The Political Economy of Green Industrial Warehouses

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Abstract:

Empirical evidence on the effect of environmental certification on commercial real estate properties routinely finds evidence of both significant rental rate and occupancy rate premiums accruing to owners of LEED and/or Energy Star certified properties. Interestingly, however, the underlying determinants and drivers of such premia remain largely unexplored. Building upon this literature, the current investigation expands our understanding of environmental certification and valuation effects by examining a previously unexplored property type – industrial warehouse facilities. Using a sample of 20,172 industrial properties, we find "green" certification plays an important, but contingent, role within this property type sector. Specifically, "green" warehouses in politically conservative areas rent at a significant discount relatively to their non-certified counterparts, while similar properties in politically liberal areas rent at a significant premium. These results provide further evidence on the importance of political ideology to real estate decision-making, and offer the first insight into the importance of environmental certification within the industrial warehouse property type sector.

The Political Economy of Green Industrial Warehouses

I. Introduction

Do investments in environmental certification create value for owners and managers of commercial real estate properties? Over the past decade, this and related questions have garnered increased attention from practitioners, academicians, and public policy makers, with preliminary empirical evidence tending to support the view that environmental responsibility is viewed favorably by the marketplace. From a practical perspective, the continuing evolution of new technologies and industrial processes have allowed firms to more efficiently measure, monitor, and mitigate their environmental impact, while the development and increased visibility of independent, third-party environmental performance and assessment benchmarks such as Leadership in Energy and Environmental Design (LEED) certification and the Energy Star designation provide firms with a transparent and tangible certification of best practices which they can use to demonstrate the efficacy of their commitment to such environmental initiatives to their key interested stakeholders.[1]

While concerned citizens, government regulators, and political activists may well regard environmental stewardship as a worthy goal regardless of the direct pecuniary implications for the firm's bottom-line, profit-maximizing real estate professionals may not inherently share these same goals. For example, Izzo (2000) examines the cognitive moral development of realtors and finds only 1 in 4 believe they should act to promote the general welfare rather than their own

[1] The U.S. Green Building Council first introduced LEED certification in 1998. To date, more than 5 billion square feet of commercial real estate projects, across all 50 states and in more than 90 countries, have been involved in the USGBC's certification process. For further details, see U.S. Green Building Council (2009). Similarly, the Energy Star label, which is jointly administered by the U.S. Environmental Protection Agency (EPA) and the Department of Energy (DOE), was extended to industrial warehouse facilities in 2004. To qualify for such designation, a warehouse must score within the top 25% of all such facilities in the marketplace on a comprehensive energy consumption audit. For complete details, see U.S. Environmental Protection Agency (2009).

self-interest. Similarly, Velthouse and Kandogan (2006) find finance, insurance, and real estate professionals to possess a relatively low regard for aggregate ethics, with the industry ranking 8th out of the 9 sectors studied.[2] As such, for environmental certification initiatives to be truly sustainable in a competitive, capitalistic marketplace they likely must provide positive financial returns (or at least not impose prohibitive costs) as well. Emerging empirical evidence suggest this may well be the case, and if this trend continues, suggests profit-maximizing managers would be well served to strongly consider the pursuit of such environmental certification. On the other hand, while the emerging evidence on the financial returns to investments in environmental stewardship appear promising, the literature has yet to fully identify and explore the direct mechanisms through which such green premia are derived. Are the gains primarily from improved energy efficiency, enhanced workplace productivity, or strengthened relationships with key constituents such as consumers, suppliers, and/or governmental authorities? Are these benefits uniform across space and asset markets, or do they vary with the economic vitality, visibility, and political ideology of individual market segments? Clearly, the answers to these questions offer direct insight into the long-run vitality and sustainability of environmental certification initiatives. As such, this investigation will examine the distributional and valuation consequences of environmental certification on a unique set of industrial warehouse facilities. Specifically, we will explore whether economics or ideology drive rental rates and capacity utilization at such facilities. To the best of our knowledge, this is the first direct study of the economic effects of political ideology on environmental certification and the valuation effects of industrial warehouse facilities.

[2] Mining and Construction, another industry category relevant to green business professionals, finished dead last in terms of aggregate ethics.

The remainder of this paper is organized as follows. Section two reviews the limited existing literature on the economic consequences of green building certification. Section three motivates and describes our key focal hypotheses, describes our sample data, and details the methodological approaches we employ throughout our empirical tests. We present the results of our analyses in section four, while the final section (five) summarizes our results, discusses their implications, and concludes.

II. Previous Literature

To date, the academic literature on green building, environmental certification and design, and the related valuation consequences is relatively new, but expanding rapidly. This growth is perhaps most easily exemplified by the emergence of a variety of new specialty journals dedicated to the examination and discussion of such issues. For example, the *Journal of Green Building* began publication in 2006, followed in 2009 by the *Journal of Sustainable Real Estate*, the *Green Building Journal* in 2010, and the *Canadian Journal of Green Building and Design* in 2011. Together, these outlets, as well as their more mainstream economics, finance, and real estate counterparts, have begun the long process of enhancing our understanding of the dynamics of this market segment. In the discussion which follows, we highlight the key findings from this limited existing literature which inform the valuation of environmentally certified commercial properties.

Benefits of Sustainable Design

One of the most obvious sources of value creation in "green" building construction and design derives from enhanced energy efficiency. For example, the United States General

Services Administration (GSA, 2009) reports the implementation of simple energy conservation strategies could save the federal government nearly $60 million dollars per year. With respect to formal environmental certification platforms, Watson (2009) reports LEED certification is associated with a 25% reduction in energy consumption, Choi (2009) finds LEED certified operations reduce building energy consumption costs by roughly 30%, and Goering (2009) estimates energy cost savings of 20-35% for typical green building projects. These savings have also been shown to influence observable market outcomes, as Laquatra (1986), Dinan and Miranowski (1989), and Brounen and Kik (2011) all demonstrate energy efficiency is capitalized into real estate transaction prices. Clearly, enhanced energy efficiency is a major potential benefit to the adoption of green construction and design.

Environmentally friendly facilities may also offer strategic benefits not directly related to energy consumption. For example, Miller et al. (2009) report non-trivial gains in employee productivity accruing to firms operating in green buildings. Specifically, they report workers in such facilities take nearly 3 fewer sick days per year, which translates into a direct productivity advantage in excess of 1%. Additionally, environmentally certified facilities may allow firms to more effectively brand and market their operations to an environmentally conscious set of customers and other stakeholders. Supporting this contention, Vyas and Cannon (2008) find green building initiatives are generally driven by ideology, marketing, and/or providence rather than explicit profit considerations. Finally, regulatory considerations suggest green buildings, and the firms they house, may be strategically positioned to capitalize on a commercial real estate marketplace that is being forced to become more environmentally conscious. At the local level, numerous municipalities (e.g., Austin, San Francisco, etc.) have adopted ordinances mandating increased environmental efficiency, while at the federal level Executive Order #13423 mandates annual energy consumption reductions by federal agencies of 3% per year until 2015.[3] Failure to comply with these guidelines may significantly delay, or even derail, the permitting process and thus impair the firm's or agency's ability to do business. Firms proactively adopting "green" building design may be better positioned to capitalize on opportunities created, or challenges presented, by this constantly evolving regulatory process.

Concerns Regarding Sustainable Design

While "green" building and design offers the above potential benefits, it also faces a number of barriers to its continued growth and adoption. Foremost among these concerns are cost perceptions. While Davis Langdon (2007) and Miller (2010) argue the costs associated with LEED certification are trivial, most developers do not appear to share this opinion. Specifically, survey results by Jackson (2009) find the vast majority of developers believe "green" initiatives increase construction costs more than 5%, while more than 2 in 5 developers believe such initiatives increase costs more than 10%. Similarly, Addae-Dapaah et al. (2009) find building users in Singapore consistently cite increased costs as a major deterrent to leasing green buildings. Supporting these industry perceptions, Reed et al. (2009) and Watson (2009) note the certification process is costly, time consuming, and fraught with uncertainty. Specifically, LEED certification costs frequently exceed $100,000, with the typically process taking roughly two years to complete and characterized by an attrition rate of 25-30%.[4]

Additional obstacles confronting the growth of the green building sector include concerns related to maintenance and monitoring, litigation, performance reliability, and transparency.

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[3] See Tinker et al. (2006), Woods (2008), and Simons, Choi, and Simons (2009) for further details regarding local, state, and federal regulations designed to enhance environmental and energy efficiency.

[4] Additional evidence on the cost of energy efficiency may be found in Goldman, Hopper, and Osborn (2005) and Pivo and Fisher (2010). Together, they report the cost of a typical energy efficiency retrofit at approximately $1.39 per ft^2, or approximately 0.6% of value.

First, with respect to maintenance and monitoring, D'Arelli (2008) observes that most environmental certification designations require ongoing compliance with performance standards to retain certification. This inherently increases long-run monitoring costs, but also creates potential agency conflicts between building owners and users with differing utility from environmental certification. Such conflicts may well increase costs, or limit flexibility, for both existing and future users of certified space.[5] Extending this line of reasoning, Shimizu (2010) and Yoshida and Sugiura (2010) argue that green buildings face higher expected maintenance expenses, as repair costs are generally proportional to a structure's initial investment outlay. As "green" buildings are more expensive to construct, they will likely be more expensive to maintain as well. On a related note, the reliability of green development materials, processes, and products is also an open question for debate. Addae-Dapaah et al. (2009) report three-quarters of building users in Singapore find uncertain reliability a critical roadblock to the adoption of green initiatives within the building sector, while more than 80% of their survey respondents expressed a "lack of faith" in the long-run effectiveness of such projects. Similarly, Jones and Vyas (2008) present case study evidence from Florida suggesting energy savings from green initiatives may well decay at substantially faster rates than generally assumed in typical valuation models. To the extent such rapid decay is generalizable to the broader green building marketplace, the promised benefits of green building initiatives may not be fully realizable.

Turning to liability issues, a number of authors note the increased litigation risk and uncertainty surrounding green building projects.[6] For example, what legal exposure is created by aggressive brokers and leasing agents who promise tenants green amenities which fail to

[5] See Bray and McCurry (2006) for an examination and discussion of the unintended consequences of rigid compliance with the LEED scoring system.
[6] See, for example, Anderson (2008), Butters (2008), D'Arelli (2008), Del Percio (2008), Lemieux (2008), and Seifert (2008).

materialize? What recourse do building owners and managers have against architects, engineers, and/or developers who fail to attain the desired level of certification or energy efficiency on a given structure? In practice, these questions remain largely unresolved. Finally, transparency of certification may be differentially important across property type sectors or geographic markets. As noted above, Vyas and Cannon (2008) argue many sustainability initiatives are driven by marketing and branding. Outside of the direct, tangible benefits of reduced energy consumption, enhanced employee productivity, or strategic risk reduction, transparent and visible certification offers the potential for enhanced marketing through a “plaque-in-the-lobby” effect.[7] Interestingly, most previous studies of the valuation effects of environmental certification have focused on commercial office buildings. While these facilities serve as a useful laboratory for answering many questions, the interactive nature of such space leads to a potential confounding attribution of the root cause of observed rental premiums. Are higher rents on certified properties due to enhanced energy efficiency, branding effects, or something else entirely? Furthermore, if such premia are based (even in part) on reputational capital effects, are the results generalizable to alternative property types where space branding is of more limited import. With respect to the current investigation, if green rental premiums are attributable to the branding of space, why would industrial warehouse facilities (which typically exhibit only limited public interaction) benefit? Alternatively, if energy efficiency drives green premia, such effects may well be more pronounced within the industrial sector. We explore these issues in more depth below.

Does the Market Value Environmental Certification?

[7] See Vandell and Lane (1989) and Jaffee, Stanton, and Wallace (2010) for further discussion of reputational capital effects surrounding certified commercial real estate building design and the “plaque-in-the-lobby” effect.

While the literature is expanding rapidly, to date, only a limited number of peer-reviewed publications have directly examined the rental and vacancy rate implications of environmental certification. Early studies in this area have tended to support the notion that the market values environmental certification positively. One of the first such studies was Miller, Spivey, and Florance (2008). Using a sample of Costar listed office buildings, they document both significant rental and occupancy rate premiums for environmentally certified structures. Lease rates were 5-10% higher for certified structures than for their control sample (within their multi-variate context), while occupancy rates were 3-4% higher. Wiley, Benefield, and Johnson (2010) offer a similar analysis using a national sample of class "A" office space, and document substantially larger effects. Specifically, they find an Energy Star rental premium of 7-9%, a LEED rental premium of 15-17%, and positive occupancy rate differentials of 10-11% and 16-18% for Energy Star and LEED certified structures, respectively, relative to their non-certified counterparts. Next, Pivo and Fisher (2010) report a 5.2% increase in rents and 1.3% increase in occupancy rates for responsible property investments, while internationally Yoshida and Shimizu (2010) finds green condos in Japan command a 5% price premium and Zheng et al. (2011) report a 9.1% price premium for green projects in Beijing. Continuing, Fuerst and McAllister (2011) examine a sample of 1,031 LEED (197) and/or (834) Energy Star certified properties along with over 15,000 control units. They document 4-5% lease rate premiums, and 25-26% sales price premiums, for the environmentally certified structures relative to their control group. Finally, in perhaps the most detailed and technical analysis of green premiums to date, Eichholtz, Kok, and Quigley (2011) find environmentally certified buildings enjoy a 3% rental premium over non-certified structures in terms of nominal rent, a 6% premium in effective rents, and a 16% sales price premium. Furthermore, the authors obtain detailed energy consumption usage for a subset of the buildings in their sample, and are able to document a direct linkage between the observed green premium and the energy efficiency of the structure.

While these seminal works all appear to document a positive relationship between environmental certification and market outcomes, a handful of emerging investigations offer somewhat contradictory results. For example, while Deng, Li, and Quigley (2010) document an average green premium of 14% accruing to Green Mark certified properties in Singapore, this result is heavily clustered and concentrated within the higher grades of gold and platinum certification. Basic Green Mark certification does not appear to provide significant valuation effects. Similarly, while Yoshida and Sugiura (2010) report green condominiums in Tokyo trade, on average, at a premium, they argue this result is entirely attributable to other dimensions of unit quality. After controlling for age and unit quality, they find green units under the Tokyo Green Building Program (TGBP) trade at significant discounts of 6-11%. Consistent with our discussion above, the authors attribute this finding to an expected increase in future maintenance costs for green structures relative to their non-certified peers. Finally, Jaffee, Stanton, and Wallace (2010) conclude Energy Star labeling doesn’t influence real estate valuation after asset pricing models have been properly specified. Together, these results suggest further inquiry into the valuation consequences of environmental certification is clearly needed to identify the causal linkages between environmental amenities and property valuation.

III. Data and Methodology

As noted above, while the preliminary evidence from the literature on the valuation of environmental certification for commercial real estate properties generally documents positive returns, surprisingly little work has been published which attempts to explain either crosssectional or inter-temporal variation in such green premiums. Of the few studies which have been completed, we note two important findings: 1) economic geography and 2) political ideology both appear to matter. Specifically, with respect to geography, Dermisi (2009) observes that the influence of LEED ratings on both assessed and market values in contingent upon the level of geographic aggregation employed throughout the analysis. Furthermore, Jaffee, Stanton, and Wallace (2010) document substantial geographic clustering in the location of Energy Star labeled buildings. These authors also note that both energy prices and weather expectations, which in turn both influence the anticipated cost of energy consumption, materially influence observable market rents and are location contingent. Thus, economic geography considerations appear to materially influence environmental certification processes, decisions, and valuation. Turning to political ideology, we note the findings of two recent papers. First, Brounen and Kok (2011) find that the choice of adopting green energy labels in Holland, known as Energy Performance Certificates (EPCs), may well be driven by ideological beliefs, as adoption rates dropped along with public sentiment regarding green initiatives, and rose in direct relation to the number of "green" party voters in the local region during the 2006 national elections. Similarly, Harrison and Seiler (2011) examine environmental certification premiums in U.S. office markets and find green premiums to be relatively modest at less than two percent in politically conservative, "red", or Republican counties, while similar premiums were nearly 6 percent in politically liberal, "blue", or Democratic counties. As such, we posit that geographic and ideological considerations may well influence the valuation of green warehouse facilities, and explicitly examine these possibilities in the empirical work which follows.

Our empirical analysis thus proceeds along two dimensions. First, using data from CoStar on industrial warehouse facility rents and occupancy rates, we extend previous analyses of environmental certification premiums to the industrial warehouse sector. Second, after evaluating the existence and significance of green premiums within this sector, we explore whether such premiums vary systematically with the political ideology of the local market area.[8]

Our empirical specifications require information along five key dimensions. First, information on individual property rents and occupancy rates – the core dependent variables employed throughout our investigation – are obtained from CoStar. Second, related information regarding each warehouse facility's physical attributes and environmental certification status were also obtained from CoStar. Specifically, we identify whether each facility has a crane, one or more loading docks, onsite access to railroad transportation, and the facility's parking ratio – defined as the number of parking spaces per 1,000 ft^2 of gross leasable area. Ex-ante, we hypothesize that the presence of cranes, docks, and rail access all proxy for the intensity of onsite industrial activity, and thus should be inversely related to market rents. Similarly, we hypothesize increased parking ratios are inversely related to the intensity of onsite industrial activity, or alternatively stated proxy for light industrial usage at the facility. As such, we anticipate parking ratios to be directly related to observed market rents for the warehouse facilities within our sample.

Third, we next employ an array of metrics to control for the socio-economic and demographic environment in which each facility is located. Specifically, following Jaffee, Stanton, and Wallace's (2010) finding that weather influences energy consumption and thus market rents, we collect information from the National Oceanic and Atmospheric Administration's (NOAA) National Climactic Data Center (NCDC) on both the average heating degree days, and cooling degree days, for each facility location using a 65 degrees Fahrenheit

[8] Throughout this investigation, and consistent with the reporting practices of the Federal Elections Commission (FEC), we employ county level aggregation for all political ideology voting metrics.

basis.[9] We also obtain information from the U.S. Census Bureau on the racial diversity, educational attainment, median household income, and population density for each facility's home county. We offer no prediction as to the expected coefficient on our racial diversity metric, but anticipate rents to increase with population, density, and the fraction of high school graduates in the county (as semi-skilled labor becomes increasingly available), decrease with the fraction of college graduates in the county (as the market place moves from "blue collar" to "white collar" employment industrial facilities may become less desirable), and increase along with household incomes (as the ability to pay increases). Similarly, we obtain county level estimates of unemployment rates from the Bureau of Labor Statistics (BLS), and again anticipate a negative relationship between market rents and this inverse economic vitality index. Fourth, our focal political ideology metrics are based upon voting results from the 2008 U.S. Presidential election. Specifically, using county level vote counts from the Federal Elections Commission (FEC) we first define the Percent Democratic vote as the number of votes received by Barack Obama in the county divided by the total number of Presidential votes cast in the county. Second, we define a "Blue" or Democratic county as any county in which President Obama received more votes than his Republican challenger (John McCain). Given the current ideological composition of the two major parties in the United States, we anticipate that both our Blue County and Percent Democratic vote share metrics will we positively related to the environmental consciousness of the local citizenry, and thus positively associated with

[9] Heating (cooling) degree days represent aggregate deviations from a temperature neutral standard. They are computed as the average daily (or alternatively low and high) temperatures minus a predefined constant, and then aggregated across a desired observation interval. In the context of the current investigation, we employ an industry standard benchmark of 65 degrees Fahrenheit as our baseline temperature. Thus, suppose location X has an average daily temperature of 52 degrees on January 1st. In order to elevate the ambient temperature within our facility to our 65 degree benchmark would require 13 heating degree days worth of energy consumption. Similarly, an average temperature of 91 degrees on July 1st would generate 26 cooling degree days of energy consumption. Long-run average heating degree days and cooling degree days are then collected and annualized for each location within our sample.

observable green premiums. Finally, as a robustness check, we examine whether are results are dependent upon the regulatory environment faced by the firm. As such, we control for the commercial electric rate in each jurisdiction, as well as for the existence of state sponsored tax credits, grant programs, or property tax incentives specifically dedicated to encourage environmentally conscious development. Information on electric rates was obtained from the U.S. Energy Information Association (EIA), while information on state and local government sponsored environmental initiatives was obtained from the North Carolina Solar Center's Database of State Incentives for Renewables & Efficiency (DSIRE).[10] Ex-ante, we expect both higher energy costs and the existence of government provided financial incentives to increase observable green premiums.

IV. Empirical Analysis

Table #1 provides descriptive statistics for the key variables employed throughout our analysis. Examining the data, we find industrial warehouse rents averaged $6.36 per square foot, while utilization rates averaged 56.07 percent. Relatively few (only 674 or 3.3%) of the warehouses within our dataset have cranes, slightly more than 1 in 3 (36.1%) have direct rail access, and just over half (52.0%) have onsite loading docks. The typical facility has slightly under 2 parking spaces (1.88) per 1,000 square feet of gross leasable area. Continuing on to our socio-economic and demographic characteristics, the average county in our sample is characterized by more heating than air conditioning needs, has a population in excess of 2,000,000 people, and is roughly three-quarters (76.0%) white. Over 80% of county residents have typically completed a high school education, while 27% have completed college. Sample

[10] See Tinker et. al. (2006), Woods (2008), and Simons, Choi, and Simons (2009) for further analysis and discussion of federal, state, and local government environmental initiatives.

counties were characterized by 2007 estimated median household incomes of nearly $54,000, and relatively low unemployment rates of 4.72%, though both numbers exhibit substantial variation around their reported means. Turning to our political ideology metrics, Democratic candidate Barack Obama received a majority of the vote share in counties which were home to 75.7% of our sample observations. Similarly, the typical home county for a warehouse facility within our sample gave 57.9% of their votes to President Obama. This number is five full percentage points higher than the 52.9% of the popular vote actually received by the President, and underscores the overrepresentation of urban areas within our sample. Finally, with respect to direct financial incentives to pursue green building initiatives, commercial electric rates averaged 11.03 cents per kilowatt hour across sample counties, while 31%, 48%, and 82% of sample counties, respectively, were located in jurisdictions with tax credits, grant programs, or property tax incentives available to help defray the costs of green building initiatives.

Next, we begin our analysis of the importance of political ideology on observable market outcomes by bifurcating our sample across Red and Blue county definitions. Specifically, Table #2 provides sample means for all key variables of interest employed throughout our empirical specifications segmented by Republican leaning “Red” counties and Democratic leaning “Blue” counties. Of note, both rents and capacity utilization rates appear to be substantively higher in “Blue” counties than in “Red” counties. Warehouses in “Blue” counties are marginally more likely to have cranes and loading docks on site, while facilities in “Red” counties are more likely to have direct rail access and higher parking ratios. “Blue” counties tend to be characterized by increased heating degree days, while conversely “Red” counties tend to be characterized by increased cooling degree days. Taken together, total degree days, and hence expected energy consumption, appear similar across “Red” and “Blue” counties. Not surprisingly, “Blue” counties tend to be more heavily populated, denser, and more ethnically diverse than their "Red" counterparts. Somewhat surprisingly, Democratic leaning counties are characterized by lower high school graduation rates, but higher college graduation rates, than their Republican leaning counterparts. Turning to our environmental certification metrics, industrial warehouse facilities in "Blue" counties are 2 ½ times (0.35% vs. 0.14%) more likely to be Energy Star and/or LEED certified than comparable facilities located in "Red" counties. This finding is entirely consistent with the notion that political ideology materially influences environmental decision making. Finally, examining the regulatory environment attributes reveals further differences. Specifically, electric rates appear to be lower in "Red" counties, while these same jurisdictions are also more likely to have tax credits available to help offset the cost of green development. On the other hand, "Blue" counties are characterized by an increased likelihood of both grant programs and property tax incentives available to incentivize green initiatives. Taken together, the results in Table #2 suggest industrial property market outcomes and attributes vary markedly with the political ideology of the local market area.

Continuing on to the core of our empirical analysis, Table #3 presents the results from three alternative OLS specifications regressing industrial warehouse facility rents per square foot against vectors of facility attributes, socio-economic and demographic market conditions, and location specific political ideology metrics.[11] Consistent with *a priori* expectations, rents are directly related to capacity utilization and inversely related to the intensity of onsite industrial activity across all three model specifications. Similarly, and again in-line with expectations, warehouse rents per square foot are inversely related to expected energy consumption, college

[11] Results obtained using the natural log of rent per square foot as the dependent variable yield qualitatively identical results.

graduation rates, and unemployment rates, while directly related to local area population and density levels, high school graduation rates, and local area income levels across all three models.

Turning to our focal political ideology metrics, somewhat surprisingly we find environmental certification of industrial warehouses is associated with a reduction in market rents approximately \$1.30 per ft^2. Given the sample average rent of \$6.36, these results suggest a "green" discount of approximately 20% for industrial properties located in "Red" counties. Further analysis also reveals rents to be systematically higher in Democratic leaning, politically liberal, "Blue" counties. Finally, and perhaps most interestingly, we also interact our political ideology "Blue" county and environmental "Green" Certified metrics. This interaction term is consistently positive and suggests that while environmentally certified industrial warehouse rents may be discounted in politically conservative, Republican leaning, "Red" counties, such facilities rent at premiums of nearly 10% in politically liberal, Democratic leaning, "Blue" counties.[12] In sum, the results presented in Table #3 provide strong support for the notion that Democratic leaning counties place a higher premium on environmental certification than their more conservative, Republican leaning counterparts.

Changing gears, Table #4 presents the results of our parallel analysis which examines capacity utilization rates within industrial warehouse properties. While we retain all previously examined facility attributes and location specific socio-economic and demographic characteristics for control purposes, we offer no ex-ante predictions as to their expected empirical signs. Rather, we focus our attention once again on the interplay between our environmental certification and political ideology metrics. As with our rental rate results, we

[12] Consider, for example, the results provided in model III. The interaction term coefficient premium available in "Blue" counties (1.886) exceeds the raw "Green" certification discount coefficient (-1.269), yielding an estimated "Green" premium of \$0.617 per square foot. Given an average industrial warehouse sample rent of \$6.36 per square foot, this translates into a "Green" premium of 9.7% in "Blue" counties.

find large disparities in the demand for “green” industrial warehouse facilities across the political ideology spectrum. Specifically, Table #4 results suggest capacity utilization rates for environmentally certified industrial properties in politically conservative, Republican, “Red” counties are roughly 25% lower than those observed at non-certified facilities in similar locations. Interestingly, in politically liberal, Democratic, “Blue” counties, capacity utilization rates at environmentally certified facilities remain lower than those observed for non-certified properties in similar locations, though the approximate 5% reduction in occupancy is dramatically smaller than the 25% observed for our “Red” county locations. While the reduced occupancy rates for environmentally certified warehouse facilities noted in Table #4 are entirely consistent with the rental rate discounts previously reported for similar properties, it may also be explained by the vintage of these projects. As noted by Miller (2010), a sizable proportion of environmentally certified projects have been brought to market relatively recently. As a result, such facilities may well have disproportionately entered their lease-up phases during periods of economic turmoil and financial hardship. As a result, the higher observed vacancy rates for environmentally certified facilities may be due, in part, to temporal dependence and economic considerations rather than exclusively ideological considerations.

If political ideology influences observable industrial property market outcomes, do policy innovations mitigate these results? Table #5 explores this possibility by augmenting our full model specification of determinants of industrial warehouse per square foot rents with four additional financial incentives derived from public policy related innovations within the commercial property market. First, column I adds commercial electric rates to the existing model specification. As noted above, we obtained commercial electric rate information from the United States Energy Information Association. Throughout most of the United States, commercial electric power and capacity is supplied to industrial warehouse facilities through either publicly owned corporations or heavily regulated monopolistic enterprises. As such, the electric rate setting process frequently includes a non-trivial political component, with varying degrees of public input, supervision, and control.[13] To the extent Democratic regions are systematically characterized by higher electric rates, a finding entirely consistent with the results presented in Table #2 and the unreported positive correlation coefficient (rho=0.19) between "Blue" County status and electric rates, the observed relationship between green rental discounts, premiums, and political ideology may be an artifact of expected cost savings accruing through enhanced energy efficiency. The results reported in Column I are inconsistent with this conclusion. Specifically, while electric rates are positively related to observed market rents, after controlling for the cost of commercial electricity (per kwh) our "Green" Certification metric remains strongly negative, while our "Blue" County (political ideology) X "Green" Certified interaction term remains strongly positive. These results are also consistent with the contentions of Zheng et al. (2011) who posit electric rates and trends alone, both in the United States and China, are unlikely to be sufficient to spur wide-spread adoption of energy efficient technologies.

Continuing, column II of Table #5 alters our regulatory innovation framework by adding three variables designed to identify those jurisdictions which have tax credits, grants programs, or property tax incentives available to foster the development and expansion of green building initiatives. All else the same, such governmental interventions would be expected to reduce the cost of environmental initiatives, thus making green development more financially viable, while simultaneously driving up market rents and certification premiums. Somewhat surprisingly, while the magnitude of the negative coefficient on our environmental certification variable in reduced (approximately $0.25 per square foot) by the inclusion of controls for these

[13] See Bonardi, Holburn, and Vanden Bergh (2006) for a discussion related regulatory issues.

governmental initiatives, the coefficient estimate remains strongly negative and statistically significant. Similarly, while tax incentive and grant programs would appear to facilitate the transfer of financial resources into the commercial property market and thus increase observable market rents, two of the three policy innovation control variables exhibit unexpectedly negative coefficient sign estimates.[14] Nevertheless, our core result that environmental certification detracts from industrial warehouse rents in "Red" counties, and enhances market rents on similar facilities in "Blue" counties remains qualitatively unchanged.

Finally, column III controls for the effects of both commercial electric rates and government policy innovations simultaneously. Once again, our results remain qualitatively robust to the inclusions of these additional model parameters. Taken together, these results provide solid evidence of a statistically significant and economically meaningful relationship between the political ideology of location specific industrial warehouse property markets and the market valuation associated with environmental, "Green" (Energy Star or LEED) certification.

V. Summary and Conclusions

In this paper, we have examined whether industrial warehouse facility rents and utilization rates are materially influenced by either environmental certification or political ideology. In contrast to the previous literature, we find rental rate discounts of nearly 20% accruing to environmentally certified warehouse facilities located in politically conservative, Republican leaning, "Red" counties. On the other hand, we find rental rate premiums of approximately 10% accruing to environmentally certified warehouse facilities located in

[14] Interestingly, while the existence of both property tax incentives and grant programs to support green building initiatives are positively correlated with our "Blue" County variable, the magnitudes of these relationships are relatively small (rho=0.16 and rho=0.20 respectively). Furthermore, the correlation between "Blue" County status and the availability of tax credits for green building initiatives is actually negative (rho=-0.28).

politically liberal, Democratic leaning, "Blue" counties. Similarly, when examining occupancy or utilization rates for our sample properties, we again find non-trivial performance shortfalls accruing to environmentally certified industrial properties in "Red" counties. Specifically, our empirical findings suggest vacancy rates are roughly 25% higher for environmentally certified properties in "Red" counties than for non-certified properties in similar locations. Vacancy rates for "green" warehouses in "Blue" counties also exceed those found for similarly located non-certified properties, though the magnitude of the differential is markedly lower at approximately 5%. Finally, these results appear robust to the inclusion of an array of facility attributes, socio-economic and demographic controls, and regulatory innovations. As such, we view these findings are strongly supportive of the notion that non-pecuniary factors, including but potentially not limited to the political ideology of the local market area, may materially influence the market valuation of environmental amenities within industrial property markets. Therefore, we urge extreme caution to real estate professionals, governmental policy makers, and academic researchers when generalizing the results of environmental valuation studies to new property type sectors, geographic markets, or chronological time periods.

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Table #1
Descriptive Statistics

This table presents descriptive statistics on the average rental rates, occupancy rates, and market share for environmentally certified industrial warehouse facilities. Information on the corresponding facility attributes, socio-economic and demographic environment, regulatory incentives for “green” projects, and political ideology of the local market area are also reported.

Variable	Mean	Std. Dev.	Minimum	Maximum
Dependent Variables:				
Rental Rate	6.358	3.743	0.18	144
Occupancy Rate	56.069	40.175	0	100
Facility Attributes:				
Have Cranes (yes=1)	0.033	0.180	0	1
Have Docks (yes=1)	0.520	0.500	0	1
Rail Access (yes=1)	0.361	0.480	0	1
Parking Ratio	1.875	0.902	0.02	10
Socio-Economic & Demographic Environment:				
Heating Degree Days	4,509	2,018	475	9,030
Cooling Degree Days	1,283	769	195	3,158
Population (millions)	2.171	2.479	0.004	9.862
% Caucasian	76.04	12.59	25.40	98.40
% High School Grads	81.16	6.01	59.00	94.90
% College Grads	27.03	7.05	8.50	52.90
Unemployment Rate	4.72	1.25	2.40	18.0
Median HH Income ($,000s)	53.915	8.818	32.660	100.744
Density (000’s of people/m^2)	1.516	2.357	0.006	31.730
Regulatory Incentives for “Green” Projects:				
Electric Rates (per kwh)	11.03	3.38	6.76	26.31
Tax Credits (yes=1)	0.310	0.462	0	1
Grant Programs (yes=1)	0.481	0.500	0	1
Property Tax Incentives (yes=1)	0.818	0.386	0	1
Political Economy of Environmental Certification:				
“Green” Certified (yes=1)	0.003	0.055	0	1
Percent Democratic Vote	57.85	11.29	21.58	88.95
“Blue” County (yes=1)	0.757	0.429	0	1

Table #2
Descriptive Statistics by "Blue" County

This table presents descriptive statistics for our sample of industrial warehouse facilities segregated by political ideology. "Blue" Counties are defined as those in which Barack Obama received more votes than John McCain during the 2008 U.S. Presidential election. Information on the corresponding facility attributes, socio-economic and demographic environment, regulatory incentives for "green" projects, and political ideology of the local market area are also reported. (Blue county: n=15,271; Red county: n=4,901)

Variable	"Blue" County Mean	"Red" County Mean	T-stat of Difference
Dependent Variables:			
Rental Rate (per ft^2)	6.569	5.699	14.23***
Occupancy Rate (%)	57.03	53.06	6.03***
Facility Attributes:			
Have Cranes (yes=1)	0.036	0.024	4.00***
Have Docks (yes=1)	0.535	0.474	7.41***
Rail Access (yes=1)	0.351	0.393	-5.37***
Parking Ratio	1.858	1.928	-4.70***
Socio-Economic & Demographic Environment:			
Heating Degree Days	4,662	4,036	19.06***
Cooling Degree Days	1,160	1,664	-41.57***
Population (,000,000's)	2.331	1.670	16.34***
% Caucasian	73.37	84.35	-57.25***
% High School Grads	80.74	82.46	-17.62***
% College Grads	27.75	24.78	26.10***
Unemployment Rate	4.87	4.26	30.21***
Median HH Income ($,000)	54.302	52.711	11.02***
Density (000's of people/m^2)	1.820	0.571	33.14***
Regulatory Incentives for "Green" Projects:			
Electric Rates (cents per kwh)	11.396	9.904	27.34***
Tax Credits	0.236	0.541	-41.87***
Grant Programs	0.537	0.308	28.38***
Property Tax Incentives	0.854	0.708	23.29***
Political Economy of Environmental Certification:			
"Green" Certified (%)	0.354	0.143	2.34**
Percent Democratic Vote	62.33	43.90	140***
"Blue" County	1	0	-----

Table #3
Determinants of Industrial Warehouse Rents

This table investigates the determinants of market rents on industrial warehouse facilities. Specifically, rents are modeled as a function of the facility's attributes, socio-economic and demographic environment, and the political ideology of the county in which each facility is located. All models employ robust standard errors using White's correction.

Variable	**I**	**II**	**III**
Facility Attributes:			
% Leased	0.603	0.610	0.601
	(10.33***)	(10.42***)	(10.31***)
Have Cranes (yes=1)	-1.104	-1.197	-1.117
	(-13.42***)	(-14.53***)	(-13.55***)
Have Docks (yes=1)	-1.878	-1.853	-1.875
	(-38.47***)	(-38.11***)	(-38.24***)
Rail Access (yes=1)	-0.102	-0.115	-0.101
	(-1.95*)	(-2.22**)	(-1.94*)
Parking Ratio	0.451	0.442	0.450
	(16.03***)	(15.61***)	(15.99***)
Socio-Economic & Demographic Environment:			
Heating Degree Days (,000s of days)	-0.470	-0.447	-0.468
	(-15.21***)	(-14.71***)	(-15.12***)
Cooling Degree Days (,000s of days)	-0.867	-1.096	-0.862
	(-12.24***)	(-14.77***)	(-12.14***)
Population (,000,000's)	1.91	2.49	1.97
	(12.30***)	(16.45***)	(12.33***)
% Caucasian	0.024	0.004	0.024
	(6.53***)	(1.43)	(6.40***)
% High School Grads	0.039	0.044	0.043
	(4.63***)	(5.08***)	(5.08***)
% College Grads	-0.062	-0.048	-0.063
	(-12.60***)	(-9.80***)	(-12.78***)
Unemployment Rate	-0.457	-0.458	-0.456
	(-16.42***)	(-15.98***)	(-16.36***)
Median HH Income ($,000)	0.074	0.068	0.073
	(23.09***)	(20.63***)	(22.98***)
Density (000's of people/m^2)	0.203	0.254	0.209
	(13.11***)	(16.79***)	(13.28***)
Political Economy of Environmental Certification:			
"Green" Certified (yes=1)	-1.309	-1.351	-1.269

	(-2.86***)	(-2.56***)	(-2.74***)
Percent Democratic Vote	0.058	-----	0.053
	(12.92***)		(9.42***)
"Blue" County	-----	0.674	0.166
		(11.22***)	(2.16**)
"Blue" County X "Green" Certified	1.938	2.068	1.886
	(3.16***)	(3.08***)	(3.05***)
Intercept	0.219	4.151	0.112
	(0.24)	(5.45***)	(0.13)
Observations	20,172	20,172	20,172
F(k,N-k-1: k=17/17/18)	308.81	302.55	293.14
Prob>F	0.0000	0.0000	0.0000
R-Squared	0.2259	0.2209	0.2261

Table #4
Determinants of Industrial Warehouse Occupancy Rates

This table investigates the determinants of occupancy rates for industrial warehouse facilities. Specifically, occupancy rates are modeled as a function of the facility's attributes, socio-economic and demographic environment, and the political ideology of the county in which each facility is located. All models employ robust standard errors using White's correction.

Variable	**I**	**II**	**III**
Facility Attributes:			
Rent per ft^2	0.864	0.870	0.863
	(8.00***)	(8.08***)	(8.00***)
Have Cranes (yes=1)	-3.743	-3.917	-3.841
	(-2.11**)	(-2.20**)	(-2.16**)
Have Docks (yes=1)	6.281	6.338	6.302
	(10.32***)	(10.45***)	(10.36***)
Rail Access (yes=1)	-4.915	-4.923	-4.909
	(-8.25***)	(-8.27***)	(-8.24***)
Parking Ratio	-1.275	-1.298	-1.287
	(-3.99***)	(-4.07***)	(-4.03***)
Socio-Economic & Demographic Environment:			
Heating Degree Days (,000s of days)	2.222	2.258	2.233
	(6.55***)	(6.68***)	(6.58***)
Cooling Degree Days (,000s of days)	2.024	1.831	2.067
	(2.31**)	(2.16**)	(2.35**)
Population (,000,000's)	0.491	1.520	0.997
	(0.28)	(0.88)	(0.56)
% Caucasian	0.049	0.026	0.047
	(1.35)	(0.88)	(1.29)
% High School Grads	-0.591	-0.559	-0.560
	(-5.41***)	(-5.02***)	(-5.02***)
% College Grads	0.228	0.236	0.221
	(3.51***)	(3.77***)	(3.39***)
Unemployment Rate	-2.553	-2.542	-2.542
	(-7.32***)	(-7.27***)	(-7.28***)
Median HH Income ($,000)	0.277	0.266	0.272
	(6.85***)	(6.63***)	(6.68***)
Density (000's of people/m^2)	-0.195	-0.101	-0.146
	(-1.18)	(-0.62)	(-0.86)
Political Economy of Environmental Certification:			
"Green" Certified (yes=1)	-24.984	-24.747	-24.670
	(-1.83*)	(-1.82*)	(-1.81*)

Percent Democratic Vote	0.096	-----	0.055
	(2.05**)		(1.00)
“Blue” County	-----	1.834	1.311
		(2.22**)	(1.35)
“Blue” County X “Green Certified	20.214	19.978	19.802
	(1.39)	(1.38)	(1.36)
Intercept	68.856	72.181	68.009
	(6.14***)	(6.99***)	(6.05***)
Observations	20,172	20,172	20,172
F(k,N-k-1: k=17/17/18)	43.64	43.62	41.30
Prob>F	0.0000	0.0000	0.0000
R-Squared	0.0362	0.0362	0.0363

Table #5
Do Economic Incentives Explain "Green" Rental Disparities?

This table investigates the determinants of market rents on industrial warehouse facilities. Specifically, rents are modeled as a function of the facility's attributes, socio-economic and demographic environment, regulatory incentives in place to support "green" initiatives, and the political ideology of the county in which each facility is located. All models employ robust standard errors using White's correction.

Variable	**I**	**II**	**III**
Facility Attributes:			
% Leased	0.539	0.619	0.546
	(9.30***)	(10.61***)	(9.41***)
Have Cranes (yes=1)	-1.017	-1.027	-0.984
	(-12.42***)	(-12.53***)	(-11.99***)
Have Docks (yes=1)	-1.775	-1.815	-1.761
	(-35.79***)	(-36.33***)	(-35.15***)
Rail Access (yes=1)	-0.059	-0.067	-0.047
	(-1.15)	(-1.31)	(-0.92)
Parking Ratio	0.428	0.439	0.431
	(15.36***)	(15.56***)	(15.40***)
Socio-Economic & Demographic Environment:			
Heating Degree Days (,000s of days)	-0.241	-0.328	-0.176
	(-6.75***)	(-8.99***)	(-4.44***)
Cooling Degree Days (,000s of days)	-0.353	-0.701	-0.313
	(-4.45***)	(-9.56***)	(-3.89***)
Population (,000,000's)	1.67	1.74	1.63
	(10.51***)	(10.80***)	(10.19***)
% Caucasian	0.027	0.019	0.025
	(7.71***)	(5.13***)	(7.30***)
% High School Grads	0.059	0.037	0.051
	(7.03***)	(4.23***)	(5.77***)
% College Grads	-0.050	-0.044	-0.040
	(-10.37***)	(-8.08***)	(-7.47***)
Unemployment Rate	-0.513	-0.458	-0.509
	(-18.44***)	(-16.18***)	(-17.80***)
Median HH Income ($,000)	0.050	0.065	0.048
	(15.90***)	(20.42***)	(15.28***)
Density (000's of people/m^2)	0.190	0.221	0.198
	(12.27***)	(13.94***)	(12.59***)
Regulatory Incentives for "Green" Projects:			
Electric Rates (cents per kwh)	0.182	-----	0.171

	(15.71***)		(13.40***)
Tax Credits	-----	-0.168	-0.127
		(-2.72***)	(-2.07**)
Grant Programs	-----	-0.733	-0.325
		(-10.53***)	(-4.46***)
Property Tax Incentives	-----	0.165	-0.158
		(2.35**)	(-2.10**)
Political Economy of Environmental Certification:			
"Green" Certified (yes=1)	-0.971	-1.068	-0.930
	(-2.19**)	(-2.24**)	(-1.99**)
Percent Democratic Vote	0.055	0.046	0.050
	(9.79***)	(7.70***)	(8.35***)
"Blue" County	0.110	0.277	0.193
	(1.45)	(3.45***)	(2.43**)
"Blue" County X "Green" Certified	1.620	1.705	1.594
	(2.72***)	(2.74***)	(2.61***)
Intercept	-3.926	0.592	-3.002
	(-4.53***)	(0.63)	(-3.27***)
Observations	20,172	20,172	20,172
F(k,N-k-1: k=17/17/18)	291.64	259.91	255.56
Prob>F	0.0000	0.0000	0.0000
R-Squared	0.2392	0.2308	0.2405