Article

High stakes: a quantitative analysis of local cannabis policies and residential property sale prices in New Jersey

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Abstract

It is still unclear if there is an overall net economic benefit following the enactment of recreational cannabis laws in the United States. Supporters anticipate social equity and economic gains, while opponents express concerns about public health and safety. Public policy researchers often gauge the overall impact of cannabis legalization by studying changes in property values, yet previous studies yield mixed results, possibly due to local contextual variations. This is the first study to focus on New Jersey's cannabis legalization, where over 40% of municipalities opted to allow cannabis-related businesses starting in the fall of 2021. The research aims to answer two key research questions: factors influencing municipalities' decisions to allow or ban cannabis businesses and the effect on residential home sale prices. Our study finds that more populated, less affluent, and more liberal municipalities are more likely to permit cannabis businesses. We also find that municipalities are more likely to permit these businesses if neighboring towns do the same. Using a differences-in-differences approach, the study finds a positive association between allowing cannabis businesses and home sale prices, with a 2.7% average increase, equivalent to a $10,343 rise for the average home sale price. The findings underscore the economic impact and social considerations surrounding cannabis legalization, offering valuable insights for policymakers.

Keywords: cannabis, property values, public finance, yardstick competition, legalization, economic benefits

Introduction

In the United States, state laws and regulations on the use or sale of recreational cannabis products have evolved significantly since 2012 when the states of Colorado and Washington were the first to enact these policy changes. As of today, 22 other states have followed suit by enacting laws that either legalize the use or sale of recreational cannabis products (Davis et al., 2023). One reason for the rapid expansion of these cannabis laws across the United States is the bipartisan support these laws receive from the two

major political parties. The supporters of these laws suggest that there will be gains in social equity, fiscal, and economic outcomes, while opponents of these laws suggest legalizing cannabis will result in public health and safety costs to society.

One common outcome used by public policy researchers to measure the overall net economic benefit of legalizing cannabis in a particular jurisdiction is examining changes in property values following the enactment of legalizing cannabis products (e.g., Bruijn & Ribas, 2022; Burkhardt & Flyr, 2019; Cheng et al., 2018; Conklin et al., 2020; Kim et al., 2020; Thomas & Tian, 2021; Tyndall, 2021). Interestingly, these previous studies generally find mixed results when estimating the association between legalizing cannabis products and home sale prices. One possible reason for these mixed findings across this growing body of literature is that local context matters in how cannabis policies are implemented and how individuals respond to these cannabis policies. So far, past research has studied the impact of legalizing cannabis products on property values using data from only a few unique contexts including Canada, Colorado, Netherlands, and Washington state. Therefore, more research is needed that examines other contexts.

The current study contributes to this body of literature by examining the legalization of cannabis products in New Jersey. During the Election of 2020, New Jersey citizens voted to legalize the consumption, production, and distribution of cannabis products. While New Jersey municipalities cannot prevent citizens from possessing or consuming cannabis products, they do have the option to regulate and ban cannabis-related businesses in their own jurisdictions. By the fall of 2021, more than 60% of all New Jersey municipalities had voted to ban local cannabis-related businesses in their towns. Fig. 1 below shows the 40% of N.J. municipalities that opted in and the 60% municipalities in the state that opted out of allowing cannabis-related businesses.

Banning local cannabis-related businesses will likely have important economic and social impacts on N.J. local governments. For example, local governments that allow these businesses can levy a local tax on the sale of cannabis-related products to generate local tax revenue, and they could use this new revenue source to invest in various social programs (Link et al., 2024). Total recreational marijuana purchases were almost $80 million in New Jersey in the second quarter of 2022, which resulted in over $4.6 million tax revenues across the state (Nieto-Munoz, 2022). However, there is also uncertainty around potential social costs that the new cannabis industry might cause, including the potential for an increase in crime and traffic accidents.

In recent years, the academic literature in the field of public budgeting and finance has emphasized the need for scholarship that directly addresses the practical challenges faced by state and local policymakers (McDonald et al., 2024). This study responds to this call by examining the factors influencing the decisions of municipalities to permit or prohibit cannabis-related businesses within their jurisdictions and assessing the economic impacts of such decisions, thereby providing valuable insights for state and local policymakers. Additionally, policymakers should be aware of any economic impacts of allowing cannabis businesses. For example, in the short run, we can examine how legalizing the production and distribution of cannabis products has impacted residential property sale prices. It is possible that the banning of cannabis businesses is factored into homebuyers' decisions to buy in a particular municipality, especially if the homebuyers are concerned that these businesses may cause an increase in crime. This is important because changes
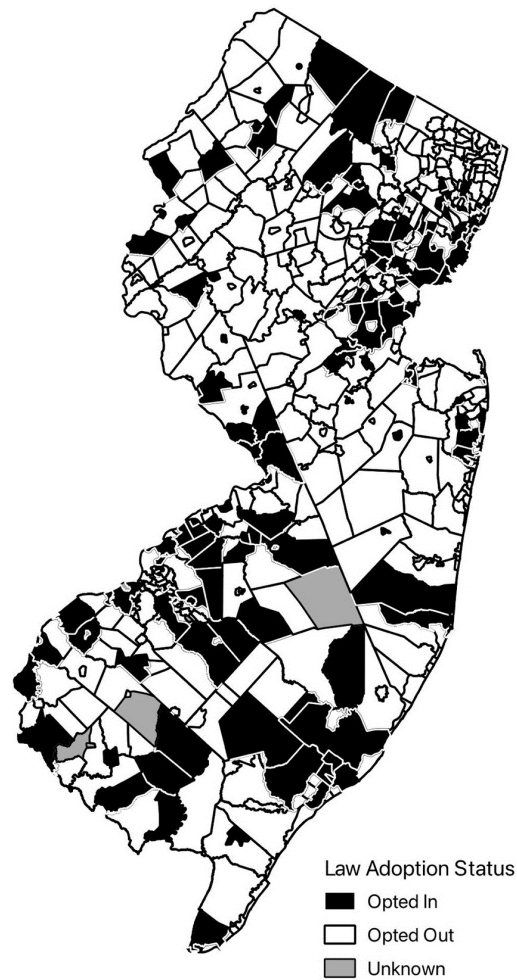
Fig. 1. Map of New Jersey municipalities by law adoption status. The black-colored municipalities opted into allowing cannabis-related businesses in their jurisdictions.

in property values can affect local government tax revenues. Specifically, this study addresses the following two research questions:

1. What factors explain why some N.J. municipalities opted to allow cannabis-related businesses and others did not?
2. What is the effect of allowing cannabis-related businesses on residential home sale prices?

Using a cross-sectional dataset of all New Jersey municipalities in 2021, we examine the factors that explain why some New Jersey municipalities voted to allow cannabis-related businesses and others did not. We find that the New Jersey municipalities most likely to allow cannabis-related businesses in their jurisdictions are those with larger populations, lower property values per capita, less affluent residents, and more liberal residents. Additionally, there is evidence that municipalities are more likely to allow cannabis-related businesses if one of their neighboring towns also allows cannabis-related businesses.

Using a differences-in-differences approach and parcel-level data on residential home sale prices in New Jersey between 2018 and 2023, we estimate the differences in average home sale prices between New Jersey municipalities that opt-in to allowing cannabis businesses compared to those municipalities that opt-out following the deadline in August 2021 for municipalities to opt-out of allowing cannabis businesses. Our results suggest that there is a positive association between the decision to allow cannabis-related businesses and home sale prices. For example, we find that the average home sale price increased by 2.7% in municipalities that allowed cannabis-related businesses compared to municipalities that did not allow these businesses, which is equivalent to a $10,343 increase for the average property in our data.

The reminder of this article is organized into four sections. Section 2 provides a brief history of cannabis legislation in New Jersey and a review of the literature of past research examining the effects of legalizing cannabis products. Sections 3 and 4 describe the data and methodology used in this study to address the two research questions mentioned above. Section 5 reports the main results of the study. The last section summarizes key takeaways and policy recommendations.

Background and Literature Review

In this literature review section, we provide a succinct historical overview of cannabis legislation in New Jersey. This will provide background on the process of how municipalities made decisions on either allowing cannabis businesses in their jurisdictions or not. Additionally, we will review empirical evidence on the association between the legalization of recreational cannabis and its ramifications on property values.

Background on cannabis legislation history in New Jersey

The legislative history of marijuana legalization in New Jersey started around 2010, with the enactment of the Compassionate Use Medical Marijuana Act of 2010 by former Governor Jon Corzine (New Jersey State Policy Lab, 2022). By 2012, the state authorized eligible medical practitioners to provide patients with certifications enabling the consumption of state-sanctioned cannabis products through the Medical Marijuana Program.

During the 2020 general election, New Jersey voters approved a ballot measure amending the state constitution to permit residents aged 21 or older to possess and partake in cannabis products. After the successful ratification of the 2020 ballot question, a set of legislative bills in New Jersey was signed into law by Governor Phil Murphy, finalizing the regulation and decriminalization of cannabis production and consumption (New Jersey League of Municipalities, n.d.). By the summer of 2021, the New Jersey Cannabis Regulatory Commission (NJCRC) shared a comprehensive set of regulations governing cannabis-related activities, which provide guidelines for establishing such businesses within the state. Notably, local governments in New Jersey retained the discretion to opt out of permitting cannabis-related businesses in their respective jurisdictions.

The deadline for municipalities to exercise the opt-out provision and prohibit cannabis establishments, distributors, and delivery services ended in August 2021 (New Jersey League of Municipalities, n.d.). After this deadline, all municipalities would automatically be enrolled to

permit these cannabis-related businesses for a minimum of five years. Municipalities that opted out by the August 2021 deadline retained the flexibility to opt in at any subsequent juncture. As indicated earlier, approximately 60% of all New Jersey municipalities had opted out. To our knowledge, there are no municipalities that opted back in after the deadline. For the current study's research design, the municipalities that opted in are included in our treatment group, and the municipalities that opted out are included in our control group.

Financial considerations played a pivotal role in the decision-making process for local governments contemplating opting in. Particularly, municipalities can impose a local cannabis tax of up to 2% on sales from cannabis cultivators and manufacturers, with an additional 1% tax applied to the wholesale of cannabis-related products (New Jersey League of Municipalities, n.d.). Moreover, the state government levies the general sales tax rate of 6.625% on the sale of cannabis-related products. Given the timing of the financial shocks from the COVID-19 pandemic, this potential new state and local cannabis tax revenue during the pandemic could be used to prevent spending cuts and reduce employee turnover (Hayes, 2019, 2020; Hayes & Kandel, 2023).

The current study is focused on understanding how the legalization of marijuana has influenced housing prices. The direction of the relationship between opting into allowing cannabis businesses and home sale prices is theoretically ambiguous. In one way, permitting cannabis businesses can contribute to the promotion of the local economy by fostering additional employment opportunities, thereby stimulating increased economic activities. Furthermore, local economic development may act as a deterrent to criminal activities, particularly in poor neighborhoods, thereby enhancing the overall sense of safety (Burkhardt & Flyr, 2019). This perception of security may attract consumers and other businesses to the area, thereby generating a heightened demand for housing, resulting in an appreciation of home values (Cheng et al., 2018) and consequently, property values—the most important source of local revenue for New Jersey municipalities. At the same time, the legalization of cannabis businesses and consumption may have adverse effects on home values, as offenses related to cannabis may experience an uptick (Adda et al., 2014; Thomas & Tian, 2021). The resulting insecurity among residents may prompt them to relocate, rendering the areas less appealing both economically and residentially, thereby leading to a depreciation in home values. The next subsection examines the empirical evidence on these theoretical claims.

Empirical evidence on the effects of cannabis laws on property values

This section provides a summary of the key findings from an expanding body of literature that investigates the association between the legalization of recreational cannabis and property values. Interestingly, the empirical evidence appears to be quite mixed. One potential explanation for this variability is that prior studies have limited their examination of the relationship to a few specific contexts. To the best of our knowledge, existing research has primarily focused on policy changes in Canada, Colorado, the Netherlands, and Washington state. This is important because not all policy changes create the same kind of "treatment" on individuals and businesses.

Several studies find positive effects of marijuana legalization on home values. Cheng et al. (2018) utilized a difference-in-differences (DiD) model and an event study to investigate the impact of legalization on home values before and after Colorado municipalities opted-in or opted-out. On

average, Cheng et al. (2018) found that house values increased by 6%, equivalent to $15,000, in opt-in municipalities compared to municipalities that banned the recreational marijuana market. They found the evidence that retail marijuana legalization (RML) significantly affected the demand for houses but did not have a corresponding impact on housing supply. Lastly, Cheng et al. (2018) found that the effects of RML in areas with high population density experienced significant positive impacts.

Burkhardt & Flyr (2019) also found positive effects of cannabis legalization on home prices in Denver, Colorado, using event study analysis. They explored the impact of opening a new dispensary on housing prices and discovered that the proximity to the dispensary significantly influenced house values. For instance, prices rose by approximately 8% in areas within a quarter-mile radius of the dispensary and by 5% in areas between a quarter and half-mile radius. Areas outside the 0.5-mile radius did not experience any significant change in home values. Burkhardt & Flyr (2019) suggested that the presence of a dispensary led to increased foot traffic, positively impacting the decline in crime rates. Similarly, Conklin et al. (2020) examined the conversion of medical marijuana stores to recreational ones in Denver, Colorado. Using a DiD model, they found a significant 8.4% increase ($26,800) in the value of single-family homes within a 0.1-mile radius of the converted dispensaries, with no observed effect beyond this radius.

Kim et al. (2020) assessed the effects of recreational marijuana legalization and the opening of new dispensaries on home values in Colorado and Washington that legalized recreational and medical marijuana. They found a statistically significant 11% increase in home values in areas with RML after the electorate voted to legalize cannabis. Using a spatial DiD model, they established that homes within a half-mile radius from the dispensary were 8% higher in value than homes farther away, controlling for all homes within a 2-mile radius.

However, there are other studies that find negative or null effects of marijuana legalization on home values (e.g., Bruijn & Ribas, 2022; Tyndall, 2021). Bruijn & Ribas (2022) examined the effects of two policy changes in the Netherlands that closed or banned cannabis businesses in a few cities. Following the closure of these cannabis shops, the researchers found that house prices increase by almost 5%, especially for homes nearest to the closed cannabis retailers. One mechanism for this increase in home prices is that the authors found that crime declined in the surrounding area following the closure of these cannabis shops. However, they find that the broader region experienced a home price decline after the closure or ban of cannabis shops, which suggests that the regional economy might be negatively impacted when these cannabis shops are either banned or closed.

Tyndall (2021) examined the effects of opening marijuana dispensaries on home values in Vancouver, Canada. Using home sale data following the opening of 84 dispensaries, Tyndall (2021) found no consistent evidence that local property values increase following the opening of a dispensary. In fact, Tyndall (2021) found some evidence that local property values decline for those properties within 100 meters of a new dispensary.

It appears that crime might be an important mechanism driving these studies' results, but there is no consistent evidence that crime is a positive or negative mechanism (e.g., Bruijn & Ribas, 2022; Chang & Jacobson, 2017). Adda et al. (2014) found that the legalization of cannabis in Lambeth led to a significant increase in cannabis-related crimes compared to the rest of London. Crime rates in the borough increased by 29%, and after the implementation of the depenalization policy, crimes

rose by 61%. Thomas & Tian (2021) used an instrumental variable model and found suggestive evidence of a 3% drop in drug-related crimes in tracts with dispensaries in Seattle. However, nuisance crimes increased by 4% within tracts and 2% in adjacent tracts. Violent crimes increased by 2.5 percentage points in adjacent tracts, while no change was observed in treated tracts.

However, Burkhardt & Flyr (2019), in their study of Denver, claimed that the introduction of a new dispensary in a vacant or insolvent location increased footfall and the presence of observant people, leading to a decline in crime rates. Colorado municipalities experienced a drop in crime rates after the conversion of medical marijuana stores to recreational ones in 2013–2014, with 4.8% fewer robberies, 3.7% fewer assaults, and a 10% reduction in overall crime compared to 2013 statistics (Conklin et al., 2020). Maier et al. (2017) found that larceny rates and aggravated assaults significantly decreased in states that decriminalized marijuana, attributing it to increased inhibitions caused by consumption. Dills et al. (2016) found no impact on crime rates following cannabis legalization in Colorado, Washington, Oregon, and Alaska. Similarly, Dills et al. (2021) asserted that legalization policies did not effectively result in either an increase or a decrease in crime rates, making it challenging to establish a clear link between crimes and the policy.

The key point is that policy and geographic context matters when studying the benefits and costs of legalizing the use and sale of cannabis products. One possible reason why there is evidence of a positive effect on property values in Colorado is that the introduction of legalized recreational cannabis was not followed by a rise in crime (e.g., Burkhardt & Flyr, 2019). However, it appears that there was a rise in local crime following the introduction of legalized recreational cannabis in other local contexts (Vancouver and the Netherlands). It is possible that Colorado is an outlier in how cannabis policies are implemented and impact society (Zambiasi & Stillman, 2020).

The current study will help fill this gap in the literature by examining the New Jersey context. Specifically, the current study will examine the association between legalizing the sale of recreational cannabis and residential home sale prices in the short run before many of the local municipalities had their first cannabis retail locations open. This allows us to estimate the home buyers' perceptions of the expected economic benefits from allowing cannabis businesses, even before these cannabis businesses open to eventually cause either positive or negative effects on crime.

Data

Municipality-level cross-sectional dataset

We first created a cross-sectional dataset of all New Jersey municipalities in 2021 using data from various publicly available data sources. We used this dataset to address our first research question examining the factors that explain why some New Jersey municipalities voted to allow cannabis-related businesses and others did not. Our outcome of interest is a binary variable that equals 1 if the municipality voted to allow cannabis-related businesses in their jurisdiction in 2021, which was the first year of legalizing cannabis-related products in New Jersey, and 0 otherwise. The data for this binary variable comes from the USA Today Network which compiled a dataset of municipality ordinances as of August 2021, which we updated doing our own internet searches of municipality ordinances through the fall of 2021 and winter of 2022 (Jaeger, 2021). Roughly 40% of the New

Jersey municipalities voted to allow cannabis-related businesses.

We collect data on a set of explanatory variables that likely influence why municipalities vary on the decision to allow cannabis-related businesses in their jurisdictions. To proxy for the overall socioeconomic status of a municipality, we collected data on the municipality revitalization index (MRI) for all N.J. municipalities in 2021 from the NJ Department of Community Affairs. The MRI combines various poverty, education, and economic variables into one index to measure the overall socioeconomic status of a local government. A higher MRI score implies that the municipality has a higher socioeconomic status. As shown below in Table 1, the average MRI score of N.J. municipalities that allowed cannabis-related businesses was –1.73, whereas it was significantly higher at 0.73 for the municipalities that opted out of allowing cannabis-related businesses.

To proxy for the political ideology of the residents in a municipality, we collect data on the percent of residents in a municipality that voted for Presidential Candidate Joseph Biden during the 2020 election. This data comes from the N.J. Department of State. As shown in Table 1, the average percent of voters for Biden in 2020 for the municipalities that allowed cannabis-related businesses was approximately 57%, while the average was only approximately 50% for municipalities that did not allow cannabis-related businesses.

It is possible that the decision to opt-in or opt-out of allowing cannabis-related businesses is influenced by whether a neighboring municipality opted-in. For example, according to yardstick competition theory, a municipality might feel economic and political pressure to compete with a neighboring local government over tax revenue and new business formation opportunities (e.g., Besley & Case, 1995; Hall & Ross, 2010; Johnston et al., 2011). Yardstick competition theory is a subfield within the larger body of literature on policy diffusion (e.g., Graham et al., 2013; Lee & Jeong, 2012; Park, 2012). To proxy for this political and economic pressure, we created a binary variable that equals 1 if at least one municipality that shares a border opted in and 0 otherwise. As shown in Table 1, more than 33% of municipalities that allowed cannabis-related businesses had at least one neighboring

Table 1. Descriptive statistics at municipality-level by law adoption status

	Opted in		Opted out	
	Mean	SD	Mean	SD
% with at least one neighbor opted in	33.63[***]		25.49	
Municipality revitalization index	–1.73[***]	5.13	0.73	4.48
Population in 2020	24,727.29[***]	36,267.25	12,629.72	16,666.23
% Voters for Biden in 2020	57.46[***]	13.87	50.18	12.77
% Residents 65 years or older	16.67[***]	5.81	19.58	9.23
Property tax rate	2.86[***]	0.79	2.52	1.20
Equalized property value per capita	141,717.87[***]	159,484.51	318,489.77	763,033.17
Total observations	153		402	

Data come from 555 out of 565 New Jersey municipalities. Ten N.J. municipalities were dropped from the sample because they had missing information about their opt-in status. The unit of analysis is at the municipality-level. At least one neighbor opted in is a binary variable that equals 1 if a neighboring municipality that shares a border with the municipality opted in and 0 otherwise. The municipality revitalization index (MRI) is a continuous variable created by the NJ Department of Community Affairs that measures the socioeconomic status of the municipality. The higher the value for the MRI implies that municipality if relatively more affluent compared to municipalities with a lower value for the MRI.

[*] p<0.1, [**] p<0.05, and [***] p<0.01.

municipality that also opted-in, which was more than 8 percentage points higher than the average for the subsample of municipalities that did not allow cannabis-related businesses.

Our cross-sectional data also includes other demographic and fiscal variables for all N.J. municipalities. As shown in Table 1, we have data on municipalities' population, the percent of residents 65 years or older, property tax rate, equalized property value per capita. Interestingly, as shown in Table 1, the average "opt-in" municipality has a higher population, less elderly residents, a slightly higher property tax rate, and significantly lower equalized property values per capita.

Parcel-level panel dataset

Second, we create a panel dataset on residential home sales at the parcel-level. This panel dataset will allow us to address the second research question examining the short-term impact of allowing cannabis-related businesses on residential property sale prices. The New Jersey property data site Pogodata.org (n.d.) contains detailed data on properties in most New Jersey municipalities in the years both before and after the decision to allow cannabis-related businesses. This data source includes parcel-level data on sale price, the age of the structure, the square foot of the land, and the square foot of the structure. This data is available for 337,629 residential property sales within 557 out of the 565 New Jersey municipalities between January 2018 and July 2023. However, 8 New Jersey municipalities were dropped from our sample because they had missing data on sale price or other relevant variables of the parcel. As shown in Table 2, our panel dataset contains 115,696 unique residential home sales in municipalities that allowed cannabis-related businesses and 221,933 unique residential home sales in municipalities that did not allow cannabis-related businesses. Table 2 reports the means and standard deviations for all variables in the panel dataset separately by law adoption status. As shown in Table 2, the typical parcel in a municipality that allows cannabis-related businesses has a lower home sale price, an older structure on the land, and less square foot compared to the typical parcel in a municipality that does not allow cannabis-related businesses.

Like the cross-sectional dataset described above, the panel dataset includes municipality-level variables including population, percent of voters for the Democratic nominee in an election, percent of residents that are 65 years or older, the municipality's property tax rate, and the equalized property value per capita.

Methodology

We address our first research question by examining how "opt-in" municipalities and "opt-out" municipalities differ across various demographic, fiscal, socioeconomic, and political factors. Specifically, we estimate the following baseline equation using ordinary least squares (OLS):

$$Opt\_in_i = \alpha + \beta X_i + \theta_i + \varepsilon_i \tag{1}$$

where i indexes municipality; Opt_in is a binary indicator that equals 1 if the municipality allows cannabis-related businesses and 0 otherwise; X is vector of the various demographic, fiscal,

Table 2. Descriptive statistics at parcel-level by law adoption status

	Opted in		Opted out	
	Mean	SD	Mean	SD
Home sale price	383,078.06***	243,346.41	465,204.99	271,685.51
Structure is less than 10 years old	0.02***		0.03	
Structure is 10–19 years old	0.07**		0.07	
Structure is 20–29 years old	0.10***		0.12	
Structure is 30–39 years old	0.14***		0.15	
Structure is 40–49 years old	0.09***		0.09	
Structure is 50 years or older	0.59***		0.52	
Structure age is missing	0.01***		0.02	
Square foot of parcel	11,485.67***	29,987.01	17,660.73	40,748.97
Square foot of structure	1,779.95***	796.04	1,986.23	917.68
% with at least one neighbor opted in	37.28***	21.42	25.38	23.99
Municipality revitalization index	−0.95***	4.63	1.10	4.78
Population in 2020	49,527.36***	63,647.88	25,453.27	26,827.60
% Votes for governor murphy in 2021	58.35***	13.74	49.38	14.31
% Residents 65 years or older	14.84***	4.84	16.66	6.36
Property tax rate	2.71***	0.72	2.48	0.70
Equalized property value per capita	139,918.94***	124,158.87	260,292.93	568,538.81
Total observations	115,696		221,933	

Data come from residential home sales between January 2018 and July 2023 across 557 out of 565 New Jersey municipalities. The eight municipalities dropped from the sample had missing information for home sales price and other relevant variables. The unit of analysis is at the parcel-level. The descriptive statistics for both opting-in and opting-out municipalities include all parcels with home sale prices between the 1st and 99th percentiles. At least one neighbor opted in is a binary variable that equals 1 if a neighboring municipality that shares a border with the municipality opted in and 0 otherwise. The municipality revitalization index (MRI) is a continuous variable created by the NJ Department of Community Affairs that measures the socioeconomic status of the municipality. The higher the value for the MRI implies that municipality if relatively more affluent compared to municipalities with a lower value for the MRI.
* p<0.1, ** p<0.05, and *** p<0.01.

socioeconomic, and political variables listed in Table 1; θ is a county fixed effect (FE); and ε is an idiosyncratic error term. The county FE controls for all unobserved factors within a county that do not vary over time. For example, a county's geographic location and proximity to specific state borders do not vary over time, and the county FE will control for these geographic location differences across the observations in the analysis.

Next, we address our second research question by examining the impact of allowing cannabis-related businesses on residential home sale prices. We estimate this impact using a differences-in-differences approach. Angrist & Pischke (2014) provide a thorough overview of the differences-in-differences methodology. Specifically, our panel data allows us to examine how the average residential home sale price changed between municipalities that allow cannabis-related businesses and municipalities not allowing these businesses after the decision to opt-in or opt-out compared to before these policy decisions were made. We estimate the following differences-in-difference regression model using OLS:

$$Price_{pmt} = \alpha + \gamma \, Opt\_in_m \times Post_t + \beta X_{pmt} + \theta_m + \tau_t + \varepsilon_{pmt} \tag{2}$$

where p, m, and t index parcel, municipality, and year, respectively; *Price* is the natural log of home sale price; *Opt_in* is a binary indicator that equals 1 if the municipality allows cannabis-related businesses and 0 otherwise; *Post* is a binary indicator that equals 1 if the date of the home sale occurred in September 2021 or after and 0 if the date of the home sale occurred before September 2021; *X* is a vector of control variables including the parcel's characteristics and the municipality's demographic, fiscal, socioeconomic, and political characteristics; θ is a municipality FE; τ is a year (FE), and ε is an idiosyncratic error term. All versions of equation (2) are estimated with month and year FEs to control for month-specific and year-specific shocks to the housing market that impacted all municipalities in the state. For example, the housing supply in January tends to be lower than in the month of May.

As a robustness check, we run alternative model specifications where we replace the municipality FEs with municipality-year FEs. The municipality-year FEs control for specific shocks impacting specific municipalities within a specific year. For example, the local housing market in a certain municipality may have been impacted differently during the pandemic than others, and the municipality-year FE is one way of controlling for that in the model. The main results are robust when including the municipality-year FE, which suggests that the housing boom during the pandemic did not impact the "opt-in" and "opt-out" municipalities differently and did not bias our estimate of the DiD coefficient.

The differences-in-differences coefficient is γ, which measures the change in the average home sale price between the "opt-in" and "opt-out" municipalities after August 2021. A positive and statistically significant coefficient for γ would suggest that allowing cannabis-related businesses increases average residential home sale prices. Standard errors are clustered at the municipality-level, which makes inference robust to arbitrary serial correlation within neighborhoods and municipalities as neighborhoods are nested in municipalities.

Results

What factors explain the decision to opt-in?

The first set of main results address our first research question examining the factors that explain why some municipalities opted into allowing cannabis-related businesses and others did not. Table 3 reports the OLS regression results from equation (1). Column 1 of Table 3 reports regression results of equation (1) that only control for population, percent of residents that are 65 years or older, the property tax rate, and the natural log of equalized property values. The next set of columns in Table 3 report analogous regressions that include additional explanatory variables. Column 2 adds in the binary variable for whether at least one bordering municipality opted into allowing cannabis-related businesses. Column 3 adds in the MRI index, which is a continuous measure of socioeconomic status. Column 4 adds in the percent of residents voting for Presidential Candidate Joseph Biden during the 2020 Election. Column 5 adds in county FE to control for all unobserved factors that do not vary over time within a county (e.g., geographic location and proximity to specific state borders).

The preferred regression model results are reported in Column 4. As shown in column 4 of Table 3, municipalities with larger populations and lower property tax bases were more likely to allow

Table 3. OLS regressions on likelihood of allowing cannabis-related businesses

	(1)	(2)	(3)	(4)	(5)
Log of population	0.063***	0.052***	0.057***	0.041***	0.043**
	(0.015)	(0.015)	(0.015)	(0.015)	(0.018)
% residents with 65+ year old	0.001	0.001	−0.000	0.000	0.000
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Property tax rate	0.001	0.002	0.000	−0.014	−0.017
	(0.022)	(0.021)	(0.018)	(0.016)	(0.017)
Log of equalized property values	−0.084***	−0.076**	−0.025	−0.046*	−0.022
	(0.030)	(0.030)	(0.029)	(0.027)	(0.032)
At least one neighbor opted in		0.104***	0.096**	0.084**	0.047
		(0.037)	(0.037)	(0.036)	(0.042)
MRI score			−0.016***	−0.013***	−0.014***
			(0.005)	(0.005)	(0.005)
% residents voting for Biden				0.005***	0.004**
				(0.001)	(0.002)
County fixed effects					√
Adjusted R-squared	0.0676	0.0765	0.0961	0.113	0.109
Total observations	565	565	565	565	565

Robust standard errors are in parentheses. The unit of analysis is at the municipality-level. At least one neighbor opted in is a binary variable that equals 1 if a neighboring municipality that shares a border with the municipality opted in and 0 otherwise. The municipality revitalization index (MRI) is a continuous variable created by the NJ Department of Community Affairs that measures the socioeconomic status of the municipality. The higher the value for the MRI implies that municipality if relatively more affluent compared to municipalities with a lower value for the MRI.

* $p<0.1$, ** $p<0.05$, and *** $p<0.01$.

OLS, ordinary least squares.

cannabis-related businesses. For example, in column 4, the coefficient on the log of population is 0.041, which suggests a 10 percent increase in a municipality's population increases the likelihood that the municipality will decide to allow cannabis-related businesses by 4.1 percentage points. A 10 percent increase in the equalized property values corresponds to a 4.6 percentage point reduction in the likelihood of allowing cannabis-related businesses. Interestingly, the percentage of elderly residents and the property tax rate have no statistical relationship with the likelihood of allowing cannabis-related businesses.

According to yardstick competition theory, a municipality might feel economic and political pressure to compete with a neighboring local government that allows cannabis-related businesses by voting to allow these businesses in their jurisdiction as well (e.g., Besley & Case, 1995; Hall & Ross, 2010). Overall, the regression results support this claim. As shown in column 4 of Table 3, municipalities with at least one neighboring municipality that opted in are 8.4 percentage points more likely to allow cannabis-related businesses compared to municipalities that have no neighboring municipality that opted in. When controlling for county FE, the coefficient for the "at least one neighbor opted in" in column 5 is smaller and no longer statistically significant. This is likely due to having less variation in the likelihood of at least one neighbor opting in within counties and having less degrees of freedom. This is one reason why the preferred regression results are those reported in column 4 without the county FE.

The regression results also suggest more affluent municipalities are less likely to vote to allow cannabis-related businesses in their jurisdiction. As shown in column 4 of Table 3, the coefficient on the MRI score is –0.014. This suggests, on average, a one-point increase in the MRI index (i.e., a unit increase in a municipality's socioeconomic status) corresponds to a 1.3 percentage point decrease in the likelihood of allowing cannabis-related businesses. This is both a statistically and practically significant relationship, since a one standard deviation in the MRI index is expected to decrease the chance of allowing cannabis-related businesses by almost 14%. Overall, this is suggestive evidence that poorer communities in the state are the most likely to adopt laws allowing cannabis-related businesses. This coefficient stays the same size and remains statistically significant, even after controlling for county FE as reported in column 5 of Table 3.

Lastly, the regression results suggest municipalities with more liberal residents are more likely to adopt laws allowing cannabis-related businesses compared to municipalities with less liberal residents. As shown in column 4 of Table 3, the coefficient for the percent of residents voting for Biden is 0.005. This suggests, on average, a one percentage point increase in the percent of residents voting for Presidential Candidate Joseph Biden during the 2020 Election corresponds to a 0.5 percentage point increase in the likelihood of allowing cannabis-related businesses, controlling for all other variables in the model. This is both a statistically and practically significant relationship. This coefficient stays the same size and remains statistically significant, even after controlling for county FE.

What is the association between home sale prices and the decision to opt-in?

The second set of main results address our second research question examining the association between allowing cannabis-related businesses and residential home sale prices. Table 4 below reports the OLS regression results from equation (2). Column 1 of Table 4 reports regression results of equation (2) that only control for municipality, year, and month FE. The first row reports the differences-in-differences coefficient, which measures the change in the average home sale price between the "opt-in" and "opt-out" municipalities after August 2021 compared to before September 2021. The next two columns in Table 4 report analogous regressions that include additional controls. Column 2 adds in variables for parcel characteristics and municipality characteristics. Column 3 replaces the municipality FEs with municipality-year FEs. By including municipality-year FEs, we can see if the main results are robustness to controlling for specific shocks impacting municipalities within a specific year. For example, the local housing market in a certain municipality may have been impacted differently during the pandemic than others, and the municipality-year FE will control for this.

Overall, the regression results reported in Table 4 suggest there is a positive relationship between home sale prices and the decision to allow cannabis-related businesses. In column 1 of Table 4, the differences-in-differences estimate is 0.006, when only controlling for municipality, year, and month FE. As reported in column 2 of Table 4, this coefficient increases slightly in size to 0.013, after controlling parcel characteristics and municipality characteristics listed in Table 4. Controlling for parcel-specific characteristics, like the square foot of the home, is important because one of the most important factors for home buyers when purchasing a property is the size of the home. By controlling for these parcel-specific characteristics in the regression model, we improve the

Table 4. Parcel-level OLS regressions on log of home sale prices

	(1)	(2)	(3)	(4)	(5)
Municipality characteristics					
Opt-in × post	0.006	0.013	0.027***	0.049***	0.034***
	(0.010)	(0.010)	(0.005)	(0.007)	(0.006)
Log of population		0.018	−1.300***	0.049	0.452***
		(0.159)	(0.010)	(0.094)	(0.149)
% residents with 65+ year old		0.001	0.067***	−0.002***	0.003***
		(0.000)	(0.001)	(0.001)	(0.001)
Property tax rate		0.001	0.740***	−0.017	−0.004
		(0.023)	(0.009)	(0.020)	(0.027)
Log of equalized property values		−0.002	0.784***	−0.025*	0.017
		(0.019)	(0.009)	(0.013)	(0.020)
At least one neighbor opted in		0.019	−1.617***	0.028	−0.076
		(0.058)	(0.024)	(0.039)	(0.060)
MRI score		0.001	0.236***	0.004***	0.001
		(0.001)	(0.003)	(0.001)	(0.001)
% Votes for Gov. Murphy, 2021		−0.002***	0.104***	−0.006***	−0.009***
		(0.001)	(0.001)	(0.001)	(0.001)
Parcel characteristics					
Structure is 10–19 years old		0.150***	0.150***	0.150***	0.150***
		(0.022)	(0.022)	(0.022)	(0.022)
Structure is 20–29 years old		0.110***	0.110***	0.110***	0.110***
		(0.023)	(0.023)	(0.023)	(0.023)
Structure is 30–39 years old		0.012	0.012	0.013	0.013
		(0.023)	(0.023)	(0.023)	(0.023)
Structure is 40–49 years old		−0.042*	−0.042*	−0.042*	−0.042*
		(0.024)	(0.024)	(0.024)	(0.024)
Structure is 50 years or older		−0.054**	−0.054**	−0.054**	−0.054**
		(0.022)	(0.022)	(0.022)	(0.022)
Structure age is missing		−0.109	−0.112	−0.111	−0.109
		(0.068)	(0.070)	(0.070)	(0.068)
Log of square foot of parcel		0.096***	0.096***	0.096***	0.096***
		(0.005)	(0.005)	(0.005)	(0.005)
Log of square foot of structure		0.560***	0.562***	0.561***	0.561***
		(0.012)	(0.012)	(0.012)	(0.012)
Controls for					
Municipality FEs	√	√		√	√
Month FEs	√	√	√	√	√
Year FEs	√	√		√	√
Municipality-year FEs			√		
Linear municipality trends				√	
Quadratic municipality trends					√
Adjusted R-squared	0.549	0.826	0.830	0.828	0.828
Observations	338,304	338,304	338,304	338,304	338,304

Clustered-robust standard errors at the municipality level are in parentheses. The unit of analysis is at the parcel-level. All regression models include all parcels with home sale prices between the 1st and 99th percentiles. Structure is less than 10 years old is the omitted group. The municipality revitalization index (MRI) is a continuous variable created by the NJ Department of Community Affairs that measures the socioeconomic status of the municipality. The higher the value for the MRI implies that municipality if relatively more affluent compared to municipalities with a lower value for the MRI.

* $p<0.1$, ** $p<0.05$, and *** $p<0.01$.

OLS, ordinary least squares; FE, fixed effect.

precision of the regression model in predicting the home sale price.

In column 3 of Table 4, the differences-in-differences estimate is 0.027 and becomes statistically significant. The regression reported in column 3 controls for municipality-year FEs and month FEs. The coefficient of 0.027 suggests that the average home sale price increased by 2.7% after August 2021 in municipalities that allowed cannabis-related businesses compared to municipalities that did not allow these businesses. This is a marginally practical difference. A 2.7% increase in the home sale price for the average parcel in an "opt-in" municipality is equivalent to a $10,343 increase.

To give a causal interpretation to the differences-in-differences results reported in Table 4, we must rely on the common trends assumption (Angrist & Pischke, 2014). A violation of this assumption would be if there was a pre-existing upward trend in average home prices in the "opt-in" municipalities compared to "opt-out" municipalities. For example, it is possible that there were changes in housing preferences in more densely populated areas over the last decade. Therefore, we must test the common trends assumption before making any causal interpretation of our main findings.

As recommended by Angrist & Pischke (2014), one way to test the common trends assumption with our dataset is control for municipality-specific linear trends in equation (2). If there is no evidence of a pre-existing trend in home prices, then we could expect to see a qualitatively similar DiD estimate with or without the municipality-specific trends added to the regression model. In Column 4 of Table 4, we report the regression results from equation (2) when we add a municipality-specific linear trend in the model. The coefficient of interest, 0.049, remains positive and statistically significant. Our results are robust if we replace the municipality-specific linear trend with a municipality-specific quadratic trend. Overall, there does not appear to be a pre-existing trend in the difference in home prices between "opt-in" and "opt-out" municipalities, and our main results suggest that there is a positive association between the decision to allow cannabis-related businesses and home prices.

Discussion

The current study explores possible factors that explain the municipalities' decisions to allow cannabis-related businesses, and the impact of allowing cannabis-related businesses on residential home sale prices. First, this study finds that the New Jersey municipalities most likely to allow cannabis-related businesses in their jurisdictions are those with larger populations, lower property values per capita, less affluent residents, and more liberal residents. Additionally, there is evidence that municipalities are more likely to allow cannabis-related businesses if one of their neighboring towns also allow cannabis-related businesses. This suggests there might be economic and political pressure to allow cannabis-related businesses to stay competitive with neighboring towns for tax revenue, businesses, and jobs.

Second, this study finds a positive association between the decision to allow cannabis-related businesses and home prices. For example, we find that the average home sale price increased by 2.7% in municipalities that allowed cannabis-related businesses compared to municipalities that did not allow these businesses, which is equivalent to a $10,343 increase for the average property in our data. Our robustness checks suggest that there is no evidence to suggest that there was a pre-existing

increasing trend in home prices for municipalities that allow cannabis-related businesses relative to those municipalities that did not allow these kinds of businesses.

The current study makes at least two important contributions to prior research. First, based on our knowledge, it is one of the first studies to make the explicit attempt to identify factors that explain why some municipalities allow cannabis businesses and others do not. Beyond the policy implications of those results, the study of the factors for opting in provide support for the academic literature on yardstick competition theory, which would argue that a municipality might feel economic and political pressure to compete with a neighboring local government that allows cannabis-related businesses by voting to allow these businesses in their jurisdiction as well (e.g., Besley & Case, 1995; Hall & Ross, 2010). Second, our study examines the association between allowing cannabis businesses and property values using an alternative context to examine this relationship. By examining the short run effect of allowing cannabis businesses in New Jersey, we can estimate home buyers' perceptions of the expected economic benefits, via changes in home sale prices, before many of the local municipalities had their first cannabis retail locations open and have a positive or negative effects on crime.

There are two broad policy recommendations based on this study. First, it is vital that state and local policymakers continue to collect data and evaluate the impacts of these cannabis-related businesses on individuals and communities. Our results suggest that the whereabouts of cannabis-related businesses are not randomly distributed across the state. For example, we find that the poorest municipalities and the municipalities with the lowest levels of property values are most likely to allow cannabis-related businesses in their jurisdictions. We do not yet fully understand the benefits and costs of these businesses on residents and local communities. If future research finds negative social costs on the community from cannabis-related businesses, then these social costs will be absorbed mainly in the most disadvantaged parts of the state.

Second, state and local policymakers in New Jersey can be cautiously optimistic about how their decision to allow cannabis-related businesses is impacting residential property sale prices. There is suggestive evidence to conclude that the decision to allow cannabis-related businesses is not causing home prices to fall, and therefore, we should not expect a negative impact on property tax bases at least in the short-run.

It is important to acknowledge potential limitations of the current study. First, we can only examine the effect of allowing cannabis-related businesses on home prices in the short-run. While we have more than enough parcel-level data on home sale prices prior to September 2021, we only have home price data for the first 22 months after the August 2021 decision. It is possible that the true impact on home prices from allowing cannabis-related businesses in the jurisdictions might take several years to show up in the data. Therefore, future researchers should collect more years of data to re-examine this research question to confirm our results. Second, we have limited data on the housing characteristics of each parcel in our dataset. It is possible that adding more detailed data, like the number of bedrooms and bathrooms, in our dataset might result in more precise estimates. However, this more detailed data was not available to us. Third, it is important for readers outside of New Jersey to avoid generalizing our main results. Our sample only includes data on municipalities and properties in New Jersey, and it is possible that our main results are sensitive to the political and

economic characteristics within New Jersey. Future researchers should test the robustness of our study's results in different contexts outside of New Jersey. Lastly, and most importantly, the study only examines how the decision to allow cannabis-related businesses impacts one possible outcome. There are numerous outcomes that future researchers should examine, including job creation, business formulation, crime, revenue collection, physical and mental wellbeing of the customers of cannabis-related products, and others.

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