Blue Sky
CONSULTING GROUP

AFFORDABLE HOUSING COST STUDY

ANALYSIS OF THE FACTORS THAT INFLUENCE THE COST OF BUILDING AFFORDABLE HOUSING IN OREGON

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Prepared by

Shawn Blosser, Laura Preuss, and Matthew Newman

Blue Sky Consulting Group

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EXECUTIVE SUMMARY

Housing costs are an important issue for many in Oregon.[1] For low-income households, high housing costs can lead to frequent moves that interfere with children's school performance or force families to live in unhealthy or substandard housing. To address the problems associated with high housing costs, federal, state and local governments have created an array of public programs intended to expand the supply of rental housing affordable to low-income Oregon households. Research suggests that increasing the supply of affordable housing can help to improve the educational attainment and health of residents while increasing economic activity and reducing social services costs.

Recognizing the importance of affordable housing, in 2018 the Oregon State Legislature passed House Bill 4006, which provided funding to conduct a study of the forces that drive the costs of developing affordable multi-family rental housing in the state.

Over the course of six months, the study team collected and analyzed data from almost 200 new construction affordable housing projects that were completed in Oregon during the past two decades. The efforts of the study team were guided by the leaders of Oregon's Housing and Community Services (OHCS) Department. The affordable housing developments analyzed represent a very diverse set of projects that span the state and provide housing to varied types of residents, including single individuals, large families, and seniors. The analysis employed widely accepted statistical techniques to identify factors that are correlated with raising or lowering the costs of developing affordable housing in Oregon.

The following are the key findings from this analysis:

- Affordable housing development benefits from economies of scale, with larger projects costing less per unit than smaller projects. According to our analysis, for each ten percent increase in the number of units, the cost per unit declines by 0.9 percent.
- Buildings that are more durable or are built to a higher standard of quality cost more. Specifically, for a 10 percent increase in our composite quality measure costs increased by about two percent, on average.
- Local factors such as community opposition can have a measurable impact on costs. Our analysis indicates that projects that had four or more community meetings cost eight percent more on average compared to those that had three or fewer community meetings.

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[1] Oregon's housing wage (or the amount one must earn to afford a 2-bedroom rental home), is 17th highest in the nation at $21.27 an hour, National Low Income Housing Coalition. (2018). Out of Reach 2018. Retrieved from https://reports.nlihc.org/oor

- Local economic conditions affect the cost of building affordable housing. Our regression analysis found that each percentage point increase in the local unemployment rate (e.g., a change from four to five percent) is associated with a five percent decrease in costs.
- Prevailing wage requirements add to the development cost of affordable housing, with projects that pay prevailing wages costing nine percent more on average after controlling for other project characteristics.
- Land costs per acre are much higher in non-rural areas but are comparable across rural and non-rural areas in terms of cost per unit and as a share of total project costs. Land costs also influence the cost of developing affordable housing, largely because they indirectly affect the type of project that is built, as developers are more likely to build taller structures on land that is more expensive to purchase.
- Taller buildings cost more per unit, with buildings that have four or more stories costing on average seven percent more to develop after controlling for other project characteristics.
- Since the year 2000, the average costs associated with local System Development Charges (SDCs) have grown almost three times as fast as the overall costs of developing affordable housing and now account for more than $8,000 per unit on average across the state.
- Comparing the construction cost of affordable housing to comparable market-rate housing suggests that affordable and market rate projects are on average roughly comparable, with affordable projects costing an average of $164 per square foot while estimated market project costs ranged from $149 to $176 per square foot.

INTRODUCTION

High housing costs add stress to tight family budgets and shape decisions about where to live and work. In Oregon, high housing costs are a source of ongoing interest among policy makers and the public. Population growth in the years following the Great Recession (including recent migration to the Portland area) has increased rents and prices for those competing for housing.[2] The median rent statewide increased by almost 14% percent between 2014 and 2017, according to the Census Bureau's American Community Survey data, and has likely increased further in the subsequent period.[3]

For low-income residents and people of color in particular, high housing costs may cause bigger problems, pushing some families into unhealthy substandard housing or causing frequent moves which can undermine children's school performance. In response, private builders and public officials alike have sought to develop means of sheltering the state's low-income residents at a reasonable cost. Federal, state and local governments have developed programs to provide affordable housing for low-income renters. The federal government's approach has generally focused on two avenues: (1) providing vouchers that low-income renters can use help make rental payments to private landlords and (2) providing funding (primarily in the form of tax credits) to increase production of affordable housing.[4] The State of Oregon's recent attempts to support affordable housing include the 2018 passing of House Bill 4007C which increased the document recording fee in order to provide an estimated additional $90 million in revenue per biennium towards affordable housing. To mitigate rising rents, the state recently passed a statewide rent control bill.

Origin and Purpose of This Report

To add to current knowledge about the costs of developing affordable multi-family rental housing in Oregon, House Bill 4006 appropriated funds for OHCS to conduct a cost study (presented in this report).

This study presents the results of an analysis of almost two hundred affordable multi-family projects completed in Oregon during the past twenty years. These projects span the entire state, and include a variety of building types, from SROs (single room occupancy) consisting of a single room to large family units with three or more bedrooms. Data for these projects were collected from OHCS' records,

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[2] Diller, Paul A., & Sullivan, Edward J., (2018). The Challenge of Housing Affordability in Oregon: Facts, Tools, and Outcomes. *Journal of Affordable Housing & Community Development Law, 27*(183).

[3] Oregon's median rent (not adjusted for inflation, including utilities) was $1,079/month in 2017, and $924 in 2014. Oregon's 2017 median rent ($1,079) exceeds the nation's median rent of $1,012/month, U.S. Census Bureau. (n.d.). 2013-2017 American Community Survey 5-Year Estimates. Retrieved June 12, 2019, from https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=CF

[4] Federal funding for other programs such as the HOME and CDBG have declining in recent years and the current administration has sought to eliminate both.

developer surveys, and publicly available information from private research institutions and state and federal governmental agencies.

In addition to the empirical analysis of multi-family housing development costs in Oregon, this study also examined the social and economic impact of affordable housing to better understand the benefits that result from investment in subsidized affordable housing.

What is Affordable Housing?

In this report, the term "affordable housing" refers to housing units developed in whole or in part with public subsidies and reserved for low-income residents. For purposes of assessing the social and economic effects of affordable housing, the term is also used to describe housing obtained with vouchers that offer rental assistance to low-income households.

The Need for Affordable Housing

Almost half of people who rent housing in Oregon are cost-burdened, according to the Oregon Center for Public Policy's (OCPP) 2016 analysis of American Census Bureau data.[5] Affordable housing more often affects Oregon's low-income communities and communities of color. The OCPP reported that close to two-thirds of low-income households (or those making less than $25,000 year) spend 50 percent or more of their income on housing costs (describing them as "severely cost-burdened" households). Communities of color experience higher levels of poverty in the state and are therefore more affected by affordable housing policies and availability. Of those who lived below the poverty line in Oregon in 2016, 27 percent African American and 23 percent were Latino or Hispanic, compared to 11 percent who were non-Hispanic Whites.[6]

Compounding the problem of affordable housing, wages are not rising at the same rate as housing costs. Although Oregon's minimum wage will continue to increase through 2023 to reach a $13.50 standard rate, Oregon renters must make an average of $15.55 an hour on average to afford a studio apartment.[7] Oregon's Homeless Leadership Coalition found that almost two-thirds of people who

[5] The term "cost burdened" describes households that spend 30% or more of their income on housing or rental costs, according to the Department of Housing and Urban Development.
[6] Bauer, Janet. Despite Overall Economic Gains, Communities of Color In Oregon Lag Economically. (2017). Oregon Center for Public Policy, Retrieved from https://www.ocpp.org/2017/09/14/20170914-nr-poverty-median-income-race/
[7] National Low Income Housing Coalition (2018)

experience homelessness in Central Oregon were previously residents, with economic issues being the primary reason for becoming homeless.[8]

When more income is used towards housing costs, households have less money to afford other essentials such as food, contributing to the fact that almost one out of seven Oregonians experience food insecurity.[9] In addition to the financial stress that high housing costs can place on households, research suggests that extreme housing burdens undermine educational attainment and are associated with poorer health outcomes and other social pathologies.

SOCIAL AND ECONOMIC EFFECTS OF AFFORDABLE HOUSING

Each year the state and local communities in Oregon invest substantial resources to help residents find affordable housing.[10] But what does the state get in return for this investment?

The potential benefits of affordable housing are very broad and extend from better school performance to improved health and well-being to increased economic activity. Research also suggests that some specialized types of developments, such as supportive housing that provides social services as well as affordable housing, can provide additional benefits in terms of reduced homelessness and lower costs for medical care and social service programs. Additionally, affordable housing built near transit ("transit-oriented development" or TOD projects) can also help to reduce emissions of greenhouse gasses.

A significant body of research describes the potential benefits of affordable housing, which can be divided into three broad categories: education, health, and economic activity. By reducing involuntary resident mobility, whether due to eviction, inability to make rent payments, or a desire to avoid unhealthy or undesirable living conditions, access to affordable housing can produce important benefits for residents in the form of improved health and school performance. In addition, affordable housing construction can boost local economic activity through expenditures on construction labor, materials, and services in the local economy.

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[8] Of the 60% of people who reported being homeless but last stably housed in this area, 40% became homeless due to economic challenges, Point in Time 2018 Tri-County Results. (2018). Homeless Leadership Coalition. Retrieved from https://cohomeless.org/wp-content/uploads/2018/07/Website-Presentation-HLC-PIT-2018.pdf

[9] Food insecurity is defined as going hungry or not knowing where one's next meal was coming from, Oregon Center for Public Policy (2018)

[10] These investments come in the form of foregone tax revenues from tax credit financed projects and tax-exempt bonds as well as direct expenditures from local property taxes and other sources.

Education

Research suggests that access to affordable housing may improve educational outcomes among residents to the extent that it reduces involuntary mobility of low-income households. Social science researchers have suggested a number of ways in which frequent family mobility translates into poor academic performance. Frequent mobility disrupts the social connections among children, parents, and teachers that have been linked to educational success.[11] Changing schools also subjects children to discontinuity in academic and social expectations, requiring an adjustment period during which academic outcomes may deteriorate.[12] In addition, living in substandard housing may increase exposure to environmental hazards that can worsen health, undermine learning or increase school absenteeism. Finally, homelessness is also associated with poor school performance.

These theories have been tested in numerous studies. Although methodological choices and data sources differ, a substantial body of research has shown a negative relationship between family mobility and educational outcomes. These poor outcomes span grade levels and racial backgrounds, and research suggests they worsen as the frequency of moves increases.[13, 14]

Because family mobility is strongly associated with socio-economic risk factors, such as poverty, parental education, and family structure, recent studies have attempted to establish the causality between family mobility and educational outcomes by looking at longitudinal data and assessing educational outcomes both before and after moving.[15] A large body of published work suggest that family mobility is associated with poorer educational performance among students as measured by overall achievement, likelihood of repeating a grade, and/or likelihood of dropping out.

One study examined a sample of ninety children who had moved at least once during their first three years of school (kindergarten to second grade).[16] In every grade studied, increased family mobility was associated with lower scores on math and reading tests. A second study looked at the mobility and achievement in a sample of low-income children in Chicago.[17] Using a longitudinal study following children from kindergarten through the seventh grade, the researchers controlled for academic achievement prior to a family's move as well as socio-economic factors. On average, reading and math

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[11] See for example, Swanson & Shneider (1999), Burkam, Lee, & Dwyer (2009), and Reynolds, Chen, & Herbers (2009)
[12] Burkam, Lee, & Dwyer (2009), Reynolds, Chen, & Herbers (2009)
[13] Burkam, Lee, & Dwyer (2009), and Mantzicopoulos & Knutson (2000) examined elementary school outcomes. Rumberger & Larson (1998) and Swanson & Shneider (1999) examined high school outcomes.
[14] Temple, Judy A., & Reynolds, Arthur J. (1999). School Mobility and Achievement: Longitudinal Findings from an Urban Cohort. *Journal of School Psychology, 37*(4): 355-377.
[15] See, for example, Burkam, Lee, & Dwyer (2009) and Reynolds, Chen, & Herbers (2009)
[16] Mantzicopoulos & Knutson (2000)
[17] Temple & Reynolds (1999)

scores were found to decrease with each successive move, with the worst outcomes for the most frequent movers.

Several other studies examined the performance of students over time to assess the impact of family mobility on achievement. Swanson and Schneider (1999) examined longitudinal survey data for a cohort of 25,000 nationally representative eighth graders. The researchers controlled for individual demographic characteristics and examined mobility from a number of perspectives: whether a child moves early or late in high school and whether the move involved a change of school, change of residence, or both. The results suggest that students who moved late in high school performed worse in math, while students who moved early in high school were more likely to drop out.

Burkam, Lee, and Dwyer (2009) used longitudinal data to study a cohort of over thirty thousand school children during the period from kindergarten through third grade. The study found that children who moved more than once during the first two years of school performed poorly in school, as did children who moved during kindergarten.

A meta-analysis conducted by Reynolds, Chen, and Herbers in 2009 examined sixteen studies looking at the link between family mobility and education success as measured by achievement scores. The studies' combined examination period covered kindergarten through grade twelve. The authors reported that, out of the twelve studies that looked at achievement, ten found increased family mobility is associated with poor outcomes in math and reading scores. They further reported that family mobility at any time in a child's education was associated with decreased school performance.

The impact of family mobility is not just limited to educational achievement. Simpson and Fowler (1994) used longitudinal data from the National Health Interview Survey to examine the impact of family mobility within a sample of over 10,000 children in grades one through twelve. Even when controlling for demographic characteristics, the researchers found children who moved three or more times had almost double the chances of having emotional or behavioral problems including depression, hyperactivity, peer conflict, and antisocial behavior, relative to those who never moved.

In 2018, The Oregonian found that over 1,700 kindergarten through eighth grade students in Portland Public Schools transitioned to three schools within a span of five years, signifying the threat that exists for some Oregon families of housing instability on children's academic and mental health well-being.[18]

[18] Barnes, Bethany. (2018). Reading, Writing, Evicted: Portland Children Don't Pay Rent But They Are Paying the Price. OregonLive, The Oregonian. Retrieved from https://www.oregonlive.com/education/2018/02/reading_writing_evicted_childr.html

Impact on dropping out

A number of other studies point to the link between family mobility and high school completion. Similar to Swanson and Schneider (1999), Rumberger and Larson (1998) use National Education Longitudinal Survey (NELS) data to track a cohort of over 11,600 students from eighth grade through two years after scheduled high school completion. Even after taking account of family background and parents' education, they found that children who moved twice or more were more likely to drop out of high school than children who had never moved. Also using NELS data, Gasper *et al.* (2012) assessed the likelihood of dropping out of school among 2,751 high school students. The researchers found that among students who were moderately at risk for changing schools during high school, dropout increased between 6 and 9%, even when controlling for other factors that may influence the drop-out rate.

Impact on Homeless Children

Research suggests that homeless children face numerous obstacles to performing well in school. Specifically, homeless children are more likely to be absent from school, repeat a grade, drop out and perform poorly on standardized achievement tests.[19] To the extent that access to affordable housing reduces homelessness, it has the potential to improve school performance for these children.

Effects of Substandard Housing on Educational Performance

Exposure to environmental hazards such as lead can directly affect children's development while exposure to other hazards such as mold may increase the incidence or severity of asthma, which can increase absenteeism.[20] In both cases, school performance can suffer. To the extent that affordable housing provides access to living environments that reduce or eliminate exposure to these environmental hazards, it can contribute to improved school performance among residents.

Health

Research suggests that access to affordable housing can have an impact on the health outcomes of occupants by reducing exposure to environmental toxins and other hazards and/or by freeing up financial resources to pay for health care services or purchase more nutritious food.

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[19] Ernst, Greg, & Foscarinis, Maria. (1995). Education of Homeless Children: Barriers, Remedies, and Litigation Strategies. *Clearinghouse Review, Journal of Poverty Law, 29: 754-759.*
[20] Moonie, Sheniz, et. al. (2008). The Relationship Between School Absence, Academic Performance, and Asthma Status. *Journal of School Health, 78*(3): 140-148.

Limiting Exposure to Environmental Hazards

Without a sufficient supply of affordable housing, families may be more likely to live in poor quality housing that presents hazards to their health. Joshua Sharfstein and his co-authors (2001) surveyed families qualified for but still waiting to receive Section 8 housing assistance.[21] The results of their research suggest that these families were exposed to higher levels of environmental hazards or other factors that increase the likelihood of injury or otherwise impair health relative to a comparison group. The authors reported that, relative to a comparison group, those awaiting affordable housing were more likely to have encountered rats (35.1% vs. 22.1% in the comparison group), gone without heat (31.0% vs. 18.7%), experienced the absence of running water (24.3% vs. 6.1%), lived with broken toilets (18.9% vs. 5.4%), or seen peeling paint (17.6% vs. 10.8%). A comprehensive review of the impact of affordable housing on health by the Center for Housing Policy reports that "well-constructed and managed affordable housing developments can reduce health problems associated with poor quality housing by limiting exposure to allergens, neurotoxins, and other dangers."[22]

Access to Affordable Housing Can Improve Health Outcomes

A 2012 Michigan study identified associations between housing instability and health outcomes during and following the Great Recession. The study found Increased instances of depression among those who experienced homelessness, foreclosure, or being behind on rent. Increased prevalence of anxiety attacks was found among those who had to move due to cost in the previous three years, had fallen behind on their mortgage, or experienced a foreclosure.[23]

A review of recent literature by Acevedo-Garcia *et al.* found that affordable housing policies "may potentially contribute to improving the health of both adults and children."[24] Two of the studies reviewed stand out: one (Katz, Kling, and Liebman, 2001) measured a range of physical and mental health outcomes and a second (Leventhal and Brooks-Gunn, 2003) assessed the mental health of mothers and children. Both studies examined the effects of the Moving to Opportunity (MTO) program, a Housing and Urban Development Department (HUD) experiment in which participants were randomly offered a) a Section 8 voucher valid only in a low-poverty area, b) a Section 8 voucher without geographic restriction, or c) no voucher. In both studies the treatment groups had statistically

[21] Sharfstein, Joshua, et. al. (2001). Is Child Health at Risk While Families Wait for Housing Vouchers? *American Journal of Public Health, 91*(8): 1191–1192.
[22] Maqbool, N., Vivieiros, J., & Ault, M. (2015). The Impacts of Affordable Housing on Health: A Research Summary. C*enter for Housing Policy*.
[23] Prepared by Meredith Horowski, based on a paper by Burgard, et. al. (2012). Housing Instability and Health: Findings from the Michigan Recession and Recovery Study. *National Poverty Center, Issue Brief #29*.
[24] Acevedo-Garcia, Dolores, et. al. (2004). Does Housing Mobility Improve Health? *Housing Policy Debate, 15*(1).

significant improvements in health outcomes, including fewer accidents, fewer behavioral problems, and greater incidences of feeling calm and peaceful.

Another finding was reported by Harkness and Newman in 2005, who examined a sample of 44,000 households in thirteen states and found that low-income families that lived in areas with more affordable housing rated their children as having better health than low-income families living in areas with less affordable housing.[25]

Access to Affordable Housing Can Free-up Financial Resources

In addition to reducing the threats to physical and mental wellbeing, access to affordable housing can improve health by freeing up financial resources to pay for health care services. Using longitudinal data from the Consumer Expenditure Survey, Levy and DeLeire (2008) assessed the spending habits of the uninsured versus the insured, controlling for demographic traits, income, and location. They concluded that the uninsured spend a larger share of income on housing, food, and education than the insured population, suggesting the poor households shift their spending away from buying health insurance to cover expenses for basic necessities. A recent report by Harvard University's Joint Center for Housing Studies found that severely cost-burdened low-income households spent 47 to 53 percent less on basic needs such as healthcare, food, and transportation relative to low income households who were not cost-burdened.[26] The report also found that severely cost-burdened families with children spent 50% less on food and 75% less on healthcare than other non-cost-burdened low income families with children.

Other researchers have observed that poor households must often choose between paying for housing and paying for food. Reviewing data for almost 12,000 children surveyed by the Children's Sentinel Nutrition Assessment Program (C-SNAP), researchers assessed the impact of receiving a rent subsidy on birth weight. [27] After controlling for demographic characteristics and participation in other transfer payment programs, the authors found that children receiving rent subsidies had higher birth weights compared to similar children in households without rent help. This suggests that by easing the strain on family budgets imposed by high housing costs, affordable housing enhances poor households' ability to meet the basic nutritional needs of pregnant mothers and their children.

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[25] Harkness, Joseph, and Newman, Sarah J. (2005). Housing affordability and children's well-being: Evidence from the National Survey of America's Families. *Housing Policy Debate, 16(*2): 223-255.
[26] Joint Center for Housing Studies of Harvard University tabulations of 2015 US Bureau of Labor Statistics. (2017).
[27] Food security status defined as regular access to an adequate amount of food, Meyers, Alan, Cutts, Diana, & Frank, Deborah. (2005). Subsidized Housing and Children's Nutritional Status: Data from a Multisite Surveillance Study. *Archives of Pediatrics Adolescent Medicine, 159(6*): 551–556.

Economics

The principal economic argument in support of affordable housing suggests that investments in affordable housing development increase economic activity, thereby benefiting the state's economy and generating additional tax revenue for the state and local governments.

Impact on the Economy of Construction Expenditures

Housing development generates economic activity directly from construction expenditures as well as from follow-on expenditures by construction workers and firms in the local economy. A number of studies have been conducted that measure the local economic impact stemming from development of affordable housing. These studies suggest that development of affordable housing can generate both temporary construction-related employment and ongoing consumer purchase driven jobs in the local economy. For example, a 2010 study by the National Association of Home Builders estimated that construction of a 100 unit LIHTC affordable housing development leads to the creation of 122 jobs related to the construction activity and 30 ongoing jobs related to the purchases made by residents in the local economy.[28] This local economic activity can, in turn, create fiscal benefits for the state and local governments as a result of sales taxes collected on construction materials, income taxes paid by construction and other workers, and corporation or income taxes on profits earned by builders, developers, and other affected firms.

Because much of the direct cost of developing affordable housing is paid for in the form of federal tax credits, a substantial fraction of this economic activity represents additional or new economic activity in Oregon that would not occur in the absence of the affordable housing development. That is, because the development is financed by tax credits, in the absence of such development at least some fraction of these financial resources likely would be paid to the federal government as taxes instead of invested in Oregon's economy. We were not able to identify any studies that directly measured the fraction of spending that represents new economic activity. Nevertheless, given the amount of resources spent each year on development of affordable housing, the effect is likely substantial.

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[28] These estimates reflect the overall extent of economic activity in a local region and do not necessarily reflect new economic activity, since some portion of the resources devoted to development of affordable housing are shifted from other regions where economic activity would decrease. In addition, the increased local expenditures from residents of affordable housing reflect, at least in part, a transfer from taxpayers who subsidize affordable housing development through higher taxes. See National Association of Home Builders. (2010). The Local Impact of Typical Housing Tax Credit Developments.

Impact on Regional Competitiveness and Employment

Research also suggests that affordable housing can lead to improvements in a local economy to the extent that lower housing costs are viewed as a comparative advantage by employers and workers. According to a report by the Center for Housing Policy, a lack of "affordable housing can affect an employer's ability to attract and retain employees and can thus have implications for regional economic competitiveness."[29] This report goes on to note that access to "affordable housing programs may contribute to employee retention." Therefore, while subsidized affordable housing comprises just one element of an overall housing market, to the extent that it lowers housing costs for local workers it may contribute to improved regional competitiveness.

Evidence also suggests a link between housing security and job security. A 2016 study in Milwaukee found that over four percent of people who lost a job in the previous two years experienced a forced move, and that those who experienced a forced move were 11 to 22 percent more likely to experience a job loss.[30] Anticipating or experiencing the loss of housing can present challenges for maintaining a job, by increasing absences from work to search for housing, requiring a move farther away from one's job site, or working to secure temporary shelter or childcare for family members. These findings suggest that areas with greater availability of affordable housing may also present better job security for residents.

Impact on Property Values

A common objection to affordable housing projects is that they threaten property values of nearby homes. Although this perception is firmly rooted, it is not firmly supported by empirical studies. In a review of seventeen studies examining the issue, Mai Thi Nguyen (2005) found that current research does not support a definitive conclusion about the relationship between affordable housing and property values.[31] Instead, the impact depends on a range of factors, including the management of the project, the neighborhood in which it is located, and the concentration of affordable developments within a confined geographic area. The study's author notes, for example, that "not only can a well-maintained affordable housing development not detrimentally affect property values, it is conceivable that it can raise property values in neighborhoods, such as those that contain abandoned homes and

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[29] Wardrip, Keith, Williams, Laure, & Hague, Suzanne. (2011). The Role of Affordable Housing in Creating Jobs and Stimulating Local Economic Development. *Center for Housing Policy*.
[30] Forced moves included situations were tenants had no choice but to relocate, including formal or informal evictions due to missed rent payments, landlord foreclosures, or housing condemnations, Desmond, Matthew & Gershenson, Carl. (2016). Housing and Employment Insecurity Among the Working Poor. *Social Problems, 63*(1), 46-67.
[31] Nguyen, Mai Thi. (2005). Does Affordable Housing Detrimentally Affect Property Values? A Review of The Literature. *Journal of Planning Literature, 20*(1):15-24.

neglected or physically deteriorating properties." The author further notes that, "when negative effects exist, they are small."

Other Benefits of Affordable Housing

Impact on Social Service Costs

In addition to the impact on jobs and the economy, research suggests that certain types of affordable housing may help to save taxpayer money by reducing the utilization of public services by chronically homeless individuals. Specifically, affordable housing that combines housing with targeted health and social services (known as supportive housing) has the potential both to reduce homelessness and to lower costs for social services programs. According to a 2010 report by Dennis Culhane and Thomas Byrne of the University of Pennsylvania, for example, "there are compelling principles underpinning the concept of permanent supported housing as well as significant evidence of it being both an effective and fiscally sound strategy for reducing chronic homelessness."[32] Examining administrative data from New York City, researchers compared the use of shelters, psychiatric, medical, and veteran hospitals, Medicaid, jails, and prisons by persons with severe mental illness who were housed in affordable housing against the service use of those who were not.[33] With the exception of Medicaid use, the researchers found that use of all other categories of service decreased, with a net reduction of $12,146 of total annual service use per person in affordable housing. These service cost savings covered 95 percent of the housing program cost. Similar results were found in a study of supportive housing for chronically homeless alcoholics in Seattle, WA that compared the service use of residents against the service use of those on the waiting list.[34] The researchers of the Seattle study concluded that after just six months in the program, individuals who were placed in housing decreased their alcohol use as well as their use of hospitals and jails.

In Oregon, supportive housing has also been associated with decreases in healthcare expenditures among residents. In a pilot study for a permanent supportive housing facility in Portland that provides fully integrated social, physical, and mental health services on-site, reductions occurred in Medicaid costs and self-reported hospitalizations among Medicaid and non-Medicaid residents. Access to

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[32] Culhane, Dennis & Byrne, Thomas. (2010). Ending Chronic Homelessness: Cost-Effective Opportunities for Interagency Collaboration. *University of Pennsylvania ScholarlyCommons.*

[33] Culhane et al. (2002). Public Service Reductions Associated with Placement of Homeless Persons with Severe Mental Illness in Supportive Housing. *University of Pennsylvania ScholarlyCommons.*

[34] Larimer, Mary E. (2009). Health Care and Public Service Use and Costs Before and After Provision of Housing for Chronically Homeless Persons with Severe Alcohol Problems. *JAMA, 301*(13).

primary care visits slightly increased while the program saw an average annual drop in Medicaid costs of $8,724 the year after residents moved into the program.[35]

Environmental Impacts

Affordable housing also has the potential to facilitate the accomplishment of other state policy goals, including the reduction in greenhouse gas (GHG) emissions. By constructing housing near transit, transit-oriented developments (TOD) can help to reduce GHG emissions by allowing residents to use transit instead of personal vehicles for many of their transportation needs. According to a study in 2002 by the federal Transportation Research Board, "TODs can contribute toward creating a more sustainable built form, functioning as a counter-magnet to auto induced sprawl."[36] Specifically, the report notes that "research shows living and working near transit stations correlates with higher ridership" and cites a 2000 study by Arrington where almost 80 percent of residents who moved near Portland's MAX Orenco station reported an increase in their transit usage. According to a 2011 study by the Texas Department of Transportation, "moving into TOD decreases VMT [vehicle miles traveled] by an average of 15 percent, or about 3,500 miles per year."[37] These effects may be especially pronounced among the low-income residents of affordable housing. According to a report by the California Housing Partnership, "while living in TOD homes increases transit ridership among people of all incomes, low-income people demonstrate the highest transit ridership in TOD neighborhoods."[38] Therefore, in addition to the other effects discussed previously, constructing affordable housing as part of TODs has the potential to reduce GHG emissions as a result of increased transit ridership and decreased use of individual passenger cars. Other policies, such as those that encourage use of environmentally sustainable or energy-efficient building materials can also act to help the state achieve important policy goals.[39]

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[35] Wright, BJ., et.al. (2016). Formerly Homeless People Had Lower Overall Health Care Expenditures After Moving into Supportive Housing. *Health Affairs, 35*(1): 20-27.
[36] Chisholm, Gwen. (2002). Transit-Oriented Development and Joint Development in the United States: A Literature Review. *Research Results Digest, Number 52*.
[37] Clower, Terry L., et. al. (2011). Evaluating the Impact of Transit-Oriented Development. *Texas Department of Transportation*.
[38] California Housing Partnership and TransForm. (2013). Why Cap and Trade Auction Proceeds Should Fund Affordable Homes Near Transit. Retrieved from https://1p08d91kd0c03rlxhmhtydpr-wpengine.netdna-ssl.com/wp-content/uploads/2015/11/33-TOD_Housing_Program_WhitePaper_Final.pdf
[39] A full life cycle analysis of the impact of energy efficiency and environmentally sustainable building materials and approaches was beyond the scope of this study.

In Sum

In sum, the body of existing social and economic research suggests that access to affordable housing can produce important benefits for the State of Oregon. This research suggests that access to affordable housing can improve educational outcomes, improve health and wellbeing, boost economic activity, and lower social services costs, among other benefits.

STUDY METHODOLOGY

The principal goals of our empirical analysis were twofold: First, we sought to analyze the factors that influence the cost of building subsidized affordable multi-family housing in Oregon. Second, we sought to compare the costs of building affordable housing to the costs of building comparable market rate multi-family rental housing.[40]

Each of these analyses is characterized by the complex and interactive nature of the underlying factors that can influence costs. For example, projects built in densely populated urban areas may be more expensive than projects built in rural areas. Similarly, larger projects may be less expensive on a per unit basis to construct than smaller projects due to economies of scale. Since larger projects also tend to be built in urban areas, isolating the relationship of economies of scale to cost when looking across diverse geographic regions can be particularly challenging. One approach might be to look only at projects in urban areas. However, this requires a sufficient number of similar urban projects with which to make comparisons. And, if some of these urban projects confronted other unique challenges, such as significant community opposition, it can become difficult to determine whether it is the extent of community opposition or economies of scale that drive a cost differential. When the analysis is broadened to include multiple potential cost factors, the analysis becomes that much more complex.

In order to analyze the multiple factors that can influence costs simultaneously, we used the statistical technique known as regression analysis. Regression analysis is commonly used by economists and others when seeking to measure the relationship between one factor (e.g., project size) on another factor (e.g., cost of building affordable housing). One of the important benefits of regression analysis is that it allows the investigator to isolate the relationship between two variables in an environment in which multiple factors are at work. In this way, using regression analysis allows the researcher to measure the impact of project size on the cost of building affordable housing without needing to directly compare otherwise identical projects.

[40] Because of the high degree of variability in costs associated with rehabilitation projects, this study focused on the costs for newly constructed housing units.

When economists discuss regression analysis results, they typically talk in terms of “controlling for” other factors. “Controlling for” could also be written as “taking account of.” For example, regression analysis can measure the relationship between project size and unit cost while “controlling for” (taking account of) the extent of community opposition, project location, and various other factors. As such, regression analysis can be used to investigate the relationship between project size and project development cost independent of (or while controlling for) other factors that may also be related to cost such as community opposition or project location.

Fine Print

While it has many advantages, regression analysis is also subject to some important limitations. First, while regression analysis can indicate that one factor (e.g., project size) is correlated with an outcome (e.g., lower costs per unit), it generally does not allow for definitive statements about causality. Instead, it simply offers a measure of the relationship between two variables (e.g., larger projects are associated with lower costs per unit), but generally cannot say for certain that one thing causes the other.

Second, a regression analysis result is not a certainty, but instead a statement about likelihood. For example, when a result is said to be “statistically significant,” this means that the result is very unlikely to be due to random chance or variations across different samples that may be drawn from an underlying population. And, while regressions can provide point estimates of the extent of the correlation of one variable with another, there is a margin of error around these estimates. Conversely, when a result is described as “not statistically significant,” this does not necessarily mean that there is no relationship between the two variables. Instead, it means that, given the limitations of available data and the details of the regression model used, the researcher cannot say with confidence whether the two variables are positively correlated, negatively correlated, or not correlated at all.

Finally, in spite of our best efforts to collect data on as many relevant factors as possible, a regression analysis may nevertheless fail to capture one or more important factors (e.g., factors that influence development costs may still be excluded from the analysis). To the extent that one or more missing variables is correlated with one of the included variables, it is possible that the coefficient on the included variable is biased (i.e., is not an accurate reflection of the relationship between the included variable and cost, for example). This phenomenon (called “omitted variable bias”) is a pitfall to which any regression analysis potentially would be subject and simply means that the point estimate from the regression analysis may be too high or too low relative to the “actual” value. Nevertheless, we have no reason to believe that omitted variables are biasing the findings reported here; indeed, the results we present reflect findings that are robust across multiple versions of the regression models that we developed.

Data Sources

In order to analyze the factors associated with the cost of developing affordable housing in Oregon we relied upon data from three main sources: (1) Low Income Housing Tax Credits (LIHTC) and HOME Investments Partnership (HOME) application and cost certification data, (2) data collected from surveys of project developers, and (3) data from various public sources. Each data source is described in more detail below.

LIHTC and HOME Data

Data provided to OHCS by developers as part of the application process for LIHTC and HOME funding represent the primary source of project-specific data used in this study. Developers seeking to utilize these funding sources must submit an application to OHCS and provide additional documentation once the project is completed. These documents contain important information, such as type and size of the project, location, developer type and experience, and the number and type of additional financing sources.

Many of the applications and other project documents submitted within the last five to seven years are stored as electronic files by OHCS. Because the electronic documents were available only for more recent projects or contained only some of the project data needed for our analysis, we also gathered data from the paper project archive files stored by OHCS. These project files contain both the information originally submitted as part of the application process and the final cost certification reports provided by the developer once a project is completed. The final cost certification worksheets contain financial information about each project and are required to be reviewed by an independent auditor; as such, the final applications and cost certifications contain the best and most accurate information available about actual final project costs and characteristics and were used as the primary data source for this analysis whenever possible.

We collected data for projects approved by OHCS from 2000 through 2018 and limited our analysis to include only projects that have been completed, or “placed in service.” Examining only projects that were placed in service allowed us to analyze actual construction and other development costs, as opposed to cost estimates or projections. Because of the dramatic changes in the housing market that took place during the “Great Recession” that started in 2008, we sought to analyze projects completed prior to 2008, as well as during and following the Great Recession that began in 2009. This enabled us to examine how costs have changed over time and during periods of economic expansion and contraction, as well as provide a representative sample of newly constructed affordable projects across the state.

Developer Surveys

The OHCS electronic and paper files contain a wealth of information about the individual projects; however, some information needed for the analysis was not included among these sources. Specifically, we sought information about local requirements for design/review, the number of community meetings held to discuss the project, and the nature of the land purchase for the project (i.e., whether the purchase was an arm's length transaction). We also sought information about the relative quality and durability of the construction materials employed, so that we could accurately compare projects that may vary across quality and durability characteristics. Finally, we collected information about the developers who built these projects, such as the developer's size and experience and the types of on-staff employees.

Information about these factors (among others) was collected via a survey of affordable housing developers conducted in the spring of 2019.[41] Specifically, a survey request was sent to each developer for the projects included in our analysis, (the "Developer Survey"). A second survey was also sent to developers of market rate multi-family projects to collect information for comparable market rate developments (the "Market Rate Survey").

Public Data Sources

Finally, project and developer information from the OHCS records and the two surveys was supplemented with publicly available information. This public information included data on construction wage rates and employment statistics from the Bureau of Labor Statistics (BLS), population and demographic data from the Bureau of the Census, interest rate data from the Federal Reserve Board, and construction cost information from RSMeans. A complete list of public data sources and description for the variables used in the analysis can be found in Appendix 1.

The Final Data Set

These three main data sources were combined to form the final data set. From the original 172 new construction projects that received either LIHTC tax credits or HOME funding, 123 projects had complete data available, including a usable response from the Developer Survey.[42]

[41] A copy of the survey instrument along with a description of the survey methodology is included in Appendix 3: Developer Survey Instrument.

[42] Unless otherwise specified, these 123 projects were used in the regression analysis and for producing the descriptive exhibits that follow.

Cost Measures

In order to analyze the factors that influence the cost of developing affordable housing in Oregon, we first needed to determine how the report would express “cost.” While this may seem a straightforward matter, the choice of cost measure can have an important impact on the results of any analysis. For example, comparing projects on a cost per square foot basis (without controlling for other factors that influence costs) would likely find that larger units are less expensive to construct relative to smaller units. Thus, a comparison of costs per square foot in one community that had a need for large family housing to the costs in another that had a need for single room occupancy units would presumably find that the costs of developing housing in the first community were lower than in the second. Examining costs on a per unit basis would likely lead to the opposite conclusion. That is, large family units are generally more expensive on a per unit basis than smaller SRO units.

In order to address this issue, we examined costs on a per unit basis while taking account of the number of units and the size of the units in square feet. This approach allows us to measure the impact of the cost factor of interest (e.g., economies of scale) on the cost per unit independent of differences across projects in terms of project or unit sizes.[43, 44]

To determine the cost per unit, we relied upon the audited cost certification and final proforma worksheets submitted by LIHTC and HOME applicants once a project is placed in service. The cost measure we utilized was total development cost net of costs for land acquisition. We excluded land costs because these costs can vary widely and are highly dependent on geography. Land costs were examined separately.[45]

RESULTS

This section discusses the results of our analysis of the affordable housing developments and the factors that are correlated with higher or lower development costs. We first provide an overview of the data, examining the main factors that appear to influence costs. We then present the results of our regression analysis. Finally, we look at the range of land acquisition costs associated with affordable

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[43] The cost measure used in the regression analysis was defined as the natural logarithm of cost per unit, as discussed in Appendix 4: Detailed Regression Results.

[44] To confirm our results, we also examined costs on a per square foot basis and on a per bedroom basis and found similar results.

[45] Note that, in addition to the regression models discussed below which are based on total development cost per unit net of land cost, we also analyzed total construction cost per unit, a measure that excludes land costs as well as site preparation, developer fees, and several other cost categories. Results for the construction cost regression analyses were similar to those results reported for total development cost net of land.

housing developments and compare the actual costs for constructing affordable housing to estimated construction costs for comparable market rate apartment buildings in Oregon.

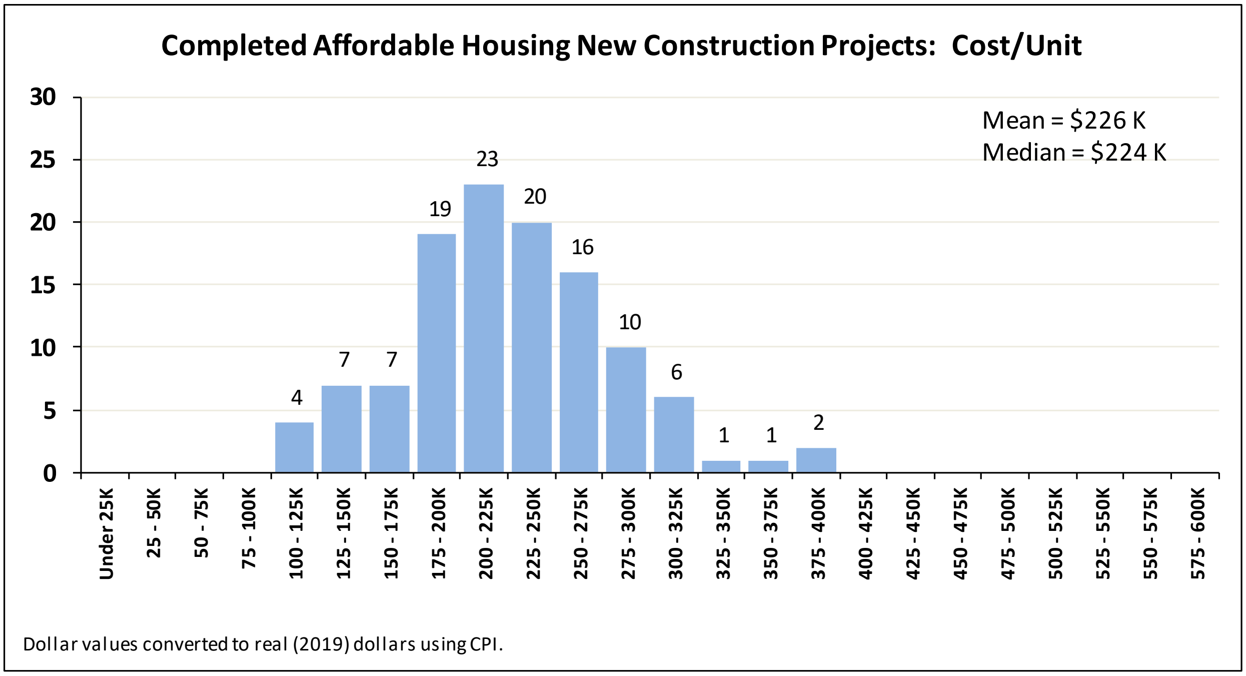
Overview of the Affordable Project Data

The projects included in our analysis represent a very diverse set of housing options, ranging in size from large projects with six stories and more than 200 units to single story projects with fewer than five units.[46] Some projects in our study consist primarily of larger units, where units with three or more bedrooms comprise over half of the units for the project. Other projects are comprised entirely of studios and SROs. In terms of location, these projects span the entire state, including highly developed urban centers as well as rural communities.

Reflecting this diversity, the cost of developing these projects varied widely as well, from less than $500K at the low end to more than $50 million at the high end, when converted to 2019 dollars. When viewed on a cost per unit basis, there was a considerable amount of variation in the data, with the least expensive projects costing around $100,000 per unit while the most expensive were almost $400,000 per unit (when adjusted for inflation). However, most projects were in between these two extremes, with an overall average cost of $226,000 per unit. Figure 1 presents the distribution of projects on a cost per unit basis.

[46] Descriptive statistics that report costs on a per unit basis exclude projects with fewer than 3 units.

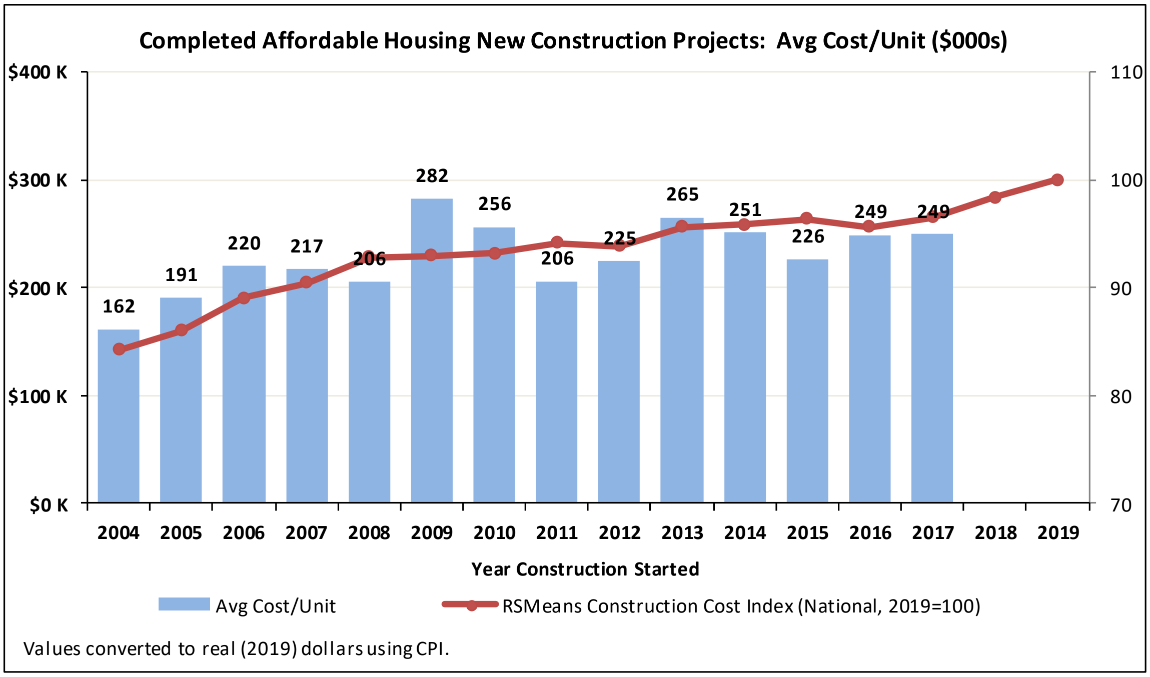
FIGURE 1: COST PER UNIT FOR AFFORDABLE PROJECTS ANALYZED



Costs Have Changed Over Time

For the projects in our data set, the start year for construction ranged over a period of eighteen years, from 2000 through 2017. During this period, the state's economy experienced significant changes, and the costs of developing affordable housing changed as well. Figure 2 shows the average cost per unit in real (2019) dollars for the years 2004 through 2017 for the projects included in the analysis. As Figure 2 shows, the average cost per unit fluctuated considerably but generally rose until 2009. Note that projects that started construction in 2009 likely would have received bids from contractors in 2008, prior to the start of the Great Recession when costs were much higher. After 2009, however, the average cost per unit fell for two years in a row, decreasing by more than 25 percent from $282,000 per unit in 2009 to $206,000 per unit by 2011. Costs then increased through 2013 and were roughly stable at around $250,000 per unit from 2014 through 2017. Overall, the average cost per unit for projects constructed in 2017 was about $88,000 higher in real terms than projects constructed in 2004, representing an average annual increase of 3.4 percent over this period.

FIGURE 2: AVERAGE COST PER UNIT FOR COMPLETED PROJECTS, 2001 – 2017



For comparison, Figure 2 also includes the RSMeans Construction Cost Index over the same period.[47] As the graph shows, the RSMeans index roughly tracks the average cost per unit over the period and indicates that while construction costs were relatively flat between 2013 and 2017, they have since increased through 2019.

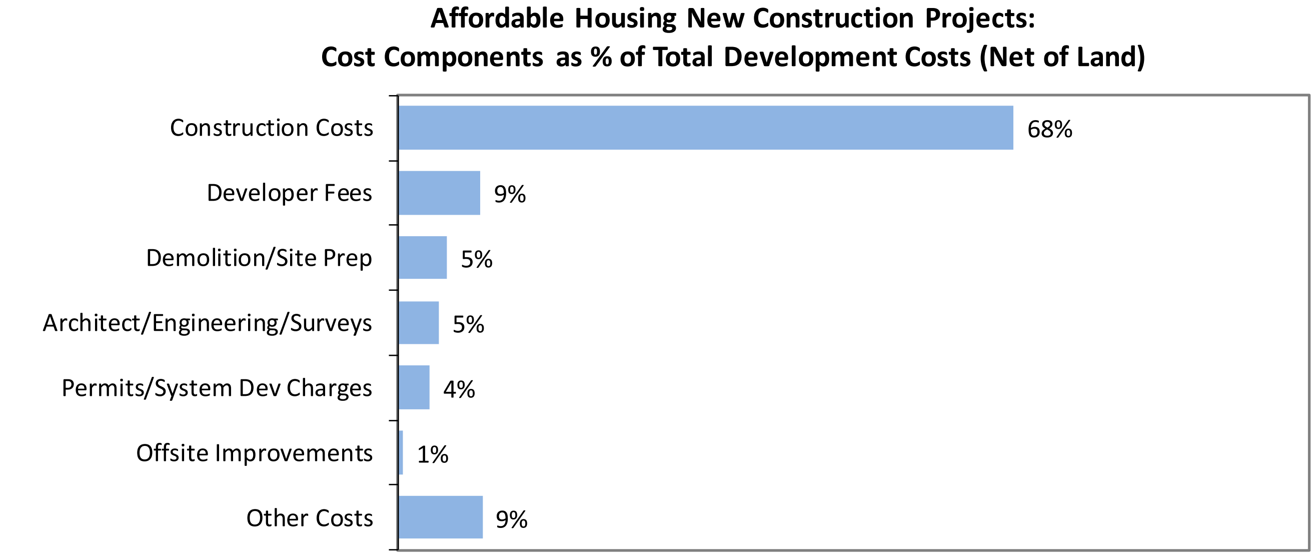
Components of Development Cost

Development costs for affordable housing projects come from a variety of sources. Figure 3 presents data on the various cost components as a percentage of total development cost (net of land) for the projects included in our analysis. On average, construction costs were the largest component of development costs at 68 percent, and developer fees were second at nine percent. Demolition and/or site preparation accounted for five percent, as did the combined total of architect, engineering and survey fees. Building permits and system development charges (SDCs) represented four percent of development costs, and offsite improvements averaged one percent. The remaining nine percent of development costs accounted

[47] The Construction Cost Index equals 100 as of January 2019.

for in the “Other” category include interest, accounting and legal fees, insurance, property taxes, and other soft costs.

FIGURE 3: SOURCES OF DEVELOPMENT COST



Average calculated by summing (real) cost measures across all affordable projects and dividing by total project costs excluding land.

Analysis of cost component data indicates that these costs have not grown equally over the study period. As shown in Figure 4, development costs net of land grew an average of 2.7 percent annually (adjusted for inflation) from the 2000-2003 period through the 2014-2017 period, or by an average of just over $78,000 per unit statewide.[48] Real construction costs grew an average of 2.6 percent annually over this same period, while developer fees grew slightly faster at 3.7 percent annually. Most other components had growth rates below the average; however, the cost of permits and system development charges more than tripled over this period, with an annual growth rate of 8.9 percent annually. The National Impact Fee Survey shows increasing costs for system development charges (known elsewhere as "impact fees") for multifamily developments in Oregon between 2005 and 2015. According to the national survey, system development charges have increased at a higher rate for Oregon (58%) compared to the rest of the nation (43%) during this period.[49]

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[48] Note that for some years, data were available for just a handful of projects. Therefore, data were combined into four-year periods in order to minimize fluctuations due to outliers or individual project differences.
[49] Duncan Associates. (2015). National Impact Fee Survey 2010, 2015. ImpactFees.com, Retrieved from http://www.impactfees.com/resources/surveys/

FIGURE 4: GROWTH IN COST COMPONENTS OVER TIME

	Avg Real Cost per Unit* 2000-'03	2014-'17	Change ($)	Change (%)	Annual Pct Change
Construction Costs	116,347	167,277	50,930	44%	2.6%
Developer Fees	14,413	23,927	9,514	66%	3.7%
Demolition/ Site Prep	9,871	13,876	4,005	41%	2.5%
Architect/ Engineering/ Surveys	8,769	10,317	1,548	18%	1.2%
Permits/ System Dev Charges	3,659	12,020	8,361	228%	8.9%
Other Costs	16,902	20,718	3,816	23%	1.5%
TOTAL COSTS NET OF LAND	**169,962**	**248,137**	**78,175**	**46%**	**2.7%**

** Costs represent 4-year moving average and are converted to real (2019) dollars using CPI.*

Location, Location, Location

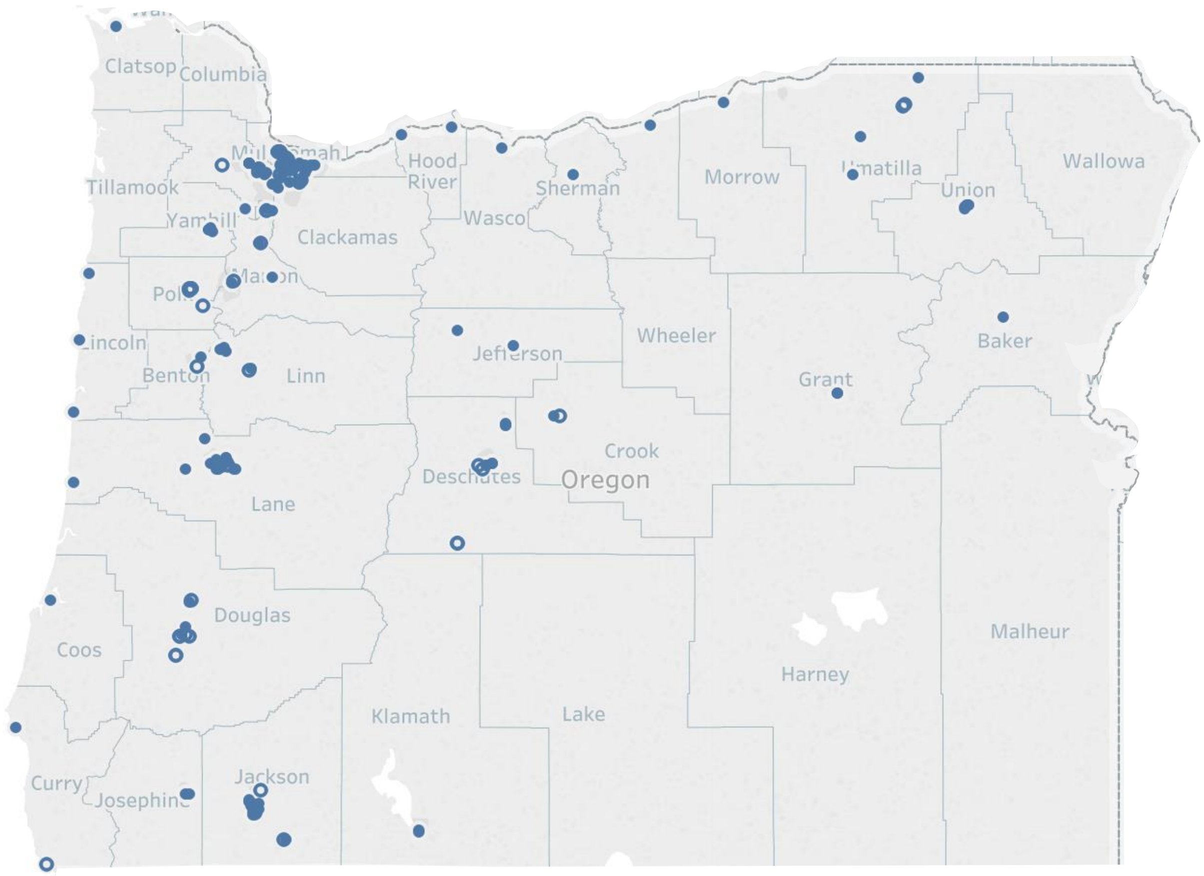
The projects included in our analysis were spread across Oregon and included densely populated areas such as Portland as well as rural communities throughout the state. For the purposes of allocating funds for affordable housing, OHCS divides the state into three regions: (1) the "Metro" region which represents the Portland metropolitan area and includes Clackamas, Multnomah and Washington Counties; (2) the "Non-Metro Participating Jurisdiction" regions that include the Eugene/Springfield area, the Salem/Keizer area, and Corvallis, and (3) the "Balance of the State" region which represents the remainder of the state. OHCS also classifies a project as rural if it is located in a community with a population of 15,000 or less in counties within Metropolitan Statistical Areas or with populations of 40,000 or less in other parts of the state. The projects used in this analysis were located in all three of the OHCS geographic regions, and about one third of the projects were located in rural areas, as shown in Figure 5.

FIGURE 5: OHCS GEOGRAPHIC REGIONS

OHCS Geographic Region	Projects	Region Description
Metro Region	40	Clackamas, Multnomah and Washington Counties
Non-Metro Participating Jurisdiction Region	15	Eugene/Springfield, Salem/Keizer, Corvallis
Balance of State Region	68	Remainder of state
OHCS Rural Designations*		
Projects Designated as Non-Rural	84	
Projects Designated as Rural	39	
* Rural areas are defined as: Communities with population 15,000 or less outside of the Portland Urban Growth Boundary in counties within Metropolitan Statistical Areas (Benton, Clackamas, Columbia, Deschutes, Jackson, Lane, Marion, Multnomah, Polk, Washington and Yamhill Counties) and communities with 40,000 population or less in the balance of the state.		

To further illustrate the locations or the projects used for our analysis, Figure 6 provides a map with the location of each project included in the study.

FIGURE 6: AFFORDABLE PROJECTS INCLUDED IN STUDY



Project with Survey Response   Project without Survey Response

Sorting It All Out: A Statistical Analysis of the Factors that Drive Development Costs

Given the diversity of the types of projects developed over the past two decades, talking about the typical or average affordable housing project is of limited use. Each project represents the unique circumstances of the occupants it was intended to house, the time period and location in which it was developed, and the characteristics of and choices made by the developer who built it, among other factors. Nevertheless, careful examination of the data can reveal some insights into the factors that are associated with higher (or lower) costs of developing affordable housing.

In the following sections we discuss the results of our regression analysis, which allow us to measure the cost differentials associated with specific project and developer characteristics while taking account of other cost factors. In interpreting these results, it is important to note that, like the results of any statistical analysis, the coefficients reported are not exact values and are subject to uncertainty.[50] Nevertheless, the results presented below provide an indication of the direction and extent of the relationship between the factors analyzed and the cost of developing affordable housing. A full description of the regression analysis and the results is provided in Appendix 4: Detailed Regression Results.

Project Characteristics

Looking at the size of the projects and building characteristics can help to explain a significant portion of the cost variation. The study included project type characteristics in its analysis not only to take account of cost differences due entirely to these factors, but also to indicate the cost differences associated with choices about the type of units and structures built.

As one would expect, our regression results show that larger units cost more to build. For every ten percent increase in the average square feet per unit, the cost per unit increases by six percent. For an average unit that costs about $226,000, a ten percent increase in average unit size from 900 to 990 square feet would be expected to result in an increase of just under $14,000 per unit.

The regression results also confirm that the type of building constructed affects costs. Specifically, our analysis suggests that, when controlling for other factors, housing units in buildings that were four stories or taller were about 7% more expensive to build than projects with 3 or fewer stories.

In addition to the type of structure built, the type of construction wages paid also had an impact on project cost. More than half the projects in our analysis paid prevailing wages, either state wage rate determinations by Oregon’s Bureau of Labor and Industries (BOLI) or federal Davis-Bacon rates. Our regression results indicate that projects that paid prevailing wages cost 9% more per unit than those that did not pay prevailing wages, holding all other factors constant. This finding is consistent with

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[50] In order to determine if our results were robust, we tested many different versions of our regression model. In a small number of these alternatives, the significance level or size of some of the explanatory variables (e.g., prevailing wages or developer type) decreased. The results presented here, however, were generally robust across many different versions of the regression models we tested, although the exact value of estimates varied across models. Additional details about these alternative regression models is provided in Appendix 4: Detailed Regression Results.

affordable housing studies for other states, including California and New York. For California, a 2014 study by the state's four main affordable housing agencies estimated that prevailing wage requirements increased the cost of developing affordable housing by 11 percent. [51] A more recent study from 2017 that focused on California's four largest metropolitan areas estimated that prevailing wage requirements for new affordable housing increased costs between 15 and 16 percent.[52] Similarly, a 2016 report by New York's Independent Budget Office (IBO) found that federal Davis-Bacon requirements added 23 percent to construction costs for affordable housing projects in New York City, after controlling for other project characteristics.[53]

Local Factors

The local community in which a project is built can also influence costs in a variety of ways. For example, local community opposition to a development project can act to delay the project, or even to increase costs directly to the extent that developers make changes to projects to mollify community opposition. Measuring the extent of community support or opposition for a particular project was not feasible. However, we did measure the number of community meetings a developer held, which can serve as a proxy measure for the extent of community opposition. Our analysis indicates that projects with four or more community meetings were on average about eight percent more expensive to complete relative to projects with fewer than four meetings. Again, as with all the findings discussed here, this result held even after accounting for project size, project location, economic conditions, and other factors that we controlled for in our analysis. Note, however, that while four or more community meetings was associated with an increase in costs, relatively few projects had this many meetings (about 25 percent had four or more meetings).

Another local factor that can affect the cost of affordable housing is the state of the local economy. If the local economy is growing and there is a lot of construction activity taking place in the area, it may be difficult to find the contractors and construction workers needed to complete a project. Using the county unemployment rate as an indicator of the state of the local economy, we found that each percentage point decrease in the unemployment rate is associated with a five percent increase in the cost per unit. According to BLS data, between 2000 and 2017 the statewide monthly unemployment

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[51] California Department of Housing and Community Development, California Tax Credit Allocation Committee, California Housing Finance Agency, and California Debt Limit Allocation Committee. (2014). Affordable Housing Cost Study.
[52] Palm, M., & Niemeier, D. (2018). Does Placing Affordable Housing Near Rail Raise Development Costs? Evidence from California's Four Largest Metropolitan Planning Organizations. *Housing Policy Debate*, 28(2), 180-198.
[53] New York City Independent Budget Office. (2016). The Impact of Prevailing Wage Requirements on Affordable Housing Construction in New York City.

rate varied from as low as 4.1 percent to as high as 11.9 percent, with the unemployment rate in individual counties for the projects included in our analysis reaching as high as 15.7 percent.[54] Since 2017 the statewide unemployment rate has been quite low by historical standards, with monthly rates fluctuating between 4.0 and 4.4 percent. Our regression results indicate that if the unemployment rate were to rise, for example from 4.4 percent to 5.4 percent, the average cost to build an affordable unit would decrease by approximately $12,000.

Economies of Scale

Because fixed costs can be spread over all the units constructed, building a larger project can often be less expensive on a per-unit basis. For example, adding an additional story to a two-story project will add units without increasing costs for the roof. The result is that the cost per unit will be lower. Our analysis confirms this effect. According to our results, for each 10 percent increase in the number of units, the cost per unit declines by 0.9 percent. For a typical project, for example, if the number of units increased by 10 percent, from 42 to 46 units, our results suggest that the cost per unit would fall by about $2,000, from $226,000 to $224,000.

Currently there is a cap on the amount of LIHTC tax credits that Oregon awards to any single project. To the extent this cap limits the size of the project developed, it may also limit the extent to which affordable housing developers are able to benefit from the economies of scale identified here.

Building Quality and Durability

The quality and durability of a building can also have an impact on the costs of construction. We asked developers to evaluate the quality and durability of their projects over six measures: (1) roofing quality/warranty period, (2) quality and durability of exterior finishes, (3) quality and durability of windows, (4) quality and durability of floor finishes, (5) bathroom durability and finishes, and (6) kitchen durability and finishes. For each of these six measures, developers were asked to rate the quality according to a three-point scale: 1 (low), 2 (medium), and 3 (high). For each project a composite score was calculated based on the average score across all six reported quality measures. This composite measure, which ranged from a low of 1.3 to a high of 3.0, had an average value of 2.2 across all projects. The composite quality measure was included in our regression analysis to evaluate how choices about the quality and durability of materials affect development costs.

Our results suggest that building quality and durability can have a significant impact on costs. Specifically, consider a project with an overall quality score of 2.0, just below the reported average.

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[54] The 15.7 percent unemployment rate occurred in 2009 in Douglas County (see https://data.bls.gov).

Increasing the composite quality score by ten percent to 2.2 is associated with a two percent increase in the cost per unit for an average project, or approximately $4,600 per unit.

It should be noted that many quality and durability improvements included at the time of initial construction can lower ongoing maintenance and repair cost. These up-front investments could well pay for themselves in lower operation and maintenance costs over time. A full lifecycle analysis of the overall impact of these factors was beyond the scope of this study. Nevertheless, higher levels of building quality and durability are associated with higher initial development costs, as indicated by the results of our regression analysis.

Other Factors that May Influence Costs

In addition to those cost drivers that our regression analysis found to be statistically significant, we also investigated several other potential cost drivers that were identified through numerous structured interviews with developers of affordable and market rate housing, discussions with OHCS personnel, and prior published research on affordable housing construction in Oregon and other states. We collected the necessary data for the projects included in our analysis and conducted multiple additional statistical analyses to test whether these potential cost drivers were associated with higher or lower costs for affordable housing in Oregon. According to the results of our regression analysis, however, these additional factors were not found to have a statistically significant correlation with development costs. Note, however, that this does not necessarily mean that these factors have no impact on cost. Instead, our results suggest that, when controlling for the factors we were able to control for and using the data available to us, we did not find a statistically significant relationship between these factors and project costs. In some cases, a relationship may well exist today, but did not exist during the span of our study period.

Some of the factors we examined include the following:

- Developer characteristics generally were not found to have a statistically significant impact on per unit cost for the projects in our study. Past studies have been mixed on this issue. For example, a report by the General Accounting Office (GAO) found no statistically significant difference between for-profit and nonprofit developers in terms of the cost of developing affordable housing, while a later study that used 2,500 LIHTC projects nationwide estimated that costs for nonprofit developers were $15,000 higher per unit after accounting for project and location characteristics.[55] We analyzed a number of developer characteristics, including

[55] Ballard, M. J. (2003). Profiting from poverty: The competition between for-profit and nonprofit developers for low-income housing tax credits. *Hastings LJ*, *55*(211).

whether the developer was a for-profit or nonprofit organization, the developer experience in terms of the number of projects developed, and the developer size in terms of the number of employees. None of these characteristics were found to be a statistically significant predictor of cost in our analysis.

- Local government building requirements, such as density maximums and design requirements, could affect project costs by requiring developers to make costly changes to their project designs to meet these requirements. Indeed, prior research has found that more restrictive local land use policies increase the cost of housing generally, both for owner-occupied units and for rental units.[56] Using data collected from our affordable developer survey, we tested whether locally imposed design requirements or the project being built to the local density maximum had an effect on project cost. In both cases we could not isolate any statistically significant relationship between these factors and project cost when controlling for other factors such as project location or the number of community meetings.
- Local hiring requirements were often mentioned by developers as adding to project costs. This could result in higher costs directly if those entities that meet the hiring criteria charge higher rates or by causing delays if the developer must search longer or compete with others to hire the limited number of businesses that fulfill the hiring requirements. According to our survey responses, there were nineteen projects that involved a local hiring requirement. Our regression analysis did not identify a statistically significant relationship between these local hiring requirements and project costs; however, these requirements may well have other impacts such as extending the time required to find suitable contractors or limiting the number of bids a developer may receive.
- Certain location-specific characteristics, such as population density and household income, may also be related to the cost of developing affordable housing. The added complexity of building new affordable housing in areas that are already densely populated could be expected to add to costs, and building in wealthier areas may also add to costs either directly by having higher local wage rates for construction workers or indirectly through community opposition that triggers project design changes. We tested whether the density (population per square mile) or median household income at the census tract level were important predictors of project cost (excluding land). Our analysis indicated that these factors were not statistically significant predictors of per unit cost after controlling for project location and the number of community meetings

[56] See for example Quigley, J. M., & Raphael, S. (2005). Regulation and the high cost of housing in California. *American Economic Review*, 95(2), 323-328.

associated with the project. However, as demonstrated in our analysis of land costs that follow (see specifically Figure 8), the land cost per acre was highest in the lowest income census tracts. In addition, we tested whether being located in a rural area influenced project costs (net of land). Our results show that, when controlling for other factors such as building height and economies of scale, being located in a rural area did not have a statistically significant impact on development costs (net of land).

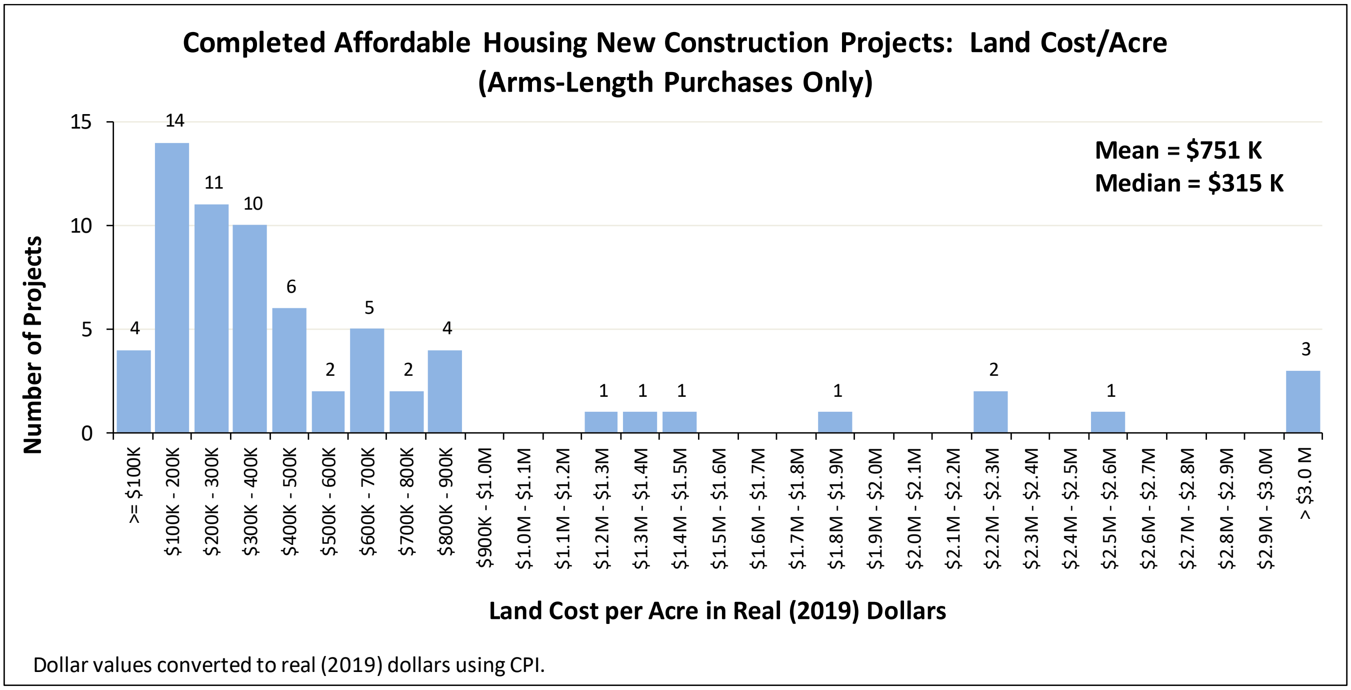
- We also tested whether having a land use appeal before the Oregon Land Use Board of Appeals (LUBA) was associated with any identifiable increase in cost. These types of appeals were identified by developers and OHCS staff as potentially adding to project development costs given the associated delays in completing the project. Using data collected from our survey plus additional research, we identified only five projects in our sample that had a land use appeal before LUBA. Our regression analysis found no statistically significant difference in cost per unit associated with a LUBA appeal after controlling for other project characteristics.
- OHCS has recently taken action to encourage participation of minority-owned, women-owned and/or emerging small business (MWESB) contractors in the development of affordable housing projects and is requiring applicants to enter into a diversity, equity and inclusion (DEI) agreement to promote the state's equity goals. However, these actions were too recently adopted to measure the impact on project costs in this study. Future studies may be able to determine if these actions have had an impact on project costs.

Land Costs

Land costs comprise an important part of the total cost to develop affordable housing. Land costs vary widely across the state as well as within individual jurisdictions as a function of many factors, including parcel size and shape, extent of required site remediation or preparation, proximity to amenities, and a host of other factors. Often the land used for an affordable housing development may be provided at a deep discount, or even for free, whereas in other cases developers must purchase land in an "arm's length" transaction and pay the full market price. Results in this section relate only to those projects where the developer confirmed that the land was acquired via an arm's-length transaction.

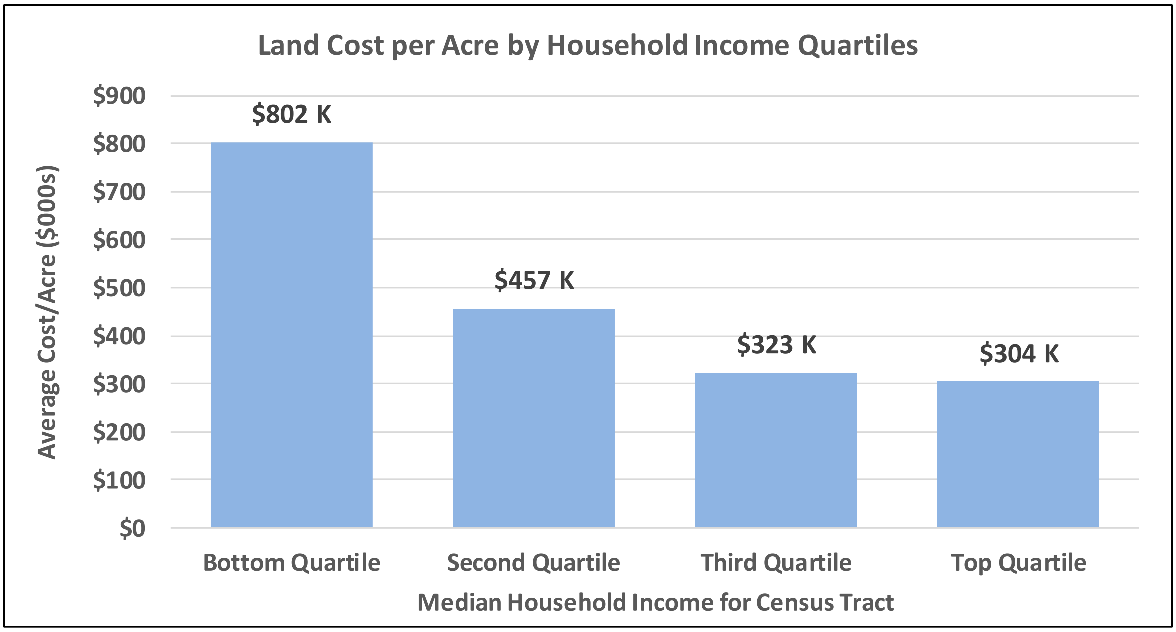
For the 123 projects included in our regression analysis, there were 68 projects with confirmed arm's-length land purchases. Land costs varied considerably across these 68 projects when measured on a cost per acre basis, as shown in Figure 7. Perhaps most telling is the difference between the average and median values. The *median* land cost in 2019 dollars for these projects was approximately $315,000 per acre, which means that half of the projects paid more than $315,000 and half paid less than $315,000. The *average* (or mean) value, however, was approximately $751,000 per acre, reflecting the impact of a small number of very expensive land purchases. The graph confirms this, showing that many projects had land costs below $200,000 per acre, with a long "tail" extending to the right of the histogram with fewer and fewer land purchases at the most expensive end of the spectrum, where 3 projects paid more than $3 million per acre for land (in 2019 dollars).

FIGURE 7: ARMS-LENGTH LAND COSTS: COST PER ACRE



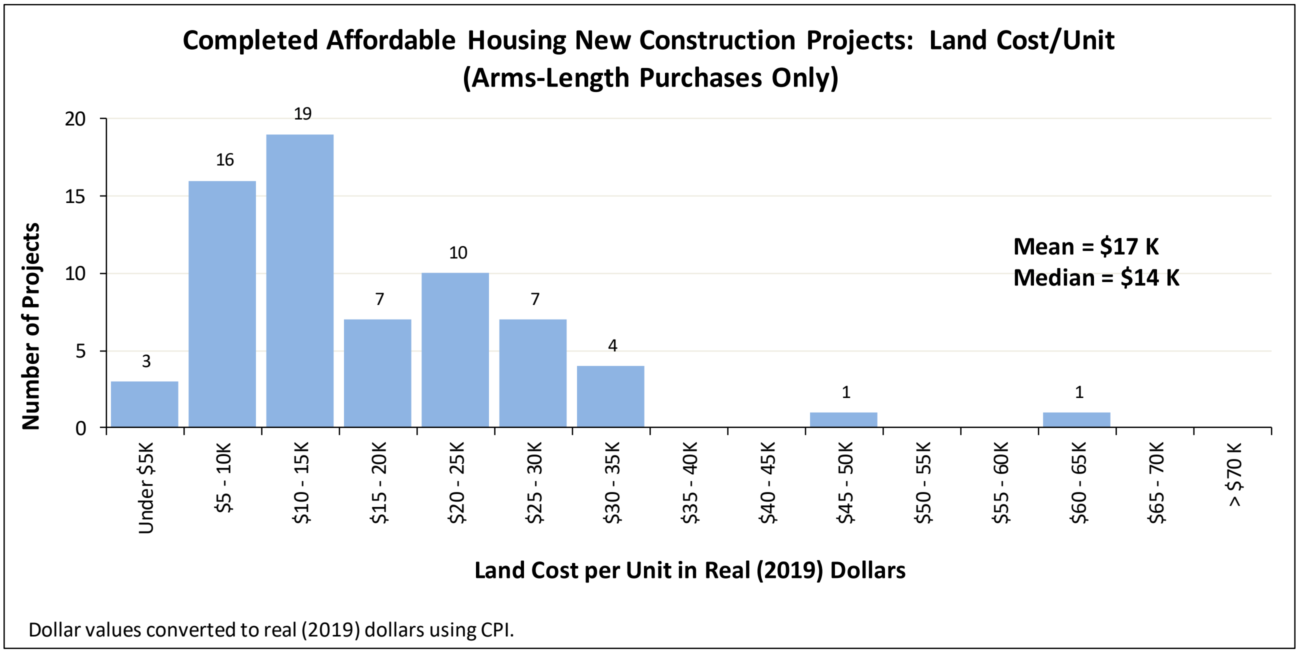
Land costs also vary by the level of income for the census tract where the projects were built. Land costs were considerably higher for projects located in low income areas relative to high income areas, as shown in Figure 8. The projects built in census tracts representing the lowest income quartile had land costs per acre of just over $800,000, while projects in census tracts for the top income quartile had an average land cost per acre of just over $300,000. These differences in land costs indicate that affordable projects located in low-income areas are likely to also be densely populated areas where land costs are much higher, adding to total project costs.

FIGURE 8: LAND COST PER ACRE BY INCOME QUARTILES



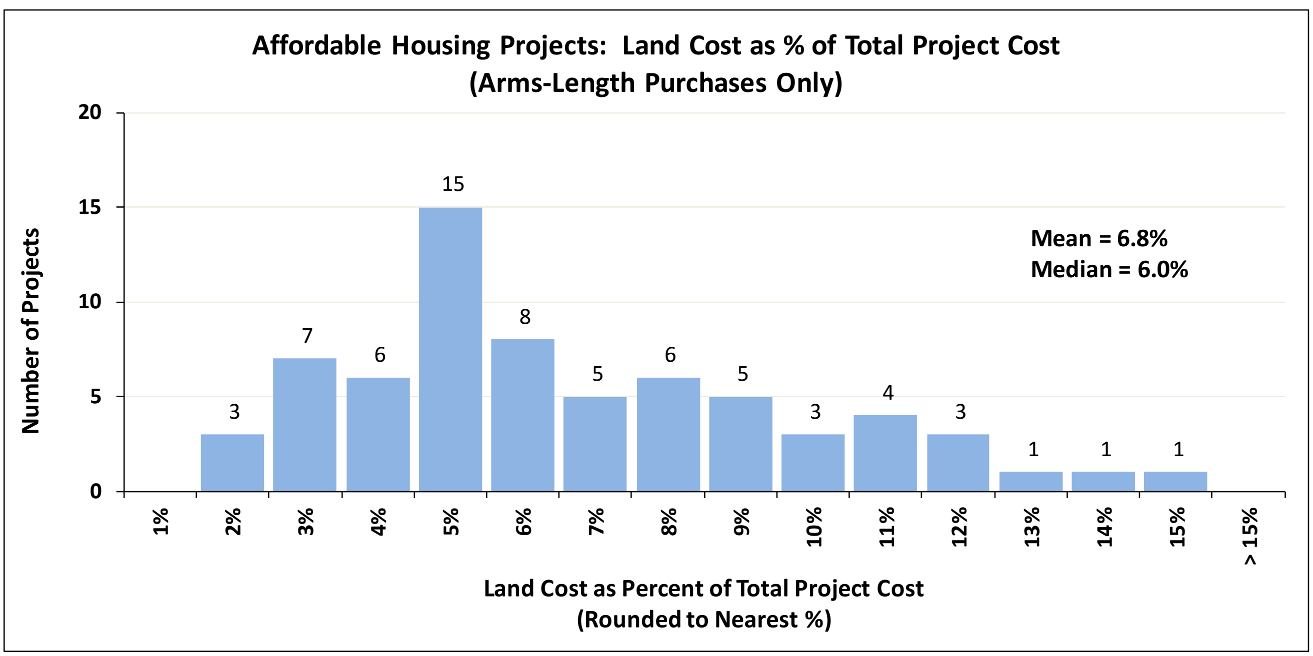
An analysis of the land cost per unit reveals a much narrower range across project with a much smaller difference between the average and median values. The average cost per unit was about $17,000 while the median value was $14,000. Figure 9 shows the land cost per unit for those projects in our sample with an arm's-length land purchase transaction. As the graph shows, there were only two projects with land cost above $40,000 per unit, and the project with the highest land cost per unit was just over $60,000. However, 35 of the 68 projects had land costs per unit that ranged from $5,000 to $15,000.

FIGURE 9: ARMS-LENGTH LAND COSTS: COST PER UNIT



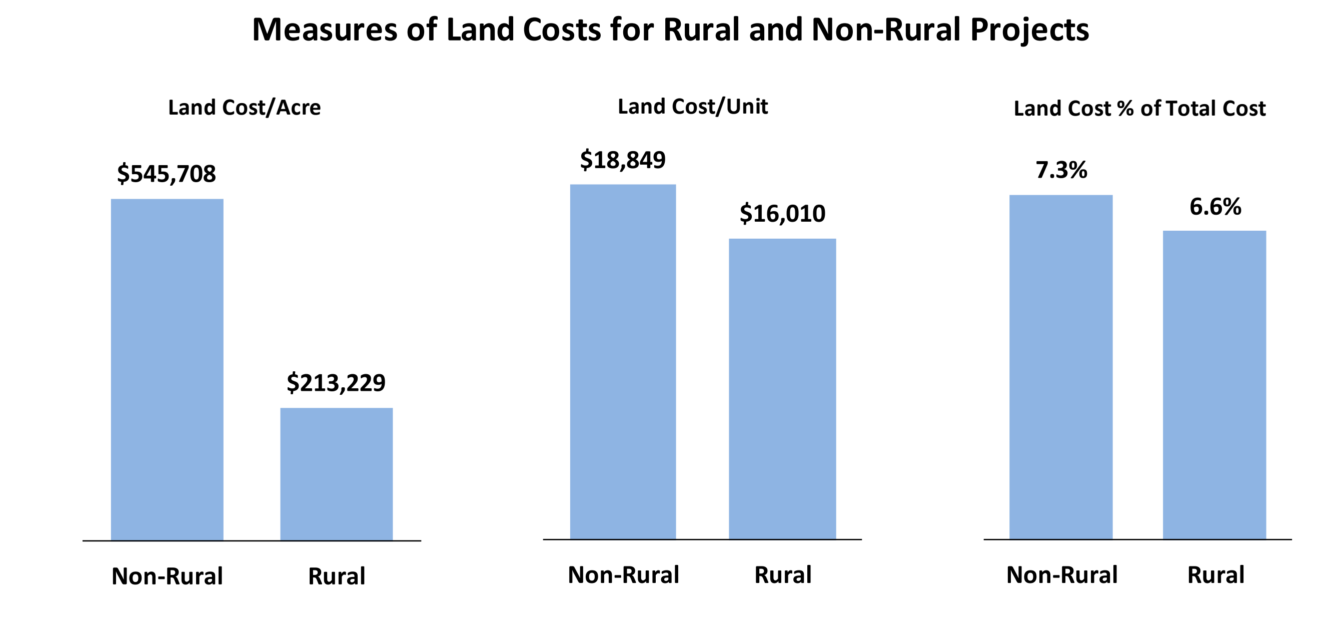
For these 68 projects, land costs as a percent of total project cost ranged from as little as two percent to as much as 15 percent. On average, land costs accounted for slightly less than 7 percent of total project costs, as shown in Figure 10.

FIGURE 10: ARMS-LENGTH LAND COSTS: PERCENT OF TOTAL PROJECT COST



While these measures of land cost varied across projects, land costs were generally lower in rural areas than in non-rural areas. As shown in Figure 11, land costs per acre were more than twice as expensive for projects in non-rural areas, though this difference was much less pronounced in terms of land costs per unit or land costs as a percent of total project cost.

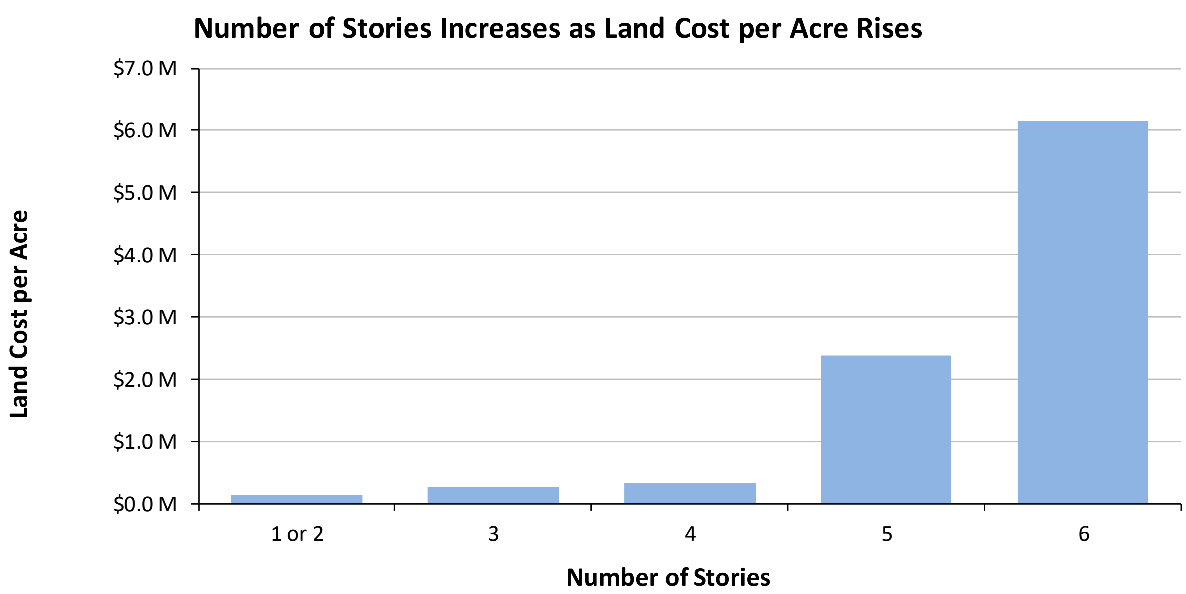
FIGURE 11: LAND COSTS IN RURAL AND NON-RURAL AREAS



Dollar values converted to real (2019) dollars using CPI. Includes only projects with confirmed arms-length land purchases.

Looking at land cost per unit or as a share of total project cost tells only part of the story of the impact of land cost on development, however. While land costs account for around seven percent of total project costs on average, the true impact of land costs on project costs may be in the ways that it influences choices about what type of physical housing is built. In regions where land costs are higher, for example, developers respond by building taller projects (which tend to cost more per unit), resulting in denser housing than in areas with lower land costs. Figure 12 shows that, as the land cost per acre rises, so too does the number of stories. As indicated earlier in our regression analysis results, this need to construct taller buildings can act to increase costs, as projects with 4 or more stories were, on average, seven percent more expensive per unit, all other things equal.

FIGURE 12: NUMBER OF STORIES AS A FUNCTION OF LAND COST PER ACRE



Land costs converted to real (2019) dollars using CPI.

COMPARISON TO MARKET RATE PROJECTS

In addition to examining the factors that may cause one affordable project to be less expensive relative to another, we also sought to examine whether there are differences in development costs between subsidized affordable projects and comparable market rate projects. Unlike the affordable projects financed with tax credits or HOME financing, where much of the data needed to analyze costs are available from the applications and project files, only limited data were available for market rate developments.

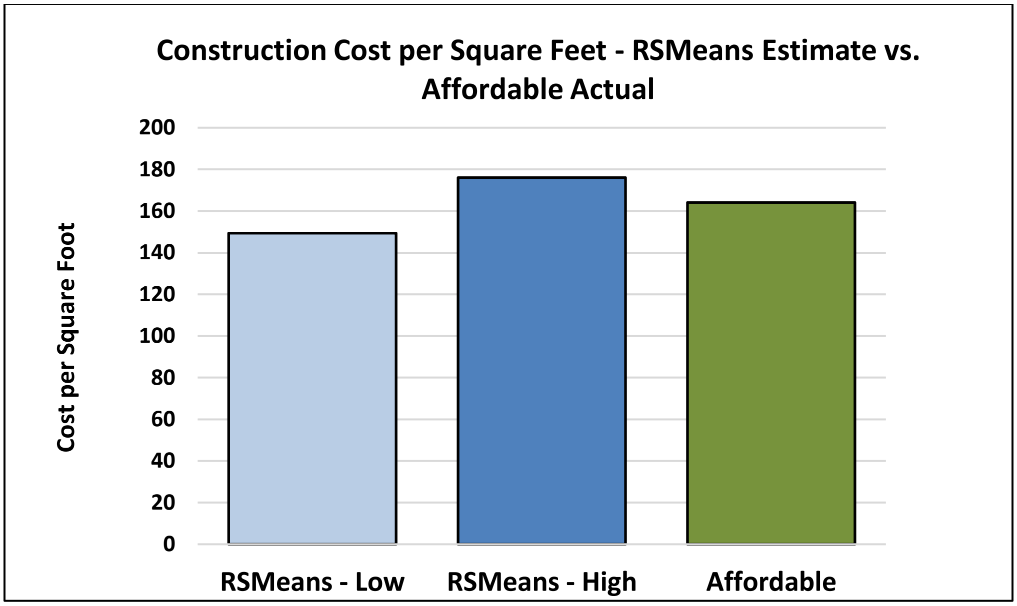
Affordable and market rate developments differ inherently in ways that affect construction decisions. Based on developer observations and cost estimate comparisons, however, this does not necessarily result in large cost differences. Affordable housing is generally built to sustain long-term affordability by charging limited rent to low-income households. Market rate housing concentrates on making a profit either by charging market rent or by selling a project after it is constructed, with both market rents and market sales prices determined by factors such as location, size, and amenities. Materials for affordable housing can be of higher quality and durability so that they can last over time, and therefore require more upfront costs to construct but less operating and maintenance costs over time. Market rate developments may try to minimize initial costs with more basic materials since future operating costs and upgrades can be covered by rent revenue and expected rent increases over time. However, some market rate project may choose higher quality finishes on certain highly visible project elements, such as cabinets or countertops in order to attract tenants. Affordable housing developments may also be subject to prevailing wage requirements, while market rate projects may or may not use higher-cost union labor. In developer interviews, several developers acknowledged the higher initial costs of affordable housing development but were skeptical that this leads to much higher costs than market rate projects overall.

To collect information on development costs for market rate projects, we collaborated with OHCS and developed a market rate survey. We directly contacted several market rate developers and asked those developers of affordable projects who also build market-rate housing to provide information on their market rate projects as well. In spite of outreach efforts designed to increase the market rate survey response rate, just five developers responded to our survey with usable cost information for six market rate projects, too few to use in a regression analysis from which reliable results could be obtained.

In lieu of this analysis, we prepared a cost comparison by estimating construction costs for market-rate projects using a commercial construction cost estimating software service, RSMeans. Building characteristic data for a sample of 35 affordable housing projects were collected from our database, and cost comparisons were developed for an otherwise comparable market rate structure using the RSMeans "Square Foot Calculator." Estimated market rate costs were then compared to the actual costs of the sample of affordable housing projects.[57] Results indicated that construction costs for affordable projects (a weighted average of $164 per square foot) fall on average between "Low" and "High" market rate cost estimates from RSMeans (with weighted averages of $149 and $176 per square foot respectively, as shown in Figure 13).

[57] Additional information on RSMeans analysis is presented in Appendix 5.

FIGURE 13: COMPARISON OF MARKET RATE AND AFFORDABLE PROJECTS[58]



CONCLUSION

During the past two decades, public subsidies in the form of tax credits and HOME financing have been used to facilitate the development of thousands of affordable housing units throughout Oregon. Research indicates that access to safe, healthy and stable housing provides numerous benefits, such as enabling low-income children to perform better in school, improving the health of residents, reducing the need for costly community services, and stimulating the state's economy.

The affordable housing developments we analyzed represent a very diverse set of projects from across the state and vary in project size from single-story projects with fewer than five units to multi-story apartment complexes with over 200 units. This diversity notwithstanding, our analysis suggests that there are several factors associated with the costs of developing these essential housing units, including the building attributes, types of wages paid, economic conditions, and the local community characteristics in which the housing is built.

[58] Affordable project costs were converted to 2019 costs using RSMeans National Cost Index so that they could be compared to the RSMeans 2019 cost estimates for market rate projects.

Key Findings

The following are key findings from our analysis:

- ***Economies of Scale*** Affordable housing is characterized by economies of scale, with larger projects costing less per unit than smaller projects to develop. According to our analysis, for each ten percent increase in the number of units, the cost per unit declines by 0.9 percent.
- ***Quality/Durability*** Building quality and durability add to costs. Buildings that are more durable or are built to a high standard of quality cost more to develop. For example, a ten percent increase in our composite quality measure is associated with an increase in costs of about two percent, on average.
- ***Local Economic Conditions*** Local economic conditions can also affect the cost of building affordable housing. Specifically, our analysis found that each percentage point increase in the local unemployment rate (e.g., a change from four to five percent) is associated with a five percent decrease in costs per unit.
- ***Community Meetings*** Local factors such as community opposition to a project can have a measurable impact on costs. We found that projects with more community opposition (measured by the number of community meetings) are associated with higher costs, with those projects that had four or more community meetings costing on average eight percent more to develop.
- ***Prevailing Wage Requirements*** Prevailing wages add to costs, with projects that pay prevailing wages costing nine percent more on average to develop.
- ***Land Costs*** Land costs per acre are much higher in non-rural areas but are comparable across rural and non-rural areas in terms of cost per unit and as a share of total project costs. Land costs are also higher in low income areas, adding to costs for projects built to serve those communities. In addition, land costs influence the cost of developing affordable housing, as they indirectly affect the type of project that is built, with developers being more likely to build taller structures on land that is more expensive to purchase.
- ***Building Height*** Projects that are taller cost more per unit. Specifically, our regression analysis indicates that projects that have four or more stories cost on average seven percent more to develop all things equal.
- ***Permit Fees and System Development Charges (SDCs)*** While real development costs net of land increased by 2.7 percent annually during the period analyzed, the annual average cost increases associated with SDCs were about three times higher at 8.9 percent.
- ***Affordable vs. Market Rate*** Limited available data suggests that construction costs for affordable and market rate projects are (roughly) comparable. Our analysis shows that the

estimated construction cost per square foot for market rate projects analyzed ranged from $149 to $176, while the actual average construction cost per square foot for comparable affordable projects was $164 per square foot.

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APPENDIX 1: DATA DESCRIPTIONS AND SUMMARY STATISTICS

The table presented in Figure 14 below provides descriptions of the data collected for our analyses, as well as summary statistics for the projects included in the data set as described on page 21 of the report. As discussed in the report, most of the data items were contained in the OHCS project file (those variables do not have a source cited in the descriptions). Data derived from survey responses are noted as such, as are those data items that were collected from other public sources. The public sources used were as follows:

- Census Data: Data from the 2000 and 2010 US Census were used to provide the household income and population density for the census tracts of the affordable projects. The median household income for each census tract was stored in the variable "HHIncome". Population density was defined as the census tract total population divided by the land area of the census tract in square miles and stored in the variable "Density." The Census data were downloaded from the IPUMS NHGIS website at https://data2.nhgis.org/downloads.

- Construction Wage Rates and Employment Statistics: Annual wage rates and employment data for the construction trades from 1999 through 2018 were provided by the Bureau of Labor Statistics (BLS). The BLS data for Oregon includes the total number of employed workers and the average hourly wage for various job descriptions. The wage rates as reported were nominal wages and were converted to real (2019) values using the CPI. In addition to analyzing each job category individually, a composite average wage rate was constructed using the weighted average wage rate and the total number of employees across seven construction trades, including carpenters, drywallers, electricians, painters, plumbers, roofers, and sheet metal (HVAC) workers. The annual values were assigned to individual projects using the construction start year. The values used in the final analysis included the combined values and the values for carpenters only, and are provided in the variables Wages_AllTrades, Num_AllTrades, Wages_Carpenters, and Num_Carpenters. The data were downloaded from the BLS website: https://download.bls.gov/pub/time.series/oe/.

- Unemployment Rate: The unemployment rate by county and by year was taken from data reported by the BLS. The annual unemployment rate was merged with the project data by county and by construction start year. Summary statistics are provided for the variable "UnempRate." The data were downloaded from the BLS website: https://data.bls.gov/pdq/SurveyOutputServlet.

- Interest rates: The series "Market yield on U.S. Treasury securities at 10-year constant maturity, quoted on investment basis" was used to provide a measure of interest rates at the time each project was initiated. Annual rates were merged to the project data by construction start year, providing the value for the variable "Int10Yr" for each project. These data were downloaded from the Federal Reserve's website: https://www.federalreserve.gov.

- Consumer Price Index: The annual CPI figures were used to convert all dollar values to current (2019) values. Annual values were used for each year and matched to projects by construction start year. The 2019 value used to calculate the current real value was the CPI value for January 2019. The CPI series "CPI-Urban for US, Western States" was used because the Portland-Salem MSA index was discontinued in 2018. The data were downloaded from the BLS website: https://data.bls.gov/pdq/SurveyOutputServlet.
- Construction Cost Index: The annual Construction Cost index from RSMeans was used as a measure of changes to the cost of constructing affordable housing over time. The index reports annual percent change based on December-over-December values and include both labor and material costs. The RSMeans index values were merged with the project data by construction start year and stored in the variable "CostIndex." The index values were downloaded from the RSMeans website: https://www.rsmeansonline.com/references/unit/refpdf/hci.pdf.

FIGURE 14: SUMMARY STATISTICS FOR FINAL DATA SET

Variable	Description	Num Non-Missing	Min	Max	Mean	Std Dev
Pct4	Dummy = 1 if project is a 4% tax credit project	123	0.00	1.00	0.12	0.00
Pct9	Dummy = 1 if project is a 9% tax credit project	123	0.00	1.00	0.59	1.00
HOME	Dummy = 1 if project received HOME financing	123	0.00	1.00	0.38	0.00
CostReal_Tot	Total project cost (excluding land) in real (2019) dollars	123	471,470	53,751,157	9,715,355	9,809,437
CostReal_Const	Total construction cost in real (2019) dollars	123	324,236	36,685,763	6,562,852	6,272,274
CostRealTot_BR	Total project cost (excluding land) per bedroom in real (2019) dollars	123	63,554	331,716	152,687	139,559
CostRealTot_SqFt	Total project cost (excluding land) per square foot in real (2019) dollars	123	120.79	418.82	228.05	218.99
Num_Stories	Max number of stories for project	123	1.00	6.00	2.86	3.00
Stories_4Plus	Dummy = 1 if Num_Stories >= 4	123	0.00	1.00	0.31	0.00
SqFt_Total	Total square footage of project	123	1,904.00	245,338.00	43,422.20	40,648.00
SqFt_Common	Square footage of common space for project	123	0.00	36,561.00	5,884.33	2,713.00
SqFt_ResUnits	Square footage of residential units for project	123	1,904.00	226,628.00	34,142.54	31,502.00
ParkingSpaces	Total number of parking spaces for project	119	0.00	223.00	37.95	29.00
SiteAcres	Site size in acres	120	0.16	37.38	1.97	1.06
Units_Tot	Total number of units for project	123	1.00	236.00	42.10	40.00
Bedrooms	Total number of bedrooms for project (studios counted as 1BR, 4+ counted as 4BR)	123	4.00	420.00	69.07	60.00
SubParking	Dummy = 1 if project had subterranean or podium parking	121	0.00	1.00	0.09	0.00
Density	Density for census tract per census data	123	1.60	11,567.10	3,176.01	2,670.30
HHIncome	Median household income for census tract per census data	123	16,186.00	74,531.00	36,576.69	33,721.00
Int10Yr	Rate of Federal Annual 10-Year Constant Maturity for year construction started	113	1.80	6.03	3.11	3.21

Variable	Description	Num Non-Missing	Min	Max	Mean	Std Dev
UnempRate	BLS unemployment rate for county for year construction started	123	3.50	15.70	7.57	6.80
CostIndex	RSMeans Construction Cost Index as of construction start year.	123	53.20	94.00	80.34	80.70
Wages_Carpenters	BLS Average hourly wage rate for Oregon Carpenters as of construction start year in real (2019) dollars	123	22.97	26.94	24.43	24.22
Wages_AllTrades	BLS Average hourly wage rate for Oregon Construction Trades (Carpenters, Drywallers, Electricians, Painters, Plumbers, Roofers, and Sheetmetal (HVAC) Workers) as of construction start year in real (2019) dollars	123	26.16	28.75	27.03	27.10
Num_Carpenters	BLS total number of employees for Oregon Carpenters as of construction start year	123	8,240.00	17,350.00	12,758.29	12,740.00
Num_AllTrades	BLS total number of employees for Oregon Construction Trades (Carpenters, Drywallers, Electricians, Painters, Plumbers, Roofers, and Sheet Metal (HVAC) Workers) as of construction start year	123	25,610.00	42,130.00	34,377.89	35,520.00
DevType_ForProfit	Dummy = 1 if developer is for-profit (from survey)	123	0.00	1.00	0.12	0.00
DevType_NonProfit	Dummy = 1 if developer is non-profit (from survey)	123	0.00	1.00	0.60	1.00
DevType_OtherGov	Dummy = 1 if developer is either government agency or "other" (from survey)	123	0.00	1.00	0.26	0.00
Dev_Employees	Number of employees for developer (from survey)	123	0.00	900.00	125.37	47.00
Dev_Exp_Aff	Developer Experience - number of affordable projects completed in past 20 years (from survey, top-coded at 101)	123	0.00	101.00	28.17	17.00
Dev_Exp_Mkt	Developer Experience - number of market rate projects completed in past 20 years (from survey)	120	0.00	35.00	1.11	0.00
Dev_Exp_All	Developer Experience - number of market rate and affordable projects completed in past 20 years (from survey)	120	0.00	106.00	29.91	17.00
DensityMax	Dummy = 1 if project built at local government-imposed density maximum (from survey)	88	0.00	1.00	0.44	0.00
PW	Dummy = 1 if project paid prevailing wages (from survey, supplemented by application data and BOLI data)	123	0.00	1.00	0.53	1.00
HiringReq	Dummy = 1 if local hiring requirements/goals influenced hiring decisions for project (from survey)	87	0.00	1.00	0.22	0.00
ReviewReq	Dummy = 1 if developer believed local review requirements added more than 5% to construction costs relative to original design (from survey)	80	0.00	1.00	0.30	0.00
Meetings_None	Dummy = 1 if number of community/neighborhood meetings for project = "none" (from survey)	117	0.00	1.00	0.15	0.00
Meetings_1to3	Dummy = 1 if number of community/neighborhood meetings for project = "1 - 3" (from survey)	117	0.00	1.00	0.59	1.00
Meetings_4Plus	Dummy = 1 if number of community/neighborhood meetings for project = "more than 3" (from survey)	117	0.00	1.00	0.26	0.00

Variable	Description	Num Non-Missing	Min	Max	Mean	Std Dev
LUBA	Dummy = 1 if the project involved any land use appeals before the Land Use Board of Appeals (LUBA) (from survey, supplemented with LUBA data and additional research)	100	0.00	1.00	0.05	0.00
Qlty_Average	Average value of seven quality measures listed below (bath, kitchen, exterior, floor, roofing, and windows)	123	1.33	3.00	2.16	2.17
Qlty_Bath	Quality measure for bathroom (1=low, 2=medium, 3=high) (from survey)	122	1.00	3.00	1.95	2.00
Qlty_Kitchen	Quality measure for bathroom (1=low, 2=medium, 3=high) (from survey)	120	1.00	3.00	1.97	2.00
Qlty_Exterior	Quality measure for bathroom (1=low, 2=medium, 3=high) (from survey)	123	1.00	3.00	2.18	2.00
Qlty_Floor	Quality measure for bathroom (1=low, 2=medium, 3=high) (from survey)	123	1.00	3.00	1.98	2.00
Qlty_Roofing	Quality measure for roofing (1=low (10-yr warranty), 2=medium (15-yr warranty), 3=high (20-yr warranty) (from survey)	121	1.00	3.00	2.77	3.00
Qlty_Windows	Quality measure for windows (1=low (basic aluminum sliders), 2=medium (vinyl or PVC sliders/casement), 3=high (composite wood clad) (from survey)	123	1.00	3.00	2.10	2.00
Rural_OHCS	Dummy = 1 if project designated "Rural" by OHCS	123	0.00	1.00	0.32	0.00
OR_Rgn_Metro	Dummy = 1 if project designated as being in "Metro" region by OHCS	123	0.00	1.00	0.33	0.00
OR_Rgn_NonMetro	Dummy = 1 if project designated as being in "Non-Metro Participating Jurisdiction" by OHCS	123	0.00	1.00	0.12	0.00
OR_Rgn_Balance	Dummy = 1 if project designated as being in "Balance of State" by OHCS	123	0.00	1.00	0.55	1.00
ConstYr_2000	Dummy = 1 if construction started in 2000	123	0.00	1.00	0.01	0.00
ConstYr_2001	Dummy = 1 if construction started in 2001	123	0.00	1.00	0.01	0.00
ConstYr_2002	Dummy = 1 if construction started in 2002	123	0.00	1.00	0.02	0.00
ConstYr_2003	Dummy = 1 if construction started in 2003	123	0.00	1.00	0.01	0.00
ConstYr_2004	Dummy = 1 if construction started in 2004	123	0.00	1.00	0.07	0.00
ConstYr_2005	Dummy = 1 if construction started in 2005	123	0.00	1.00	0.05	0.00
ConstYr_2006	Dummy = 1 if construction started in 2006	123	0.00	1.00	0.07	0.00
ConstYr_2007	Dummy = 1 if construction started in 2007	123	0.00	1.00	0.05	0.00
ConstYr_2008	Dummy = 1 if construction started in 2008	123	0.00	1.00	0.12	0.00
ConstYr_2009	Dummy = 1 if construction started in 2009	123	0.00	1.00	0.07	0.00
ConstYr_2010	Dummy = 1 if construction started in 2010	123	0.00	1.00	0.10	0.00
ConstYr_2011	Dummy = 1 if construction started in 2011	123	0.00	1.00	0.06	0.00
ConstYr_2012	Dummy = 1 if construction started in 2012	123	0.00	1.00	0.08	0.00
ConstYr_2013	Dummy = 1 if construction started in 2013	123	0.00	1.00	0.03	0.00
ConstYr_2014	Dummy = 1 if construction started in 2014	123	0.00	1.00	0.05	0.00
ConstYr_2015	Dummy = 1 if construction started in 2015	123	0.00	1.00	0.09	0.00
ConstYr_2016	Dummy = 1 if construction started in 2016	123	0.00	1.00	0.10	0.00
ConstYr_2017	Dummy = 1 if construction started in 2017	123	0.00	1.00	0.03	0.00

APPENDIX 2: COMPARISON OF SAMPLE TO POPULATION

For the purposes of conducting our analyses we were limited to including only those 123 projects that had complete project files and for which we received the additional required information from the Developer Survey. To examine whether or not the projects that were available for our analyses were indeed representative, we compared those that had usable survey responses to the larger population for various characteristics that could be compared and were available from the OHCS files. Figure 15 below provides a summary of this comparison.

FIGURE 15: COMPARISON OF ALL PROJECTS TO PROJECTS INCLUDED IN ANALYSIS

	All Available Projects (172 Projects)	Included in Analysis (123 Projects)		All Available Projects (172 Projects)	Included in Analysis (123 Projects)
Project Characteristics			***Project Approval Year***		
Avg Number of Units	42.95	42.10	2000	0.6%	0.8%
Avg Square Feet per Unit	1,023	1,031	2001	3.5%	1.6%
Avg Units per Acre	37.62	36.68	2002	1.7%	2.4%
Avg Number of Stories	2.82	2.86	2003	2.9%	3.3%
Pct w/4+ Stories	28.5%	30.9%	2004	9.3%	6.5%
			2005	9.3%	8.9%
Location of Projects			2006	8.7%	8.1%
OHCS Rural Project	31.4%	31.7%	2007	7.6%	7.3%
Metro Region	34.9%	32.5%	2008	7.6%	8.1%
Non-Metro PJ	9.9%	12.2%	2009	6.4%	6.5%
Balance of State Region	55.2%	55.3%	2010	6.4%	7.3%
			2011	6.4%	7.3%
Funding Type			2012	4.7%	2.4%
4 Percent LIHTC	14.0%	12.2%	2013	7.0%	8.1%
9 Percent LIHTC	54.1%	59.3%	2014	7.0%	8.1%
HOME	41.9%	38.2%	2015	9.3%	11.4%
			2016	1.7%	1.6%

As the table above suggests, the sample of projects used in our analyses is very similar to the larger universe in almost all respects. The project characteristics are very similar, with both groups consisting of about 42 to 43 units per project and unit sizes of just over 1,000 square feet. The density and average height for the two groups is also quite similar at around 37 units per acre, and 2.8 to 2.9 stories per project on average; Around 30 percent of the projects in both groups involved buildings of four or more stories. The percentage of rural projects was also comparable between the two groups at about 31 percent, as were the share of projects in the Portland Metro region, Non-Metro Participation Jurisdiction region, and the Balance of the State. In terms of funding type, there were slightly more 9 percent LIHTC projects in the group used in the analysis (59 vs. 54 percent), with slightly fewer 4 percent projects 12 vs. 14 percent) and slightly fewer HOME projects as well (38 vs. 42 percent). For the year of project approval, the two groups were within two or three percentage points of one another for each year from 2000 through 2016.

In spite of the similarity among the groups of projects, it is important to note that our data do not represent a truly random sample of projects from the potential universe of projects completed. Instead, it reflects the projects for which complete data (including survey responses from developers) were available. It is therefore possible that there is some systematic bias in the data. This possibility notwithstanding, the comparison of our data to the larger universe of projects suggests that the sample used in our analyses is in fact representative and unlikely to exhibit these types of biases.

APPENDIX 3: DEVELOPER SURVEY INSTRUMENT AND RESPONSES

Affordable Housing Developer Survey Instrument

Oregon Housing and Community Services

Affordable Housing Developer Survey:

The Oregon Housing and Community Services Department is undertaking a large-scale study designed to measure the factors that influence the cost of building affordable housing in Oregon.

This survey seeks to collect some information about the organizations that develop affordable housing in Oregon and also asks for some information about the projects you have built in the state over the past several years. We have attempted to make the survey as short as possible by only asking for information that cannot be obtained from any other source.

This project is very important not only to the State of Oregon, but to the entire affordable housing community and the populations we all serve. Additional information about the project can be found at the project website.

For questions about this survey, please contact Mitch Hannoosh, Research Analyst Oregon Housing and Community Services, at (503) 986-2038 or via email at mitchell.hannoosh@oregon.gov or Matthew Newman, Principal at Blue Sky Consulting Group, at (510) 654-6100 x202 or via email at mnewman@emailbluesky.com.

Your contact information:

Below, we have entered your contact information as it appeared on a recent tax credit application for your organization. Please update this information if it is out of date or if you (the person filling out this survey) are not the contact person listed on the application.

Your name: ______________________ Your e-mail address: ____________________

Please tell us about your organization:

1a.	How many people are employed by your organization?	1
1b.	How many affordable multi-family housing projects has your organization developed over the past 20 years?	2
1c.	How many market rate multi-family housing projects has your organization developed over the past 20 years?	3
1d.	Which of the following does your organization employ in house to assist with the development process? (please check all that apply)	☐ Architects ☐ Engineers ☐ Property Managers ☐ Real Estate Acquisition professionals ☐ General Contractors ☐ None of the above

Project Name: _____________ Project City:_________________ Application Year: _________________

2a.	In what year and month did construction start?	Year: _________ Month: __________
2b.	What type of prevailing wages were paid by the contractor who built the project?	○ Commercial ○ Residential ○ N/A
2c.	Did a locally imposed hiring requirement or goal influence hiring decisions for this project?	○ Yes ○ No ○ I don't know
2d.	Did locally imposed requirements for design/review or requirements imposed to mitigate community opposition to the project add more than 5% to construction costs relative to the architect's original design?	○ Yes ○ No ○ I don't know
2e.	How many community or neighborhood meetings were held regarding the project?	• None • 1 –3 More than 3
2f.	Was the project built at local government imposed density maximum?	○ Yes ○ No ○ I don't know
2g.	Did the project involve any land use appeals before the Land Use Board of Appeals (LUBA)?	○ Yes ○ No ○ I don't know
2h.	Was the project site acquired through an "arm's length" transaction (i.e. the purchase price reflected the market value of the site)?	○ Yes – the project site was acquired through an "arm's length" transaction ○ No – the project site was donated, partially paid for by others, or otherwise not acquired via an "arm's length" transaction ○ I don't know
2i.	Did the project include underground or podium parking?	○ Yes ○ No ○ I don't know

The questions in the section below are designed to measure the quality and durability of the construction techniques and materials used to build each project. For each project characteristic listed in the table below, please choose the option that most closely matches the construction characteristics of the listed project. If the precise construction method or material for a project is not listed, please choose the option that most closely matches that actual method or material used.

3a.	Roofing quality/warranty period?	low – 10 years medium – 15 years high – 20 years NA
3b.	Quality and durability of exterior finishes?	low – least expensive to install, less durable medium – compromise between installation cost and durability high – most expensive to install, most durable NA
3c.	Quality and durability of windows?	low – basic aluminum sliders medium – vinyl or PVC sliders or casement windows high – composite wood clad NA
3d.	Quality and durability of floor finishes?	low – least expensive to install, less durable medium – compromise between installation cost and durability high – most expensive to install, most durable NA
3e.	Bathroom quality and durability?	low – least expensive to install, less durable medium – compromise between installation cost and durability high – most expensive to install, most durable NA
3f.	Kitchen quality and durability?	low – least expensive to install, less durable medium – compromise between installation cost and durability high – most expensive to install, most durable NA

Affordable Housing Developer Survey Summary of Usable Responses

SURVEY QUESTION		SUMMARY OF RESPONSES	Developers	Projects
1a.	How many people are employed by your organization?	Up to 5	9	9
		6 – 10	5	10
		11 – 25	9	26
		26 – 50	8	19
		51 – 100	9	30
		> 100	14	29
		(No Response)	0	0
1b.	How many affordable multi-family housing projects has your organization developed over the past 20 years?	Up to 5	19	26
		6 – 10	11	21
		11 – 25	12	43
		26 – 50	4	12
		51 – 100	3	3
		> 100	5	18
		(No Response)	0	0
1c.	How many market rate multi-family housing projects has your organization developed over the past 20 years?	None	45	107
		1 – 3	3	5
		4 – 6	3	3
		7 – 10	0	0
		> 10	2	5
		(No Response)	1	3
1d.	Which of the following does your organization employ in house to assist with the development process? (please check all that apply)	Architects	13	32
		Engineers	12	30
		Property Managers	31	73
		Real Estate Acquisition professionals	21	61
		General Contractors	14	33
		None of the above	18	36

SURVEY QUESTION		RESPONSE SUMMARY	Projects
2a.	In what year and month did construction start?	(see summary at end of appendix)	
2b.	What type of prevailing wages were paid by the contractor who built the project?	Commercial	16
		Residential	48
		I don't know / No Response	59
2c.	Did a locally imposed hiring requirement or goal influence hiring decisions for this project?	Yes	19
		No	68
		I don't know / No Response	36

SURVEY QUESTION		RESPONSE SUMMARY	Projects
2d.	Did locally imposed requirements for design/review or requirements imposed to mitigate community opposition to the project add more than 5% to construction costs relative to the architect's original design?	Yes No I don't know / No Response	24 56 43
2e.	How many community or neighborhood meetings were held regarding the project?	None 1 to 3 More than 3 No Response	17 69 31 6
2f.	Was the project built at local government imposed density maximum?	Yes No I don't know / No Response	39 49 35
2g.	Did the project involve any land use appeals before the Land Use Board of Appeals (LUBA)?	Yes No I don't know / No Response	5 95 23
2h.	Was the project site acquired through an "arm's length" transaction (i.e. the purchase price reflected the market value of the site)?	Yes No I don't know / No Response	72 26 25
2i.	Did the project include underground or podium parking?	Yes No I don't know / No Response	11 108 4
3a.	Roofing quality/warranty period. low = 10 years medium = 15 years high = 20 years	Low Medium High No Response	2 24 95 2
3b.	Quality and durability of exterior finishes. low – least expensive to install, less durable, medium – compromise between installation cost and durability high – most expensive to install, most durable	Low Medium High No Response	3 95 25 0
3c.	Quality and durability of windows. low = basic aluminum sliders medium = vinyl or PVC sliders or casement windows high = composite wood clad	Low Medium High No Response	1 109 13 0
3d.	Quality and durability of floor finishes. low – least expensive to install, less durable, medium – compromise between installation cost and durability high – most expensive to install, most durable	Low Medium High No Response	13 100 10 0
3e.	Bathroom quality and durability. low – least expensive to install, less durable, medium – compromise between installation cost and durability high – most expensive to install, most durable	Low Medium High No Response	11 106 5 1

SURVEY QUESTION		RESPONSE SUMMARY	
			Projects
3f.	Kitchen quality and durability. low – least expensive to install, less durable, medium – compromise between installation cost and durability high – most expensive to install, most durable	Low	12
		Medium	100
		High	8
		No Response	3

Response Summary for Question 2a: In what year and month did construction start?																			
Month	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**TOTAL**
Jan	-	-	-	-	-	-	1	1	1	-	-	-	1	-	-	-	-	1	**5**
Feb	-	-	-	-	-	-	-	1	-	-	-	-	1	-	-	1	-	-	**3**
Mar	-	-	-	-	1	-	-	1	2	3	-	-	-	1	-	-	-	-	**8**
Apr	-	-	-	-	1	-	-	-	1	-	7	1	-	-	1	1	4	1	**17**
May	-	-	-	1	-	-	-	-	2	-	-	2	1	-	-	1	1	-	**8**
Jun	-	-	-	-	-	1	1	-	5	-	2	1	-	1	1	3	1	-	**16**
Jul	-	-	-	-	-	-	1	1	-	-	1	-	-	-	2	2	1	-	**8**
Aug	-	-	-	-	-	-	1	-	-	1	-	-	-	1	-	2	2	1	**8**
Sep	-	-	-	-	-	-	1	-	1	2	1	1	-	-	-	-	2	1	**9**
Oct	1	-	-	-	2	-	-	1	-	1	-	1	1	-	-	1	-	-	**8**
Nov	-	1	-	-	-	1	-	-	1	-	-	1	4	-	2	-	-	-	**10**
Dec	-	-	-	-	1	1	1	-	-	-	1	-	1	-	-	-	1	-	**6**
Month N/A	-	-	1	-	2	2	-	-	1	-	-	-	-	1	-	-	-	-	**7**
Total	**1**	**1**	**1**	**1**	**7**	**5**	**6**	**5**	**14**	**7**	**12**	**7**	**9**	**4**	**6**	**11**	**12**	**4**	**113**
No Response*	**-**	**1**	**-**	**1**	**1**	**1**	**2**	**1**	**2**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**10**
**Projects with no response are listed by the year of the application approval.*																			

APPENDIX 4: DETAILED REGRESSION RESULTS

The results of the regression model we discuss in the text are presented in Figure 16 below. For a detailed description of the variables see Appendix 1: Data Descriptions and Summary Statistics.

FIGURE 16: REGRESSION RESULTS - BASIC REGRESSION

Dependent Variable:	Log of the Cost per Unit in 2019 Dollars						
Number of Observations	109			R-Squared	0.8031		
Dependent Mean Value	12.3196			Adjusted R-Squared	0.7468		
Explanatory Variable	Coefficient	T-Statistic		Explanatory Variable	Coefficient	T-Statistic	
Intercept	8.4069	12.7181	**	Year construction started			
Building 4+ Stories	0.0678	1.6718	*	Const Yr = 2000	0.2553	0.3351	
Log of SqFt per Unit	0.6125	9.0001	**	Const Yr = 2001	(0.1150)	(0.1972)	
Log of Number of Units	(0.0867)	(4.2458)	**	Const Yr = 2003	(0.5208)	(1.2643)	
Prevailing Wages Paid	0.0901	2.8552	**	Const Yr = 2004	0.0443	0.1018	
Avg Quality Measure	0.2024	3.1641	**	Const Yr = 2005	0.0048	0.0111	
Project had 4+ Meetings	0.0828	2.2452	**	Const Yr = 2006	0.0617	0.1182	
OHCS Rural Project	0.0536	1.2348		Const Yr = 2007	0.1378	0.2804	
County Unemployment Rate	(0.0553)	(4.0638)	**	Const Yr = 2008	0.0760	0.2372	
Intrest Rate (10-yr T-Bill)	(0.0911)	(0.4998)		Const Yr = 2009	0.5111	1.8003	*
				Const Yr = 2010	0.3815	1.4898	
				Const Yr = 2011	0.1118	0.6076	
				Const Yr = 2012	0.1271	1.3360	
				Const Yr = 2013	0.1504	1.1355	
				Const Yr = 2014	0.1156	0.8425	
				Const Yr = 2015	0.0379	0.5373	

* Indicates statistical significance at the 90% confidence level.
** Indicates statistical significance at the 95% confidence level.

The dependent variable for the regression is the natural log of the real cost per unit for each project.[59] Values of continuous explanatory variables were also logged. This transformation enables the coefficients on the explanatory variables to be interpreted as the percent change in the cost measure.

In addition to the results presented above, we also tested a number of additional specifications designed to measure the impact of potential cost drivers (see regression results above for more

[59] In addition to the log of cost per unit, we also examined costs on a per square foot, per bedroom and overall basis, and obtained largely similar results in each case.

information). None of these additional factors added to the explanatory power of the base model, met the threshold for statistical significance, or was found to be sufficiently robust across different specifications.

It should be noted that our final model includes several variables that were not found to be statistically significant but were nonetheless included as control variables to account for various factors, including interest rates at the time (the interest rate on the 10-year Treasury bond), as well as variables to account for fixed effects such as the geographic location of the project (the “rural” dummy variable), and the year dummy variables to account for timing differences for the year construction began. We also tested whether different location variables, such as whether the project was in one of the three regions used by OHCS (Portland Metro, Non-Metro Participating Jurisdictions, and Balance of the State) rather than using the more simple designation of rural projects vs non-rural projects, and found comparable results. Therefore these additional variables were not included in the final model presented above.

APPENDIX 5: COMPARISON TO MARKET RATE CONSTRUCTION COST ESTIMATES

Although a direct comparison between actual affordable and market rate projects would provide the most useful basis for analysis, lack of available data prevents such a comparison. In order to at least shed some light on the relative cost of building affordable housing, we developed a comparison between actual and estimated construction costs. Specifically, we compared the actual construction cost information for affordable projects to an estimate of market rate construction costs for multifamily apartment buildings with similar characteristics using the construction cost estimation service RSMeans.

RSMeans is a national cost estimation firm that provides printed and software resources for use in estimating construction costs. Using the RSMeans "Square Foot Estimator" we developed market rate construction cost estimates for a sample of 35 affordable projects and compared the results to actual costs from affordable projects. The Square Foot Estimator uses a limited set of inputs to prepare a cost estimate for a given project. Specifically, for each project, information can be entered about the type of project (e.g., 1 – 3 story apartment, 4 – 7 story apartment, or 8+ story apartment), size of project (perimeter and area measured in square feet), project location (Oregon had 8 specified regions), and wall/framing type. Most affordable projects in Oregon that are four stories or higher have first story concrete structures underneath upper wood-framed stories. RSMeans software provided a variety of wall and framing type options that did not always match affordable housing materials reported by developers, therefore, "Low" and "High" construction costs were calculated to provide a possible range of market-rate costs based on different wall framing types. In addition, the results were adjusted to reflect whether standard union or open shop labor was used for each project.[60]

The results of a comparison of actual affordable project costs with estimates from the RSMeans "Square Foot Estimator" indicate that the cost per square foot of the actual affordable projects fell between the Low and High estimated market rate project construction costs.

[60] In order to adjust the Square Foot Estimator results for standard union vs. open shop labor, we applied standard union rates to projects which had used prevailing wages in their affordable developments.

APPENDIX 6: ABOUT THE BLUE SKY CONSULTING GROUP

This report was prepared by the Oregon Housing and Community Services Agency (OHCS) based on analysis conducted by Matthew Newman, Shawn Blosser, and Laura Preuss of the Blue Sky Consulting Group.

The Blue Sky Consulting Group is a public policy and economics consulting firm specializing in strategic and analytical services for public, not-for-profit, and private sector clients. Blue Sky's team of subject matter experts and staff come from the highest levels of government, academia and the private sector to assist clients with strategic or analytical challenges across a broad range of practice areas. The firm offers a range of strategic and analytical services to clients; at the core of these services lies an ability to provide non-partisan and rigorous analysis to help clients address complex challenges.

The firm was founded in 2005 by Tim Gage and Matthew Newman. Tim Gage is a highly-regarded public servant, having spent over 24 years as a fiscal advisor with both houses of the California Legislature and as the Director of the California Department of Finance. Mr. Gage received a Bachelor of Arts degree in Philosophy with honors from Harvard College and a Master of Public Policy degree from the Goldman School of Public Policy at the University of California at Berkeley. Matthew Newman was the founding Executive Director of the California Institute for County Government, a nonpartisan public policy research institute. Previously, Mr. Newman worked as a Senior Consultant for LECG, an international economics and public policy consulting firm, and as a Policy Analyst for California's Legislative Analyst's Office. Mr. Newman is a Phi Beta Kappa, magna cum laude graduate of the College Honors program at the University of California at Los Angeles and holds a Master of Public Policy degree from Harvard University's Kennedy School of Government.

Financial resources to support this project were provided by the State of Oregon.