log likelihood	15299.10	Hannan-Quinn criter.	-5.896614
F-statistic	264.7815	Durbin-Watson stat	1.983373
Prob(F-statistic)	0.000000		

Equation 3

Dependent Variable: DLOG(HOME_VALUE)
Method: Least Squares
Sample (adjusted): 1976Q3 2014Q1
Included observations: 151 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000126	0.000103	1.220152	0.2245
DLOG(HOME_VALUE(-1))	3.422078	0.084608	40.44619	0.0000
DLOG(HOME_VALUE(-2))	-4.715284	0.290447	-16.23455	0.0000
DLOG(HOME_VALUE(-3))	3.207793	0.414947	7.730601	0.0000
DLOG(HOME_VALUE(-4))	-1.021041	0.294375	-3.468507	0.0007
DLOG(HOME_VALUE(-5))	0.099917	0.087176	1.146142	0.2537
DLOG(STRUCTURE_COST)	-0.001891	0.018933	-0.099874	0.9206
DLOG(STRUCTURE_COST(-1))	0.018153	0.027105	0.669720	0.5041
DLOG(STRUCTURE_COST(-2))	0.019472	0.025649	0.759190	0.4490
DLOG(STRUCTURE_COST(-3))	-0.045938	0.025477	-1.803141	0.0735
DLOG(STRUCTURE_COST(-4))	0.010150	0.028541	0.355615	0.7227
DLOG(STRUCTURE_COST(-5))	-0.001417	0.019622	-0.072196	0.9425

R-squared	0.999671	Mean dependent var	0.016153
Adjusted R-squared	0.999645	S.D. dependent var	0.027313
S.E. of regression	0.000515	Akaike info criterion	-12.22889
Sum squared resid	3.69E-05	Schwarz criterion	-11.98911
Log likelihood	935.2812	Hannan-Quinn criter.	-12.13148
F-statistic	38350.67	Durbin-Watson stat	1.965305
Prob(F-statistic)	0.000000		

Equation 4

Dependent Variable: DLOG(STRUCTURE_COST)
Method: Panel Least Squares
Date: 01/17/15 Time: 18:15
Sample (adjusted): 1986Q2 2014Q1
Periods included: 112
Cross-sections included: 46
Total panel (balanced) observations: 5152

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001927	0.000157	12.28393	0.0000
DLOG(STRUCTURE_COST(-1))	0.776437	0.014254	54.46998	0.0000
DLOG(STRUCTURE_COST(-2))	-0.247952	0.017868	-13.87705	0.0000
DLOG(STRUCTURE_COST(-3))	0.220937	0.018024	12.25765	0.0000
DLOG(STRUCTURE_COST(-4))	-0.095922	0.017864	-5.369479	0.0000
DLOG(STRUCTURE_COST(-5))	-0.064315	0.013721	-4.687465	0.0000
DLOG(TURNER)	0.097041	0.009814	9.887585	0.0000
DLOG(CONSTUCTION_WAGE)	0.151363	0.025151	6.018260	0.0000
DLOG(PPI_LUMBER)	0.004119	0.003505	1.175277	0.2399
DLOG(PPI_METAL)	0.040145	0.003759	10.67938	0.0000
DLOG(PPI_MINERAL)	0.037536	0.011755	3.193220	0.0014
DLOG(PPI_CM)	0.006658	0.001414	4.708841	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.635240	Mean dependent var	0.009330
Adjusted R-squared	0.631231	S.D. dependent var	0.008553
S.E. of regression	0.005194	Akaike info criterion	-7.671688
Sum squared resid	0.137442	Schwarz criterion	-7.599253
Log likelihood	19819.27	Hannan-Quinn criter.	-7.646339
F-statistic	158.4483	Durbin-Watson stat	1.977948
Prob(F-statistic)	0.000000		

Equation 5

Dependent Variable: DLOG(STRUCTURE_COST)
Method: Panel Least Squares
Sample (adjusted): 1986Q2 2014Q1
Periods included: 112
Cross-sections included: 46
Total panel (balanced) observations: 5152

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001810	0.000158	11.45987	0.0000
DLOG(STRUCTURE_COST(-1))	0.809023	0.013999	57.79048	0.0000
DLOG(STRUCTURE_COST(-2))	-0.246010	0.018036	-13.64028	0.0000
DLOG(STRUCTURE_COST(-3))	0.218631	0.018193	12.01716	0.0000
DLOG(STRUCTURE_COST(-4))	-0.097669	0.018032	-5.416333	0.0000
DLOG(STRUCTURE_COST(-5))	-0.075886	0.013800	-5.499078	0.0000
DLOG(CONSTUCTION_WAGE)	0.216002	0.024516	8.810807	0.0000
DLOG(PPI_LUMBER)	0.009965	0.003488	2.857451	0.0043
DLOG(PPI_METAL)	0.039400	0.003794	10.38507	0.0000
DLOG(PPI_MINERAL)	0.088476	0.010666	8.295354	0.0000
DLOG(PPI_CM)	0.009298	0.001402	6.634425	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.628241	Mean dependent var	0.009330
Adjusted R-squared	0.624229	S.D. dependent var	0.008553
S.E. of regression	0.005243	Akaike info criterion	-7.653070
Sum squared resid	0.140079	Schwarz criterion	-7.581905
Log likelihood	19770.31	Hannan-Quinn criter.	-7.628166
F-statistic	156.5785	Durbin-Watson stat	2.000053
Prob(F-statistic)	0.000000		

Equation 6

Dependent Variable: DLOG(STRUCTURE_COST)
Method: Panel Least Squares
Sample (adjusted): 1986Q2 2014Q1
Periods included: 112
Cross-sections included: 46
Total panel (balanced) observations: 5152

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.002117	0.000167	12.64654	0.0000
DLOG(STRUCTURE_COST(-1))	0.773715	0.014266	54.23429	0.0000
DLOG(STRUCTURE_COST(-2))	-0.247891	0.017851	-13.88642	0.0000
DLOG(STRUCTURE_COST(-3))	0.218490	0.018024	12.12232	0.0000
DLOG(STRUCTURE_COST(-4))	-0.095099	0.017850	-5.327805	0.0000
DLOG(STRUCTURE_COST(-5))	-0.067663	0.013747	-4.921997	0.0000
DLOG(TURNER)	0.095987	0.009811	9.783786	0.0000
DLOG(CONSTUCTION_WAGE)	0.158972	0.025238	6.298994	0.0000
DLOG(PPI_LUMBER)	0.003417	0.003509	0.973976	0.3301
DLOG(PPI_METAL)	0.039716	0.003758	10.56833	0.0000
DLOG(PPI_MINERAL)	0.043703	0.011898	3.672962	0.0002
DLOG(PPI_CM)	0.006887	0.001414	4.869243	0.0000
CEC93	-0.001347	0.000417	-3.227976	0.0013

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.635985	Mean dependent var	0.009330
Adjusted R-squared	0.631912	S.D. dependent var	0.008553
S.E. of regression	0.005189	Akaike info criterion	-7.673343
Sum squared resid	0.137162	Schwarz criterion	-7.599637
Log likelihood	19824.53	Hannan-Quinn criter.	-7.647550
F-statistic	156.1391	Durbin-Watson stat	1.975132
Prob(F-statistic)	0.000000		

Equation 7

Dependent Variable: DLOG(STRUCTURE_COST)
Method: Panel Least Squares
Sample (adjusted): 1986Q2 2014Q1
Periods included: 112
Cross-sections included: 46
Total panel (balanced) observations: 5152

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001927	0.000157	12.25549	0.0000
DLOG(STRUCTURE_COST(-1))	0.776433	0.014256	54.46245	0.0000
DLOG(STRUCTURE_COST(-2))	-0.247944	0.017872	-13.87335	0.0000
DLOG(STRUCTURE_COST(-3))	0.220934	0.018027	12.25599	0.0000
DLOG(STRUCTURE_COST(-4))	-0.095917	0.017867	-5.368443	0.0000
DLOG(STRUCTURE_COST(-5))	-0.064323	0.013725	-4.686468	0.0000
DLOG(TURNER)	0.097008	0.009888	9.810273	0.0000
DLOG(CONSTUCTION_WAGE)	0.151469	0.025436	5.954955	0.0000
DLOG(PPI_LUMBER)	0.004120	0.003505	1.175218	0.2400
DLOG(PPI_METAL)	0.040147	0.003760	10.67787	0.0000
DLOG(PPI_MINERAL)	0.037579	0.011853	3.170299	0.0015
DLOG(PPI_CM)	0.006659	0.001415	4.705234	0.0000
CEC	-1.01E-05	0.000357	-0.028207	0.9775

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.635240	Mean dependent var	0.009330
Adjusted R-squared	0.631159	S.D. dependent var	0.008553
S.E. of regression	0.005194	Akaike info criterion	-7.671300
Sum squared resid	0.137442	Schwarz criterion	-7.597594
Log likelihood	19819.27	Hannan-Quinn criter.	-7.645506
F-statistic	155.6380	Durbin-Watson stat	1.977949
Prob(F-statistic)	0.000000		

Equation 8

Dependent Variable: DLOG(STRUCTURE_COST)
Method: Panel Least Squares
Sample (adjusted): 1986Q2 2014Q1
Periods included: 112
Cross-sections included: 46
Total panel (balanced) observations: 5152

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001916	0.000158	12.16547	0.0000
DLOG(STRUCTURE_COST(-1))	0.776343	0.014256	54.45901	0.0000
DLOG(STRUCTURE_COST(-2))	-0.247933	0.017869	-13.87539	0.0000
DLOG(STRUCTURE_COST(-3))	0.221122	0.018027	12.26622	0.0000
DLOG(STRUCTURE_COST(-4))	-0.095915	0.017865	-5.368839	0.0000
DLOG(STRUCTURE_COST(-5))	-0.064362	0.013721	-4.690680	0.0000
DLOG(TURNER)	0.098269	0.009951	9.875474	0.0000
DLOG(CONSTUCTION_WAGE)	0.150001	0.025217	5.948321	0.0000
DLOG(PPI_LUMBER)	0.004142	0.003505	1.181694	0.2374
DLOG(PPI_METAL)	0.040133	0.003759	10.67545	0.0000
DLOG(PPI_MINERAL)	0.036244	0.011881	3.050530	0.0023
DLOG(PPI_CM)	0.006626	0.001415	4.684240	0.0000
CEC05	0.000288	0.000385	0.748878	0.4540

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.635281	Mean dependent var	0.009330
Adjusted R-squared	0.631199	S.D. dependent var	0.008553
S.E. of regression	0.005194	Akaike info criterion	-7.671410
Sum squared resid	0.137427	Schwarz criterion	-7.597704
Log likelihood	19819.55	Hannan-Quinn criter.	-7.645616
F-statistic	155.6649	Durbin-Watson stat	1.978313
Prob(F-statistic)	0.000000		

Equation 9

Dependent Variable: DLOG(STRUCTURE_COST)
Method: Panel Least Squares
Sample (adjusted): 1986Q2 2014Q1
Periods included: 112
Cross-sections included: 46
Total panel (balanced) observations: 5152

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001891	0.000159	11.87062	0.0000
DLOG(STRUCTURE_COST(-1))	0.776537	0.014254	54.47992	0.0000
DLOG(STRUCTURE_COST(-2))	-0.247805	0.017867	-13.86952	0.0000
DLOG(STRUCTURE_COST(-3))	0.221453	0.018028	12.28412	0.0000
DLOG(STRUCTURE_COST(-4))	-0.095655	0.017864	-5.354513	0.0000
DLOG(STRUCTURE_COST(-5))	-0.063567	0.013732	-4.629282	0.0000
DLOG(TURNER)	0.097381	0.009817	9.919370	0.0000
DLOG(CONSTUCTION_WAGE)	0.152527	0.025165	6.061137	0.0000
DLOG(PPI_LUMBER)	0.004040	0.003505	1.152643	0.2491
DLOG(PPI_METAL)	0.040267	0.003760	10.70918	0.0000
DLOG(PPI_MINERAL)	0.036818	0.011767	3.128904	0.0018
DLOG(PPI_CM)	0.006597	0.001415	4.664073	0.0000
CEC10	0.000637	0.000489	1.302643	0.1928

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.635362	Mean dependent var	0.009330
Adjusted R-squared	0.631282	S.D. dependent var	0.008553
S.E. of regression	0.005193	Akaike info criterion	-7.671633
Sum squared resid	0.137396	Schwarz criterion	-7.597927
Log likelihood	19820.13	Hannan-Quinn criter.	-7.645839
F-statistic	155.7196	Durbin-Watson stat	1.978964
Prob(F-statistic)	0.000000		

Equation 10

Dependent Variable: DLOG(HOME_VALUE)
Method: Panel Least Squares
Sample (adjusted): 1986Q2 2014Q1
Periods included: 112
Cross-sections included: 46
Total panel (balanced) observations: 5152

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000904	0.000403	2.241585	0.0250
DLOG(HOME_VALUE(-1))	0.845280	0.012484	67.70796	0.0000
DLOG(HOME_VALUE(-2))	-0.304945	0.015807	-19.29212	0.0000
DLOG(HOME_VALUE(-3))	0.217913	0.016310	13.36095	0.0000
DLOG(HOME_VALUE(-4))	0.485694	0.016130	30.11100	0.0000
DLOG(HOME_VALUE(-5))	-0.453063	0.013139	-34.48157	0.0000
DLOG(STRUCTURE_COST)	0.274411	0.033178	8.270793	0.0000
DLOG(STRUCTURE_COST(-1))	-0.394293	0.042655	-9.243820	0.0000
DLOG(STRUCTURE_COST(-2))	0.065146	0.043487	1.498043	0.1342
DLOG(STRUCTURE_COST(-3))	0.069487	0.043618	1.593099	0.1112
DLOG(STRUCTURE_COST(-4))	0.112566	0.043080	2.612925	0.0090
DLOG(STRUCTURE_COST(-5))	0.015226	0.033479	0.454780	0.6493
DLOG(TURNER)	-0.044797	0.026234	-1.707580	0.0878
DLOG(CONSTUCTION_WAGE)	-0.153808	0.059653	-2.578399	0.0100
DLOG(PPI_LUMBER)	0.069518	0.008537	8.143051	0.0000
DLOG(PPI_METAL)	0.039513	0.008986	4.397233	0.0000
DLOG(PPI_MINERAL)	-0.064930	0.029759	-2.181852	0.0292
DLOG(PPI_CM)	-0.002216	0.003351	-0.661373	0.5084
CEC93	0.001269	0.000984	1.289336	0.1973

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.737279	Mean dependent var	0.008249
Adjusted R-squared	0.734026	S.D. dependent var	0.023552
S.E. of regression	0.012146	Akaike info criterion	-5.971260
Sum squared resid	0.750631	Schwarz criterion	-5.889929
Log likelihood	15445.96	Hannan-Quinn criter.	-5.942798
F-statistic	226.6438	Durbin-Watson stat	1.975633
Prob(F-statistic)	0.000000		

Equation 11

Dependent Variable: DLOG(HOME_VALUE)
Method: Panel Least Squares
Sample (adjusted): 1986Q2 2014Q1
Periods included: 112
Cross-sections included: 46
Total panel (balanced) observations: 5152

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001095	0.000381	2.873835	0.0041
DLOG(HOME_VALUE(-1))	0.845832	0.012483	67.75673	0.0000
DLOG(HOME_VALUE(-2))	-0.304622	0.015809	-19.26892	0.0000
DLOG(HOME_VALUE(-3))	0.216957	0.016311	13.30135	0.0000
DLOG(HOME_VALUE(-4))	0.485151	0.016131	30.07521	0.0000
DLOG(HOME_VALUE(-5))	-0.454235	0.013119	-34.62317	0.0000
DLOG(STRUCTURE_COST)	0.273328	0.033166	8.241148	0.0000
DLOG(STRUCTURE_COST(-1))	-0.396044	0.042651	-9.285675	0.0000
DLOG(STRUCTURE_COST(-2))	0.065456	0.043496	1.504870	0.1324
DLOG(STRUCTURE_COST(-3))	0.068061	0.043606	1.560800	0.1186
DLOG(STRUCTURE_COST(-4))	0.114116	0.043083	2.648774	0.0081
DLOG(STRUCTURE_COST(-5))	0.011095	0.033400	0.332196	0.7398
DLOG(TURNER)	-0.046552	0.026354	-1.766425	0.0774
DLOG(CONSTUCTION_WAGE)	-0.137688	0.060031	-2.293627	0.0219
DLOG(PPI_LUMBER)	0.068842	0.008520	8.080174	0.0000
DLOG(PPI_METAL)	0.039442	0.008987	4.388943	0.0000
DLOG(PPI_MINERAL)	-0.056575	0.029690	-1.905537	0.0568
DLOG(PPI_CM)	-0.001889	0.003350	-0.563934	0.5728
CEC	-0.000721	0.000836	-0.863049	0.3882

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.737232	Mean dependent var	0.008249
Adjusted R-squared	0.733978	S.D. dependent var	0.023552
S.E. of regression	0.012147	Akaike info criterion	-5.971079
Sum squared resid	0.750766	Schwarz criterion	-5.889748
Log likelihood	15445.50	Hannan-Quinn criter.	-5.942617
F-statistic	226.5884	Durbin-Watson stat	1.975845
Prob(F-statistic)	0.000000		

Equation 12

Dependent Variable: DLOG(HOME_VALUE)
Method: Panel Least Squares
Sample (adjusted): 1986Q2 2014Q1
Periods included: 112
Cross-sections included: 46
Total panel (balanced) observations: 5152

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001238	0.000380	3.259820	0.0011
DLOG(HOME_VALUE(-1))	0.842545	0.012446	67.69607	0.0000
DLOG(HOME_VALUE(-2))	-0.304094	0.015750	-19.30770	0.0000
DLOG(HOME_VALUE(-3))	0.211800	0.016269	13.01827	0.0000
DLOG(HOME_VALUE(-4))	0.482714	0.016076	30.02753	0.0000
DLOG(HOME_VALUE(-5))	-0.458797	0.013092	-35.04461	0.0000
DLOG(STRUCTURE_COST)	0.280750	0.033066	8.490642	0.0000
DLOG(STRUCTURE_COST(-1))	-0.395578	0.042490	-9.309842	0.0000
DLOG(STRUCTURE_COST(-2))	0.064756	0.043331	1.494473	0.1351
DLOG(STRUCTURE_COST(-3))	0.066109	0.043447	1.521609	0.1282
DLOG(STRUCTURE_COST(-4))	0.115847	0.042920	2.699114	0.0070
DLOG(STRUCTURE_COST(-5))	0.014544	0.033265	0.437217	0.6620
DLOG(TURNER)	-0.054155	0.026186	-2.068117	0.0387
DLOG(CONSTUCTION_WAGE)	-0.115552	0.059301	-1.948575	0.0514
DLOG(PPI_LUMBER)	0.067837	0.008490	7.990487	0.0000
DLOG(PPI_METAL)	0.039960	0.008952	4.463602	0.0000
DLOG(PPI_MINERAL)	-0.043319	0.029486	-1.469117	0.1419
DLOG(PPI_CM)	-0.001491	0.003336	-0.446848	0.6550
CEC05	-0.005700	0.000919	-6.200153	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.739164	Mean dependent var	0.008249
Adjusted R-squared	0.735934	S.D. dependent var	0.023552
S.E. of regression	0.012103	Akaike info criterion	-5.978460
Sum squared resid	0.745246	Schwarz criterion	-5.897129
Log likelihood	15464.51	Hannan-Quinn criter.	-5.949998
F-statistic	228.8652	Durbin-Watson stat	1.981639
Prob(F-statistic)	0.000000		

Equation 13

Dependent Variable: DLOG(HOME_VALUE)
Method: Panel Least Squares
Sample (adjusted): 1986Q2 2014Q1
Periods included: 112
Cross-sections included: 46
Total panel (balanced) observations: 5152

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001147	0.000384	2.984877	0.0029
DLOG(HOME_VALUE(-1))	0.846660	0.012505	67.70583	0.0000
DLOG(HOME_VALUE(-2))	-0.304082	0.015816	-19.22606	0.0000
DLOG(HOME_VALUE(-3))	0.217189	0.016304	13.32123	0.0000
DLOG(HOME_VALUE(-4))	0.485524	0.016129	30.10339	0.0000
DLOG(HOME_VALUE(-5))	-0.455769	0.013184	-34.56869	0.0000
DLOG(STRUCTURE_COST)	0.273898	0.033168	8.257829	0.0000
DLOG(STRUCTURE_COST(-1))	-0.396293	0.042647	-9.292309	0.0000
DLOG(STRUCTURE_COST(-2))	0.064640	0.043487	1.486411	0.1372
DLOG(STRUCTURE_COST(-3))	0.066776	0.043613	1.531124	0.1258
DLOG(STRUCTURE_COST(-4))	0.113484	0.043074	2.634647	0.0084
DLOG(STRUCTURE_COST(-5))	0.010323	0.033407	0.309019	0.7573
DLOG(TURNER)	-0.045331	0.026243	-1.727371	0.0842
DLOG(CONSTUCTION_WAGE)	-0.147714	0.059337	-2.489403	0.0128
DLOG(PPI_LUMBER)	0.068817	0.008519	8.078069	0.0000
DLOG(PPI_METAL)	0.039069	0.008986	4.347839	0.0000
DLOG(PPI_MINERAL)	-0.057751	0.029511	-1.956908	0.0504
DLOG(PPI_CM)	-0.001898	0.003348	-0.567020	0.5707
CEC10	-0.001479	0.001155	-1.281305	0.2001

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.737278	Mean dependent var	0.008249
Adjusted R-squared	0.734025	S.D. dependent var	0.023552
S.E. of regression	0.012146	Akaike info criterion	-5.971255
Sum squared resid	0.750634	Schwarz criterion	-5.889925
Log likelihood	15445.95	Hannan-Quinn criter.	-5.942793
F-statistic	226.6426	Durbin-Watson stat	1.977839
Prob(F-statistic)	0.000000		

Equation 14

Dependent Variable: DLOG(HOME_VALUE)
Method: Panel Least Squares
Sample (adjusted): 1986Q2 2014Q1
Periods included: 112
Cross-sections included: 2
Total panel (balanced) observations: 224

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.001081	0.002271	-0.476275	0.6344
DLOG(HOME_VALUE(-1))	1.225801	0.061577	19.90665	0.0000
DLOG(HOME_VALUE(-2))	-0.600264	0.100409	-5.978165	0.0000
DLOG(HOME_VALUE(-3))	0.339158	0.108031	3.139456	0.0019
DLOG(HOME_VALUE(-4))	0.320256	0.104581	3.062294	0.0025
DLOG(HOME_VALUE(-5))	-0.474333	0.068970	-6.877376	0.0000
DLOG(STRUCTURE_COST)	0.963874	0.404006	2.385791	0.0179
DLOG(STRUCTURE_COST(-1))	-1.582326	0.609963	-2.594133	0.0101
DLOG(STRUCTURE_COST(-2))	0.949938	0.629377	1.509331	0.1327
DLOG(STRUCTURE_COST(-3))	-0.604683	0.630488	-0.959071	0.3386
DLOG(STRUCTURE_COST(-4))	1.020839	0.662328	1.541288	0.1247
DLOG(STRUCTURE_COST(-5))	-0.524964	0.416532	-1.260322	0.2089

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.872796	Mean dependent var	0.009452
Adjusted R-squared	0.865561	S.D. dependent var	0.034564
S.E. of regression	0.012673	Akaike info criterion	-5.842393
Sum squared resid	0.033888	Schwarz criterion	-5.644396
Log likelihood	667.3480	Hannan-Quinn criter.	-5.762472
F-statistic	120.6458	Durbin-Watson stat	1.751721
Prob(F-statistic)	0.000000		

Equation 15

Dependent Variable: DLOG(STRUCTURE_COST)
Method: Panel Least Squares
Sample (adjusted): 1986Q2 2014Q1
Periods included: 112
Cross-sections included: 46
Total panel (balanced) observations: 5152

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001993	0.000160	12.48398	0.0000
DLOG(STRUCTURE_COST(-1))	0.775345	0.014258	54.38108	0.0000
DLOG(STRUCTURE_COST(-2))	-0.247958	0.017861	-13.88261	0.0000
DLOG(STRUCTURE_COST(-3))	0.220133	0.018021	12.21514	0.0000
DLOG(STRUCTURE_COST(-4))	-0.095765	0.017858	-5.362654	0.0000
DLOG(STRUCTURE_COST(-5))	-0.065547	0.013727	-4.775105	0.0000
DLOG(TURNER)	0.096732	0.009812	9.858777	0.0000
DLOG(CONSTUCTION_WAGE)	0.154092	0.025172	6.121664	0.0000
DLOG(PPI_LUMBER)	0.003875	0.003506	1.105444	0.2690
DLOG(PPI_METAL)	0.039997	0.003758	10.64222	0.0000
DLOG(PPI_MINERAL)	0.039672	0.011790	3.364745	0.0008
DLOG(PPI_CM)	0.006734	0.001414	4.763263	0.0000
INCEC93	-0.001803	0.000818	-2.204135	0.0276

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.635588	Mean dependent var	0.009330
Adjusted R-squared	0.631510	S.D. dependent var	0.008553
S.E. of regression	0.005192	Akaike info criterion	-7.672253
Sum squared resid	0.137311	Schwarz criterion	-7.598547
Log likelihood	19821.72	Hannan-Quinn criter.	-7.646460
F-statistic	155.8716	Durbin-Watson stat	1.977294
Prob(F-statistic)	0.000000		

Equation 16

Dependent Variable: DLOG(STRUCTURE_COST)
Method: Panel Least Squares
Sample (adjusted): 1986Q2 2014Q1
Periods included: 112
Cross-sections included: 46
Total panel (balanced) observations: 5152

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001924	0.000157	12.26125	0.0000
DLOG(STRUCTURE_COST(-1))	0.776345	0.014256	54.45822	0.0000
DLOG(STRUCTURE_COST(-2))	-0.248001	0.017869	-13.87893	0.0000
DLOG(STRUCTURE_COST(-3))	0.220943	0.018025	12.25732	0.0000
DLOG(STRUCTURE_COST(-4))	-0.095951	0.017865	-5.370784	0.0000
DLOG(STRUCTURE_COST(-5))	-0.064272	0.013721	-4.684042	0.0000
DLOG(TURNER)	0.097469	0.009835	9.910334	0.0000
DLOG(CONSTUCTION_WAGE)	0.150151	0.025215	5.954864	0.0000
DLOG(PPI_LUMBER)	0.004113	0.003505	1.173369	0.2407
DLOG(PPI_METAL)	0.040131	0.003759	10.67486	0.0000
DLOG(PPI_MINERAL)	0.037052	0.011777	3.146054	0.0017
DLOG(PPI_CM)	0.006637	0.001414	4.692572	0.0000
INCEC	0.000477	0.000701	0.680377	0.4963

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.635274	Mean dependent var	0.009330
Adjusted R-squared	0.631192	S.D. dependent var	0.008553
S.E. of regression	0.005194	Akaike info criterion	-7.671391
Sum squared resid	0.137430	Schwarz criterion	-7.597685
Log likelihood	19819.50	Hannan-Quinn criter.	-7.645597
F-statistic	155.6602	Durbin-Watson stat	1.977950
Prob(F-statistic)	0.000000		

Equation 17

Dependent Variable: DLOG(STRUCTURE_COST)
Method: Panel Least Squares
Sample (adjusted): 1986Q2 2014Q1
Periods included: 112
Cross-sections included: 46
Total panel (balanced) observations: 5152

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001933	0.000157	12.30456	0.0000
DLOG(STRUCTURE_COST(-1))	0.776343	0.014256	54.45860	0.0000
DLOG(STRUCTURE_COST(-2))	-0.247953	0.017869	-13.87646	0.0000
DLOG(STRUCTURE_COST(-3))	0.220805	0.018026	12.24912	0.0000
DLOG(STRUCTURE_COST(-4))	-0.095920	0.017865	-5.369129	0.0000
DLOG(STRUCTURE_COST(-5))	-0.064307	0.013721	-4.686717	0.0000
DLOG(TURNER)	0.096497	0.009844	9.802976	0.0000
DLOG(CONSTUCTION_WAGE)	0.152065	0.025170	6.041405	0.0000
DLOG(PPI_LUMBER)	0.004102	0.003505	1.170333	0.2419
DLOG(PPI_METAL)	0.040152	0.003759	10.68049	0.0000
DLOG(PPI_MINERAL)	0.038181	0.011789	3.238655	0.0012
DLOG(PPI_CM)	0.006671	0.001414	4.717604	0.0000
INCEC05	-0.000550	0.000759	-0.724571	0.4687

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.635278	Mean dependent var	0.009330
Adjusted R-squared	0.631197	S.D. dependent var	0.008553
S.E. of regression	0.005194	Akaike info criterion	-7.671403
Sum squared resid	0.137428	Schwarz criterion	-7.597697
Log likelihood	19819.53	Hannan-Quinn criter.	-7.645609
F-statistic	155.6632	Durbin-Watson stat	1.977829
Prob(F-statistic)	0.000000		

Equation 18

Dependent Variable: DLOG(STRUCTURE_COST)
Method: Panel Least Squares
Sample (adjusted): 1986Q2 2014Q1
Periods included: 112
Cross-sections included: 46
Total panel (balanced) observations: 5152

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001931	0.000158	12.25042	0.0000
DLOG(STRUCTURE_COST(-1))	0.776384	0.014257	54.45616	0.0000
DLOG(STRUCTURE_COST(-2))	-0.247965	0.017869	-13.87648	0.0000
DLOG(STRUCTURE_COST(-3))	0.220871	0.018028	12.25167	0.0000
DLOG(STRUCTURE_COST(-4))	-0.095946	0.017866	-5.370279	0.0000
DLOG(STRUCTURE_COST(-5))	-0.064414	0.013727	-4.692566	0.0000
DLOG(TURNER)	0.097018	0.009816	9.883848	0.0000
DLOG(CONSTUCTION_WAGE)	0.151272	0.025155	6.013566	0.0000
DLOG(PPI_LUMBER)	0.004126	0.003506	1.176884	0.2393
DLOG(PPI_METAL)	0.040133	0.003760	10.67414	0.0000
DLOG(PPI_MINERAL)	0.037622	0.011760	3.199048	0.0014
DLOG(PPI_CM)	0.006663	0.001414	4.712005	0.0000
INCEC10	-0.000260	0.000971	-0.267618	0.7890

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.635246	Mean dependent var	0.009330
Adjusted R-squared	0.631164	S.D. dependent var	0.008553
S.E. of regression	0.005194	Akaike info criterion	-7.671314
Sum squared resid	0.137440	Schwarz criterion	-7.597608
Log likelihood	19819.31	Hannan-Quinn criter.	-7.645520
F-statistic	155.6414	Durbin-Watson stat	1.977881
Prob(F-statistic)	0.000000		