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Abstract

The "secondary effects" legal doctrine allows municipalities to zone, or otherwise regulate, sexually oriented businesses. Negative "secondary effects" (economic externalities) justify limiting First Amendment protection of speech conducted inside strip clubs. One example of a secondary effect, cited in no fewer than four United States Supreme Court rulings, is the negative effect of strip clubs on the quality of the surrounding neighborhood. Little empirical evidence that strip clubs do, in fact, have a negative effect on the surrounding neighborhood exists. To the extent that changes in neighborhood quality are reflected by changes in property prices, property prices should decrease when a strip club opens up nearby. We estimate an augmented repeat sales regression model of housing prices to estimate the effect of strip clubs on nearby residential property prices. Using real estate transactions from King County, Washington, we test the hypothesis that strip clubs have a negative effect on surrounding residential property prices. We exploit the unique and unexpected termination of a 17 year moratorium on new strip club openings in order to generate exogenous variation in the operation of strip clubs. We find no statistical evidence that strip clubs have "secondary effects" on nearby residential property prices.

JEL Codes: K10, K23, R30, R38, R52

Sexually oriented business; secondary effects doctrine; repeat sales regression model

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1 Introduction

A substantial empirical literature examining the effects of local disamenities on local property values exists. In economic terms, the presence of certain individuals, activities, or conditions generate negative externalities that adversely affect property values. Examples include group homes (Colwell et al., 2000), registered sex offenders (Linden and Rockoff, 2008), methamphetamine labs (Congdon-Hohman, 2013), and businesses that emit toxic chemicals (Currie et al., 2015). In many instances, the presence and location of these disamenities involves some aspect of public policy. For example, the siting of group homes is often determined by public agencies, sex offender registries are maintained and publicized by local governments, and plant locations are regulated by local zoning laws. In this literature, documenting the negative impacts of disamenities on property values often plays an important role in assessing the efficacy of public policy.

One potential local disamenity is the operation of strip clubs (gentleman's clubs, exotic dancing, nude dancing, etc.). Many local policies prohibit or limit the operation of these businesses within municipal limits. The Supreme Court of the United States (SCOTUS) has heard several cases that specifically involve nude dancing at strip clubs. Historically, SCOTUS has viewed nudity and nude dancing as a form of free speech protected under the First Amendment; however, the extent of this protection is limited by the presence of *secondary effects* - a negative externality in the jargon of First Amendment law - generated by strip clubs. Common claims of secondary effects cited in case law include increases in local crime and decreases in local property values, specifically residential property values, near strip clubs.

Despite numerous references to the importance of secondary effects in court cases, the existing evidence supporting the existence of such negative effects is either anecdotal or rudimentary. Supreme Court Justice David Souter remarked in his dissenting opinion on *Erie v. Pap's AM (2000)*, a SCOTUS decision on an Erie, Pennsylvania ordinance aimed at eliminating strip clubs because of their secondary effects

> ...the evidence of reliance must be a matter of demonstrated fact, not speculative supposition. By these standards, the record before us today is deficient in its failure to reveal any evidence on which Erie may have relied, either for the seriousness of the threatened harm or for the efficacy of its chosen remedy.

The opinion of Justice Souter highlights the difference between public perception of the impact of strip clubs and their actual impact on the local economy. A telephone survey by West and Orr (2007) found evidence that moral objections to a sexually oriented businesses (SOB - a category that includes strip clubs, adult bookstores and adult movie theaters) were more important than any objections based on observable, quantifiable secondary effects. However, in a survey of residents living less than 1300 feet from an SOB, Hubbard et al. (2013) found that that more than 40% of the respondents were unaware of *any* SOB in operation in the area, suggesting secondary effects play no role. In that same study, homeowners who were aware of a relevant SOB in operation for more than 3 years reported no negative perceptions of the SOB.

Objective empirical evidence of measurable secondary effects generated by SOBs like strip clubs can help inform public debate over regulation of these businesses and legal decisions on these regulations. We analyze the impact of strip clubs on nearby property values using market transactions. We investigate secondary effects using market real estate transaction prices instead of alternative outcomes like crime data for three reasons. First, numerous studies have shown that market transaction prices capitalize the effect of crime, as well as a host of other local factors, into property values. Second, there is considerable debate about the usefulness and interpretation of crime statistics in the context of SOBs (Weinstein and McCleary, 2011). An increase in reported crime near an SOB can result from either an increase in criminal activity or an increase in law enforcement in the area. For example, Paul et al. (2001) point out some municipalities increase police presence in the vicinity of recently opened strip clubs. Third, while crime data can exhibit short-run fluctuation due to criminal activity or law enforcement, property values reflect homeowners' long-run perceptions of the local area, including crime, a point emphasized by Besley and Mueller (2012).

This paper investigates the impact of strip clubs on nearby residential property prices in Seattle, Washington. Seattle represents an interesting setting for analyzing the effect of strip clubs on residential real estate prices. The city passed a one-year moratorium on the opening of new strip clubs in 1988. This moratorium was subsequently renewed annually for the next 18 years. In 2005, a federal judge ruled that the moratorium was illegal; in the following years, a number of new strip clubs opened throughout the Seattle area and a number also closed. The timing of these openings and closings generates plausibly exogenous variation in strip club location and allows us to control for unobserved, property-specific variation in prices by comparing same-property sales over time. In the absence of intertemporal variation in location, cross-sectional analysis suffers from an omitted variable bias: the estimated secondary effects must be interpreted as a proxy for all unobserved neighborhood disamenities relevant for the location in question, Ross et al. (2011). Using fixed-effects to control for such unobserved variables can be difficult, as the bias in the disamenity can be related to the spatial scale of the fixed-effect, Abbott and Klaiber (2011).

We analyze variation in individual residential property values in Seattle, Washington over the period 2000-2014 using all transactions of single-family homes and condominiums on file at the King County, Washington Assessor's Office. Exploiting temporal variation of operating strip clubs, real estate price effects are estimated using an augmented repeat sales regression model. We find little evidence that strip clubs have any statistically significant impact on nearby residential property prices when pooling observations for all strip clubs operating in Seattle over the sample period. Results suggest lower residential property prices near two specific clubs, but idiosyncratic factors associated with the location of these clubs could also explain these lower property prices. The evidence produced here does not support the idea that strip clubs represent a negative externality in this setting; in legal terms, the empirical evidence suggests strip clubs do not generate negative secondary effects.

2 Legal History of Sexually Oriented Businesses

2.1 SCOTUS Cases

To combat content-based regulations by local government, strip club owners have traditionally characterized activities that occur in their businesses as a form of speech. While freedom of speech is guaranteed by the First Amendment to the U.S. Constitution, that guarantee is not absolute. Over time, SCOTUS has developed several doctrines to guide legal limitations on speech, discussed below. Justice Oliver Wendell Holmes, Jr. initially held in the landmark decision, *Schenck v. United States (1919)*: "The most stringent protection of free speech would not protect a man in falsely shouting fire in a theatre and causing a panic." This theorem was ultimately refined in *Brandenburg v. Ohio (1969)* to become the current controlling legal doctrine, which restricts impinging speech only to cases where it incites "imminent lawless action."

SCOTUS first addressed the topic of nude dancing (or exotic dancing or stripping) in *California v. LaRue (1972)*, holding that the activity operates on the periphery of First Amendment speech protections. This decision was subsequently affirmed in *Doran v. Salem Inn Inc. (1975)*. However, SCOTUS characterized nude dancing as symbolic speech, which is afforded fewer protections than other forms of speech per the holding in *United States v, O'brien (1968)*.

In this study, we are primarily interested in SCOTUS rulings that pertain to municipal zoning laws applicable to SOBs. Legally, municipal regulation of SOBs is controlled by the secondary effects doctrine. This doctrine, as applicable to SOBs, was first articulated by SCOTUS in *Young v. American Mini Theatres Inc. (1976)*. In *Young v. American Mini Theatres Inc. (1976)*, SCOTUS held that a municipality could prohibit two or more SOBs from operating near one another, stating [1]

> In the opinion of urban planners and real estate experts who supported the ordinances, the location of several such businesses in the same neighborhood tends to attract an undesirable quantity and quality of transients, adversely affects property values, causes an increase in crime, especially prostitution, and encourages residents and businesses to move elsewhere.

Here, the initial application of the doctrine does not allow for the outright prohibition of SOBs, yet it enables

[1] The idea behind dispersing SOBs was in response to the failed attempt of the City of Boston to reduce secondary effects by concentrating SOBs in a single location. Concentration of SOBs appeared to amplify the secondary effects of SOBs in Boston. For an excellent survey of the history of SOB regulation, see Weinstein and McCleary (2011)

the use of municipal zoning laws to limit the potential secondary effects that SOBs generate. Ten years later, in *Renton v. Playtime Theatres Inc. (1986)*, SCOTUS expanded the secondary effects doctrine, stating that SOBs can be zoned into or out of locations. In its decision, SCOTUS held

> The ordinance by its terms is designed to prevent crime, protect the city's retail trade, maintain property values, and generally "protec[t] and preserv[e] the quality of [the city's] neighborhoods, commercial districts, and the quality of urban life," not to suppress the expression of unpopular views.

These statements clearly demonstrate that crime, neighborhood quality and property values are examples of the secondary effects that SCOTUS has in mind when determining the legality of municipal zoning laws for SOBs.

Two cases set the stage for the most recent SCOTUS ruling. In *Barnes v. Glen Theatre Inc. (1991)*, SCOTUS expanded the secondary effects doctrine to include not only the location of SOBs, but also the nature of their economic activity. The majority of justices found that an Indiana law requiring dancers to wear g-strings and pasties was not an overbearing infringement on the dancers' speech. Further, three separate concurring majority opinions hinged on the same principle: as long as the message the dancer was trying to convey is not overly abridged, the requirement to wear g-strings and pasties is constitutional. Interestingly, SCOTUS called attention to the direct economic consequences of the law in this case. Specifically, one of the dancers working at the the strip club in question stated that she would earn more money if she were allowed to dance completely nude. Consequently, despite First Amendment protection, some economic activities of nude dancers can be curtailed by local regulations in the presence of secondary effects.

In a similar case, *Erie v. Pap's AM (2000)*, SCOTUS upheld an Erie, Pennsylvania law prohibiting all-nude dancing. However, for the first time, multiple Justices in both the majority and dissenting opinions acknowledged a limited or non-existent impact of certain regulations on secondary effects.[2] Justice Souter provides excellent motivation for this research in writing that, although evidence of any secondary effects associated with SOBs is lacking, the hypothesis that SOBs cause secondary effects is "amenable to empirical treatment." [3]

[2]Justice O'Connor: *"Requiring dancers to wear pasties and G-strings may not greatly reduce these secondary effects"*; Justice Scalia: *"I am highly skeptical, to tell the truth, that the addition of pasties and G-strings will at all reduce the tendency of establishments such as Kandyland to attract crime and prostitution, and hence to foster sexually transmitted disease."*; Justice Stevens: *"To believe that the mandatory addition of pasties and a G-string will have any kind of noticeable impact on secondary effects requires nothing short of a titanic surrender to the implausible."*; Justice Souter: *"As to current fact, the city councils closest approach to an evidentiary record on secondary effects and their causes was the statement of one [city] councilor, during the debate over the ordinance, who spoke of increases in sex crimes in a way that might be construed as a reference to secondary effects . . . But that reference came at the end of a litany of concerns ("free condoms in schools, drive-by shootings, abortions, suicide machines" and declining student achievement test scores) that do not seem to be secondary effects of nude dancing."*

[3]See footnote 3 in Justice Souter's dissenting opinion in *Erie v. Pap's AM (2000).*

SCOTUS revisited the zoning issue in *City of Los Angeles v. Alameda Books, Inc. (2002)*, expounding on Justice Souter's observation about the feasibility of an empirical study of secondary effects. The City of Los Angeles produced a 1977 study of secondary effects as evidence of the importance of secondary effects in this case. SCOTUS held that zoning laws were legal, although several justices questioned the conclusions reached in the then-25 year old study. The study showed individual SOBs do not increase nearby crime rates, but a concentration of SOBs do increase nearby crime rates; results for nearby property prices were inconclusive.

Drawbacks to the Los Angeles study are discussed at length by Paul et al. (2001). However, the most striking feature of the 1977 Los Angeles study to an economist is the small cost and large benefits from a comparable study using modern computing, GIS software and econometric methods. Justice Souter wrote at length on this topic in his dissenting opinion on *City of Los Angeles v. Alameda Books, Inc. (2002)*

> Equal stress should be placed on the point that requiring empirical justification of claims about property value or crime is not demanding anything Herculean . . . These harms can be shown by police reports, crime statistics, and studies of market value, all of which are within a municipality's capacity or available from the distilled experiences of comparable communities . . . [W]e must be careful about substituting common assumptions for evidence, when the evidence is as readily available as public statistics and municipal property valuations, lest we find out when the evidence is gathered that the assumptions are highly debatable. The record in this very case makes the point . . . The lesson is that the lesser scrutiny applied to content correlated zoning restrictions is no excuse for a government's failure to provide a factual demonstration for claims it makes about secondary effects; on the contrary, this is what demands the demonstration.

The empirical evidence developed here represents a response to the demands of Justice Souter for an evidentiary basis that the presence of one type of SOB – a strip club – generates secondary effects. The methods used here are standard in the real estate economics literature and do not place "Herculean demands" on the researcher.

2.2 Strip Clubs in Seattle

Seattle, Washington represents an interesting setting for studying externalities generated by SOBs. The city of Seattle first enacted a moratorium on the opening of new strip clubs in 1988l; this moratorium was renewed annually for the next 18 years. On September 12th, 2005, a federal judge ruled the process of annual renewal unconstitutional, thereby ending the *de facto* moratorium on the establishment of new strip clubs. In response, Seattle's city council – fearing a dramatic increase in the number of strip clubs operating in the city – proposed some of the strictest rules ever faced by the industry[4]. Under the proposed rules, dancers would be required to maintain a distance of at least four foot between themselves and their customers. In effect, this would have prevented dancers from performing lap dances and receiving tips directly from the customers. In addition, establishments would also be required to maintain bright, commercial-store style lighting (Johnson, 2005). The proposed restrictions on the operation of strip clubs did not pass a November 2006 voter referendum; Seattle voters rejected the regulations by a 2-to-1 margin. Shortly after this referendum, several new clubs opened in in Seattle for the first time in 17 years.

We use the end of the moratorium to generate plausibly exogenous variation in the number and location of strip clubs in Seattle. While the location of new strip clubs is not randomly assigned, the timing of the end of the moratorium on new clubs was uncertain and determined by both a federal court ruling and a voter referendum. Presumably, both of these events are exogenous to other economic factors that affect property values. In addition to openings, a number of strip clubs also closed during the sample period. Furthermore, we also have examples of strip clubs opening in areas zoned off limits to SOBs in other municipalities, land purchased for a strip club, legally approved after a lengthy suit, but never built. We use all of these events in order to provide strong robustness checks to the empirical evidence generated in the paper.

3 Secondary Effects and SOBs

Most of the research on the secondary effects associated with SOBs examines the relationship between the presence of SOBs and crime. Much of this research was performed at the behest of municipal planning departments when developing new zoning ordinances; many of these studies were not peer-reviewed. Paul et al. (2001) provides a critical survey of the most frequently cited municipal studies.

Much of the existing peer-reviewed research fails to achieve consensus on the effects of SOBs on crime, and scholars provide both sides of the contradictory results in legal testimony.[5] Linz et al. (2004) matches SOBs to other establishments and finds that SOBs do not increase telephone calls requesting police assistance ("calls for service"). McCleary and Meeker (2006) attacks the validity of calls for service as an inappropriate measure of crime. McCleary and Weinstein (2009) find police reports increase in the area near a single SOB in Sioux City, Iowa over the period 2002-2005 relative to a nearby hotel. Other research uses concentric zones and compares crime rates at varying distances from SOBs and find crime decreases as the distance from an SOB increases, Linz et al. (2006); McCord and Tewksbury (2012); McCord (2014). However, when

[4]See http://seattlepi.nwsource.com/printer/ap.asp?category=6600&slug=WST%20Seattle%20Stripping. From a 2005 Associated Press article by Gene Johnson: "No lap dances. No placing dollar bills in a dancer's G-string. And the clubs must have what one council member likens to "Fred Meyer" lighting, a reference to the department store chain. 'It's wiping out an entire industry in Seattle,' said Gilbert Levy, a lawyer for Rick's gentleman's club (Johnson, 2005)

[5]http://secondaryeffectsresearch.com/biblio

controlling for the density of nearby alcohol establishments, Enriquez et al. (2006) finds that the existence of a strip club is not associated with an increase in nearby crime.

Although there is some debate on the correct use of crime for analyzing externalities from SOBs data exists, a number of previous studies have, documented a statistical relationship between criminal activity and property values. Many papers on the economics of crime uses crime statistics as covariates to explain observed variation in property values.[6] In general, these studies find a negative relationship between crime and property values. However, some studies have found insignificant relationships, Kain and Quigley (1970); Ridker and Henning (1967), and at least one study finds a positive relationships between crime and property prices, Case and Mayer (1996). Just as an increase in criminal activity should decrease property prices, an increase in law enforcement should increase property prices. Frischtak and Mandel (2012) examine the introduction of new police stations in Rio de Janeiro and find the associated drop in crime due to the new police stations explains 15% of the growth in property values.

It is possible that the presence of an SOB represents a signal of higher future crime to local residents, possibly crime of a sexual nature. However, results linking the location of current sexual offenders to future sexual offenses are inconclusive. Agan (2011) finds that sex offender registries applied to census block level data can not be used to predict the location of future sex abuse incidents. Using incident level data, Prescott and Rockoff (2008) find evidence that close acquaintances, including neighbors, are less likely to be the victims of sexual abuse following the advent of sex offender registries in areas. Regardless of the effect of sex offender registries on future sexual crimes, previous research has unequivocally found a negative relationship between convicted sexual offenders and property prices. Using cross-sectional data, Larsen et al. (2003) find property prices within a tenth of a mile of a convicted sexual offender sell for 17% less. Using intertemporal variation in the presence of convicted sexual offenders, Linden and Rockoff (2008); Pope (2008) find more modest impacts of 4% and 3%, respectively.

If SOBs have a negative effect on real estate prices, it is important to accurately measure this effect. If no strip club openings or closings occurred during the sample period, our analysis would proceed in a cross-sectional setting. Absent any location-specific control variables, Ross et al. (2011) showed that, despite accurate identification of the location of a proposed disamenity, the estimated coefficient on an amenity location variable suffers from omitted variable bias; the estimated coefficient on an amenity location variable actually captures the relative effects of all observed and omitted local amenities and disamenities. Including fixed effects can mitigate this bias, but Abbott and Klaiber (2011) point out that omitted variable bias will remain if fixed effects indicator variables are created at too large a spatial scale. For example, census

[6]Specific examples include Thaler (1978); Cullen and Levitt (1999); Schwartz et al. (2003); Gibbons and Machin (2008); Ihlanfeldt and Mayock (2010). For a recent survey, see Benson and Zimmerman (2010).

blocks and zip codes represent convenient spatial units for fixed effects. However, if important and relevant disamenities exist at geographic levels below this scale, omitted variable bias will still exist in parameter estimates on amenity location indicator variables.

If the variable of interest is time-varying in a sample, changes in prices can be used to identify the effect of a disamenity. In this study, openings and closings of strip clubs following the end of the moratorium in 2005 generate a time-varying measure of the presence of a strip club at a specific location in Seattle. In practice, the estimated effect of a disamenity is identified by differencing an hedonic model and estimating an augmented repeat-sales model (RSR) like Case and Shiller (1988); differencing an hedonic model removes all biases due to omitted time-invariant factors. One of the earliest examples of this technique, Mayer (1998), undertakes such a procedure and finds auction premiums and discounts based on this method are more credible than estimates from an un-differenced hedonic model. Similar differenced estimators have been applied to assess the effects of environmental externalities, Case (2006); Chay and Greenstone (1998); Muehlenbachs et al. (2014), and externalities generated by nearby property foreclosures, Gerardi et al. (2015); Harding et al. (2009).

4 Empirical Analysis

4.1 Methodology

Two approaches can be used to analyze the effect of proximity to some built environment feature like a strip club on nearby residential property values: hedonic regression models and repeat sales regression (RSR) models. Each has strengths and weaknesses and each is widely used in the literature. The hedonic approach models residential property transaction prices as a linear function of time, location, property-specific factors, and other attributes. If the log transaction price of residential property $i = 1, \ldots, N$ sold at time $t = 1, \ldots, T$, denoted by p_{it}, is given by

$$p_{it} = \delta_t + f(\beta, x_{it}) + \phi z_{it} + \mu_i + u_{it} \tag{1}$$

then Equation (1) is a standard hedonic property price model. The parameter δ_t captures the market-wide property price level at time t. The vector x_{it} is a (possibly) time-varying vector of observed property attributes and β reflects the hedonic prices of these attributes. The scalar z_{it} is determined by the proximity between property i and the nearest operating strip club at time t and is defined below. The unobserved terms μ_i and v_{it} capture unobserved time-invariant and unobserved time-varying attributes of each property. An hedonic price model can also allow for different time trends and attribute prices based on property type (single family home or condominium) and location (downtown or not downtown).

It is common in the hedonic price regression literature to assume a simple functional form for $f(\beta, x_{it})$ such as $f(\beta, x_{it}) = \beta' x_{it}$. Transformations of, and interactions between, the variables in x_{it} can be included given the flexible form. Despite this flexibility, estimating complex functional forms is computationally intensive and could possibly require the researcher to collect a large number of relevant explanatory variables.

The treatment indicator variable z_{it} is constructed in a three step process designed to indicate the presence of any nearby operating strip club at the time of each transaction. In the first step, the distance between property i and strip club c, d_{ic}, is calculated for all $c = 1, \ldots, C$. An indicator variable, $\mathbf{1}(d_{ic} \leq K)$, is created to identify properties within K of strip club c. We use $K \in \{500ft, 1000ft, 2000ft\}$; other values for K produce similar results to those reported here.

In the second step, an indicator variable for the presence of strip club c in operation at time t, $\mathbf{1}(t_c^1 \leq t \leq t_c^2)$, is constructed using the opening date, t_c^1, and closing date, t_c^1, for each strip club. In cases where a strip club is still in operation at the end of the sample period, this indicator variable simplifies to $\mathbf{1}(t_c^1 \leq t)$.

In the third step, an interaction term $z_{itc} = \mathbf{1}(d_{ic} \leq K) \times \mathbf{1}(t_c^1 \leq t \leq t_c^2)$ is constructed. Heuristically, the variable z_{itc} indicates if property i was 1) near strip club c at the time of its sale while 2) strip club c was open for business. It is possible that a property can be near more than 1 operating strip club. In this situation, we assume that the impact of both strip clubs on property prices are non-additive. Under this assumption, we create and indicator variables $z_{it} = max\{z_{it1}, ..., z_{itC}\}$ reflecting the presence of multiple strip clubs nearby. As a robustness check, we construct an additive indicator variable $z_{it}^* = \sum_c z_{itc}$ and us this in the regression models. The results in the paper are robust to this alternative specification.

The variable z_{it} captures the treatment effect of a strip club where the transaction price for all properties within K of an operating strip club are shifted by a constant amount ϕ. If $\phi < 0$ ($\phi > 0$) the effect of the treatment is to decrease (increase) nearby property values by an amount equal to ϕ. Because z_{it} is the product of time-invariant and time-varying terms, the treatment effect can be time-varying when a strip club either opens or closes at a specific location.

Although the parameters of Equation (1) can be estimated using the ordinary least squares (OLS) estimator, the nuisance parameters μ_i must be accounted for in this setting. If the nuisance parameters μ_i are assumed random and exogenous, the generalized least squares estimator represents the minimum variance, unbiased estimator. As noted in Mayer (1998), if the variables in x_{it} do not adequately control for dwelling quality, least-squares estimation will mistakenly attribute differences in unobserved quality to the coefficient on the treatment effect, ϕ. For instance, if a strip club opens in an area of low quality housing, the least-squares regression parameter estimate would indicate that strip clubs have a negative impact on nearby property prices.

These econometric problems can be avoided by including more explanatory variables in x_{it} or by using appropriate instrumental variables for dwelling quality. An alternative approach that does not require choice among many potential explanatory variables is to explicitly estimate μ_i by including a dummy variable for each property transacted in the sample. However, sale prices for properties with only a single sale will be perfectly predicted by the coefficient $\widehat{\mu_i}$, and such sales will not allow for the identification of ϕ.

A practical alternative to including dummy variables for each property transacted is to control for unobservable heterogeneity at the census block, census tract, or zip code level. In hedonic regression model results not reported here, alternative levels of spatial aggregation for fixed effects were assumed for μ_i, including zip code-, census block- and property-level fixed effects. A Chow test, AIC, and BIC model selection criteria indicate property level fixed effects are the preferred choice in this setting. These results are available by request.

As an alternative to property-specific fixed effects in hedonic regression models, it is possible to estimate ϕ using a RSR approach. In the RSR approach, transaction price data from dwellings sold multiple times in the sample period (repeat sales) are used to identify δ_t. For two sales of property i at times s and $s \leq t$, the change in price is found by differencing Equation (1)

$$\begin{aligned} p_{it} - p_{is} &= \delta_t - \delta_s + \phi(z_{it} - z_{is}) + v_{it} \\ v_{it} &= f(\beta, x_{it}) - f(\beta, x_{is}) + u_{it} - u_{is} = \Delta f_{its} + \Delta u_{its} \end{aligned} \tag{2}$$

In Equation (2), changes in same-property prices are driven by changes in the overall market price level, changes in the treatment effect and an error term. By differencing Equation (1), the time-invariant nuisance parameter μ_i is no longer present in the regression model, Equation (2). It is common in the RSR literature to assume $E[\Delta f_{its}] = 0$ but that $E[\Delta f_{its}^2] = \sigma_f^2 \times (t - s)$. Under these conditions, a weighted least-squares estimator, where the weights depend on the elapsed time between observed transactions, provides the minimum variance, unbiased estimator for the parameters in Equation (2). The appendix describes this weighted least squares methodology in detail. All reported parameter estimates and estimated standard errors from the RSR model reported below use this weighted least squares approach.

In addition, using differenced transaction prices eliminates the need to collect detailed information on property attributes or specify a functional form for x_{it}. When relevant variables are omitted from an hedonic regression model, the model is mis-specified and can provide misleading conclusions. For these reasons, we focus on the results from the RSR approach when assessing the effect of an operating strip club on nearby property transaction prices, but also estimate and report results for hedonic regression models for comparison.

In Equation (1), the treatment effect (the presence of a nearby operating strip club) has an effect on property transaction price levels. In certain situations, the treatment effect will also impact changes in transaction prices for the same property as shown in Equation (2). Estimating ϕ from Equation (2) requires discarding all those transactions for properties with only a single sale in the sample. As discussed above, the same number of transactions are effectively discarded when including property-level dummy variables in Equation (1). The degrees of freedom in Equation (1) are smaller than the degrees of freedom in Equation (1) as β must also be estimated in Equation (1).

Although z_{it} is a standard indicator variable taking values 1 or 0, in Equation 1, $\Delta z_{it} := z_{it} - z_{is}$ takes three possible values. In order to illustrate this, suppose there is only a single strip club in the city. In this situation, $\Delta z_{it} = \mathbf{1}(d_i \leq K) \times [\mathbf{1}(t^1 \leq t \leq t^2) - \mathbf{1}(t^1 \leq s \leq t^2)]$. Assuming property i is within K of the strip club, $\Delta z_{it} = 0$ whenever $t^1 \leq s, t \leq t^2$ or $s, t < t^1$ or $t^2 < s, t$. In this situation, both sales occur while the strip club is in operation, or both occur when the strip club is not in operation. Alternatively, when sale t occurs when the strip club is operating but sale s occurs when the strip club is nor operating, $\Delta z_{it} = 1$. $\Delta z_{it} = -1$ when the roles are reversed. Thus, only those sales where $\Delta z_{it} = 1$ or $\Delta z_{it} = -1$ can be used to identify the treatment effect. This is true for Equation 1 or Equation 2. As such, we define sales identified by these values as *identifying sales*. Summarizing:

- $\Delta z_{it} = 0 \iff z_{it} = z_{is} = 1$ or $z_{it} = z_{is} = 0$: there is no change in the treatment effect. Property i is near an operating strip club both at times s and t. Alternatively, property i is not near any operating strip club during periods s and t.

- $\Delta z_{it} = 1 \iff z_{it} = 1, z_{is} = 0$: property i is given the treatment. Property i is within $K$of a strip club that opens at some time τ where $s < \tau \leq t$

- $\Delta z_{it} = -1 \iff z_{it} = 0, z_{is} = 1$: the treatment is removed from property i. Property i is within K of a strip club that opens before time s and closes at some time τ where $s < \tau \leq t$

In the hedonic model defined by Equation 1, z_{it} is allowed to take on values of 0 or 1 and ϕ is interpreted as a shift in the transaction price when the property receives the treatment of location near an operating strip club. The interpretation of ϕ is the same in Equation (2) although Δz_{it} can take on values of -1, 0, or 1. When $\phi < 0$, price changes where $\Delta z_{it} = 1$ are expected to be lower as a strip club has opened nearby between the the first and second sale. Similarly, when $\Delta z_{it} = -1$ property prices are expected to increase as a nearby strip club was closed between the first and second sale.

4.2 Asymmetric Opening and Closing Effects

The above empirical models assume the treatment effect of an operating strip club on property prices shifts property prices by ϕ. If the strip club closes, the treatment effect is removed and property prices revert back to pre-treatment levels. An alternative approach is to assume that strip clubs shift property prices by ϕ_{OPEN} when opening and by ϕ_{CLOSE} when closing. For simplicity assume there is only a single strip club, we can modify Equation (1) in order to estimate these different effects

$$p_{it} = \delta_t + f(\beta, x_{it}) + \phi_{OPEN} \times \mathbf{1}(t^1 \leq t) + \phi_{CLOSE} \times \mathbf{1}(t^2 \leq t) + \mu_i + u_{it} \tag{3}$$

Here, t^1 and t^2 represent the opening and closing dates of a nearby strip club, as before. Setting $\phi_{OPEN} = -\phi_{CLOSE}$ results in Equation (1). Therefore, Equation (3) represents an asymmetric effect whereby the opening and closing of a strip club are allowed to have different effects on property prices.

We can also difference Equation (3) in order to estimate ϕ_{OPEN} and ϕ_{CLOSE} using repeat sales. Differencing Equation (3) we have

$$p_{it} - p_{is} = \delta_t - \delta_s + \phi_{OPEN} \times \mathbf{1}(s < t^1 \leq t) + \phi_{CLOSE} \times \mathbf{1}(s < t^2 \leq t) + v_{it}. \tag{4}$$

Like the identification requirements for ϕ in Equation (2), only certain repeat sales can be use to identify ϕ_{OPEN} and ϕ_{CLOSE} in this regression model. To wit, repeat sales before and after the opening of a strip club can be used to identify the effect of a club opening on prices. Sales before and after the closing of a strip club are used to identify the effect of a club closing on prices. Repeat sales for which $s \leq t^1, t^2 \leq t$ can be used to identify ϕ_{OPEN} and ϕ_{CLOSE} in Equation (4) whereas these sales cannot be used to identify ϕ in Equation (2).

4.3 Data Description

The data come from the King County, Washington Assessor's Office. King County includes the city of Seattle and surrounding municipalities. The property transaction price data available through the assessor's office dates to 1990 and includes all transactions that occurred in King County. Because the reference period for our study includes the period before and after the elimination of the moratorium on the opening of new strip clubs, we use data from only those properties sold between January 1, 2000 and December 31, 2013. After applying reasonable filters for the observable hedonic variables and removing all non-arms length transactions, we have a total of 317,056 residential property sales over this period.

The Assessor's Office transactions data includes numerous property characteristics that might affect property values. Property attributes range from those commonly found in real estate data sets like square footage, year of construction, number of bedrooms and bathrooms, to variables unique to the Seattle area like view indicators for Puget Sound, Lake Washington and Mount Rainier, property quality indicators on a

Table 1: Summary Statistics - Houses and Condos

Panel A:	All Sales: N=317,056			
	Mean	Std Dev	Min	Max
Sale Price ($1,000s)	365.4	229.7	10.2	2,000
Bedrooms	2.949	1.068	0	8
Full Baths	1.484	0.607	0	7
Condo	0.253	0.435	0	1
Sale Year	2006	3.735	2000	2013
Distance to Club < 1000 feet	0.004	0.060	0	1
Distance to Club < 2000 feet	0.018	0.132	0	1
Panel B:	Sales Within 2,000 ft, N=5,441			
	Mean	Std Dev	Min	Max
Sale Price ($1,000s)	379.9	214.5	31.5	2,000
Bedrooms	2.3	1.2	0	8
Full Baths	1.31	0.52	0	4
Condo	0.415	0.493	0	1
Sale Year	2005	3.77	2000	2013

scale 1-5, and binary indicators for property features. Summary statistics for typical property variables are presented in Table 1.

Panel A on Table 1 contains summary statistics for all residential property transactions over the 2000-2013 period. Panel B contains summary statistics for only those transactions involving properties located within 2,000 ft of an operating strip club. From Panel A and Panel B, properties located within 2,000 ft of a strip club are more expensive, have fewer bedrooms and bathrooms, and are more likely to be condominiums than the average property in the sample.

We have information on the location of 24 strip clubs that were either open during the entire sample period, opened sometime after January 1, 2000 or closed sometime before December 31, 2013. The location of the strip clubs and a random sample of 10,000 residential properties from the sample are shown on Figure 1. Strip clubs, identified at the center of a ring, tend to be located either in the north part of the city, downtown or south of the city. The rings identify a circle with radius 2000 feet around each strip club. Condominium buildings are indicated with squares, and single family houses are indicated with dots. Despite this geographic variation, we use the results above to argue that the markets in these areas share similar characteristics, including unobservable factors affecting property values.

Figure 2 contains a smaller scale plot for one of the strip clubs in the sample, Pandora' Adult Cabaret. This club is located in the North of Seattle, in the third ring from the top of Figure 1. The number 522 is faintly visible in this ring. 2 shows alternative rings with radii of 500 feet, 1000 feet and 2000 feet around this club.

Figure 1: Dwelling and Strip Club Locations

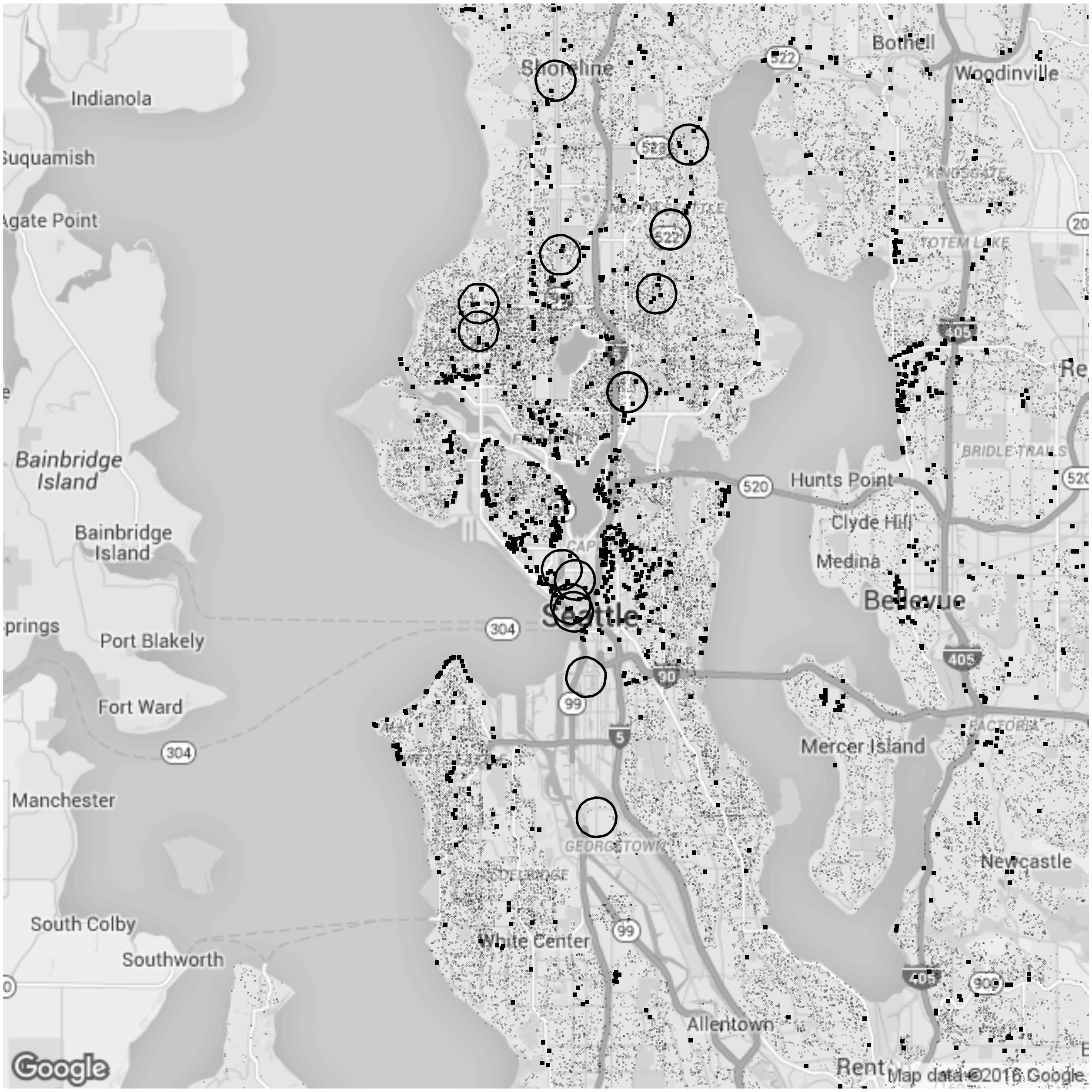
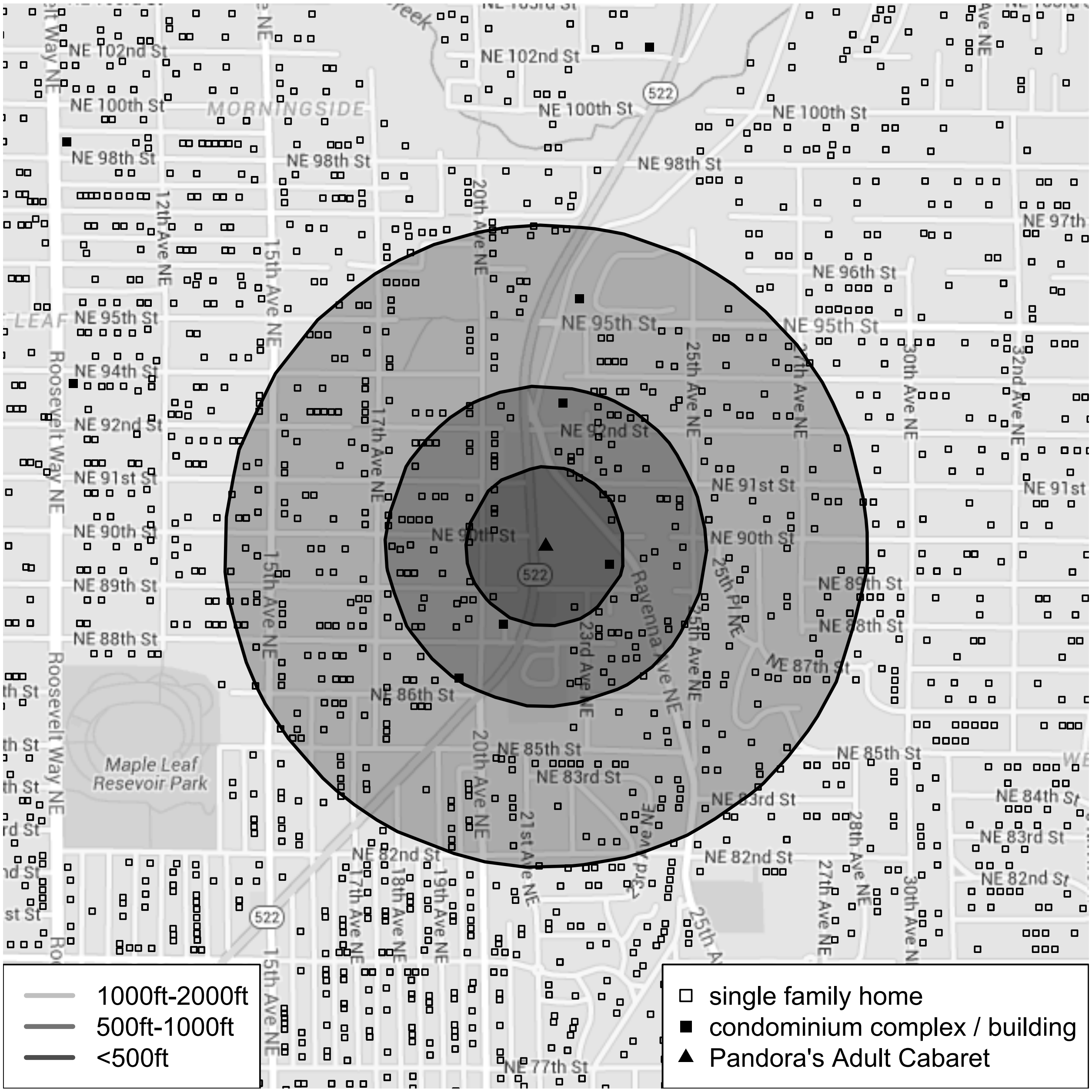


Figure 3 shows the citywide residential property price index calculated using a quarterly RSR model and base value of 100 in the first quarter of 2000.[7] This RSR model is estimated assuming a single price index for all repeat sale transactions in each quarter of the sample and is intended to illustrate general price changes and the opening and closing of strip clubs over time.

Figure 3 plots the estimated quarterly repeat sale price index. This index shows a pattern of boom and bust common to most cities during over period. At the start of the 2000s, property prices grew at a

[7]The hedonic price index for the same period is nearly identical.

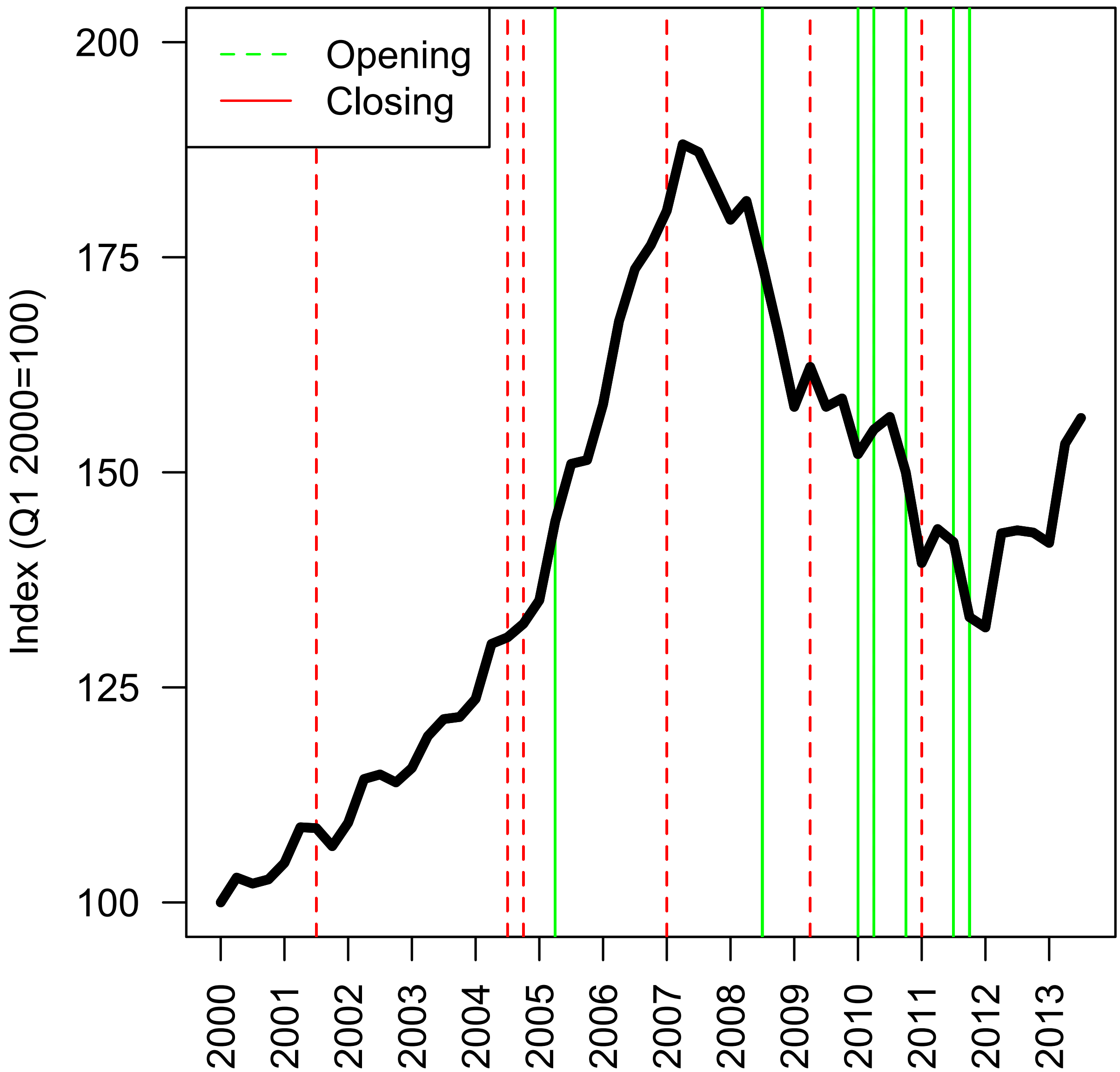
Figure 2: Pandora's Cabaret



moderate pace. A boom and bust period can clearly be seen in the middle of the decade; the index peaks in the summer of 2007 at 190 and bottoms out in the summer of 2012 at 112. Figure 3 underscores the need to control for citywide changes in property prices over time in any regression model.

Figure 3 also shows club openings (green dashed vertical lines) and closing (red dashed vertical lines) in the Seattle area. A number of openings and closings occur throughout the sample period. 14 clubs were in operation at the start of the sample in 2000. Six of these clubs closed during the sample period. Six openings occurred after the lifting of the moratorium on new strip clubs openings in 2006. The one club opening prior

Figure 3: Citywide Price Index and Club Openings and Closings



to the end of the moratorium, in 2005, was the reopening of a club with a new name (Club Paradise) in the same building as a club that closed in late 2004 (Stilettos). This club is located in Lakewood, which is in King County but outside Seattle.

Again, the increase in openings of new strip clubs in Seattle after the September 2005 moratorium end, and the 2006 referendum on the proposed operating restrictions, is not related to other economic changes that might also affect property values over this period. from Figure 3, while the Seattle housing market boomed from 2000 until mid 2007, most of the strip club openings took place after the peak of the housing market in 2007. Thus the openings should be plausibly exogenous to changes in other economic factors affecting property prices in Seattle during the sample period.

Table 2 contains detailed information about the opening dates, closing dates and identifying sales for strip clubs that were in operation during the sample period. Some strip clubs operated continuously over the entire sample period while other clubs opened, closed or both opened and closed. From Table 2, only 15 sales can be used to estimate the treatment effect of strip clubs within 500 feet of a property when using either a RSR or hedonic model with property-specific fixed effects. Increasing the distance to 2000 feet increases the number of identifying transactions to 370. Not controlling for property-specific fixed effects increases the number of properties within 500 feet to 249 but possibly introduces some of the econometric problems discussed above.

Table 2: Total Sales and Identifying Sales by Proximity to Clubs

			Identifying Sales within			All Sales within		
Club	Opening Year	Closing Year	500ft	1000ft	2000ft	500ft	1000ft	2000ft
Centerfolds	Before 2000		0	0	0	19	150	1071
Club Extasy	Before 2000	2004	2	3	13	2	14	47
Club Paradise	2005		0	0	0	0	0	0
Club SinRock	2010		0	1	4	0	2	6
Dancing Bare	Before 2000		0	0	0	46	179	576
Deja Vu Showgirls - Downtown	Before 2000		0	19	77	0	118	399
Deja Vu Showgirls - Federal Way	Before 2000	2001	0	0	6	0	0	15
Deja Vu Showgirls - Lake City	Before 2000		0	0	0	3	127	363
Deja Vu Showgirls - Seattle	Before 2000	2007	0	0	0	56	107	1591
Deja Vu Showgirls - Tukwila	Before 2000		0	0	0	0	64	176
Dreamgirls at Rick's	2011		2	4	16	3	7	37
Dreamgirls at SoDo	2010		0	0	0	0	0	0
Jiggles Gentlemans Club	2010	2011	0	0	1	0	0	1
Kittens Cabaret	Before 2000		0	0	0	0	2	47
Little Darlings	2008		0	2	14	0	2	258
Lusty Lady	Before 2000	2010	5	13	157	48	129	1330
Pandora's Adult Cabaret	2011		3	16	35	8	32	94
Rick's	Before 2000	2010	2	4	23	16	68	271
Sands Showgirls	Before 2000		0	0	0	42	195	810
Stilettos	Before 2000	2004	0	0	0	0	0	0
Sugars	Before 2000	2009	1	2	24	6	30	208
Total			15	64	370	249	1226	7300

RSR models, and hedonic regression models with dwelling-specific fixed effects, can be estimated and the the treatment effect parameter identified, using only the identifying sales shown on Table 2. Hedonic models with zip code or census block fixed effects, or no fixed effects, can be estimated and the the treatment effect parameter identified, using all sales in the sample. A glance back at Figure 2, and the observations contained in each ring around that club, shows why the sample sizes increase as the radius of the ring increases.

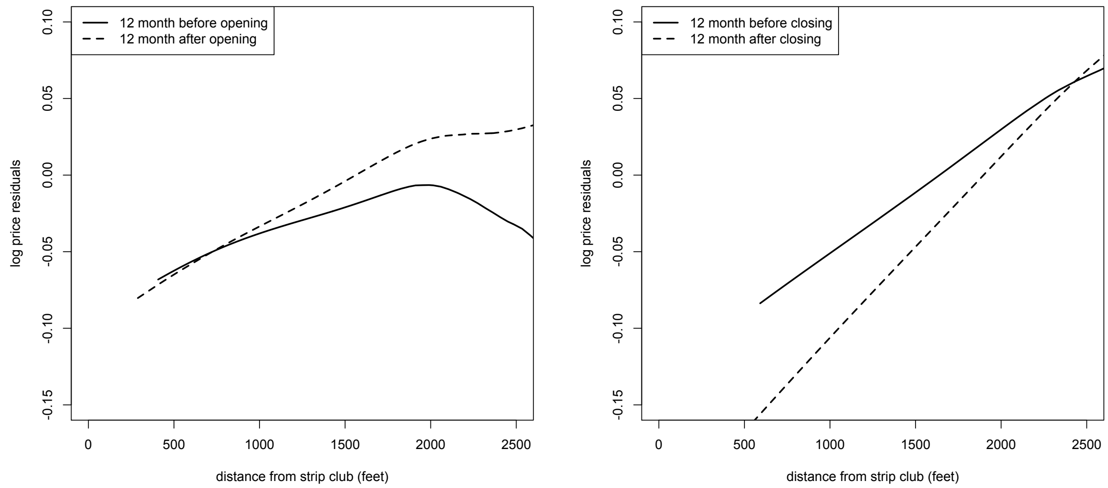
4.4 Pooled Results

The treatment effect parameter ϕ can be estimated using either Equation (1), a hedonic regression model, or Equation (2), an RSR model, using least squares. As mentioned above, when estimating Equation (1), we are required to specify the variables in x_{it}. We use the number of bedrooms, the number of full bathrooms, and quarterly fixed effects. We estimate separate time fixed effects for both single family homes and condominiums in order to control for possibly different price dynamics in each market. Unreported results indicate that the results are robust to a more complex functional form.

We first examine the relationship between the residuals from an hedonic regression model, Equation (1), excluding the treatment indicator variable z_{it}, and distance to a strip club, d_{ic}. This should reveal any systematic relationship between general unexplained variation in property prices and proximity to a strip club. If the presence of a strip club affects property prices, the price gradient of the residuals will exhibit systematic changes before and after strip club openings and closings. In particular, if the presence if a strip club is a negative externality, the price gradient will decrease at close distances. Figure (4) shows this residual and the distance between each property in the sample and the nearest strip club. This figure contrasts the price gradient for those properties sold within 12 months of a strip club opening or closing. The solid line is the gradient 12 months before each opening; the dashed line is the gradient 12 months after each opening. It is clear from the figures that properties located further from a strip club sold for larger prices, as the price gradient is increasing. Despite this, the opening of a strip club does not seem to impact nearby property prices, as the price gradient in Panel (a) is nearly identical for all properties sold within 1000 feet of a strip club 12 months before and 12 months after the opening. Similarly, if strip clubs have a negative impact of property prices, the closing of a strip club should increase nearby property prices. Surprisingly, Panel (b) indicates the closing of a strip club is associated with a decrease in property prices for nearby properties. In particular, property prices are expected to decrease by more than 5% at a distance of 500ft.

Next, we estimate an hedonic regression model containing the treatment indicator variable and property-level fixed effects. The treatment indicator identifies properties within 500 feet, 1,000 feet, and 2,000 feet of an operating strip club, and a pooled model including all three proximity indicators. Results are reported in Table 3. The number of identifying transactions for each distance are reported on Table 2. The table contains parameter estimates, estimated standard errors, and other regression diagnostic statistics. The results indicate that operating strip clubs do not impact property prices at any of the three alternative distances. These results are not surprising given Figure (4), which shows little impact of proximity to a club on residual variation in transaction prices.

Given the arguments above in favor the RSR, and the weak results from the hedonic regression models



(a) Strip Club Openings

(b) Strip Club Closings

Figure 4: Price Gradient Around Strip Club Openings and Closings

Table 3: Hedonic Model Regression Results, Dwelling Fixed-Effects

	(1)	(2)	(3)	(4)
Number of Bedrooms	0.003	0.003	0.003	0.003
	(0.012)	(0.012)	(0.012)	(0.012)
Number of Bathrooms	0.024	0.024	0.024	0.024
	(0.026)	(0.026)	(0.026)	(0.026)
Distance to club < 500 feet	0.065			0.081
	(0.074)			(0.079)
Distance to club < 1000 feet		−0.010		−0.045
		(0.027)		(0.033)
Distance to club < 2000 feet			0.018	0.028
			(0.016)	(0.019)
Observations	310,771	310,771	310,771	310,771
R^2	0.983	0.983	0.983	0.983
Adjusted R^2	0.934	0.934	0.934	0.934
Residual Std. Error	0.140	0.140	0.140	0.140
Degrees of Freedom	79406	79406	79406	79404)

Dep. var.: log transaction price. Parameter estimates & (est. standard errors).

shown on Table 3, we turn to the results obtained from estimating Equation (2), a repeat sales model. This model contains only the treatment indicator variable and the treatment effect parameter, $\widehat{\phi}$, and terms capturing market-wide property price effects. The unknown parameters of Equation (2) are initially estimated by pooling all repeat sale single-family home and condominium transactions. We estimate the parameters using OLS, and include quarterly time fixed effects to control for market-wide factors affecting property prices, based on Equation (2). Results are shown on Table 4.

The top panel on Table 4 uses a pooled sample of all repeat sale properties. Like the hedonic results, the pooled estimates for $\widehat{\phi}$ are not statistically different from zero, indicating that strip clubs have no significant impact on property prices at any distance between 500 feet and 2000 feet.

However, the effect of strip clubs on single family home prices may differ from the effect of strip clubs on condo prices. Many single family home residents have children in the household; many condominium residents are single, or couples without children. As a result, strip clubs might affect single-family home prices differently than condominium prices. By restricting the sample to only condominiums or only single-family homes, we can test whether or not the presence of an operating strip club has different impacts on the two types of properties. The bottom panels in Table (4) show results for the two sub-samples. These results indicate that strip clubs do not have a statistically significant negative impact on either type of property. Table 4 contains no evidence that an operating strip club is associated with lower residential property prices in Seattle over this sample period. These results are robust to use of an annual price index in place of the quarterly price index.

Table 4: RSR Model Results - Pooled Sample, Quarterly Market Price Index

Pooled, N=74,969			
Indicator Variable Radius (K)	$\widehat{\phi}$	std err ($\widehat{\phi}$)	p-value
Property within 500 ft of a club	-0.092	0.103	0.369
Property within 1000 ft of a club	-0.027	0.031	0.378
Property within 2000 ft of a club	0.026	0.019	0.171
Condominiums, N=23,351			
Indicator Variable Radius (K)	$\widehat{\phi}$	std err ($\widehat{\phi}$)	p-value
Property within 500 ft of a club	-0.063	0.119	0.597
Property within 1000 ft of a club	-0.053	0.030	0.071
Property within 2000 ft of a club	-0.018	0.024	0.437
Single-Family Homes, N=51,618			
Indicator Variable Radius (K)	$\widehat{\phi}$	std err ($\widehat{\phi}$)	p-value
Property within 500 ft of a club	0.025	0.147	0.866
Property within 1000 ft of a club	-0.008	0.060	0.889
Property within 2000 ft of a club	0.048	0.026	0.070

The results in Table 4 assume a common market-wide price effect for all areas around strip clubs in

Seattle. It is possible that areas near where strip clubs operate experience different price dynamics from areas far from strip clubs. That is, areas near strip clubs could represent a different sub-market in the Seattle real estate market. In this case, using all properties in Seattle as the comparison group when assessing the effect of strip clubs on nearby property values could generate specification bias in the parameter estimates. In order to control for this possibility, we repeat the estimation procedure using only those properties that are less than 1 mile from the location of any past, present or future strip club as the comparison group, instead of using all other properties in Seattle. In other words, we assume that the locations within one mile of a strip club represent a homogenous sub-market in the Seattle residential property market. By doing so, we can compare the price levels for properties located within K of a strip club to those properties located less than a mile from a strip club but further than K from a strip club, a narrower geographic comparison area that allows for geographically differing market-wide price effects.

Table (5) contains results from the RSR model, estimated by OLS, when the sample is restricted to properties within 1 mile of a past, present or future strip club location. This represents our preferred model specification, as it addresses the possibility that distinct geographic sub-markets exist in Seattle, and that strip clubs operate in one sub-market.

The top panel of Table (5) uses the pooled sample of all dwellings with repeat sales in the sample period within one mile of a strip club location; the bottom two panels use sub-samples of only condos and only single family homes with repeat sales within one mile of a strip club location. Like the results in Table 4, the results from the pooled sample in Table 5 indicate that the presence of an operating strip club is not associated with any differential in residential property prices over this period. These results indicate price dynamics for those properties within K of an operating strip club are no different from price dynamics for properties between K and 1 mi of a strip club.

However, the results using the condominium sub-sample, and the single family home sub-sample, provide weak evidence that strip clubs are associated with residential property price differentials in some cases. From the middle panel on Table (5), condominiums located within 1000 feet of a strip club have transactions prices about 5.5% lower than condominiums located farther from operating strip clubs. Some weak evidence also suggests that condominiums within 500 feet also sell for lower prices, but the p-value on the t-test that this parameter estimate is significantly different from zero is only borderline significant (p-value = 0.056). Again, this is evidence of negative "secondary effects" of strip clubs on condominium transaction prices. Recall from Table 2 that there are relatively few identifying sales, under 100, in these areas very near by strip clubs.

Somewhat surprisingly, the results from the last line of Table 5 indicates that strip clubs are associated with increased property values for single-family homes located within 2000 feet. This parameter estimate suggests that strip clubs represent a local amenity, in that single family homes sold within 200 feet of an

Table 5: RSR Model Results - Less than 1 Mile from Club Sub-market, Quarterly Price Index

Pooled, N=10,537			
Indicator Variable Radius (K)	$\widehat{\phi}$	std err ($\widehat{\phi}$)	p-value
Property within 500 ft of a club	-0.091	0.065	0.150
Property within 1000 ft of a club	-0.026	0.029	0.268
Property within 2000 ft of a club	0.028	0.016	0.083
Condominiums, N=4,243			
Indicator Variable Radius (K)	$\widehat{\phi}$	std err ($\widehat{\phi}$)	p-value
Property within 500 ft of a club	-0.058	0.029	0.056
Property within 1000 ft of a club	-0.055	0.024	0.029
Property within 2000 ft of a club	-0.020	0.020	0.238
Single-Family Homes, N=3,874			
Indicator Variable Radius (K)	$\widehat{\phi}$	std err ($\widehat{\phi}$)	p-value
Property within 500 ft of a club	0.024	0.041	0.337
Property within 1000 ft of a club	-0.008	0.057	0.395
Property within 2000 ft of a club	0.048	0.020	0.022

operating strip club had a higher price than those sold within one mile of a club, but more than 2000 feet from a club.

The opening of a new strip club could have a different impact on nearby residential property values than the closing of a strip club. In the methods section, we discuss an empirical approach that accounts for differential opening and closing effects. The RSR model accounting for differential opening and closing effects is Equation (4). The results from estimating Equation (4) using the weighted least squares approach described in the appendix are displayed in Table (6). Due to the small number of sales within 500 feet of clubs in the sample, we do not estimate the model using only transactions within 500 feet.

The results Table (6) provide no support for the idea that opening and closing of clubs have different effects on nearby residential property prices. The p-values on Table (6) indicate that none of the parameter estimates capturing the effect of club openings and closings on nearby property values for the pooled sample, the condo sub-sample, and the single family home sub-sample, are statistically different from zero at conventional significance levels.

4.5 Results for Specific Locations

The pooled results on Table 4 assume that all strip clubs in the sample are homogenous, in terms of club characteristics and characteristics of nearby neighborhoods. However, from Figure 1, the clubs are located throughout the Seattle area, with one exception. Downtown Seattle, in particular the area east of the Pike Street Market, contains a cluster of strip clubs located relatively close to one another. This area differs in

Table 6: RSR Model Results - Opening and Closing Effects, Quarterly Price Index

Pooled, N=74,969			
Indicator Variable Radius (K)	$\widehat{\phi}$	std err ($\widehat{\phi}$)	p-value
Property within 1000 ft, Club Closed	0.003	0.046	0.942
Property within 1000 ft, Club Opened	-0.057	0.056	0.308
Property within 2000 ft, Club Closed	-0.008	0.027	0.766
Property within 2000 ft, Club Opened	0.048	0.038	0.212
Condominiums, N=23,351			
Indicator Variable Radius (K)	$\widehat{\phi}$	std err ($\widehat{\phi}$)	p-value
Property within 1000 ft, Club Closed	0.043	0.037	0.245
Property within 1000 ft, Club Opened	-0.051	0.058	0.374
Property within 2000 ft, Club Closed	0.008	0.027	0.768
Property within 2000 ft, Club Opened	-0.051	0.058	0.374
Single-Family Homes, N=51,618			
Indicator Variable Radius (K)	$\widehat{\phi}$	std err ($\widehat{\phi}$)	p-value
Property within 1000 ft, Club Closed	-0.097	0.141	0.492
Property within 1000 ft, Club Opened	0.024	0.086	0.783
Property within 2000 ft, Club Closed	-0.032	0.043	0.455
Property within 2000 ft, Club Opened	0.081	0.046	0.078

terms of the number of clubs, and potentially in terms of the characteristics of the nearby neighborhood. Some heterogeneity in club location and club characteristics likely exists in this sample, so the pooled results on Table 4 may not reflect outcomes for all strip clubs in the sample.

In order to assess the extent to which club-specific characteristics and locations affect the relationship between strip clubs and nearby property values, we estimated the parameters of Equation (2) using data from property transactions around specific strip clubs in the sample, again using the weighted least squares approach described in the appendix. The results, shown on Table 7, use 1 mile to define the group of comparison repeat sales transactions, and estimate the parameters using OLS, like the results on Table 5. The time index δ_t^* is defined as an annual index for this regression model, because of the relatively small sample sizes; a quarterly time index produced similar results.

The primary concern in selecting specific clubs is the number of repeat sales near these clubs over the sample period. Most of the individual strip clubs shown on Table 7 opened or closed during the sample period and had a substantial number of nearby repeat sales transactions. For this analysis, we use a cutoff distance of K equals 2000 feet for the proximity indicator function $\Delta I_{it}(M)$. In addition, we eliminated any property located within 2000 feet of a school or daycare center from this analysis sample. Seattle zoning regulations prohibit the operation of a strip club within 800 feet of a school or daycare center. Results including these properties near schools and daycare centers were very similar to those on Table 7.

We estimate separate regression models for five individual strip clubs that opened or closed during the

Table 7: RSR Model Results - Specific Locations

Pooled Sample				
Model	Param. Est.	Std. Error	p-value	Obs.
Deja Vu Showgirls - Downtown, 2000 Feet	-0.017	0.024	0.490	2451
Rick's , 2000 Feet	-0.049	0.040	0.228	886
Sugars, 2000 Feet	-0.073	0.043	0.091	633
Lusty Lady, 2000 Feet	-0.049	0.015	0.001	1923
Pandora's Adult Cabaret, 2000 Feet	-0.112	0.029	0.001	1027
ASF SEATTLE, 2000 Feet	-0.021	0.041	0.619	946
Condominiums				
Model	Param. Est.	Std. Error	p-value	Obs.
Deja Vu Showgirls - Downtown, 2000 Feet	-0.018	0.024	0.463	2381
Lusty Lady, 2000 Feet	-0.049	0.015	0.001	1923
Single-Family Homes				
Model	Param. Est.	Std. Error	p-value	Obs.
Rick's , 2000 Feet	0.019	0.039	0.623	694
Sugars, 2000 Feet	-0.069	0.043	0.110	424
Pandora's Adult Cabaret, 2000 Feet	-0.038	0.032	0.233	933
ASF SEATTLE, 2000 Feet	-0.005	0.044	0.907	703

sample period: the Deja Vu Showgirls Seattle location (closed in 2007), Sugars in Shoreline just north of Seattle (closed in 2009), the Lusty Lady in downtown Seattle near the Pike Place Market (closed 2010) and Pandora's Adult Cabaret, located on Lake City Way in northeast Seattle (opened in 2011). In addition, as a placebo test, we estimate a regression model for transactions near a property located at 10507 Aurora Avenue (identified as ASF SEATTLE on Table 7) that was purchased in 2008 by a company that operates several Seattle area clubs with the intention of opening a strip club at that location. The proposed club never opened at that location, despite a lengthy, public legal battle. The property was eventually sold, and in mid 2012 a mixed use five story building was constructed on the site. We use the 2008 purchase date, and 2012 ground breaking for the mixed use building, as the dates for a placebo test, under the assumption that the location had characteristics that made it desirable as the location for a strip club and, absent legal problems, a strip club would have operated at that location.

The top panel on Table 7 shows results using the pooled condominium and single family home transaction data for these clubs. For two clubs, the Lusty Lady located in downtown Seattle, and Pandora's Adult Cabaret, the results on Table 7 suggest that residential property prices are lower within 2000 feet of these strip clubs, compared to residential property prices more than 200 feet from the clubs, and less than one mile from the clubs. The Lusty Lady was an iconic Seattle strip club located across the street from the Seattle Art Museum and a few blocks from the Pike Place Market. It closed in 2010. Although property values were lower within 2000 feet of this club, the proximity of the Seattle Art Museum, Pike Place Market, Benaroya

Hall, and other cultural landmarks suggests that the residential real estate dynamics in downtown Seattle must have differed substantially from the rest of Seattle. It is difficult to believe that this negative impact can be attributed to a single strip club, even in the relatively small impact area used here.

Pandora's Adult Cabaret is located in suburban northeast Seattle in a neighborhood referred to as "middle class" in many descriptions. The key feature of this strip club's location is a large mobile home park less than 1000 feet from the club. Mobile home parks have been shown to reduce nearby property values substantially (Munneke and Slawson, 1999). The proximity of a large mobile home park to Pandora's Adult Cabaret may contribute to the estimated negative impact of this club on residential property values. Note that the negative impact also operates at small distances, 2000 feet, from the club.

The bottom panels contain results using data near specific clubs using the condominium and single family home sub-samples. Regression models cannot be estimated for all five clubs on the top panel of Table 7 because of a lack of identifying observations. Some evidence that property values were lower near these clubs, compared to property values in the one mile comparison area, can also be seen on the bottom two panels of Table 7. In particular, condominium prices were lower near the Lusty Lady.

From the top and bottom panels on Table 7, residential property values near the ASF Corporation site were no different than residential property values for the comparison group within one mile of the location, during the period when a new strip club was proposed for this location. The proposed strip club in this location was known to Seattle residents, as high-profile legal actions took place during the permitting process. The lack of any effect on nearby residential property values indicates that strip clubs are not necessarily located in areas with lower property values, and that the possibility that a club might open at a specific location does not have an effect on property values.

5 Conclusion

The relationship between the City of Seattle and local strip clubs is tumultuous, at best. For more than 20 years, the city limited the number of strip clubs in operation using various forms of bans, ordinances and zoning regulations. One reason the City of Seattle took these actions was to prevent a decline in property values due to possible negative externalities, or "secondary effects" generated by the presence of strip clubs in local neighborhoods. The situation in Seattle mirrors conditions in the rest of the country. Attempts to regulate strip clubs, and other SOBs, through municipal zoning laws occurred in other cities around the country, and generated a substantial body of legal cases, including a number of SCOTUS decisions on the activities in strip clubs. The guiding legal principle for these cases, the "secondary effects doctrine" refers to the idea that strip clubs generate negative externalities in the local economy.

This claim by the City of Seattle, and the application of the "secondary effects doctrine" in SCOTUS decisions, is directly testable under the null hypothesis that nearby property values remain unchanged after the opening or closing of a strip club. This study formally tests this hypothesis while explicitly controlling for heterogeneity in local property price dynamics. An analysis of property transaction prices using annual and quarterly price indexes and multiple cutoffs distances for the impact area of strip clubs, we find no statistical evidence that the presence of strip clubs was associated with any abnormal property price declines or increases in Seattle over the period 2000-2014 using property transaction prices and a RSR model when pooling all Seattle strip clubs. We find weak evidence that property prices were lower near two specific clubs.

This paper is the first to analyze property values for evidence that strip clubs are disamenities/generate negative externalities/generate "secondary effects" in an urban setting. Previous research analyzed crime data, which have well-known limitations, ore relied on convenience surveys of property assessors, or other non-systematic, non-evidence based approaches. Property values should reflect any direct "secondary effects," as well as any indirect effects working through a possible increase in crime near strip clubs; property values represent an improved approach for generating evidence about the importance of "secondary effects" of SOBs compared to crime data, since real estate transactions prices reflect market valuations of residences, and not the many factors that can affect crime rates.

The results provide important information for policy makers seeking to regulate SOBs and firms operating in this industry. Despite claims based on anecdotal evidence, or rudimentary statistical analyses carried out by local planning agencies, the systematic evidence generated here does not support the idea that strip clubs in Seattle generated any "secondary effects" in terms of negative impacts on nearby residential property values. Furthermore, any local crime directly attributable to strip clubs would also affect property values, so our results also contradict claims that crime generated by the presence of a strip club will harm nearby property owners. While regulators may decide to limit SOBs on moral grounds, this research contributes evidence disputing claims that negative economic impacts justify regulation or elimination of SOBs in urban areas.

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6 Appendix

The RSR results reported in the paper use a weighted least squares approach that corrects for bias generated by long periods between observed sales. Suppose changes in a property transaction price in dwelling i between time s and time t is given by

$$p_{it} - p_{is} = \delta_t - \delta_s + \phi(z_{it} - z_{is}) + v_{it} \tag{5}$$

where δ_t and δ_s are market-wide factors affecting property values at time t and s respectively and the equation error terms errors are defined as

$$v_{it} = f(\beta, x_{it}) - f(\beta, x_{is}) + u_{it} - u_{is} = \Delta f_{it} + \Delta u_{it}. \tag{6}$$

The weighted repeat sales estimation procedure used here to account for the effect of time between observed transactions involves three steps. First, the effect on changes in market wide conditions on changes in property transactions prices are estimated by ordinary least-squares applied to Equation (5). The squared OLS residuals from this regression, $\widehat{v_{it}}^2$, are then regressed on an intercept and $t - s$, the elapsed time between observed transactions.

$$\widehat{v_{it}}^2 = a + b \times (t - s) + e_{it} \tag{7}$$

The estimated intercept from this model, $\widehat{a}$, is an estimate of the variance of Δu_{it}. The slope coefficient estimate, $\widehat{b}$, is an estimate of the variance of changes in property valuations due to changes in property attributes, Δf_{it}. The predicted values from Equation (7) are consistent estimates of the variance of v_{it}. The weighted least-squares regression approach in this paper uses the inverse square root of the predicted variance, $w_{it} = (\widehat{a} + \widehat{b} \times (t - s))^{-0.5}$, as weights. The weighted repeat-sales regression model estimator is the set of coefficients that minimize the weighted sum of squared residuals where weights are given by w_{it}. This approach accounts for the effect of time between observed transactions on the parameter estimate of interest in the RSR model, Equation (2.