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Entry, Growth, and Survival in the Green Industry

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Abstract

Economists are interested in the factors that induce firm entry, lead to growth, and help firms succeed in various markets. Such information can be helpful to policymakers but, unfortunately, such patterns have not been considered for "green industries." This paper takes advantage of a recent definition of green industries proposed by the Bureau of Labor Statistics to investigate patterns characterizing these industries within the State of Texas. Leveraging the differences between the five sub-categories within the BLS definition, this study attempts to identify the comparative advantage each county has within the green economy.

JEL Classification: O44, Q56, R30.

Keywords: Green industry, Firm entry, Employment growth, Firm survival.

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INTRODUCTION

There is widespread agreement within the developed economies that reducing the negative environmental impacts from production and consumption activities will yield net social benefits. Although progress has been made, the political side of the equation has often been complicated where strong economic interests are involved. In the United States, for example, the lack of sufficiently broad and adequately funded political coalitions at the national level has limited U.S. participation in international efforts to control greenhouse gas emissions. Even the introduction of market-based methods, such as a market for carbon emission permits, has proven elusive at the national level. Given the political difficulties in the U.S.in implementing policies designed to promote sustainable activities, it is natural to ask if there are elements in the market economy that promote or favour green industrial activity in the absence of specific policy interventions. If so, policymakers might more easily exploit such elements to pursue development of green activities. This study considers this question in the context of small geographies within the State of Texas, a state that has demonstrated a commitment to minimal regulation and promotion of free market principles. The question is whether localized economic influences exist which favour the entry, growth, and survival of green industry firms. The approach to this investigation is through a comparative analysis of green and non-green firms.

Useful insights may be achieved from such a focus on localized explanations for growth in green activities. Fitzgerald (2010) argued that without comprehensive national policy incentivizing greener forms of economic development, it is often up to cities and regions to ensure sustainable growth. She pointed out that many cities are taking the initiative to promote sustainable development and attract “green collar”' jobs. For decades, regional scientists have noted that the mix of industries is a key determinant of a location's economic performance; e.g., Isard (1960). In a world in which the need for sustainable development is gaining momentum, it should not be surprising that local policymakers and planners are looking to promote the entry and growth of employment in such activities. For some, indirect approaches, such as fostering a local culture of innovation, may provide more attractive avenues to a sustainable future. Rennings (2000) suggests a path by which eco-innovations can lead to sustainable development.

Kahn (2006) claims that "Heavy manufacturing tends to be priced out of richer cities, giving way to relatively low-pollution industries, such as service and finance." If so, a policy focus on high-wage employment, rather than the nature of the employment activity, may lead to the same sustainable outcome. Grodach (2011) considered the motivations and perceptions of sustainable development in the Dallas—Fort Worth area, finding that "lack of coordinated regional planning" is a key barrier. On the other hand, Devereux et al. (2007) considered whether government subsidies (discretionary grants) affected where domestic and multinational firms located new plants. They found firms to be quite insensitive to government policies (consistent with much of the conclusion reached by those studying the pollution haven hypothesis) and more attracted to areas offering, for example, co-location benefits. This suggests that the intrinsic features of locations, whether exogenously fixed (such as resources) or endogenously determined (such as market structure and firm agglomeration), are more important. Thus, if the regulatory environment is not a factor, can it be that green industries are attracted to locations due to the popular environmental sensitivities of the locality? Some evidence for localized demand for environmental attributes was provided by Eichholtz et al. (2010) who found that buildings with green ratings (characterized by Leadership in Energy and Environmental Design (LEED) or Energy Star certification) garnered significantly higher commercial office rents.

This paper takes pages from traditional industrial organization (IO) and regional economic analyses. The IO approach is inspired by the work of Dunne et al. (1988, 1989).

The regional approach has emphasized the importance of agglomeration economies (including knowledge spillovers) to explain location choices of firms (Rosenthal and Strange (2003), Woodward et al. (2006)), firm exits (Staber (2001)), firm and industry growth (Glaeser et al. (1992), Henderson et al. (1995), Combes (2000), De Silva and McComb (2012b)), and labor productivity (Ciccone and Hall (1996)). The analysis includes agglomeration effects (within a county as well as in contiguous counties) and knowledge spillover effects (either through firm agglomeration effects or by university and junior college research funding) in our analysis.

One challenge that has precluded a thorough investigation of the green industry has been the lack of a clear definition of what exactly comprises this part of the economy. This study employs a definition proposed by the Green Jobs Initiative at the U.S. Bureau of Labor Statistics (BLS). In their classification scheme, green industries are identified at the six-digit level of the North American Industry Classification System (NAICS).[1] Note, since the BLS definition was proposed after the end of our period of analysis, there can be no endogeneity problems due to counties and municipalities attempting to attract the recently-defined green industries.

This analysis focuses exclusively on the State of Texas during the period 2000--2006 and employs Quarterly Census of Employment and Wages (QCEW) data. These data contain key establishment-level variables at a reasonable level of industry disaggregation. Although data limitations restrict the analysis to one state, the restriction is attractive in that environmental regulations are typically enacted at federal and state levels. As such, any differences in changes (observed or unobserved) to environmental regulations at the local level must result from regional demand.

Texas is a large and diverse economy and restricting the analysis to Texas is not, in fact, overly limiting. Indeed, as the second-largest state economy in the U.S., Texas ranked as the 15th largest economy in the world in a comparison of countries and states by gross domestic product, surpassing many notable national economies.[2] Texas contains 25 Metropolitan Statistical Areas (MSAs), of which four had populations in excess of one million in 2010. Texas is also a high growth state, having experienced a 20% increase in population over the period 2000-2010. Income levels are quite heterogeneous across the state's localities. These characteristics allow an investigation of the relationship between local variables and firm entry, growth and exit.

There have been recent initiatives at the state-level to recruit manufacturing firms to Texas, and to promote development of “high tech” industries directly by means of state development assistance to early stage commercialization and indirectly through assistance to the state universities. For the most part, these have occurred after the period of this analysis. In general, state legislators champion the notion of minimal government and regulation intended to alter market outcomes. Indeed, Texans often point to limited state government as a key attraction for firms looking for a place to relocate, expand, or start-up. There has been greater receptivity at the local level to municipal and regional government initiatives to attract economic development. Nevertheless, Texas serves as a relatively attractive laboratory to consider market influences on the growth of sustainable economic activity.

The conclusion of this study is that the green and other industries appear to respond to similar non-policy factors. In general, entry, growth, and exit patterns for green and non-green firms within a specific industry are often quite similar. Moreover, the results are fairly consistent when considering all counties in Texas compared to findings from an analysis restricted only to those counties belonging to MSAs. This suggests that rural counties do not have endowment-driven comparative advantages that are driving the results. Canonical regional science factors like agglomeration, population density, and income are important in explaining firm activity. In some instances, there is a separate effect for these factors when conditioning on green firms. For example, agglomeration effects are most important in explaining firm entry and employment growth. Although agglomeration effects are, for the most part, not fundamentally different in attracting green industries, they help green employment growth in some specific industries. Concerning survival, wages, size, and experience are most important to any firm for remaining in the industry. Green firms are occasionally more likely to exit compared to other firms, although this effect is sometimes weakened if the green firm has previous experience. In general though, the green and non-green constituents of a given sector are not all that different from each other. While these conclusions might be disappointing to some, they also suggest that there are no inherent disadvantages to green industry development at the local level.

DEFINING THE GREEN INDUSTRY

On July 15, 2009, in order to measure green jobs accurately, the BLS created a discussion draft for the Workforce Information Council. The main objective was "to produce objective and reliable information on the number of green jobs, how that number changes over time, and the characteristics of these jobs and the workers in them." In addition to partitioning the number of jobs by industry that are associated with green goods and services (GGS) production, the BLS was interested in estimating the occupational employment and wages for establishments identified as producing these GGS. In particular, green jobs are either

1. Jobs in businesses that produce goods or provide services that benefit the environment or conserve natural resources.

2. Jobs in which workers' duties involve making their establishment's production processes more environmentally friendly or use fewer natural resources.

The BLS identified 333 six-digit industries from the 2007 NAICS as green. This study employs the final definition that was announced in volume 75, number 182 of the Federal Register Notice.[3] For each of these industries, the BLS provided examples suggesting why the industry was included. Each individual six-digit NAICS code is reviewed to see if that industry fits with the definition of green industry or other (non-green) industry. For example in the construction industry, the BLS identifies residential building contractors as green goods producers, but highway, street, and bridge construction is not. The rationale provided is that, for the former, these builders install energy efficient materials when building. Note that, in reality, not all of these residential builders' output is green. Our data are unable to identify an establishment's relative green output as Hootendoorn et. al. (2014), but assuming compliance with statutory building requirements, these firms produce sufficient green products to be categorized as part of the green industry.

DATA

The data for this study come from two primary sources. First, firm-level data for the State of Texas are gotten from the QCEW. The data track monthly employment and quarterly total wages reported by every establishment in the state as required under the Texas unemployment insurance program. Each record includes the specific location (address) of the establishment, the business liability start-up date, and the relevant six-digit NAICS code. Separate establishments (branches) of the same firm are distinguished and reported in unique records. This panel data set is comprised of observations from the first quarter of 2000 (2000Q1) through the fourth quarter of 2006 (2006Q4). Each record also includes each establishment's unique Employer Identification Number (EIN). Therefore, the appearance of a new EIN is used to define market entry and the disappearance of an EIN is treated as an exit.[4]

Since the BLS definition concerned 2007 NAICS codes but the QCEW data involve 2002 NAICS codes, the green categories are identified in the 2002 NAICS classification by employing concordances provided by the U.S. Census Bureau.[5] Details are provided in the Appendix which also includes a table describing the variables used in the analysis. Thus, the data are consistent in terms of industry definitions and establishments' assignments to industry categories for the entire period. As noted, the industry definitions to which individual establishments or particular activities are assigned pre-date the introduction of the BLS definition of the green industries in 2009. Lastly, given the sharp downturn in macroeconomic activity that occurred at the end of 2008, and the concomitant impact on the broader Texas economy that resulted, an analysis of localized variables' effects on establishment entry and performance in the post-2008 period could be complicated by these broader influences. Inasmuch as there does not appear to have been any substantive changes to the policy landscape at the state-level in Texas since 2007 that would broadly affect establishment entry and performance of either green or brown industry firms, the period under consideration appears to be a good choice from these other perspectives.

Table 1 contains a comparison of the firm (establishment) and employment distributions across the two-digit 2002 NAICS sectors conditional on being classified as a part of the brown or green industries. The numbers in the table correspond to the percent of green and other firms, respectively, or the share of green and other employment, averaged over the sample periods, that is attributed to each of the sectors listed—as such, the columns sum to 100%. In total, 23.32% of Texas firms are part of the green industry representing 18.01% of total employment. Agricultural firms account for a much larger share of the green industry due to the production of services, perhaps related to organic produce and meat. However, as a share of green employment, the sector is far less substantial. A third of green firms are considered part of the construction sector, while a quarter of green employees are construction-related.

[Table 1 here]

The high share of green employment in construction appears primarily due to LEED policies and Energy Star certification. For example, many six-digit 2002 NAICS sectors produce or install LEED-eligible materials or concern installation of efficient environmental control systems. Likewise, the high share of firms and employment in the professional, scientific, and technical services is due to land surveying, architectural services, and energy or resource-efficient design services, often relating to LEED. Although the shares of green and brown firms in the manufacturing and educational services sectors are comparable, the shares of green employment in these sectors far outranks that of brown employment, suggesting these green firms are larger than their brown counterparts within these two-digit sectors, at least on average. Educational services at the six-digit codes defined as "junior Colleges" and "colleges and Universities" are both considered part of the green industry since they provide training for green jobs.[6]

Figure 1 is a map depicting the average green intensity for each county—a relative measure computed as the number of green firms in a county over the number of other firms in a county. For reference, the 25 MSAs (using the largest city) are labelled, as identified by the U.S. Census Bureau based on population. Surprisingly, some counties have more green firms than brown firms, as indicated by a green intensity greater than one. A map considering an employment-based measure of the green intensity has the same qualitative features.

[Figure 1 here]

Accounting for agglomeration effects will be important in this analysis. The number of firms is the count from the previous period, essentially the number of incumbents, within the "own-county" and neighbouring counties, used to construct agglomeration variables. The neighbouring aggregates help capture spillover effects between contiguous counties. To account for other factors that might be important in explaining firm entry, employment growth, or firm survival, the QCEW data are complemented with data from other sources. Specifically, county-level data, such as population density, were collected from the U.S. Census Bureau's Annual Population Estimates. The average quarterly county income is calculated by taking the average wages paid in the county for all establishments reported in the QCEW data. Income seems not only to be a natural attractor of firm investment, but may be particularly important for green investment and/or employment: if demand for green goods is income elastic, then higher incomes would induce a proportionally greater increase in demand for green goods and services. The empirical models specified below allow for income to have a different influence on the green industry compared with the non-green industry.

In addition to the agglomeration and income effects, this study also investigates whether the presence (and size) of a research centre affects the green industry. Having research universities provides access to expert consultants and allows for specialized funding sources which may play a significant role in attracting green industries. For example, Abramovsky et al. (2007) found evidence that business-sector research and development activity is often located near university research departments. In order to capture such effects, the local presence of a four year university, junior college, or a research institution is included. Data on annual university research and development (R&D) expenditures were obtained from the National Science Foundation.

Yearly median undeveloped land price is employed to account for factor costs, as in Bresnahan and Reiss (1991). These values are collected for each of 33 land market regions (composed of aggregations of counties) in Texas by the Texas A&M Real Estate Center. Since ths variable does not change across quarters and is common to groups of counties, the county-specific property tax rate is also included. Lastly, as Woodward et al. (2006) suggested, cultural and natural amenities are important to industrial attraction and skilled workforce retention. To capture this effect, as in De Silva and McComb (2012a), the share of county employment in local cultural and recreational amenities is used as a measure of the locality's urban amenities. While natural amenities may be valued, urban amenities are both more immediate and relevant to day-to-day life for full-time employed individuals. These activities also reflect the scope of the locality's amenities for business travellers as well as informal business and social interaction.

All QCEW variables are observed across the 28 quarters constituting the data sample for each of Texas' 254 counties. Entry, exit, and employment variables are aggregated based on the green industry definition (and our green-other partition), yielding 14,224 (=28×254×2) observations, two per county in each quarter for our industry analysis.

EMPIRICAL MODELS & ESTIMATION

This section describes the formal econometric models and estimates that are used to help understand the relationship between regional variables and the green (or non-green) industries. In the spirit of Dunne et al. (1988, 1989), the interest is in firm entry, employment growth, and survival. This section of the paper is further sub-divided into three subsections corresponding to each of these topics.[7]

Entry

Firm entry helps promote competition and improve efficiency. An immediate impact of new firms on a local economy is that they allow for job creation. This section describes the inquiry into the factors that are correlated with new firm entry with particular emphasis on whether the effects of these factors differ between the green and non-green sectors.

To the greatest possible extent, a canonical set of explanatory variables that has appeared in the IO and regional economics literatures is used. There has been interest in both fields in spatial effects, expressed through agglomeration economies that attract firms and exhibit a self-reinforcing tendency toward industrial growth. Agglomeration effects are captured by computing the number of firms already in an industry within a given county at a given time. Agglomeration can be particularly important in location decisions when proximity to market is not a dominant factor. Thus, where localization leads to pooling of labor, facilitation of communication among suppliers, access to intermediate inputs, and technological spillovers, an existing industry concentration increases the attractiveness of a locality for an establishment surveying areas in which to locate. Any clustering of green industries may also be the result of a deeper regional environmental consciousness insofar as it reflects social receptivity and interest in green activities. While it is not possible to account explicitly for local attitudes toward "going green" given our data, county fixed effects are used to help capture unobserved, county-specific effects that were constant throughout the data period. Similarly, quarter-specific fixed effects are used to capture the possibility that these attitudes (or other factors, such as the overall health of the U.S. and Texas economies) are changing over time in all counties Note also that since all models are estimated by NAICS industry, the estimations also implicitly include industry effects as well.

To consider factors that affect entry (firm investment), counts of the number of firms within each industry (or subcategory) that entered each county in a given quarter are included within a Poisson specification. For the Poisson case, Gourieroux et al. (1984) showed that a consistent and asymptotically normal estimator can be obtained without specifying the probability density function of disturbances. Wooldridge (1999) showed that the fixed effects Poisson estimator is consistent and asymptotically normal as long as

$$\mathrm{E}\left(y_{i_g jt}\middle|\alpha_j, x_{i_g jt}; \beta\right) = \alpha_j \exp(x'_{i_g jt}\beta)$$

where, in our case, $y_{i_g jt}$ represents the number of entering green or other firms in industry i_g, in county *j*, at time *t*, and α_j is fixed effect for county *j*. Furthermore, Wooldridge derived a robust covariance matrix for the Poisson quasi-maximum likelihood (QML) estimator with conditional fixed effects. Thus, given an interest in the effects of the explanatory variables on the mean response, a Poisson model is estimated by QML. While the estimated coefficients obtained from Poisson QML estimation are identical to Poisson regressions with fixed effects, the standard errors are adjusted for overdispersion.[8]

Tables 2—3 report results from 16 models estimated via Poisson QML in which robust standard errors are reported. These models are intended to uncover any differences in the entry behavior between green and non-green firms within an industry. All models include, as conditioning variables, measures of county income, agglomeration within a county (computed as the number of like firms already present in the county of a certain type—green or other by industry), agglomeration in neighbouring (contiguous) counties, university and junior college funding for each county, the county unemployment rate, the population density of the county, the property tax rate of the county, the undeveloped land price for the market region to which the county belongs, as well as county and time fixed effects to account for county-level and time-specific unobserved heterogeneity.[9]

[Tables 2—3 about here]

The most consistent results concern agglomeration being an important factor in explaining firm entry—the more like firms, the more likely firms are to enter the area.

This is consistent with List (2001) (as well as others cited in our introduction) who found that agglomeration is a factor in driving firm entry. However, one can see that in most sectors, agglomeration does not encourage green entry any differently when compared to non-green industry entrants. The exceptions to this are the agriculture and utilities sectors, for which green firms are less likely to locate in areas with a high number of existing green firms. This is somewhat expected. Consider a county with high quality wind power resources. Once wind generating farms are developed in areas best suited for wind power generation, potential entry is reduced as the key resource, accessible windy terrain, is in fixed supply. The same goes for a gas or coal electricity generating plant that, at efficient scale, meets the county demand. On the other hand, being green seems to amplify the agglomeration effects for the manufacturing and finance industries. There is no evidence of knowledge spillovers (beyond that captured by the agglomeration variables) in attracting new firms nor consistent support of other variables such as unemployment rate and undeveloped land prices.

However, population density is another key factor in explaining firm entry as demand will of course increase with population.

Although income shows a primarily significant effect on entry overall, its effect is quite mixed, depending on the sector that is interacted with the green industry dummy. For example, the manufacturing and information sectors are more likely to see green entrants for higher incomes. In contrast, green waste management and remediation service establishments are highly likely to enter low income areas. These establishments may provide hazardous waste removal services and therefore choose to locate near firms that produce such discharge. A recent paper by De Silva et al. (2016) shows that polluting firms in Texas, as identified by the EPA, locate in low-income, high-minority population areas. Therefore, one should see a similar pattern with these waste management and remediation service establishments. The results in this paper suggest that these remediation establishments are indeed more likely to locate in low-income areas compared to high-income areas.

The Poisson QML models are re-estimated as a robustness check the using the ordered probit technique. Here the dependent variable takes values 0, 1, 2, and 3, when a specific industry for a given county at time t observes no entrants, one entrant, two entrants, and three or more entrants respectively. Qualitative results are quite similar to what is observed in the Poisson models. As mentioned earlier, all models are estimated for the MSA counties only. The models were also estimated using on only the green establishments and only the non-green establishments (which have the advantage of essentially interacting the green dummy variable with each of the covariates). This would be analogous to the approach taken by List and Co (2000). Any of these results are available from the corresponding author upon request.

Employment Growth

To evaluate whether there are differences in the growth of the green and other industries, a simple regression model is utilised to try and explain the percentage change in industry employment of the counties. Specifically, in comparing the green and other industries within a two-digit NAICS code, the estimation uses a fixed effects model with *AR*(1) disturbances, introduced by Baltagi and Wu (1999), which can be stated as follows:

$$\log\left(E_{i_g jt} + 1\right) = x'_{i_g jt}\beta + \alpha_{i_g} + \gamma_j + \theta_t + \varepsilon_{i_g jt}$$

$$\varepsilon_{i_g jt} = \rho\varepsilon_{i_g jt} - 1 + \eta_{i_g jt}$$

where $|\rho| < 1$ and $\varepsilon_{i_g jt}$ is independent and identically distributed with mean zero and variance σ_n^2. The industry-specific (green and other) fixed effects parameter is α_{i_g}. The parameters γ_j and θ_t account for county and time specific unobserved heterogeneity. In The term $E_{i_g jt}$ denotes total employment in industry i_g, in county j, during period t. As controls, include the same set of variables used to estimate the entry models described in the previous subsection.

Given space constraints, the results from estimation of these regression models are presented in the appendix. Because the full and restricted (MSA-only) sample results are at least qualitatively similar, the results are interpreted in a way that applies to both samples. In general, agglomeration effects are always positive and significant; being green amplifies this except in the agriculture and information sectors. Likewise, income almost always has a positive effect on employment growth; its effect is often negative when interacted with the green dummy and in several cases this effect offsets the overall income effect. The two effects go in the same direction for the agriculture and information sectors. Being populous spurs growth in a statistically significant way in all but the agriculture sector. Aside from these primary results, other variables are occasionally significant but the sign and magnitude of the effects varies across industries. Alternative formulations were considered, including models with the logarithm of industry (subcategory) employment as the dependent variable and the logarithm of total (green industry) employment as an explanatory variable (the assumption being that green or other employment differ from the trend in total employment). Other models that tried to explain variation in the share of industry employment in the green and other industries were also estimated, and had qualitatively similar estimation results. However, the interpretation of the coefficients differs and is more complicated given the interest in employment growth and not changes in the composition of employment which may "improve" even though employment is decreasing. These results are available from the corresponding author upon request.

Firm Survival

Lastly, the probability of exit by green and other establishments is estimated using simple probit models. Only establishments that entered since 2000:Q1 are included. This allows an examination of the full life-cycle of plants. This approach eliminates any concerns about left censoring, and possible selection biases arising from it. Right censoring is accounted for in the estimation procedure. Note that this is now an establishment-level analysis.

There are 33,494 green construction establishments that entered since 2000:Q1. Out of these firms, 14,486 exit during our sample period. There are 8,197 firms that had past experience in the same industry. An entrant firm seems quite small at start-up, averaging only about nine employees at the initial stage. These establishments tend to stay in the market for about 20 months. Average initial wage per quarter is about $8,810. Similar patterns can be observed for other industries as well. Considering industries, green entrants are higher for agriculture, utilities, construction, manufacturing, and management.

Exit results are reported in the appendix and the covariates are the same as those included in our earlier econometric models. The main interest is in the coefficient of the green firms. It indicates that green agricultural, construction, waste management, and other sector plants tend to have higher exit probabilities compared to non-green firms in the same industry. However, green finance and arts sector establishments have lower probability of exit compared to non-green firms in same two digit NAICS codes. Flexibility of the probit model allows the researcher to add time effects and age as covariates. In general, establishments with higher wage rates, larger firms, and older firms have lower exit rates. These results are in line with the existing literature (see for example Dunne et al. (2005)). Beyond these effects, no clear picture emerges across all industries concerning the other variables.

CONCLUSION

Taking as given the BLS definition of the green industries, this analysis compares features of these industries to that of all other industries over a consistent period. In general, there is little evidence that localized factors that encourage entry, growth, or exit are inherently different for green and non-green firms within two digit NAICS codes. Indeed, localized agglomeration within a county seems to be the primary factor in attracting and growing firms of all types. Of particular note is the absence of regional income as a significant, positive explanatory variable when interacted with the green indicator variable. This result stands in contrast to any assertion that demand for environmental quality and/or sustainability is income elastic. Economists have also provided evidence of an environmental Kuznets curve (EKC) that depicts an inverted U-shaped relationship between various pollution measures and levels of economic activity; e.g., Grossman and Krueger (1995). In the spirit of the empirical research on the EKC, alternative empirical models in which income enters as a polynomial were estimated. But no significant differences were found from what is herein already reported, suggesting that local income effects are not essential in the development of localized green activities.

Texas represents an attractive opportunity to isolate market effects on green industry entry, growth and exit. This investigation of localization and market factors that affect the green industries suggests that there are no inherent reasons, beyond regional agglomeration, to expect an expansion in green activities without specific non-market policy interventions. While this analysis cannot speak to the efficacy of various policies designed to attract green firms as, for example, Palmer and Burtraw's (2005) comparison of policies aimed at increasing the contribution of renewables to the total U.S. electricity supply, it might be concluded that reliance on steadily increasing household incomes and follow-on market effects will not likely produce satisfactory results for areas that are looking to expand the share of sustainable economic activities at the local or regional level.

These results should give pause to advocates of a strictly market approach to growing a green economy. Clearly, the basic mechanics of localized markets, in the absence of specific policy interventions, are similar across the developed world. While cultural attitudes and institutional environments differ, unregulated market responses are probably quite similar across localities. Thus, local policy makers, in the absence of state or national policy interventions, will need to pursue localized policy options to achieve objectives in the expansion and share of green activities in local and regional economies. This analysis can be conducted at any level of geographic/spatial aggregation, or in any country, as long as appropriate data are available. However, some degree of acuity is lost as the level of spatial aggregation increases.

One could leverage variation in policies across states (in either a subnational, or international evaluation, given most environmental policies are set at the federal level) or across countries to consider the costs and benefits of policies aimed at encouraging sustainable development. Such policy-specific research would provide a valuable contribution in complementing our analysis. Given the finding that green and other industries do not respond in markedly different ways to non-policy factors, there may be an especially key role for policymakers in areas wanting to stimulate green investment and growth.

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NOTES

1. See http://www.bls.gov/green/

2. GDP for countries were obtained from The World Factbook produced by the CIA while GDP for states came from the BEA.

3. http://www.bls.gov/green/final_green_def 8242010_pub.pdf or the official industry list.

4. Following Dunne et al. (2005), some EINs appear in a given quarter but are associated with previous EINs which we do not treat as new. The change in EIN may have occurred because the establishment changed hands, a partnership was broken, or for any number of reasons. In our firm survival analysis, we control for these “firms with past experience.”

5. See http://www.census.gov/eos/www/naics/concordances/concordances.html.

6. Unfortunately while the BLS justified their classifications of which sectors belonged in the green industry, no rationale was provided for why some sectors were not part of the green industry. We assume no special insight concerning the classification of the green and other industries and take the BLS definition as given. In the Appendix, we provide two tables with additional summary statistics of interest: one characterizing the distribution of firms and employees by green and other sectors and the other showing the average number of entrants and incumbents over these partitions and within various two-digit NAICS codes.

7. Readers may wonder whether our findings in going forward are inherently different for MSA counties than for the State of Texas as a whole. We will gladly provide estimates of models using a restricted sample involving only counties that are in a Texas MSA upon request. This restriction is motivated by the clear observation that most entry occurred around population centers. The results are not qualitatively different.

8. Simcoe (2007) provided an implementation of the Poisson QML model with conditional fixed effects suggested by Wooldridge (1999).

9. In explaining entry, all right-hand side variables were lagged by a quarter to reflect the county environment at the time each new firm considered entering. The first table in the Appendix describes how each variable was constructed.

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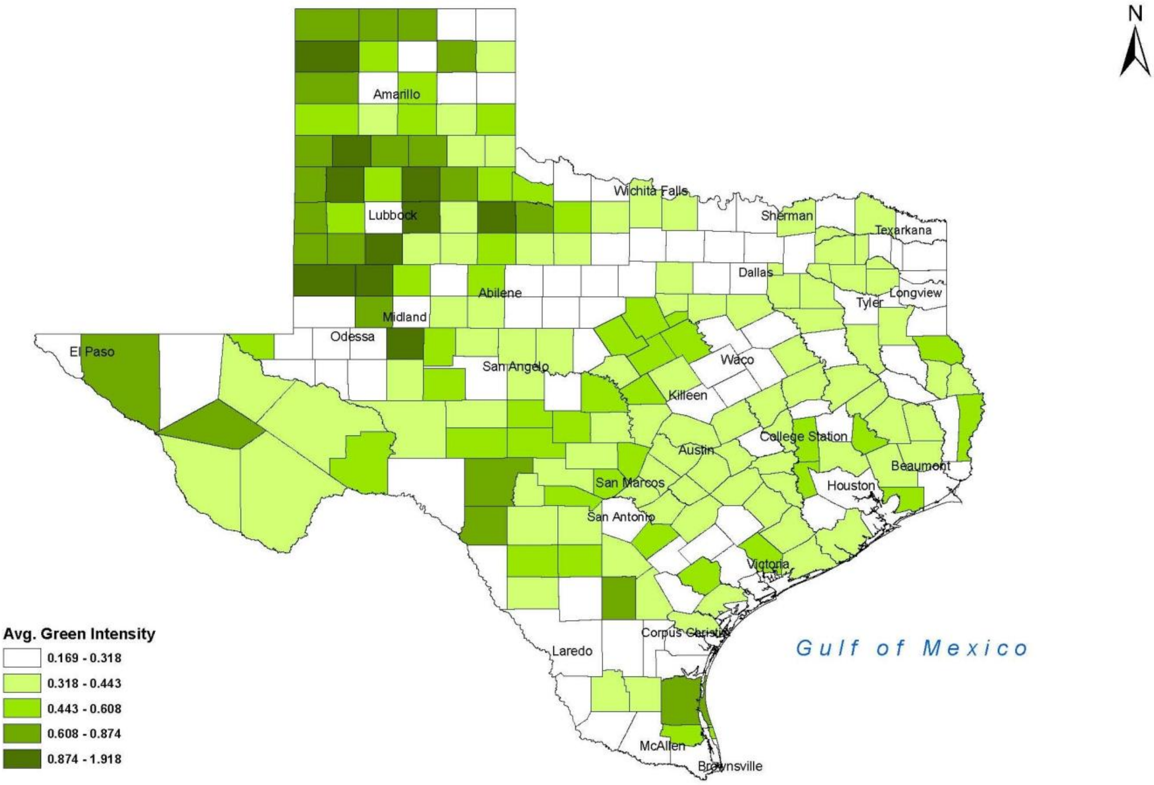

Figure 1: Average distribution of green firm intensity

Table 1: Distribution of Green and Other Industry Activity across Sectors

NAICS - 2 Title	Establishments		Employment	
	Other	Green	Other	Green
Agriculture	0.19	7.47	0.07	2.68
Mining	1.74	–	2.25	–
Utilities	0.18	1.70	0.31	3.51
Construction	0.48	33.82	0.96	24.99
Manufacturing	4.86	5.13	8.23	19.37
Wholesale	9.33	0.44	5.77	0.39
Retail	17.87	1.05	15.76	0.48
Transportation	3.95	0.36	5.51	1.55
Information	1.43	3.39	2.50	5.36
Finance	7.97	0.19	5.75	0.07
Real Estate	5.90	–	2.23	–
Scientific	5.03	27.03	1.96	15.50
Management	0.13	0.73	0.06	1.65
Waste Management	4.87	4.35	8.09	3.25
Education	1.12	1.05	6.71	14.18
Health Care	12.41	–	13.51	–
Arts & Ent.	1.28	0.40	1.01	1.04
Accommodation	9.61	–	10.36	–
Other	9.98	10.32	2.31	3.43
Public Admin.	1.65	2.57	6.65	2.58

Table 2: Poisson QML Estimation Results Concerning the Number of Entrants

Variable	Number of entrants$_{i_g,j,t}$							
	Agriculture	Utilities	Construction	Manufac	Wholesale	Retail	Transport	Information
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Green industry	5.490**	2.281	-0.515	-4.419**	6.282*	-0.708	-3.507	-6.919***
	(2.458)	(3.837)	(1.832)	(1.943)	(3.732)	(2.034)	(6.703)	(2.047)
Log (income)$_{j,t-1}$	0.790	1.341	0.977***	2.015***	2.430***	-0.162	0.822*	1.180*
	(0.536)	(1.809)	(0.351)	(0.605)	(0.373)	(0.322)	(0.434)	(0.624)
Log (income)$_{j,t-1}$	-0.393	-0.150	0.231	0.387*	-1.019**	-0.235	-0.015	0.774***
× Green industry	(0.279)	(0.461)	(0.223)	(0.229)	(0.442)	(0.248)	(0.739)	(0.240)
Log (agglomeration)$_{i_g,j,t-1}$	1.229***	0.426	0.637***	0.163	0.604***	0.031	-0.179	0.092
	(0.202)	(0.264)	(0.145)	(0.100)	(0.093)	(0.117)	(0.217)	(0.121)
Log (agglomeration)$_{i_g,j,t-1}$	-1.181***	-0.384*	-0.066	0.157***	0.138*	-0.062	0.006	-0.093
× Green industry	(0.187)	(0.221)	(0.091)	(0.050)	(0.082)	(0.072)	(0.087)	(0.066)
Log (agglomeration in neighbors)$_{i_g,j,t-1}$	-0.357**	-0.134	-0.029	-0.054	-0.003	0.153*	0.203**	-0.101
	(0.165)	(0.253)	(0.126)	(0.055)	(0.068)	(0.084)	(0.100)	(0.095)
Log (agglomeration in neighbors)$_{i_g,j,t-1}$	0.556***	0.061	0.078	-0.107**	0.036	-0.027	-0.020	-0.055
× Green industry	(0.134)	(0.196)	(0.072)	(0.043)	(0.071)	(0.058)	(0.091)	(0.057)
Log (college funds)$_{j,t-1}$	-0.012	-0.083*	-0.001	-0.013	0.004	0.008	-0.002	-0.008
	(0.015)	(0.045)	(0.004)	(0.010)	(0.005)	(0.010)	(0.006)	(0.010)
Log (junior college funds)$_{j,t-1}$	-0.002	0.004	-0.002	0.000	-0.004*	-0.003	0.002	0.001
	(0.009)	(0.014)	(0.002)	(0.004)	(0.002)	(0.003)	(0.004)	(0.005)
Log (population density)$_{j,t-1}$	1.225***	1.454**	0.704***	1.615***	0.498***	1.142***	1.641***	2.832***
	(0.238)	(0.735)	(0.158)	(0.248)	(0.053)	(0.181)	(0.209)	(0.382)
Unemployment rate$_{j,t-1}$	-0.012	0.173*	0.014	0.011	0.083***	-0.012	0.065***	0.014
	(0.037)	(0.095)	(0.018)	(0.040)	(0.024)	(0.021)	(0.023)	(0.047)
Property tax rate$_{j,t-1}$	0.331	-2.514*	-0.005	-1.159*	-0.295	-0.112	-0.377	0.372
	(0.440)	(1.432)	(0.296)	(0.659)	(0.376)	(0.311)	(0.419)	(0.863)
Log (undeveloped land price)$_{j,t-1}$	0.183	0.430	-0.110	0.069	-0.095	0.297***	-0.210**	0.033
	(0.172)	(0.445)	(0.086)	(0.151)	(0.092)	(0.080)	(0.092)	(0.182)
Amenities employment ratio$_{j,t-1}$	1.840	-4.449	-0.486	2.737	4.321***	0.241	-1.650	6.174*
	(1.908)	(5.322)	(1.223)	(2.669)	(1.594)	(1.313)	(2.069)	(3.589)
County effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of obs.	14,224	14,224	14,224	14,224	14,224	14,224	14,224	14,224
R^2	0.469	0.463	0.979	0.899	0.983	0.976	0.944	0.869

*** Denotes statistical significance at the 1 percent level, ** denotes statistical significance at the 5 percent level and * denotes statistical significance at the 10 percent level. Robust standard errors are in parentheses.

Table 3: Poisson QML Estimation Results Concerning the Number of Entrants (cont.)

Variable	Number of entrants$_{i_g,j,t}$							
	Finance	Scientific	Management	Waste	Education	Arts	Other	Public Admin
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Green industry	5.763	0.177	10.697**	8.036***	7.845**	15.987***	3.111***	-1.165
	(4.722)	(0.831)	(5.194)	(1.159)	(3.929)	(4.823)	(1.184)	(3.140)
Log (income)$_{j,t-1}$	0.063	0.650*	5.479**	1.145***	2.576***	1.032	0.114	0.803
	(0.464)	(0.332)	(2.496)	(0.429)	(0.879)	(0.766)	(0.302)	(0.897)
Log (income)$_{j,t-1}$	-1.392**	-0.009	-1.132*	-1.007***	-0.851*	-2.237***	-0.468***	0.028
× Green industry	(0.578)	(0.098)	(0.600)	(0.139)	(0.493)	(0.575)	(0.142)	(0.386)
Log (agglomeration)$_{i_g,j,t-1}$	0.011	0.378***	0.161	0.455***	0.595***	-0.039	0.225**	-0.518
	(0.162)	(0.110)	(0.326)	(0.087)	(0.213)	(0.164)	(0.095)	(0.347)
Log (agglomeration)$_{i_g,j,t-1}$	-0.049	0.013	0.170	-0.058	0.033	-0.113	0.018	-0.204
× Green industry	(0.232)	(0.029)	(0.269)	(0.040)	(0.209)	(0.224)	(0.025)	(0.177)
Log (agglomeration in neighbors)$_{i_g,j,t-1}$	-0.116	0.038	0.066	-0.141**	-0.097	-0.178	-0.011	0.049
	(0.131)	(0.082)	(0.285)	(0.068)	(0.312)	(0.123)	(0.087)	(0.308)
Log (agglomeration in neighbors)$_{i_g,j,t-1}$	0.446***	0.002	-0.111	0.025	-0.163	0.065	-0.047**	0.036
× Green industry	(0.173)	(0.026)	(0.224)	(0.031)	(0.224)	(0.178)	(0.022)	(0.132)
Log (college funds)$_{j,t-1}$	0.001	0.003	0.063	0.016***	-0.056	0.001	-0.006	-0.010
	(0.005)	(0.005)	(0.070)	(0.005)	(0.041)	(0.011)	(0.004)	(0.028)
Log (junior college funds)$_{j,t-1}$	0.000	-0.001	0.002	-0.003	-0.002	-0.001	0.002	0.001
	(0.003)	(0.002)	(0.014)	(0.003)	(0.009)	(0.005)	(0.002)	(0.015)
Log (population density)$_{j,t-1}$	3.007***	1.049***	1.041***	1.467***	1.484***	3.641***	1.344***	1.360***
	(0.363)	(0.126)	(0.236)	(0.159)	(0.502)	(0.482)	(0.241)	(0.474)
Unemployment rate$_{j,t-1}$	0.036	0.009	-0.093	0.012	-0.015	0.023	0.038**	0.146**
	(0.032)	(0.020)	(0.237)	(0.024)	(0.066)	(0.046)	(0.019)	(0.070)
Property tax rate$_{j,t-1}$	-0.354	0.006	1.659	-0.209	-1.040	2.046***	-0.109	-0.556
	(0.672)	(0.345)	(2.146)	(0.380)	(1.024)	(0.765)	(0.315)	(0.926)
Log (undeveloped land price)$_{j,t-1}$	-0.079	0.022	0.173	-0.025	-0.044	0.407**	-0.034	-0.146
	(0.096)	(0.076)	(0.442)	(0.092)	(0.214)	(0.193)	(0.076)	(0.365)
Amenities employment ratio$_{j,t-1}$	-0.019	0.546	-6.443	-2.087	7.574	9.023***	1.181	5.242
	(2.108)	(1.407)	(11.320)	(1.785)	(7.637)	(2.518)	(1.263)	(3.248)
County effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of obs.	14,224	14,224	14,224	14,224	14,224	14,224	14,224	14,224
R^2	0.976	0.978	0.372	0.975	0.642	0.885	0.980	0.154

*** Denotes statistical significance at the 1 percent level, ** denotes statistical significance at the 5 percent level and * denotes statistical significance at the 10 percent level. Robust standard errors are in parentheses.

A Appendix

As we discussed in describing the data we used in our research, one difficulty we faced concerned the mapping between the 2002 NAICS codes which characterize the QCEW data and the 2007 NAICS codes which were used by the BLS to define the green categories. To identify the green categories in the 2002 NAICS classification we used the concordances provided by the U.S. Census Bureau—see footnote 10. We were forced to drop seven 2002 NAICS industries which appear to be extinct—none of the industries had any new firms enter over our sample period and are not listed in the concordances.[1] In situations where one 2002 NAICS code corresponded with multiple 2007 NAICS codes, we specified the industry as green if and only if all 2007 NAICS codes were defined to be green. In this sense our definition of the green industry is slightly more conservative than the definition intended by the BLS. Specifically, because of this reason we were forced to drop eleven 2002 NAICS codes due to conflicts in the way the corresponding 2007 NAICS codes were classified—at least one 2007 NAICS code was defined as green while at least one other code was considered non-green.[2] A related issue concerned defining which 2002 NAICS sectors comprised the green category variables. For instances in which a 2002 NAICS code mapped to multiple 2007 NAICS codes, we assigned the set of all the 2007 NAICS subcategories to the 2002 NAICS code. For example, 2002 NAICS code 235710 is associated with 2007 NAICS codes 238991, 238992, 238111, and 238112, which are all considered green industries under the BLS definition.

In table A.1, we describe the covariates used in the models we considered.

[1]Specifically, we dropped the 2002 NAICS codes 239891, 502362, 505221, 505411, 505413, 508141, and 513330.

[2]For this reason, we had to drop 2002 NAICS codes 234120, 234910, 234930, 235210, 315211, 315212, 326291, 326299, 339111, 421930, and 514199.

Table A.1: Conditioning Variables

Variable	Description
BLS Green	An indicator variable corresponding to whether the observation relates to the green (= 1) or brown (= 0) industry.
Income	Average wages per quarter paid in the county for all establishments as reported in QCEW data.
Agglomeration	The number of like firms already present in the county of a certain type (i.e., green, other by industry.)
Agglomeration in neighbors	Analogous to agglomeration, but considers like firms in all contingent counties for a given (base) county.
College funds	University and research center R&D expenditures reported by the NSF. The annual NSF data actually span two calendar years. To convert these annual R&D expenditures into quarterly data, we used a fourth of a given year's total for Q1-Q3 (each), and a fourth of the given year's total for Q4 of the previous calendar year (as the federal fiscal year begins in October). Although the NSF provides research funding by institution and is identified by granting agency (i.e., DoE, EPA, DoD, etc.) we aggregated total federal awards by geographically distinct institutions (i.e., system campuses are scored separately) to compute a measure of R&D at the county level.
Junior college funds	The same as college funds, but R&D expenditures by junior colleges within a county for a given quarter.
Unemployment rate	The county-specific, seasonally unadjusted, end-of-quarter unemployment rate.
Population density	County-estimated annual population density from U.S. Census.
Property tax rate	Annual county property tax rate.
Undeveloped land price	The yearly, median undeveloped land price in each of 33 land market regions in Texas for the counties comprising the region, as reported by the Texas A&M Real Estate Center.
Amenities employment ratio	The share of county employment in NAICS 71, (arts, entertainment, and recreation), NAICS 721110 (hotels and motels), 722110 (full service restaurants), and 722410 (drinking places, alcoholic beverages) as reported in the QCEW data. The NAICS 72 activities also reect the scope of the locality's amenities for business travelers as well as informal business and social interaction.
Age	The number of months that have passed since the firm's start date.
New firm	Firms that are three years old or younger (have an age of no more than 36 months).
Firms with past experience	Firms that have a prior existing EIN and were later reassigned; for example, if the establishment changed hands or if a partnership was broken up. We do not observe the reason for the change.
Wage	Establishment-level quarterly average wage which was calculated by dividing the quarterly wage bill for the establishment by its average number of employees for that quarter.
Employment ratio	The firm's current employment as a share of total industry (or subcategory) employment within a county for a given quarter.

Table A.2: Green vs. Other Industry Summary Statistics

Category	Green		Other	
	Per County Average Number of		Per County Average Number of	
	Entrants	Incumbents	Entrants	Incumbents
Agriculture	0.528	31.980	0.064	2.701
	(1.032)	(38.067)	(0.375)	(6.313)
Utilities	0.067	7.334	0.052	2.571
	(0.355)	(12.349)	(0.429)	(7.859)
Construction	4.404	142.697	0.124	6.804
	(16.294)	(507.052)	(0.508)	(13.921)
Manufacturing	0.223	11.601	0.610	37.640
	(1.199)	(54.776)	(2.793)	(169.499)
Wholesale	0.028	1.883	3.166	130.274
	(0.212)	(8.267)	(16.049)	(636.624)
Retail	0.119	4.437	5.611	250.058
	(0.578)	(17.344)	(24.041)	(888.648)
Transportation	0.036	1.545	1.622	54.835
	(0.299)	(5.377)	(6.081)	(190.453)
Information	0.315	14.441	0.675	19.800
	(1.678)	(62.612)	(3.823)	(88.176)
Finance	0.031	0.802	3.355	110.637
	(0.307)	(4.355)	(16.512)	(460.856)
Scientific	3.642	113.948	2.418	69.598
	(19.617)	(597.242)	(12.698)	(325.494)
Management	0.098	3.060	0.048	1.879
	(1.205)	(14.809)	(0.363)	(11.367)
Waste Management	0.570	18.334	2.541	67.134
	(2.278)	(69.362)	(13.181)	(333.658)
Education	0.153	4.429	0.400	15.613
	(1.346)	(16.104)	(1.953)	(54.642)
Arts & Ent.	0.020	1.705	0.555	17.772
	(0.152)	(4.476)	(2.275)	(64.523)
Other	0.887	43.984	4.119	138.730
	(3.751)	(161.433)	(20.014)	(631.330)
Public Admin.	0.077	11.121	0.205	23.348
	(0.296)	(10.036)	(0.862)	(26.767)

Standard deviations are in parentheses.

Table A.3: Distribution of Firms and Employees by Green and Other Sectors

NAICS - 2 Title	Number of Establishments		Average Employment		Average Wage	
	Green	Other	Green	Other	Green	Other
Agriculture	11,600	1,229	7.686	10.093	5,279.129	5,495.398
			(30.720)	(18.481)	(26,388.030)	(11,914.870)
Utilities	2,115	1,052	41.912	53.554	9,737.709	18,506.350
			(225.638)	(163.736)	(31,103.440)	(41,966.710)
Construction	62,584	2,420	15.984	62.646	8,647.338	8,666.346
			(82.549)	(394.417)	(20,662.590)	(16,628.800)
Manufacturing	4,068	15,027	107.134	42.692	11,909.900	9,067.186
			(582.378)	(286.867)	(30,808.150)	(12,458.160)
Wholesale	690	54,179	19.859	18.434	8,639.123	13,736.900
			(48.339)	(122.272)	(21,729.260)	(31,127.030)
Retail	1791	94,034	9.844	26.427	4,364.403	5,700.619
			(32.120)	(319.507)	(16,136.390)	(10,744.350)
Transportation	516	25,713	105.292	42.632	6,672.319	9,211.531
			(352.931)	(628.705)	(15,039.780)	(27,538.140)
Information	5,732	8,746	33.632	53.685	12,881.040	14,604.950
			(146.528)	(413.363)	(10,6621.500)	(48,978.590)
Finance	341	42,185	7.765	23.444	20,419.850	12,306.740
			(25.257)	(184.343)	(10,1852.900)	(40,193.750)
Scientific	50,157	34,337	12.278	11.376	16,214.790	12,539.090
			(63.799)	(74.358)	(89,961.550)	(57,499.740)
Management	1,021	806	48.968	12.675	19,223.090	32,926.110
			(125.790)	(76.697)	(12,3876.700)	(151,175.100)
Waste Management	7,908	31,122	16.110	49.967	6,372.091	9,945.718
			(63.499)	(353.225)	(9,629.413)	(57,763.010)
Education	1,548	6,506	63.499	187.440	9,607.865	6,411.796
			(326.266)	(962.829)	(18,408.650)	(16,428.710)
Arts & Ent.	490	8,378	58.843	23.502	5,597.938	6,302.824
			(178.116)	(80.120)	(6,040.231)	(45,792.880)
Other	16,224	61,071	7.169	6.861	7,369.511	4,243.323
			(27.977)	(37.541)	(7,587.266)	(5,222.871)
Public Admin.	2,745	6,835	22.561	123.453	8,357.914	8,388.740
			(161.769)	(1,052.672)	(5,186.889)	(4,849.930)

Standard deviations are in parentheses. These are total number of establishments in TX and average number of employees per establishment.

Table A.4: County Level Summary Statistics

Variable	Mean	
	All counties	MSA counties
Average county median income ($)	5,634.453	6,331.342
	(1,116.463)	(1,262.84)
College funds	1,032,005.00	3,312,625.00
	(8,647,983.00)	(1.53e+07)
Junior college funds	18,163.21	48,502.60
	(171,931.300)	(300,250.30)
Unemployment rate	5.450	5.307
	(1.872)	(1.304)
Population density	92.794	250.335
	(270.746)	(441.489)
Property tax rate	0.530	0.469
	(0.163)	(0.144)
Undeveloped land price ($)	301.293	451.114
	(254.563)	(306.408)
Amenities employment ratio	0.041	0.047
	(0.036)	(0.023)

Standard deviations are in parentheses below

Table A.5: Regression Results for the Log of Industry Employment

Variable	Log of Industry Employment$_{i_g,j,t}$							
	Agriculture	Utilities	Construction	Manufac	Wholesale	Retail	Transport	Information
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log (income)$_{j,t-1}$	0.042***	0.033***	0.165***	0.026**	0.148***	0.193***	0.209***	0.022**
	(0.012)	(0.011)	(0.009)	(0.013)	(0.010)	(0.009)	(0.012)	(0.009)
Log (income)$_{j,t-1}$	0.128***	-0.005	-0.072***	-0.082***	-0.221***	-0.228***	-0.283***	0.034***
× Green industry	(0.010)	(0.009)	(0.008)	(0.009)	(0.008)	(0.007)	(0.010)	(0.006)
Log (agglomeration)$_{i_g,j,t-1}$	1.674***	0.898***	0.802***	0.941***	0.841***	1.012***	0.713***	1.012***
	(0.030)	(0.031)	(0.030)	(0.021)	(0.017)	(0.016)	(0.024)	(0.018)
Log (agglomeration)$_{i_g,j,t-1}$	-0.621***	0.032	0.091***	0.242***	0.194***	0.014	0.462***	-0.086***
× Green industry	(0.043)	(0.045)	(0.031)	(0.030)	(0.031)	(0.023)	(0.033)	(0.026)
Log (agglomeration in neighbors)$_{i_g,j,t-1}$	-0.009	0.064***	0.037	0.010	0.002	-0.022*	-0.039**	0.033***
	(0.017)	(0.017)	(0.023)	(0.007)	(0.009)	(0.012)	(0.016)	(0.009)
Log (agglomeration in neighbors)$_{i_g,j,t-1}$	0.030	-0.027	-0.064**	0.015	0.010	0.027	0.052***	-0.011
× Green industry	(0.028)	(0.027)	(0.025)	(0.011)	(0.018)	(0.016)	(0.019)	(0.014)
Log (college funds)$_{j,t-1}$	-0.002	0.003**	0.006***	-0.002	0.004***	0.004***	0.003**	0.004**
	(0.003)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)
Log (junior college funds)$_{j,t-1}$	-0.004*	0.001	-0.000	-0.000	-0.000	0.001	0.002	0.001
	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Log (population density)$_{j,t-1}$	-0.000	0.512***	0.369***	0.623***	0.374***	0.263***	0.488***	0.516***
	(0.013)	(0.016)	(0.011)	(0.021)	(0.014)	(0.010)	(0.016)	(0.013)
Property tax rate$_{j,t-1}$	-0.015	-0.056	-0.088*	-0.035	-0.037	-0.059	-0.117**	-0.175***
	(0.072)	(0.054)	(0.046)	(0.064)	(0.047)	(0.040)	(0.054)	(0.051)
Log (undeveloped land price)$_{j,t-1}$	-0.024	0.017	0.089***	0.039**	0.032***	0.011	-0.007	-0.032**
	(0.018)	(0.014)	(0.012)	(0.017)	(0.012)	(0.010)	(0.014)	(0.013)
Amenities employment ratio$_{j,t-1}$	-0.130	0.162	0.571***	0.119	0.025	0.097	0.086	0.517***
	(0.242)	(0.136)	(0.125)	(0.159)	(0.118)	(0.113)	(0.136)	(0.132)
County effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of obs.	13,716	13,716	13,716	13,716	13,716	13,716	13,716	13,716
R^2	0.902	0.714	0.890	0.833	0.926	0.976	0.894	0.875
ρ(AR)	0.560	0.918	0.855	0.925	0.914	0.839	0.916	0.891
$\rho(\sigma^2)$	0.586	1.075	0.597	1.166	0.711	0.460	0.851	0.755
Modified Bhargava D-W	1.101	0.454	0.551	0.457	0.492	0.659	0.489	0.472
Baltagi-Wu LBI	1.428	0.766	0.868	0.751	0.785	0.959	0.801	0.774

*** Denotes statistical significance at the 1 percent level, ** denotes statistical significance at the 5 percent level and * denotes statistical significance at the 10 percent level. Robust standard errors are in parentheses.

Table A.6: Regression Results for the Log of Industry Employment (cont.)

Variable	Log of Industry Employment$_{i_g,j,t}$							
	Finance	Scientific	Management	Waste	Education	Arts	Other	Public Admin
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log (income)$_{j,t-1}$	0.224***	0.076***	-0.062***	0.069***	0.617***	0.004	0.068***	0.177***
	(0.007)	(0.010)	(0.013)	(0.015)	(0.011)	(0.010)	(0.008)	(0.009)
Log (income)$_{j,t-1}$	-0.319***	-0.069***	0.065***	-0.136***	-0.517***	-0.050***	-0.007	-0.111***
× Green industry	(0.007)	(0.008)	(0.009)	(0.009)	(0.007)	(0.005)	(0.007)	(0.009)
Log (agglomeration)$_{i_g,j,t-1}$	0.769***	0.768***	0.857***	0.981***	0.366***	1.280***	0.873***	1.244***
	(0.016)	(0.017)	(0.034)	(0.025)	(0.030)	(0.020)	(0.016)	(0.024)
Log (agglomeration)$_{i_g,j,t-1}$	0.109***	-0.012	0.237***	0.048	1.000***	0.561***	0.055***	-0.146***
× Green industry	(0.025)	(0.023)	(0.050)	(0.035)	(0.036)	(0.039)	(0.021)	(0.034)
Log (agglomeration in neighbors)$_{i_g,j,t-1}$	0.014	-0.006	0.077***	-0.017	0.009	0.015	0.002	0.073***
	(0.009)	(0.011)	(0.016)	(0.014)	(0.020)	(0.012)	(0.011)	(0.016)
Log (agglomeration in neighbors)$_{i_g,j,t-1}$	0.010	0.045***	0.066**	0.071***	-0.032	-0.031	-0.075***	-0.082***
× Green industry	(0.012)	(0.016)	(0.026)	(0.021)	(0.024)	(0.021)	(0.016)	(0.026)
Log (college funds)$_{j,t-1}$	0.005***	0.002	-0.002	0.000	0.010***	0.011***	0.002*	0.021***
	(0.001)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.001)	(0.002)
Log (junior college funds)$_{j,t-1}$	-0.001	0.001	0.003	-0.002	0.009***	0.004*	0.001	0.004***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)
Log (population density)$_{j,t-1}$	0.268***	0.501***	0.314***	0.433***	0.666***	0.211***	0.316***	0.311***
	(0.011)	(0.015)	(0.022)	(0.021)	(0.013)	(0.012)	(0.012)	(0.008)
Property tax rate$_{j,t-1}$	0.030	-0.122**	-0.066	-0.220***	-0.519***	-0.207***	-0.064	0.005
	(0.033)	(0.053)	(0.060)	(0.084)	(0.061)	(0.064)	(0.043)	(0.040)
Log (undeveloped land price)$_{j,t-1}$	0.026***	0.028**	-0.014	0.063***	-0.206***	0.038**	0.035***	-0.077***
	(0.009)	(0.014)	(0.016)	(0.021)	(0.015)	(0.016)	(0.011)	(0.010)
Amenities employment ratio$_{j,t-1}$	0.103	0.154	0.023	-0.099	0.345*	4.173***	0.123	-0.063
	(0.081)	(0.136)	(0.144)	(0.220)	(0.182)	(0.209)	(0.116)	(0.127)
County effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of obs.	13,716	13,716	13,716	13,716	13,716	13,716	13,716	13,716
R^2	0.961	0.907	0.799	0.857	0.850	0.907	0.929	0.847
ρ(AR)	0.926	0.894	0.944	0.884	0.790	0.671	0.860	0.709
$\rho(\sigma^2)$	0.537	0.598	0.761	0.885	1.219	0.657	0.482	0.732
Modified Bhargava D-W	0.440	0.510	0.405	0.516	0.708	0.931	0.578	0.778
Baltagi-Wu LBI	0.743	0.801	0.698	0.817	1.018	1.218	0.869	1.029

*** Denotes statistical significance at the 1 percent level, ** denotes statistical significance at the 5 percent level and * denotes statistical significance at the 10 percent level. Robust standard errors are in parentheses.

Table A.7: Probit Estimation Results for Probability of Exit

Variable	Probability of exit$_{l_g,i,j,t}$							
	Agriculture	Utilities	Construction	Manufac	Wholesale	Retail	Transport	Information
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Green firm$_l$	0.016**	-0.086	0.020**	-0.013	-0.016	0.035	0.167	-0.010
	(0.007)	(0.059)	(0.009)	(0.011)	(0.011)	(0.027)	(0.174)	(0.011)
Firms with past experience$_l$	-0.008**	-0.006	0.006	0.004***	0.008***	0.006***	0.006***	0.002*
	(0.004)	(0.004)	(0.004)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
Firms with past experience$_l$	0.013*	0.017***	-0.003	0.008***	0.002	-0.005**	-0.017***	0.009***
× Green firm$_l$	(0.007)	(0.007)	(0.004)	(0.003)	(0.006)	(0.002)	(0.003)	(0.003)
Log (wage)$_{l,t}$	-0.007***	-0.002	-0.008***	-0.006***	-0.005***	-0.007***	-0.011***	-0.006***
	(0.002)	(0.002)	(0.003)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)
Log (wage)$_{l,t}$× Green firm$_l$	-0.002	0.005*	-0.005*	0.002	0.003	-0.003	-0.007	0.002
	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)	(0.002)	(0.005)	(0.001)
Log (agglomeration)$_{i_g,j,t}$	0.002	-0.001	-0.001	-0.002*	0.001*	-0.001*	0.000	0.001
	(0.003)	(0.003)	(0.004)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
Log (agglomeration)$_{i_g,j,t}$	-0.001	-0.001	0.001	0.003	0.000	0.004**	0.008	0.002
× Green firm$_l$	(0.003)	(0.005)	(0.004)	(0.002)	(0.003)	(0.002)	(0.006)	(0.002)
Log (agglomeration in neighbors)$_{i_g,j,t}$	0.003	-0.002	-0.000	0.000	-0.000	0.000	-0.000	0.000
	(0.003)	(0.003)	(0.004)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)
Log (agglomeration in neighbors)$_{i_g,j,t}$	-0.006*	0.002	-0.000	-0.002	0.000	-0.002	-0.007	-0.004*
× Green firm$_l$	(0.003)	(0.004)	(0.004)	(0.002)	(0.003)	(0.002)	(0.005)	(0.002)
Log(firm size)$_{l,t}$	-0.012***	-0.011***	-0.015***	-0.011***	-0.017***	-0.014***	-0.017***	-0.014***
	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Age$_{l,t}$	-0.000***	-0.000	-0.000***	-0.000	-0.000***	-0.000***	-0.000***	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log (college funds)$_{j,t}$	-0.000	0.000*	0.000**	0.000***	0.000	0.000	0.000*	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log (junior college funds)$_{j,t}$	0.000	0.000	0.000	-0.000**	-0.000	-0.000***	0.000*	-0.000*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Unemployment rate$_{j,t}$	0.002***	0.003***	0.001***	0.001**	-0.000	0.000	0.000*	0.000
	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)
Log (population density)$_{j,t}$	0.000	0.001	0.002***	0.001	0.001**	0.001***	0.001	0.003***
	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)
Property tax rate$_{j,t}$	-0.003	-0.022**	-0.004	0.003	-0.004	-0.004**	0.003	-0.015***
	(0.004)	(0.011)	(0.003)	(0.005)	(0.003)	(0.002)	(0.004)	(0.006)
Log (undeveloped land price)$_{j,t}$	0.001	0.003	0.000	0.002	-0.000	-0.000	0.000	-0.002**
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of obs.	57,538	11,657	349,745	84,316	269,649	513,772	132,615	94,281
Log likelihood	-6,877.229	-1,406.581	-56,156.778	-11,380.331	-39,048.058	-69,902.571	-20,979.932	-14,394.909

*** Denotes statistical significance at the 1 percent level, ** denotes statistical significance at the 5 percent level and * denotes statistical significance at the 10 percent level. Robust standard errors are in parentheses. Marginal effects are reported.

Table A.8: Probit Estimation Results for Probability of Exit

Variable	Probability of $\text{exit}_{l_g,i,j,t}$							
	Finance	Scientific	Management	Waste	Education	Arts	Other	Public Admin
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Green firm_l	-0.025***	0.000	-0.049	0.074***	0.031	-0.031***	0.025**	0.023
	(0.001)	(0.004)	(0.046)	(0.020)	(0.026)	(0.003)	(0.010)	(0.030)
Firms with past experience_l	0.009***	-0.002**	0.005	0.009***	0.006**	0.006***	0.003***	0.006***
	(0.001)	(0.001)	(0.006)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)
Firms with past experience_l	-0.002	0.008***	0.006	-0.012***	-0.003	0.025	-0.001	-0.007***
× Green firm_l	(0.007)	(0.001)	(0.008)	(0.001)	(0.005)	(0.018)	(0.001)	(0.002)
Log $(\text{wage})_{l,t}$	-0.006***	-0.004***	-0.003	-0.009***	-0.006***	-0.009***	-0.009***	-0.001
	(0.000)	(0.000)	(0.002)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)
Log $(\text{wage})_{l,t}$× Green firm_l	0.007***	-0.001	0.003	-0.005***	-0.004**	0.008	-0.004***	0.000
	(0.003)	(0.000)	(0.004)	(0.001)	(0.002)	(0.006)	(0.001)	(0.002)
Log $(\text{agglomeration})_{i_g,j,t}$	-0.002***	-0.002***	0.005	0.002**	0.001	0.000	-0.002***	0.008***
	(0.001)	(0.001)	(0.005)	(0.001)	(0.002)	(0.001)	(0.000)	(0.001)
Log $(\text{agglomeration})_{i_g,j,t}$	-0.002	-0.001*	-0.008	-0.004***	-0.008**	-0.013	0.001	-0.004
× Green firm_l	(0.008)	(0.001)	(0.006)	(0.001)	(0.003)	(0.013)	(0.001)	(0.003)
Log $(\text{agglomeration in neighbors})_{i_g,j,t}$	0.000	-0.000	-0.005	-0.001	0.001	-0.002	-0.001***	-0.002
	(0.001)	(0.001)	(0.004)	(0.001)	(0.002)	(0.001)	(0.000)	(0.001)
Log $(\text{agglomeration in neighbors})_{i_g,j,t}$	0.002	0.002**	0.007	0.002	0.010***	0.013	0.002**	-0.002
× Green firm_l	(0.008)	(0.001)	(0.006)	(0.001)	(0.003)	(0.012)	(0.001)	(0.003)
$\text{Log(firm size)}_{l,t}$	-0.014***	-0.018***	-0.012***	-0.013***	-0.016***	-0.018***	-0.021***	-0.007***
	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)
$\text{Age}_{l,t}$	-0.000***	-0.000***	0.000	-0.000***	-0.000	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log $(\text{college funds})_{j,t}$	0.000	0.000***	0.000	0.000	0.000	0.000	0.000	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log $(\text{junior college funds})_{j,t}$	-0.000*	0.000	-0.000	-0.000	-0.000	-0.000	0.000**	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Unemployment $\text{rate}_{j,t}$	-0.001*	-0.000	-0.003	0.001	0.000	-0.001	-0.001***	-0.000
	(0.000)	(0.000)	(0.002)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)
Log $(\text{population density})_{j,t}$	0.005***	0.002***	0.005	0.001**	-0.000	0.003***	0.002***	0.000
	(0.000)	(0.000)	(0.003)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)
Property tax $\text{rate}_{j,t}$	-0.003	-0.014***	0.004	-0.006	0.004	-0.003	-0.006**	-0.010*
	(0.003)	(0.003)	(0.019)	(0.004)	(0.008)	(0.007)	(0.002)	(0.006)
Log $(\text{undeveloped land price})_{j,t}$	0.002***	0.002***	-0.001	-0.000	-0.002	-0.003**	0.000	-0.003***
	(0.001)	(0.001)	(0.004)	(0.001)	(0.002)	(0.001)	(0.000)	(0.001)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of obs.	222,322	455,818	9,254	230,345	37,676	46,824	420,418	17,871
Log likelihood	-32,620.147	-68,955.550	-1,379.245	-36,812.111	-5,194.684	-7,485.531	-66,091.372	-1,684.999

*** Denotes statistical significance at the 1 percent level, ** denotes statistical significance at the 5 percent level and * denotes statistical significance at the 10 percent level. Robust standard errors are in parentheses. Marginal effects are reported.