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Changing Markets for Pharmacies Across the Rural-Urban Divide

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Changing Markets for Pharmacies Across the Rural-Urban Divide

Abstract

Before the COVID Pandemic overwhelmed rural health care services, the density of these services in rural areas has been declining. The closures of rural hospitals have become common place and disappointingly somewhat expected. One piece of the rural health care puzzle that has received less attention centers on pharmacies. In this analysis we explore patterns in pharmacies across the urban-rural spectrum over the 2011 to 2020 period using US county level data. We pay particular attention to differences in independent pharmacies and those that are part of a national or regional chain. We find that rural areas are more dependent on independent pharmacies and as the number of chain pharmacies increases the number of independent pharmacies declines. This pattern exposes many rural areas to gaps in access to pharmacy services.

Introduction

The provision of health services in both rural and urban communities is complex and composed of many pieces. One particular part of the rural health care mix that has gathered significant attention in both the popular press and academic literature (e.g., Kaufman, et al. 2016; Kissi, Walston and Babar 2021; Miller, Miller, Knocke, Pink, Holmes, and Kaufman 2021) is the alarming rate of rural hospital closures. Headlines such as CNN's July 31, 2021 story entitled "[h]ow the pandemic killed a record number of rural hospitals" or Becker's Healthcare February 18, 2022 story entitled "[s]taffing crisis, payment cuts put 453 hospitals at risk of closure" are increasingly common. It is widely accepted within the academic literature that there is a shortage of physicians in rural communities (e.g., Gemelas 2021) as well as a shortage of nurses, particularly in rural America (e.g., Scheidt, Heyen and Greever-Rice 2021; Advnski and Morgan 2021).

But one important piece of the rural, and urban, health care delivery system that received little attention are community pharmacies. Analysis of rural pharmacies in the U.S., Salako, Ullrich and Mueller (2018) found that between 2003 and 2018 1,231 independently owned rural pharmacies (16.1 percent) in the United States have closed, with the most drastic decline occurred between 2007 and 2009. This is largely due to policy changes in Medicare Part D reimbursement that made the process more difficult for independent pharmacies. In a study of access to pharmacies in Wisconsin, with access measured in terms of drive time, Look and his colleagues (2021) found that large parts of rural areas in

the western and northern parts of the state did not have a pharmacy within 30 minutes. In a complementary analysis Qato and her coauthors (2017) found that many more rural and poorer communities did not have access to any pharmacy services. More importantly they found that many independent pharmacies are being replaced with chain or franchise pharmacies that reduce the level of services offered to customers. For example, Qato and coauthors found that less than one percent of "mass retail" pharmacies offered home delivery of prescriptions whereas 67 percent of independent pharmacies offered such a service.

Pharmacies are an overlooked and underappreciated resource for health care, particularly in rural areas. Pharmacists play a crucial role in a patient's health care team by ensuring medications are safe for patients, providing patient counseling, and being an easily accessible source for information and care (Blouin and Adams 2017; Patwardhan, Duncan, Murphy, and Pegus 2012). Pharmacies provide preventative health services such as immunizations, blood pressure checks and glucose monitoring. Providing these routine services can help prevent patients from needing more costly care such as hospital stays. Particularly in rural areas, where patients have less access to health care services, pharmacies play a vital role in the delivery of health care:

> "With extended hours of operation, availability of home delivery of medications, and no need to schedule an appointment for counselling, community pharmacies are in the unique position being the most accessible than the other healthcare settings…" (Pednekar and Peterson 2018: p2)

In rural areas, pharmacies may be the only source of qualified health care services, especially as rural hospitals close or consolidate. Pharmacists can counsel, monitor, and advise patients on their conditions in a setting that is more convenient (and affordable) than a clinical setting. Patients have also indicated that they are often more comfortable asking the pharmacist questions than they are their doctor. Pharmacies in rural areas are much more likely to be independently owned, hence the decline in independent pharmacies will impact rural areas, that are already lacking access to healthcare services overall, disproportionately more than more urban settings. This will lead to a loss of not only medication access, but to health care access:

> "If pharmacies are closed, especially in places where there's no other health care provider, then you've got essentially a health care desert…"

Michael Hogue, president of the American Pharmacists Association.
(Kaiser Family Foundation News, March 3, 2021)

Especially for underserved locations, the option of having prescriptions delivered through the mail may seem like an attractive option when a community pharmacy is unavailable. The push to increase prescriptions-by-mail services may be convenient for routine medications, but patients with ailments requiring more immediate relief may not want to wait several days for prescriptions to be delivered. As documented by Look and colleagues (2021) those that do not have access to a local community retail pharmacy may have to drive to a more urban area for prescription services. In addition, transportation in rural areas is often barrier to services, especially for those who are elderly and/or disabled, and these groups use more prescription medications than others (Pednekar and Peterson 2018). Having a pharmacy in the community benefits everyone needing access to prescriptions, medication counseling and oversight. Further analysis is needed of the effects of transportation and access to pharmacies, particularly in rural areas.

This study proceeds in two ways. First, in the spirit of Salako, Ullrich and Mueller (2018) and Qato and her coauthors (2017), we track the number of chain and independent retail pharmacies annually from 2011 to 2020 and across the rural-urban spectrum. Our analysis moves beyond these two prior studies by not only analyzing the number (count) of pharmacies but also employment levels associated with chain and independent pharmacies. We elect to use employment to capture the scale or size of the pharmacies. A simple count of the number of pharmacies does not capture the size of pharmacies and thus the potential scope of services offered. For example, a chain pharmacy with 25 employees is operating on a difference scale than an independent pharmacy with five employees.

The second part of our analysis links the number of pharmacies, along with pharmacy employment, to a range of socioeconomic and demographic factors to investigate which community (county) characteristics are associated with independent pharmacies. As outlined in Shaffer, Deller and Marcouiller (2004) retail and service market threshold analysis provides a theoretical underpinning for community level factors that influence the location decisions of certain types of businesses, such as pharmacies. At the simplest level, different types of retail and service businesses require a minimum population level (population threshold) within the market area to support the business. For example, a study of South Dakota found that it takes 4,318 people to support one pharmacy (Khatiwada, McCurry, and Brooks 2008). Research also suggests that community characteristics like age, education and income can affect those thresholds. The focus of this study, however, is less on establishing estimates of

market population thresholds but rather is on how the presence of chain pharmacies impact independent pharmacies. Does the presence of chain pharmacies negatively impact independent pharmacies? To gain insights into this specific question we use a panel (annual 2010 to 2020) of US county level data to model the concentration of independent pharmacies. We pay particular attention to how this interrelationship differs across the urban-rural spectrum.

Beyond these introductory comments, the study is composed of four additional sections. First we provide a descriptive analysis of the presence and/or concentration of pharmacies over time and across the urban-rural section. In the next section we outline our empirical modeling approach followed by a discussion of the modeling results. The final section reviews the key findings of the study and outlines some policy options for addressing potential gaps in the rural market for pharmacies.

Trends in U.S. Pharmacies with a Focus on Urban-Rural Differences

Before turning to our analytical modeling of independent and chain pharmacies it is important to understand basic industry trends both over time, across space and the urban-rural divide. To explore these trends, we use data from the Business Dynamics Research Consortium, a project of the University of Wisconsin, Institute for Business and Entrepreneurship. These data are from a verified version of Data Axle Business Historical databases with establishment data from 1997 thru the current year. Data Axle combines numerous sources of information on businesses, such as Dunn and Bradstreet, and employs various data verification methods to build their firm level database. While no single business data source is "perfect" the Data Axle sourced data used in this study is as comprehensive as currently possible. In this sense, our core data differs from Salako, Ullrich and Mueller (2018) and Qato, et. al. (2017) who use the data files provided by the National Council for Prescription Drug Programs (NCPDP).

Between 2011 and 2020 the average number of chain pharmacies in a given US county increased from 11.2 in 2011 to 13.4 in both 2017 and 2018, but then declined to 12.4 by 2020 but the number of independent pharmacies went from 8.2 in 2011 to a peak of 11.5 in 2019, then plummeted to 8.3 in 2020 (Figure 1). This latter drop is likely due to the impact of COVID-19 but is unclear from these data. There are three general observations: (1) the average number of chain retail pharmacies is greater than independents, (2) there is a modest upward trend in both chain and independent retail pharmacies (although the upward trend for chain pharmacies appears to have stalled and reversed itself after 2018), and if COVID-19 has impacted pharmacies it is impacting independent pharmacies the greatest. This latter result makes intuitive sense in that chain pharmacies have the advantage of scale to ride out short-term economic shocks. Independent pharmacies, much like any other independent business, do

not have the comparable resources to weather economic shocks, particularly sustained longer-term shocks.

To look across the rural-urban spectrum we use the Office of Management and Budget's (OMB) 2010 definition of metropolitan and nonmetropolitan counties.[1] We further refine nonmetropolitan counties into those that are "adjacent" to a metropolitan county and those that are nonadjacent, or "remote" nonmetropolitan counties. Looking at the average number of both chain and independent pharmacies (Figure 2) we can refine our understanding of the broad national patterns (Figure 1). First, the growth in the average number of chain pharmacies is strongest for metropolitan counties between 2011 and 2017 followed by decline. A similar pattern of growth then decline also applies to adjacent and remote nonmetropolitan counties but to a less severe extent. Indeed, the pattern for the most rural counties (remote) is one of relative stability. As expected, the average number of chain pharmacies is much higher in metro counties compared to nonmetropolitan, but the average number of chains is somewhat higher in adjacent (2.9 in 2011 and 3.2 in 2020) than remote (1.6 in 2011 and 1.7 in 2020). There is also evidence of growth in the number of independent pharmacies across the rural-urban spectrum, particularly from 2017 to 2019, but the rapid decline between 2019 and 2020 holds for metropolitan, adjacent and remote nonmetropolitan counties. While the average number of independent pharmacies for metropolitan areas in 2020 are about the same as 2011, the sharp decline in 2020 was sufficient to offset any gains from 2011 to 2019. Again, we cannot determine from these data if the sharp decline in independent pharmacies in 2020 is a direct result of COVID-19 there is sufficient antidotal evidence to support the notion that COVID induced recession had a strong negative impact on independent retail pharmacies.

One of the challenges of examining the absolute number of pharmacies within a county is that the relative size of the market is not captured. Thus, by tracking the number of pharmacies per capita, or by 1,000 persons, we can gain finer insights intro differences across the rural-urban spectrum over time. The trends in average number of chain and independent pharmacies per capita (1,000 persons) over the study period by metro, adjacent and remote are provided in Figure 3. Note that the overall trends in chain pharmacies of growth followed by decline is still evident in the data but note the uptick

[1] Metropolitan [statistical] areas are standardized county or equivalent-based areas having at least one urbanized area of 50,000 or more population, plus adjacent territory that has a high degree of social and economic integration with the core, as measured by commuting ties. Specifically, if 25% or more of the labor force commutes to the core, the county is included in the metropolitan area. Counties that do not fit this definition are classified as nonmetropolitan.

in 2020 for remote rural counites. The more interesting pattern is in the concentration of independent pharmacies: the decline in 2020 is evident for metropolitan and adjacent nonmetropolitan counties, but an increase in remote counties. Indeed, for remote counties the concentration of independent pharmacies increased consistently from 2017 to 2020. Also note that the concentration of independent pharmacies is higher in remote counties over the whole period.

While the decomposition of nonmetropolitan counties into adjacent and remote provides some insights into the market for rural pharmacies, there are additional methods to group counties into finer classifications. One commonly used grouping is widely referred to as the Beale Code maintained by the USDA Economic Research Service.[2] The Beale Codes contain nine classifications of counties ranging from the largest metropolitan counties, those with populations of one million or more, to the most rural, those counties with no places (city, village or town) with a population of 2,500 and are non-adjacent to metropolitan counties. The average annual number of pharmacies per capita (1,000 persons) by Beale Code grouping over the whole of the study period is provided in Figure 4. For chain pharmacies, the density is consistent across seven of the nine classifications including some counties that are considered nonmetropolitan and remote. There is a noticeable decline in the density of chain pharmacies for nonmetropolitan counties that have no "large" places (town or village), those defined as having a population of at least 2,500. The pattern for independent pharmacies is more distinct than chain pharmacies. For larger counties, the density of concentration of chain pharmacies is consistently higher than independent pharmacies. For nonmetropolitan counties that have no places with a population of 20,000 or more, the four most rural types of counties, the concentration of independent pharmacies exceeds that concentration of chain pharmacies. It is clear from these data that as the county becomes "more rural" or "less urban" the concentration of independent pharmacies increases.

A spatial analysis of the location of chain and independent retail pharmacies complements the distribution of pharmacies across the rural-urban spectrum identified in Figure 4. Here we map the average annual concentration (number of pharmacies per 1,000 persons) of both chain and independent pharmacies (Map 1). Counties with no chain pharmacies are scattered across the U.S. but is most likely to be located in the Great Plains, particular from North Dakota south to western Texas (Map 1). This is consistent with the observation above that there is simply not a sufficient population base in many of

[2] https://www.ers.usda.gov/data-products/rural-urban-continuum-codes.aspx Note that the Beale Codes utilize the Census Bureau's definition of an "urban place" to distinguish different counties. Here the Census Bureau defines any place (city, village, town) as "urban" if it has a population of 2,500 or more people. Any place with less population is considered "rural".

these more rural counties to support a chain pharmacy. But a comparable mapping of independent pharmacies suggest that these rural counties in the Great Plains that are "chain pharmacy deserts" have relatively high concentrations of independent pharmacies. In addition, one can clearly observe a higher density of independent pharmacies from parts of Appalachia down to the Mississippi Delta. One can almost trace out the Ohio River and down the Mississippi River where the concentration of independent pharmacies stands out. While one must keep in mind that these are population adjusted concentrations, rural communities are particularly dependent on independent pharmacies.

These patterns are clear, chain pharmacies have certain market characteristics that they are looking for, such as population, before entering a market. Based on this analysis one could reasonably conclude that chain pharmacies are unlikely to look variably on the most rural counties in the US. It is in these most rural counties that independent pharmacies are more highly concentrated. If independent pharmacies are at risk from weakening market conditions (declining rural communities), increased competition from chain pharmacies servicing larger nearby urban places, the "aging out" of independent rural pharmacists, or policy shortcomings, such as lower payments from Medicare Part D (e.g., Salako, Ullrich and Mueller 2018), are most at risk of losing the services provided by pharmacies. The result of the "COVID shock" to independent pharmacies places the most rural communities at the highest risk of losing access to pharmacy services. During a period were many of these same rural communities are losing access to hospital and primary care medical services, the exposure to the loss of independent pharmacies is a cause for concern.

Market Analysis for Independent Pharmacies

As part of the exploratory analysis presented in this study, we are interested in trying to better understand the underlying market condition required for a pharmacy to be in operation. As noted in the descriptive analysis, local market population matters (Deller and Harris 1993; Shonkwiler and Harris 1996; Shaffer, Deller and Marcouiller 2004; Chakraborty 2012). For example, based on simple estimates from the data used in this analysis it takes more people on average to support an independent pharmacy (11,152) than it does a chain pharmacy (8,184). This is likely due to the ability of chain pharmacies to spread "backroom" costs over a larger number of actual stores thus lowering the population threshold required to support an individual store (pharmacy). Also note that these population thresholds are higher than those observed by Khatiwada, McCurry, and Brooks (2008) in their study of pharmacies in South Dakota which found that it takes 4,318 people to support one pharmacy.

The large increase in the population threshold from the work of Khatiwada and colleagues and the analysis provided here is likely due to the rapid decline in the number of independently owned rural pharmacies in the late 2000's observed by Salako, Ullrich and Mueller (2018). While the population has remained relatively stable from a national perspective, the number of pharmacies, particularly independent ones, declined significantly. Here, fewer pharmacies are serving more people. From a purely economic perspective, the decline in the number of competing pharmacies could enhance the market stability of the remaining pharmacies.

In addition to the population of the market demographic factors also come into play. For example, auto part stores tend not to locate in high income communities regardless of population size and/or density. The rational is simple: higher income individuals tend not to work on their own cars whereas lower income individuals are more likely to work on their own cars. These demographic and other socioeconomic factors can directly and indirectly impact the concentration of pharmacies. For example, an older population may prefer the personalized service of independent pharmacies that is more difficult to find with a chain pharmacy whereas a younger population may prefer the extended hours of operation commonly offered by chain pharmacies. In addition, the nature of the competition retail and service businesses, such as an independent pharmacy, is particularly important in understanding the presence and concentration of businesses. For independent pharmacies, what is the impact of chain pharmacies?

Empirical Model To gain insights into the community (county) characteristics associated with the location of independent pharmacies and the impact of the presence of chain pharmacies we estimate a series of models using our panel of US counties. While the county is a convenient unit of analysis, it introduces unique empirical problems, specifically spatial spillover. First, the geographic market of any given pharmacy does not stop at a county boundary and can spillover into neighboring counties. For example, a pharmacy could be located geographically near a county boundary and are likely drawing customers from the neighboring county. The geographic mapping of Wisconsin pharmacies by Look and his colleagues (2021) clearly demonstrates that the spatial markets of pharmacies, as defined by drive times, commonly cross county boundaries. This is one form of spatial spillover. Second, and more broadly, studies that have used US counties to model outcomes such as economic growth and development routinely find that the economic activity of one county spills over into neighboring counties (e.g., Deller, Kures and Conroy 2019). For example, people live in one county and commute to

another county for work. Research on the impact of commuting on retail sales suggest that an increase in the number of people commuting into a county can substantially increase retail sales of the destination county (Shields and Deller 1998). For pharmacy sales, it could be the case that customers will utilize a pharmacy close to their place of work for some purchases.

To capture the presence of potential spatial spillover effects we employ what is sometimes referred to as a "exogenous interactions model" (SLX) within the literature (e.g., Floch and Le Saout 2018). Specifically, our model can be expressed as:

$$IPh_{t,i} = \alpha CPh_{t,i} + \sum_{j=1}^{k} \beta_j X_{j,t,i} + \sum_{j=1}^{m} \theta_j WX_{j,t,i} + \tau_t + \varepsilon_{t,i}$$

Here $IPh_{t,i}$ is our measure of independent pharmacy concentration for county i in time period t, $CPh_{t,i}$ is our measure of chain pharmacy concentration for county i in time period t, $X_{j,t,i}$ is a set of k socioeconomic and demographic variables, τ_t is an annual time fixed effect, $\varepsilon_{t,i}$ is the error term that we assume has homoscedastic characteristics. Here the "spatial weight matrix", or W, captures the spatial proximity of counties. The impact of these socioeconomic and demographic variables have two dimensions, the direct effect (β) or within county effect and the indirect effect (θ) or across counties. For the latter, this is how neighboring counties impact the number of or concentration of independent pharmacies within the core county. The key coefficient of interest centers on how the presence of a chain pharmacy (CPh) impacts independent pharmacies (IPh). We expect that the introduction of chain pharmacies will exert competitive pressures on independent pharmacies and as such we expect the coefficient α to be negative. Given our cross section of i and ten years of data ($t = 1, \ldots, 10$) we have a total of 30,700 observations.

Our set of control variables ($X_{j,t,i}$) contains 13 ($k = m$ = 13) socioeconomic and demographic variables beyond population ($X_{j,t,i}$):

- Population (10K)
- Per Capita Income (1K$)
- Per Capita Income Maintenance Payments (1K$)
- Per Capital Retire Income (1K$)
- Per Capita Dividends, Interest, Rent Income (1K$)
- Percent of the Population Age Under 18

- Percent of the Population Age 65 and Over
- Percent of the Population Black
- Percent of the Population Latinx
- Percent of the Population Asian
- Population to Employment Ratio
- Percent of the Population Living in Rural Places
- Unemployment Rate
- Child Poverty Rate

Some variables, such as population and per capita income and the ethnic profile measures along with the unemployment rate and two age variables are standard measures used in the analysis of retail and service markets (e.g., Deller and Harris Shonkwiler and Harris 1996). We include retirement income to help capture the income specific to older persons, and dividend, interest, and rental income as a measure of wealth. Child poverty is another dimension of wealth and the ability to pay for goods for sale at pharmacies. We include the population to employment ratio to determine if the community (county) is more consistent with a "bedroom community" or an "employment hub". One the one hand, pharmacies may prefer to locate closer to their customer base which would draw them to more bedroom community-oriented communities, but on the other hand the retail market research literature has shown tendencies of some retailers to prefer to cluster in more employment dominated centers to capture the benefits of spillover effects through agglomerations economies as well as commuters. Finally, we include the percent of the county population classified as living in a rural place to capture our rural-urban influences that were identified in the descriptive analysis presented above.

While measuring the concentration or density of pharmacies by adjusting through population is common within the retail and service market research literature, the original approaches focused on model the number of businesses. As a form of a robustness check on our results we also model IPh as:

- Number of Independent Pharmacies per 1,000 Persons
- Independent Pharmacy Employment per 1,000 Persons
- Number of Independent Pharmacies

We have two measures of the competition measure (CPh):

- Number of Chain Pharmacies per 1,000 Persons
- Chain Pharmacy Employment per 1,000 Persons

The second employment-based measure is also included as a robustness check. As noted in the introductory comments, a simple count of the number of pharmacies does not capture the size of pharmacies and thus the potential scope of services offered. For example, a pharmacy with 10 employees is operating on a difference scale than a pharmacy with 50 employees.

For the concentration measures of independent pharmacies, we estimate the models using tradition regression (ordinary least squares or OLS). For the count measure of independent pharmacies, the implicit assumption of a continuous variables is violated, the data takes on discreet values, and thus tradition regression analysis is not suitable. but an implicit assumption to OLS is that the dependent variable, or in this case the concentration of pharmacies, is continuous. As such we use an estimator specifically designed to capture the unique distribution of the number of pharmacies, a negative binomial which accounts for over-dispersed count data, that is when the conditional variance exceeds the conditional mean. This means that a plotting of the frequency of pharmacies across counties would be dominated by a small number of pharmacies with only a handful of counties with many pharmacies. Indeed, in any given year 11.5 percent of counties have no independent pharmacies, 19.0 percent have only one, and 16.1 percent have only two. To account for the unique nature of the independent pharmacy count data we use a zero inflated negative binomial estimator. Finally, to test for differences across the urban-rural divide we estimate each model using all of the counties, then subsets of metropolitan, nonmetropolitan adjacent and then nonmetropolitan remote.

Empirical Results

There are four overriding sets of results that warrant discussion. First, and foremost, what impact does the presence of chain pharmacies have on independent pharmacies? Second, what roles do the range of socioeconomic and demographic characteristics of the region play in the concentration of independent pharmacies? Third, to what extent do spatial spillover effects from nearby counties influence the concentration of independent pharmacies? Finally, do any of the answers to the above three points or issues vary across the urban-rural divide? The results for the impact of the number of chain pharmacies per 1,000 persons have on the concentration of independent pharmacies, also measured by the number per 1,000 persons, are provided in Table 1. The parallel results using

employment concentration are provided in Table 2. The results for the simple independent pharmacy count models (estimated with a zero inflated negative binomial estimator) using number of chain pharmacies per 1,000 persons are provided in Table 3 and using employment concentration are provided in Table 4.

The data and empirical results are consistent across all four of our modeling approaches: a higher concentration of chain pharmacies places downward pressure on the presence of independent pharmacies. This result holds for all US countries aggregated together, metropolitan counties, nonmetropolitan counties that are adjacent to metropolitan counties, as well as what we refer to as remote counties. Based on the standardize regression coefficients, the impact of chain pharmacies appears to be the largest in nonmetropolitan adjacent counties, but we cannot confirm if the estimated coefficients are statistically different across the three county groupings. The result, however, makes intuitive sense: as chain pharmacies are looking to expand and grow, they are likely to look to fringe areas of growing metropolitan counties. As they enter a new market, such as a nonmetropolitan adjacent county, chain pharmacies can exert competitive market pressures on independent pharmacies. It is also likely that chain pharmacies may be interested in purchasing the customer list from independent pharmacies in order to establish market presence when entering the regional market. Indeed, there is sufficient antidotal evidence to suggest that may independent pharmacies view this opportunity to sell customer lists to support retirement decisions. Rather than sell the independent pharmacy to a new pharmacist or other potential business owner they elect to sell the customer list, close the pharmacy and retire or work for another pharmacy as a paid employee.

A detailed discussion of each of the control variables is beyond the scope of this study and as such we will highlight some of the more relevant and consistent findings. For example, the coefficient on the population-employment ratio is negative and statistically significant across all four model specifications as well as across the urban-rural spectrum. This suggests that independent pharmacies are attracted to places that could be described as employment hubs over places that could be described as bedroom communities. As expected, per capita income tends to have a positive impact on the concentration or number of independent pharmacies. This result, however, is less consistent for nonmetropolitan counties that are adjacent to metropolitan counties. Why this particular result is inconsistent when compared to the national, metropolitan and remote models is not clear. We also find that a higher proportion of the population that is Black tends to place downward pressure on the concentration of independent pharmacies and a similar result applies to the percent of the population Latinx. For the latter, however, there is mixed evidence that a higher concentration of Latinx may have

a positive impact for metropolitan counties. Thus, for Latinx there could be differences across the urban-rural divide in terms of its impact on independent pharmacies.

We do find some apparent inconsistencies when looking across the concentration models (Tables 1 and 2) and the count models (Tables 3 and 4). For example, we find consistent evidence that a higher percent of the population that is age 65 and over tends to place upward pressure on the concentration (number per capita and employment per capita) of independent pharmacies, save for employment concentrations in remote counties where the relationship is statistically insignificant. But for the count models, the relationship on percent of the population that is age 65 and over is negative consistently across the urban-rural divide. We also find a similar pattern for population: for the density measures (per 1,000 persons) higher population levels are associated with a higher concentration of independent pharmacies but for the count models the opposite holds. The latter is particularly surprising because market threshold theory predicts that as population increases, *ceteris paribus*, the number of establishments will increase. We think that for the count models (Tables 3 and 4) the presence of chain pharmacies in higher population counties, and the competitive pressure that they present, overshadows the population effect. As we have seen, independent pharmacies tend to be more prevalent in more rural counties (Figure 4) and these have lower overall population levels. This interpretation is reaffirmed by the result on the percent of the county population living in rural place in the count models. Here higher levels of rurality tends to be associated with independent pharmacies.

The results on the spatial spillover variables confirms that market for independent pharmacies is influenced not only by the socioeconomic and demographic characteristics of within the county (direct effects) but also by nearby counties (indirect effects). For some of the socioeconomic and demographic variables the direct and indirect effects move in the same direction, such as the percent of the population Latinx, but others move in the opposite direction such as the percent of the population age 65 and over. The challenge is that the consistency of the direct and indirect effects varies across the concentration and count models as well as across the urban-rural spectrum. This speaks to the complexity of the locations of independent pharmacies: results vary across space (spillovers), concentration or counts and the urban-rural spectrum. A detailed exploration of these differences is beyond the scope of this study.

Returning to the four key questions, competitive pressures of chain pharmacies, the role of socioeconomic and demographic characteristics, spatial spillover effects, and urban-rural differences, we can conclude that each play important roles in understanding the location of independent pharmacies. The core hypothesis, that chain pharmacies present significant competition to independent

pharmacies holds consistently across all models: a higher concentration of chain pharmacies places downward pressure on independent pharmacies. This result is perhaps the most consistent result in this study.

Conclusions

When thinking about rural health care services attention tends to be drawn to rural hospitals and perhaps the availability of health care professionals such as doctors and nurses. The services offered by pharmacies, however, tends to receive less attention despite pharmacies being an integral part of the health care service delivery puzzle. In this study we explore patterns in the concentration of pharmacies across the rural-urban spectrum with special attention paid to the interactions of independent and chain pharmacies. We use annual US county level data for the years 2011 to 2020. Once missing data are accounted for, we have a sample size of 30,700 counties.

Pharmacies provide vital healthcare services, particularly to those in underserved places, often stepping in to fill the gap in services. Independently owned retail pharmacies, which are more likely to serve rural areas, have been declining due to retirements, consolidations, and policy changes. While chain retail pharmacies are better able to absorb the overhead costs of running a pharmacy, particularly processing Medicare Part D reimbursements, they are less likely to be located in rural areas. In terms of health care equity, independently owned retail pharmacies offer greater access to pharmacy services to patients and communities. The decline of pharmacies and the additional health care services they provide affects rural areas disproportionately. Additional research is needed on how the continued attrition will lead to poorer health outcomes for those living in rural areas as preventative health care such as blood pressure checks, glucose monitoring, immunizations, and counseling are no longer accessible to rural patients in the absence of a pharmacy.

Beyond our simple descriptive analysis we ask four questions about the location of independent pharmacies. First, and foremost, what impact does the presence of chain pharmacies have on independent pharmacies? Second, what roles do the range of socioeconomic and demographic characteristics of the region play in the location of independent pharmacies? Third, to what extent do spatial spillover effects from nearby counties influence the concentration of independent pharmacies? Finally, do any of the answers to the above three points or issues vary across the urban-rural divide? We do find that numerous socioeconomic and demographic influence the location of independent pharmacies and that there are spatial spillover effects. The latter result suggests that when promoting the location of independent pharmacies a broader regional perspective is required. We also find that

there are important differences across the urban-rural spectrum in how these regional characteristics influence independent pharmacies.

The core result confirms our hypothesis that the presence of chain pharmacies represents significant competition and reduces the number and concentration of independent pharmacies. As such, as chain pharmacies move into or expand their presence within a region, the exert significant competitive pressures on independent pharmacies. We also find that chain pharmacies are less likely to locate in the most rural areas of the US. Based on market threshold theory, the thickness of the market in the most rural areas is simply not sufficient to make investments profitable. This exposes the most rural places in the US to the future of independent pharmacies. The rash of closures of rural independent pharmacies identified by Salako, Ullrich and Mueller (2018) and most recently during the COIVD pandemic has exposed the most rural places to further reductions in access to health care. Concerns over the waning interest of recent pharmacy school graduates to work for or own independent pharmacies is a cause for concern for the most rural areas of the US. To reduce the exposure of the most rural areas to the closing of independent pharmacies and reducing the milieu of health care services, rural health care policy needs to broaden the discussions beyond the focus on rural hospitals.

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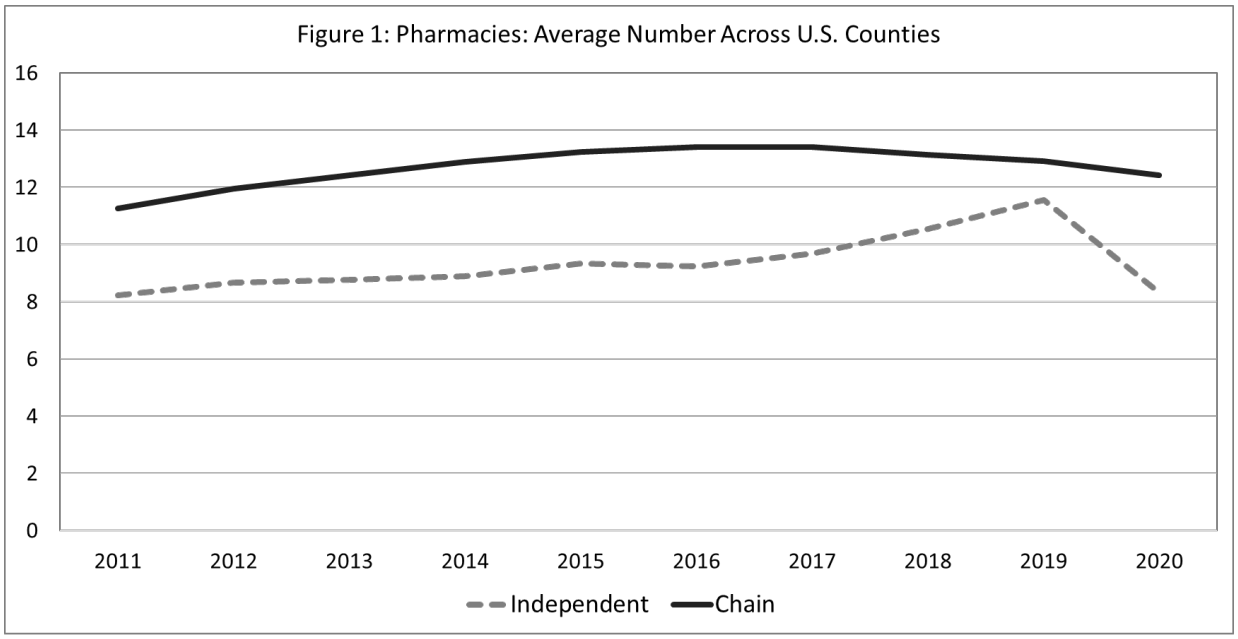
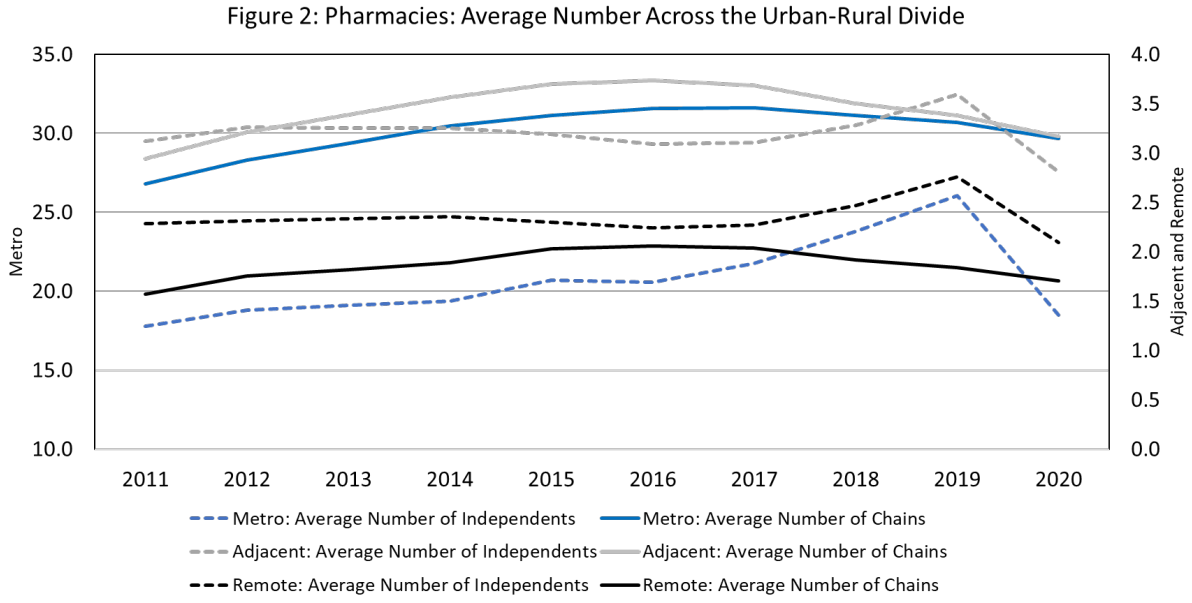
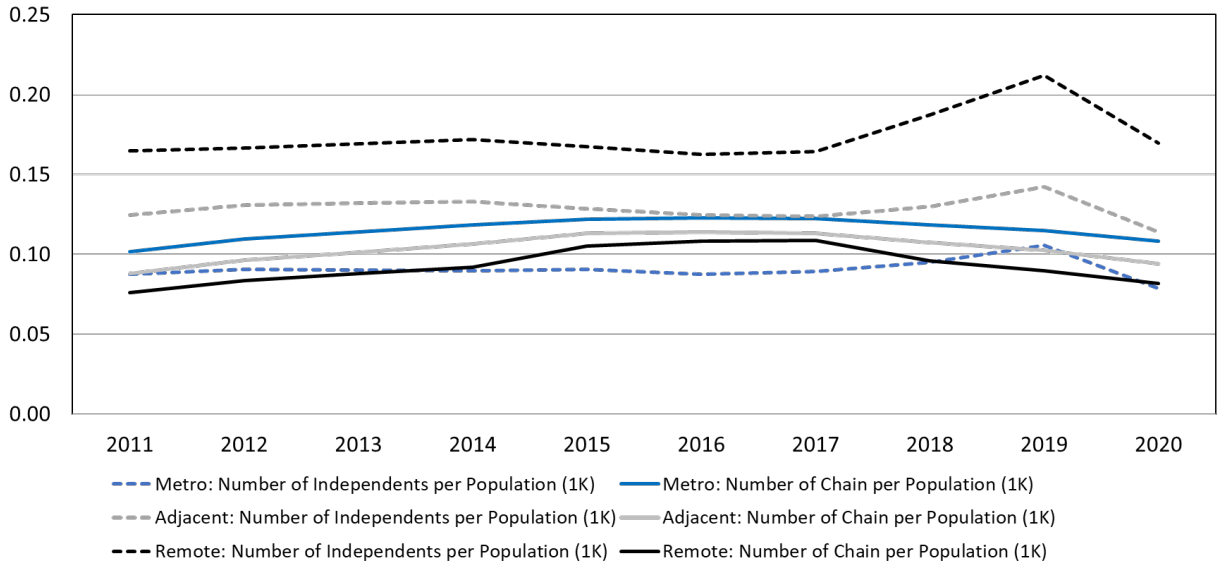


Source: Business Dynamics Research Consortium, Institute for Business and Entrepreneurship, University of Wisconsin. Calculations by the authors.



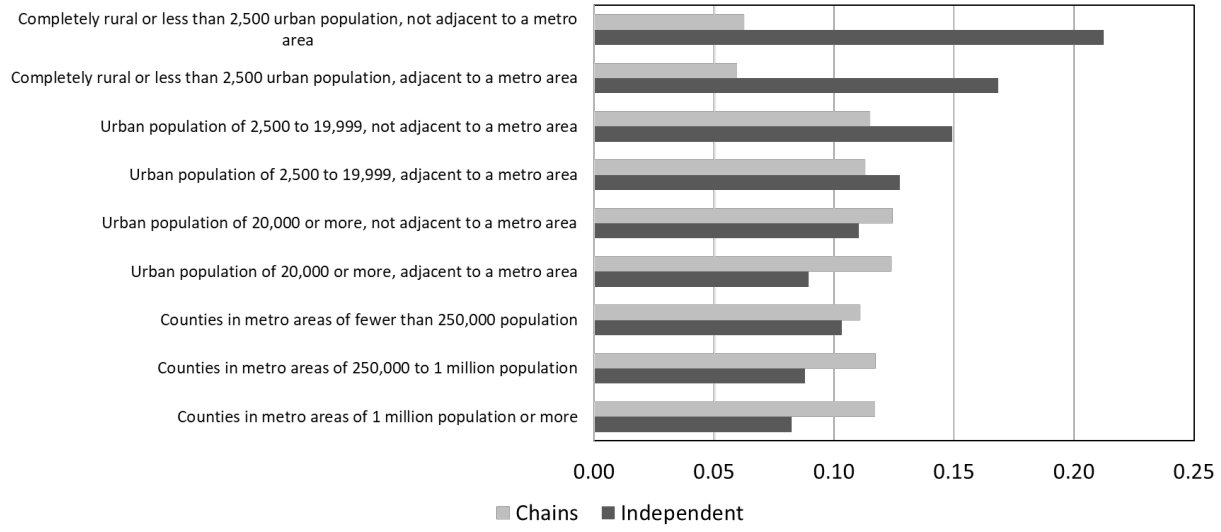
Source: Business Dynamics Research Consortium, Institute for Business and Entrepreneurship, University of Wisconsin. Calculations by the authors.

Figure 3: Pharmacies Per Population (1,000) Across the Urban-Rural Divide



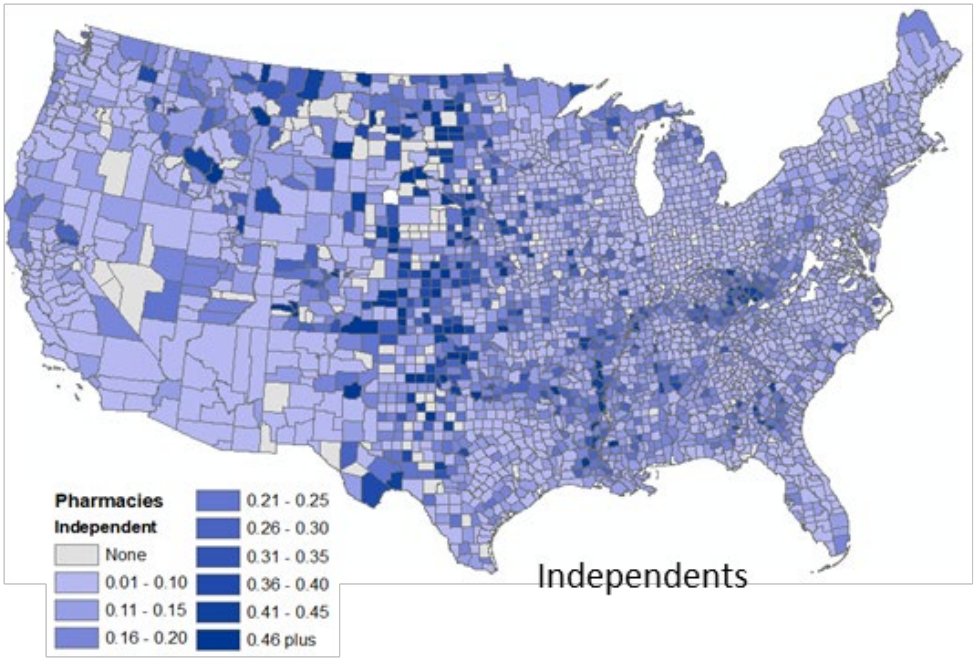
Source: Business Dynamics Research Consortium, Institute for Business and Entrepreneurship, University of Wisconsin. Calculations by the authors.

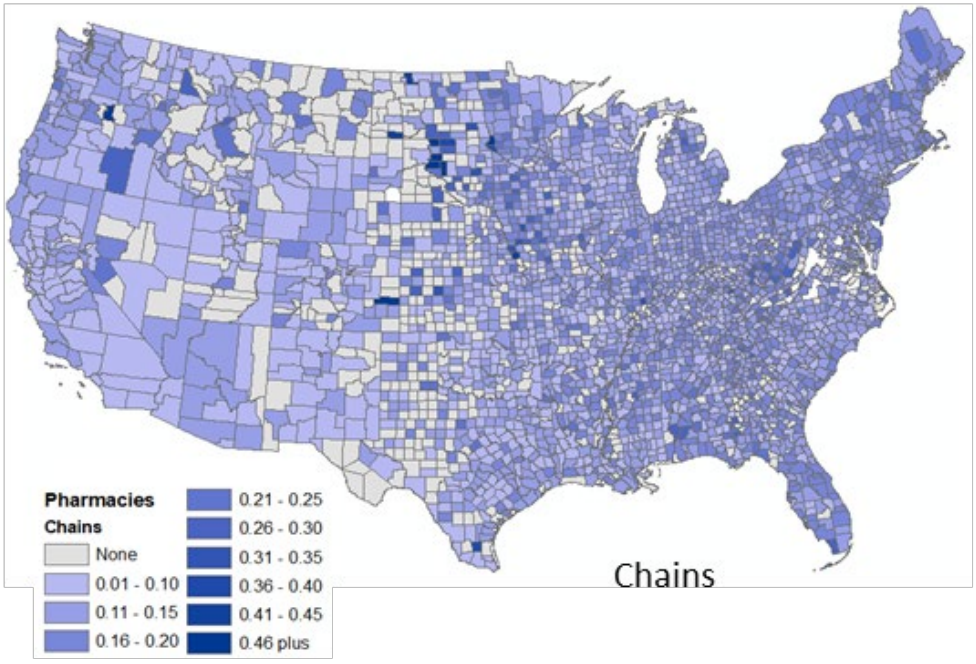
Figure 4: Average Number of Pharmacies per Population (1,000)
(Annual 2011 to 2020)



Source: Business Dynamics Research Consortium, Institute for Business and Entrepreneurship, University of Wisconsin. Calculations by the authors.

Map 1: Average Number of Chain and Independent Pharmacies per Population (1,000) (Annual 2011 to 2020)





Source: Business Dynamics Research Consortium, Institute for Business and Entrepreneurship, University of Wisconsin. Calculations by the authors.

Table 1: Number of Independent Pharamcies per 1,000 Persons Populaiton

OLS	All Counties	Metro	Nonmetro Adjacent	Nonmetro Remote
Number of Chain Pharamcies per 1,000 Persons	***-0.2239 ******	***-0.2102 ******	***-0.3022 ******	***-0.2081 ******
	(0.0001)	***(0.0001)***	***(0.0001)***	***(0.0001)***
Population to Employment Ratio	-0.1629 ***	-0.2148 ***	-0.2490 ***	-0.0473 **
	(0.0001)	(0.0001)	(0.0001)	(0.0039)
Per Capita Income (10K)	0.0369 ***	0.0741 ***	-0.0404 *	0.0417 **
	(0.0001)	(0.0001)	(0.0597)	(0.0041)
Per Capita Income from Income Maintenace Sources (1K)	0.1489 ***	0.1704 ***	0.1570 ***	0.1590 ***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Per Capita Income from Retirement Sources (1K)	0.0017	-0.0108	-0.0107	0.0216 *
	(0.7946)	(0.3041)	(0.3202)	(0.0742)
Per Capita Income from Dividends, Interest and Rent (1K)	-0.0066	0.0048	-0.0264 **	-0.0046
	(0.1716)	(0.6162)	(0.0023)	(0.6295)
Percent of the Population Age 17 and Under	-0.0138	-0.0094	-0.0375 **	-0.0423 **
	(0.1729)	(0.6677)	(0.0174)	(0.0274)
Percent of the Population Age 65 and Over	0.1119 ***	0.1121 ***	0.0679 ***	0.0799 ***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Percent of the Population Black	-0.0400 ***	-0.0913 ***	-0.0207	-0.0036
	(0.0001)	(0.0001)	(0.2315)	(0.7822)
Percent of the Population Latinx	-0.0288 **	-0.0536 **	-0.0762 ***	-0.0117
	(0.0017)	(0.0003)	(0.0001)	(0.4560)
Percent of the Population Asian	-0.0029	0.0516 ***	-0.0999 ***	-0.0410 ***
	(0.5910)	(0.0001)	(0.0001)	(0.0001)
Unemployment Rate	-0.0930 ***	-0.0342 **	-0.1340 ***	-0.1235 ***
	(0.0001)	(0.0292)	(0.0001)	(0.0001)
Child Poverty Rate	0.0663 ***	0.0753 **	0.0417	0.0074
	(0.0001)	(0.0041)	(0.1026)	(0.7807)
Percent of the Population Living in a Rural Place	-0.0082	-0.0144	-0.0750 **	0.0575 **
	(0.3998)	(0.3207)	(0.0003)	(0.0083)
Population (10K)	0.1619 ***	0.2480 ***	0.0918 ***	0.0842 ***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
W*(Population to Employment Ratio)	0.0027	0.0268 **	0.0495 **	-0.0402 **
	(0.7130)	(0.0253)	(0.0002)	(0.0086)
W*(Per Capita Income (10K))	0.0513 ***	0.0754 ***	0.0353 **	0.0267
	(0.0001)	(0.0001)	(0.0472)	(0.1058)
W*(Per Capita Income from Income Maintenace Sources (1K))	0.0072	0.0441 **	0.0438 **	0.0055
	(0.5857)	(0.0229)	(0.0496)	(0.8232)
W*(Per Capita Income from Retirement Sources (1K))	-0.0163 **	-0.0200 **	-0.0292 **	-0.0050
	(0.0024)	(0.0278)	(0.0018)	(0.6190)
W*(Per Capita Income from Dividends, Interest and Rent (1K))	-0.0057	0.0112	-0.0168 *	-0.0105
	(0.2646)	(0.2279)	(0.0534)	(0.3565)
W*(Percent of the Population Age 17 and Under)	0.0358 ***	0.0351 **	0.1307 ***	-0.0361 **
	(0.0001)	(0.0111)	(0.0001)	(0.0320)
W*(Percent of the Population Age 65 and Over)	-0.0150	0.0089	0.0535 **	-0.0912 ***
	(0.1320)	(0.5082)	(0.0005)	(0.0001)
W*(Percent of the Population Black)	-0.0377 ***	-0.0069	0.0100	-0.0810 ***
	(0.0001)	(0.6471)	(0.5619)	(0.0001)
W*(Percent of the Population Latinx)	-0.0727 ***	-0.0760 ***	-0.0243	-0.0852 ***
	(0.0001)	(0.0001)	(0.2018)	(0.0001)
W*(Percent of the Population Asian)	0.0093	-0.0147	0.0781 ***	-0.0238 *
	(0.2018)	(0.2227)	(0.0001)	(0.0869)
W*(Unemployment Rate)	-0.0445 ***	-0.0361 **	-0.0621 ***	-0.0433 **
	(0.0001)	(0.0017)	(0.0001)	(0.0057)
W*(Child Poverty Rate)	0.1228 ***	0.0916 ***	0.1123 ***	0.1075 ***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
W*(Percent of the Population Living in a Rural Place)	0.0361 ***	0.0087	0.0227 *	0.0595 **
	(0.0001)	(0.5731)	(0.0876)	(0.0003)
W*(Population (10K))	0.0075	-0.0005	-0.0345 **	0.0254 **
	(0.1622)	(0.9512)	(0.0037)	(0.0083)
F stat	176.33 ***	62.88 ***	67.98 ***	30.50 ***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
R^2	0.1793	0.1754	0.2040	0.1111
n	30,700	11,270	10,120	9,310
Time Fixed Effects	yes	yes	yes	yes

Standardized coefficients.
Marginal significance or p-values in parantheses.
Heteroscedasticity consistent standard errors.
***: Significant at 99.9%, **: Significant at 95.0%, *: Significant at 90.0%

Table 2: Number of Independent Pharmacy Employment per 1K Population

OLS	All Counties	Metro	Nonmetro Adjacent	Nonmetro Remote
Number of Chain Pharmacy Employment per 1K Persons	***-0.0869 ******	***-0.0518 ******	***-0.1494 ******	***-0.0732 ******
	(0.0001)	***(0.0001)***	***(0.0001)***	***(0.0001)***
Population to Employment Ratio	-0.0933 ***	-0.1198 ***	-0.1958 ***	0.0002
	(0.0001)	(0.0001)	(0.0001)	(0.9862)
Per Capita Income (10K)	0.0287 **	0.0141	-0.0696 ***	0.0453 **
	(0.0003)	(0.2268)	(0.0001)	(0.0002)
Per Capita Income from Income Maintenace Sources (1K)	0.1494 ***	0.0326	0.1183 ***	0.1709 ***
	(0.0001)	(0.1210)	(0.0001)	(0.0001)
Per Capita Income from Retirement Sources (1K)	0.0084	-0.0010	0.0082	0.0190
	(0.2073)	(0.9190)	(0.4620)	(0.1356)
Per Capita Income from Dividends, Interest and Rent (1K)	0.0105	0.0182	-0.0077	0.0147
	(0.1061)	(0.1400)	(0.4509)	(0.2538)
Percent of the Population Age 17 and Under	0.0130	-0.0042	-0.0164	0.0331
	(0.4238)	(0.7406)	(0.3147)	(0.2858)
Percent of the Population Age 65 and Over	0.0213 **	0.0694 ***	0.0383 **	-0.0067
	(0.0122)	(0.0001)	(0.0223)	(0.5983)
Percent of the Population Black	-0.0785 ***	-0.0194	-0.0215	-0.0806 ***
	(0.0001)	(0.2281)	(0.1874)	(0.0001)
Percent of the Population Latinx	-0.0777 ***	-0.0470 ***	-0.1005 ***	-0.0646 **
	(0.0001)	(0.0001)	(0.0001)	(0.0003)
Percent of the Population Asian	-0.0032	0.0267 **	-0.0665 ***	-0.0339 ***
	(0.5894)	(0.0173)	(0.0001)	(0.0001)
Unemployment Rate	-0.0191	-0.0265	-0.0614 **	-0.0084
	(0.1005)	(0.1085)	(0.0002)	(0.7175)
Child Poverty Rate	0.0513 **	0.0906 ***	-0.0099	0.0291
	(0.0004)	(0.0001)	(0.6836)	(0.2353)
Percent of the Population Living in a Rural Place	0.0108	0.0275 **	-0.0142	0.0535 **
	(0.2759)	(0.0471)	(0.5070)	(0.0031)
Population (10K)	0.0326 **	0.0343 **	0.0221	0.0091
	(0.0005)	(0.0464)	(0.1298)	(0.4717)
W*(Population to Employment Ratio)	0.0008	0.0295 **	0.0242 *	-0.0598 **
	(0.9214)	(0.0112)	(0.0856)	(0.0005)
W*(Per Capita Income (10K))	0.0199 *	0.0710 **	0.0426 **	-0.0294 *
	(0.0638)	(0.0058)	(0.0270)	(0.0583)
W*(Per Capita Income from Income Maintenace Sources (1K))	0.0200	0.0439 **	0.0448 *	0.0342
	(0.1140)	(0.0081)	(0.0545)	(0.1352)
W*(Per Capita Income from Retirement Sources (1K))	0.0003	-0.0069	-0.0148	0.0145
	(0.9601)	(0.5380)	(0.1160)	(0.2456)
W*(Per Capita Income from Dividends, Interest and Rent (1K))	0.0003	0.0131	-0.0089	-0.0054
	(0.9503)	(0.2397)	(0.3259)	(0.6049)
W*(Percent of the Population Age 17 and Under)	0.0015	0.0486 **	0.0339 *	-0.0483 **
	(0.8715)	(0.0014)	(0.0275)	(0.0033)
W*(Percent of the Population Age 65 and Over)	-0.0386 **	-0.0087	-0.0020	-0.0915 ***
	(0.0005)	(0.6583)	(0.9084)	(0.0001)
W*(Percent of the Population Black)	-0.0473 ***	-0.0202	-0.0523 **	-0.0869 ***
	(0.0001)	(0.1299)	(0.0055)	(0.0001)
W*(Percent of the Population Latinx)	-0.0347 ***	-0.0514 ***	0.0264	-0.0536 ***
	(0.0001)	(0.0001)	(0.1896)	(0.0001)
W*(Percent of the Population Asian)	-0.0003	-0.0035	0.0258 **	-0.0224 *
	(0.9573)	(0.7138)	(0.0214)	(0.0541)
W*(Unemployment Rate)	-0.0439 ***	-0.0251 **	-0.0305 **	-0.0571 **
	(0.0001)	(0.0187)	(0.0209)	(0.0014)
W*(Child Poverty Rate)	0.0444 **	0.0070	0.0917 **	0.0211 **
	(0.0014)	(0.7682)	(0.0003)	(0.3672)
W*(Percent of the Population Living in a Rural Place)	0.0304 **	0.0558 **	0.0140	0.0226 **
	(0.0004)	(0.0011)	(0.3007)	(0.1292)
W*(Population (10K))	0.0011	-0.0011	-0.0333 **	0.0203 **
	(0.8115)	(0.8830)	(0.0018)	(0.0107)
F stat	40.59 ***	10.68 ***	19.52 ***	14.22 ***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
R^2	0.0479	0.0349	0.0685	0.0551
n	30,700	11,270	10,120	9,310
Time Fixed Effects	yes	yes	yes	yes

Standardized coefficients.

Marginal significance or p-values in parantheses.

Heteroscedasticity consistent standard errors.

***: Significant at 99.9%, **: Significant at 95.0%, *: Significant at 90.0%

Table 3: Number of Independent Pharmacies

Zero Inflated Negative Binomial	All Counties	Metro	Nonmetro Adjacent	Nonmetro Remote
Number of Chain Pharamcies per 1K Persons	***-1.3110 ******	***-0.6536 *****	***-1.7813 ******	***-1.1583 ******
	(0.0001)	***(0.0012)***	***(0.0001)***	***(0.0001)***
Population to Employment Ratio	-0.0725 ***	-0.0844 ***	-0.2967 ***	-0.1964 ***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Per Capita Income (10K)	0.0944 ***	0.1417 ***	-0.0152	-0.0039
	(0.0001)	(0.0001)	(0.3151)	(0.6912)
Per Capita Income from Income Maintenace Sources (1K)	0.7067 ***	0.7768 ***	0.5486 ***	0.4258 ***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Per Capita Income from Retirement Sources (1K)	0.0102 **	0.0071 *	0.0064	0.0108 **
	(0.0003)	(0.0863)	(0.1348)	(0.0252)
Per Capita Income from Dividends, Interest and Rent (1K)	0.0014	0.0031 **	-0.0020	-0.0035 *
	(0.1558)	(0.0304)	(0.1778)	(0.0989)
Percent of the Population Age 17 and Under	-0.0323 ***	-0.0341 ***	-0.0140 **	-0.0436 ***
	(0.0001)	(0.0001)	(0.0010)	(0.0001)
Percent of the Population Age 65 and Over	-0.0242 ***	-0.0087 **	-0.0265 ***	-0.0448 ***
	(0.0001)	(0.0115)	(0.0001)	(0.0001)
Percent of the Population Black	-0.0059 ***	-0.0024 **	-0.0139 ***	-0.0133 ***
	(0.0001)	(0.0162)	(0.0001)	(0.0001)
Percent of the Population Latinx	-0.0024 ***	0.0127 ***	-0.0190 ***	-0.0163 ***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Percent of the Population Asian	0.1254 ***	0.0777 ***	-0.0144	-0.0406 ***
	(0.0001)	(0.0001)	(0.2863)	(0.0001)
Unemployment Rate	0.0154 ***	-0.0180 **	0.0055	0.0328 ***
	(0.0001)	(0.0019)	(0.2535)	(0.0001)
Child Poverty Rate	-0.0045 **	0.0046 *	0.0004	-0.0014
	(0.0032)	(0.0699)	(0.8694)	(0.5375)
Percent of the Population Living in a Rural Place	0.0383 ***	0.0186 ***	0.0121 **	0.0470 ***
	(0.0001)	(0.0001)	(0.0079)	(0.0001)
Population (10K)	-0.0242 ***	-0.0262 ***	-0.0128 ***	-0.0146 ***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
W*(Population to Employment Ratio)	0.1731 ***	0.0417	0.1164 **	0.0987 **
	(0.0001)	(0.1716)	(0.0002)	(0.0073)
W*(Per Capita Income (10K))	0.0417 **	0.0564 **	0.0707 **	-0.0407 **
	(0.0015)	(0.0032)	(0.0018)	(0.0460)
W*(Per Capita Income from Income Maintenace Sources (1K))	-0.1926 **	-0.2105 **	0.0903	0.0383
	(0.0005)	(0.0113)	(0.2980)	(0.6632)
W*(Per Capita Income from Retirement Sources (1K))	0.0367 ***	0.0204 **	0.0539 ***	0.0346 ***
	(0.0001)	(0.0092)	(0.0001)	(0.0001)
W*(Per Capita Income from Dividends, Interest and Rent (1K))	0.0045 **	0.0057 *	0.0072 **	-0.0083 *
	(0.0340)	(0.0669)	(0.0129)	(0.0777)
W*(Percent of the Population Age 17 and Under)	-0.0393 ***	-0.0079	-0.0459 ***	-0.0656 ***
	(0.0001)	(0.1955)	(0.0001)	(0.0001)
W*(Percent of the Population Age 65 and Over)	-0.0006	0.0186 **	-0.0085	-0.0504 ***
	(0.8548)	(0.0002)	(0.1229)	(0.0001)
W*(Percent of the Population Black)	0.0046 ***	0.0025 **	0.0128 ***	0.0027 *
	(0.0001)	(0.0472)	(0.0001)	(0.0881)
W*(Percent of the Population Latinx)	-0.0038 ***	-0.0044 **	0.0042 **	0.0002
	(0.0001)	(0.0003)	(0.0024)	(0.9020)
W*(Percent of the Population Asian)	-0.0511 ***	-0.0482 ***	0.0272 **	0.0090
	(0.0001)	(0.0001)	(0.0049)	(0.4350)
W*(Unemployment Rate)	0.0116 **	0.0111	0.0447 ***	-0.0067
	(0.0130)	(0.1051)	(0.0001)	(0.4012)
W*(Child Poverty Rate)	0.0212 ***	0.0207 ***	0.0057	0.0126 **
	(0.0001)	(0.0001)	(0.1351)	(0.0016)
W*(Percent of the Population Living in a Rural Place)	-0.0021 ***	0.0001	-0.0001	0.0022 **
	(0.0001)	(0.9368)	(0.8760)	(0.0076)
W*(Population (10K))	0.0093 ***	0.0081 ***	0.0027 ***	0.0013
	(0.0001)	(0.0001)	(0.0001)	(0.1268)
Intercept	2.2549 ***	1.2034 ***	2.5795 ***	5.1662 ***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Pearson χ2	39,216.38 ***	13,330.81 ***	10,817.78 ***	9,344.42 ***
	(0.0001)	(0.0001)	(0.0001)	(0.0055)
n	30,700	11,270	10,120	9,310
Time Fixed Effects	yes	yes	yes	yes

Marginal significance or p-values in parantheses.

***: Significant at 99.9%, **: Significant at 95.0%, *: Significant at 90.0%

Table 4: Number of Independent Pharmacies

Zero Inflated Negative Binomial	All Counties	Metro	Nonmetro Adjacent	Nonmetro Remote
Number of Chain Pharmacy Employment per 1K Persons	***-0.0070***	***-0.0236 ** ***	***-0.0340 *** ***	***-1.3110 *** ***
	(0.1133)	***(0.0052)***	***(0.0001)***	***(0.0001)***
Population to Employment Ratio	-0.0480 ***	-0.0808 ***	-0.2578 ***	-0.0725 ***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Per Capita Income (10K)	0.0957 ***	0.1416 ***	-0.0149	0.0944 ***
	(0.0001)	(0.0001)	(0.3275)	(0.0001)
Per Capita Income from Income Maintenace Sources (1K)	0.6675 ***	0.7740 ***	0.4916 ***	0.7067 ***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Per Capita Income from Retirement Sources (1K)	0.0101 **	0.0070 *	0.0064	0.0102 **
	(0.0004)	(0.0918)	(0.1375)	(0.0003)
Per Capita Income from Dividends, Interest and Rent (1K)	0.0015	0.0031 **	-0.0020	0.0014
	(0.1300)	(0.0271)	(0.1939)	(0.1558)
Percent of the Population Age 17 and Under	-0.0306 ***	-0.0342 ***	-0.0107 **	-0.0323 ***
	(0.0001)	(0.0001)	(0.0119)	(0.0001)
Percent of the Population Age 65 and Over	-0.0257 ***	-0.0095 ***	-0.0271 ***	-0.0242 ***
	(0.0001)	(0.0055)	(0.0001)	(0.0001)
Percent of the Population Black	-0.0052 ***	-0.0023 **	-0.0133 ***	-0.0059 ***
	(0.0001)	(0.0240)	(0.0001)	(0.0001)
Percent of the Population Latinx	-0.0012 **	0.0130 ***	-0.0177 ***	-0.0024 ***
	(0.0466)	(0.0001)	(0.0001)	(0.0001)
Percent of the Population Asian	0.1289 ***	0.0787 ***	-0.0082	0.1254 ***
	(0.0001)	(0.0001)	(0.5433)	(0.0001)
Unemployment Rate	0.0135 ***	-0.0182 **	0.0047	0.0154 ***
	(0.0001)	(0.0017)	(0.3384)	(0.0001)
Child Poverty Rate	-0.0040 **	0.0046 *	0.0004	-0.0045 **
	(0.0099)	(0.0738)	(0.8761)	(0.0032)
Percent of the Population Living in a Rural Place	0.0366 ***	0.0182 ***	0.0109 **	0.0383 ***
	(0.0001)	(0.0001)	(0.0169)	(0.0001)
Population (10K)	-0.0230 ***	-0.0261 ***	-0.0118 ***	-0.0242 ***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
W*(Population to Employment Ratio)	0.1601 ***	0.0366	0.1120 **	0.1731 ***
	(0.0001)	(0.2284)	(0.0004)	(0.0001)
W*(Per Capita Income (10K))	0.0428 **	0.0568 **	0.0815 **	0.0417 **
	(0.0011)	(0.0030)	(0.0003)	(0.0015)
W*(Per Capita Income from Income Maintenace Sources (1K))	-0.2058 **	-0.2191 **	0.0557	-0.1926 **
	(0.0002)	(0.0085)	(0.5225)	(0.0005)
W*(Per Capita Income from Retirement Sources (1K))	0.0359 ***	0.0210 **	0.0531 ***	0.0367 ***
	(0.0001)	(0.0074)	(0.0001)	(0.0001)
W*(Per Capita Income from Dividends, Interest and Rent (1K))	0.0045 **	0.0057 *	0.0067 **	0.0045 **
	(0.0331)	(0.0659)	(0.0219)	(0.0340)
W*(Percent of the Population Age 17 and Under)	-0.0364 ***	-0.0065	-0.0442 ***	-0.0393 ***
	(0.0001)	(0.2882)	(0.0001)	(0.0001)
W*(Percent of the Population Age 65 and Over)	0.0007	0.0190 ***	-0.0074	-0.0006
	(0.8499)	(0.0001)	(0.1808)	(0.8548)
W*(Percent of the Population Black)	0.0039 ***	0.0022 *	0.0125 ***	0.0046 ***
	(0.0001)	(0.0844)	(0.0001)	(0.0001)
W*(Percent of the Population Latinx)	-0.0037 ***	-0.0046 ***	0.0047 **	-0.0038 ***
	(0.0001)	(0.0001)	(0.0006)	(0.0001)
W*(Percent of the Population Asian)	-0.0494 ***	-0.0485 ***	0.0292 **	-0.0511 ***
	(0.0001)	(0.0001)	(0.0027)	(0.0001)
W*(Unemployment Rate)	0.0123 **	0.0117 *	0.0459 ***	0.0116 **
	(0.0087)	(0.0863)	(0.0001)	(0.0130)
W*(Child Poverty Rate)	0.0216 ***	0.0209 ***	0.0073 *	0.0212 ***
	(0.0001)	(0.0001)	(0.0555)	(0.0001)
W*(Percent of the Population Living in a Rural Place)	-0.0021 ***	0.0001	-0.0001	-0.0021 ***
	(0.0001)	(0.9598)	(0.9344)	(0.0001)
W*(Population (10K))	0.0092 ***	0.0082 ***	0.0028 ***	0.0093 ***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Intercept	1.9684 ***	1.1413 ***	2.1819 ***	2.2549 ***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Pearson $\chi 2$	38,967.53 ***	13,302.78 ***	10,776.14 ***	9,284.57 ***
	(0.0001)	(0.0001)	(0.0001)	(0.0060)
n	30,700	11,270	10,120	9,310
Time Fixed Effects	yes	yes	yes	yes

Marginal significance or p-values in parantheses.

***: Significant at 99.9%, **: Significant at 95.0%, *: Significant at 90.0%