



The Center for Business and Economic Research
Gatton College of Business and Economics
University of Kentucky

The Economic Impacts of Land Use Policies in Lexington, Kentucky

**Prepared by the Center for Business and Economic Research
Gatton College of Business and Economics
University of Kentucky**

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**Center for Business and Economic Research
Gatton College of Business and Economics
University of Kentucky**

Dr. Christopher R. Bollinger, Director
Dr. William Hoyt
Dr. Michael W. Clark, Associate Director
Xiaozhou Ding

Executive Summary

Every five years, Lexington-Fayette Urban County Government's Planning Commission adopts a comprehensive plan detailing goals and objectives that guide the city's land use planning. Maintaining the city's urban service area and preserving its rural and agricultural areas are integral parts of this plan. Within the urban service area, land is zoned to permit various types of urban uses such as residential, commercial, and industrial use. Land outside the urban service area is subject to several land use policies designed to preserve the rural characteristics of these areas.

This report examines the effects of Lexington's land use policies and specifically its urban service area. The report has seven main findings:

- 1) Economists generally evaluate urban development and land use policies based on how they affect social welfare. Policy makers must balance the benefits of development to consumers including the value of housing and the value of consumer goods produced against the societal costs such as the loss of open spaces valued by residents. Local land use policies should be designed to address these costs. However, if land use policies are too restrictive, they can prevent socially beneficial development.
- 2) One measure of the social value of development is the difference in the price of land sales where the land can be used for development against sales where the land cannot be used. Our estimates suggest that the development value of an acre of land in Fayette County is approximately \$30,000. Results from a 1997 study indicate that Lexington's households would be willing-to-pay approximately \$19,100 to \$21,800 in current dollars to preserve an acre of land used for horse farming. This is somewhat lower than the \$30,000 development value estimated—suggesting that Lexington's land use policies might be too restrictive. However, both figures have limitations.
- 3) Lexington's land use policies do not appear to be currently causing housing prices to grow faster than prices for the state, nation, and comparison cities. One reason for this might be the availability of land in surrounding counties. As these areas grow and commuting costs increase, housing prices in Lexington may increase more quickly.
- 4) Lexington's land use policies are designed in part to preserve the rural areas of Fayette County that may be valued by Lexington's residents. Our analysis of housing prices near the urban service area's boundary suggests Lexington residents do value Fayette County's rural areas. We find that house buyers in Lexington paid 1.8 percent more for houses located within ¼ mile of the rural areas preserved by the urban service area. This represents a premium of approximately \$3,700 on an average house costing \$204,000 or \$27 per month for a 15-year mortgage at 4 percent interest.
- 5) Lexington's land use policies have not significantly impeded the city's employment growth relative to the rest of its metropolitan statistical area and 18 other cities. Lexington's employment grew by 29,500 jobs, or 18 percent, from 2003 to 2014. The rest of the Lexington-Fayette KY MSA grew by 6,100 jobs, or nine percent, during this

period. Of the 18 comparison cities, only five experienced faster employment growth than Lexington.

- 6) Commuting patterns in Lexington and the 18 comparison cities suggest that while area residents are taking jobs located in Lexington, they are increasingly choosing to live in nearby counties. The number of jobs filled by workers commuting from outside Lexington increased from 64,000 in 2002 to 98,000 in 2014. The number of jobs outside Lexington that were filled by Lexington residents changed very little over this period—from 40,500 jobs in 2002 to 41,400 in 2014. Lexington’s net commuting—the difference between those commuting to Lexington and those commuting from Lexington—increased by 141 percent from 2002 to 2014. This was significantly higher than any of the comparison cities.
- 7) Expanding Lexington’s urban service area would affect both the city’s revenues and its cost to provide services. While the net fiscal effect is uncertain, there appears to be little evidence to suggest that an expansion would significantly improve the city’s fiscal situation. Nearly 70 percent of the additional recurring revenues would be needed to fund increased personnel and operating costs among the seven city divisions that would be most directly affected by an expansion: Police; Fire and Emergency; Waste Management; Water Quality; Traffic Engineering; Streets and Roads; and Parks and Recreation. Additional costs for infrastructure, corrections, social programs, and other services provided by the city could easily account for the remaining 30 percent of recurring revenues.

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I. Introduction

Every five years, Lexington-Fayette Urban County Government's Planning Commission adopts a comprehensive plan detailing goals and objectives that guide the city's land use planning. Maintaining the city's urban service area and preserving its rural and agricultural areas are integral parts of this plan. Within the urban service area, land is zoned to permit various types of urban uses such as residential, commercial, and industrial use. Land outside the urban service area is subject to several land use policies designed to preserve the rural characteristics of these areas such as being primarily zoned for agricultural use and limiting new residential construction to lots with at least 40 acres. These policies have been controversial. Some argue Lexington's land use policies limit its economic growth and that the city should expand its urban service area. Others oppose an expansion—often citing concerns that development could negatively affect the quality of living in Lexington.

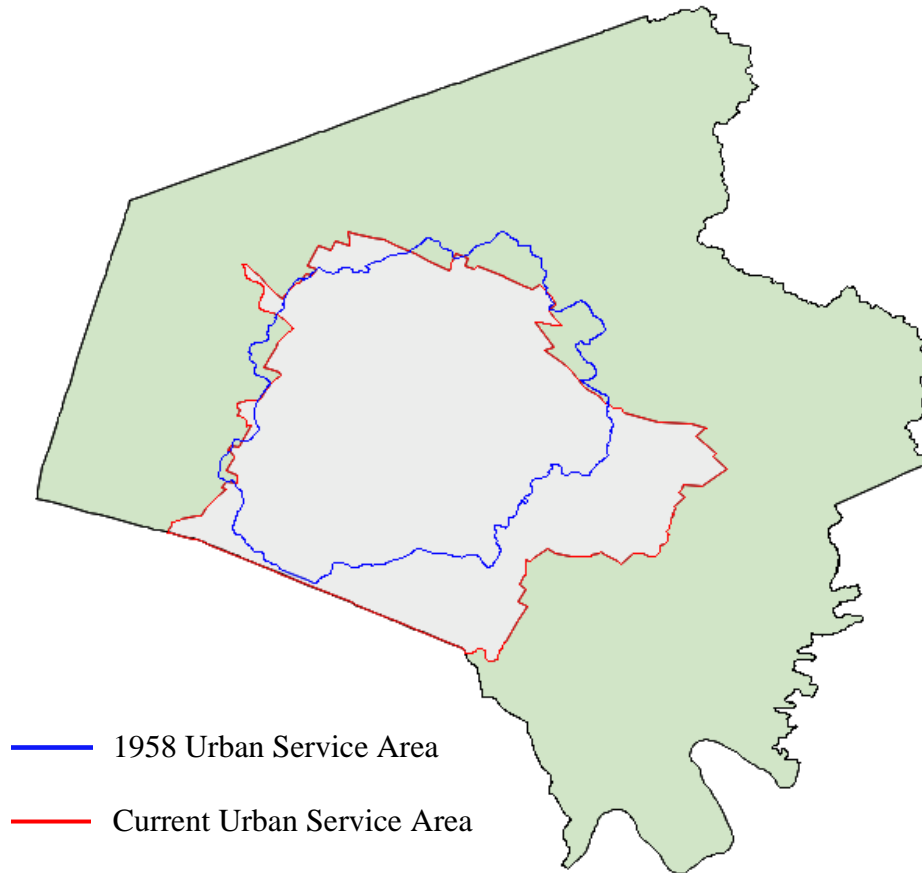
In May 2016, the Lexington-Bluegrass Association of REALTORS contracted with the University of Kentucky's Center for Business and Economic Research (CBER) to study the effects of Lexington's land use policies and specifically its urban service area. This study has six objectives:

1. summarize research that examines how land use policies affect cities;
2. evaluate whether Lexington's land use policies affect residential home prices and whether they create an amenity for residents;
3. evaluate whether Lexington's land use policies affect prices for commercial and retail property;
4. examine trends in the development of vacant land in Lexington's urban service area;
5. examine whether Lexington's land use policies affect total employment or the mix of employment in Fayette County; and
6. examine how expanding the urban service area could affect Lexington's revenues and its costs to provide services.

Lexington established the urban service area in 1957 and is often cited as the first city to adopt such a policy (Jun 2004). The city has altered the area several times through the years. The most recent major expansion in 1996 added approximately 5,400 acres (Ku 2006). Figure A shows the urban service area currently and as it was in 1958.

The urban service area defines the areas where the city will provide certain services. The city provides fire and police services in both the urban and rural areas. Within the urban area, it also provides sewer service and will collect solid waste and recycling with approval of the city council. In some urban areas, the city also provides street lights and street cleaning. Residents living outside the urban area contract with private companies to collect solid waste and are typically on septic systems.

Figure A
Lexington's Urban Service Area
1958 and Current



Source: Lexington-Fayette County Urban Government. Division of Planning.

II. Research on Land Use Policies

Economists generally evaluate urban development and land use policies based on how they affect social welfare. As Wasser (2002) explains, this involves taking a broader perspective than is typically taken by private individuals. For example, private developers typically evaluate a development project by comparing the cost they would incur by undertaking the project to the income they would earn. Likewise, households decide on where to buy or build a house by comparing the cost they incur from living in an area with the benefits of living in the area. In addition to the price of the house, households might consider factors such as commuting costs or benefits they receive from being close to parks and other amenities. Developers and households would typically select projects where the private benefits they receive exceed the private costs they incur.¹ However, if these projects impose costs on other residents, the total costs may exceed the total benefits so that social welfare declines.

¹ This does not mean that developers and households never consider how development might affect other residents. However, they have less incentive to consider these factors in their decisions.

Brueckner (2000) notes three types of costs that are often excluded from private development decisions. First, development could result in the loss of open spaces that are valued by residents. Development might also increase traffic congestion, leading to longer commutes and higher fuel costs for existing residents. Finally, the city may incur additional infrastructure costs to serve new developments if these costs are not paid directly by the developers. Each of the costs discussed by Brueckner are borne by individuals not directly involved in the development decision. Therefore, they may not be considered by those making development decisions.

Policymakers often design land use policies to address these concerns. For example, zoning regulations separate incompatible land uses such as industrial and residential uses (Quigley and Rosenthal 2004). Industrial land can contribute to pollution and noise that negatively affects individuals living in residential areas. Cities try to minimize these negative costs by creating zones to separate incompatible uses. Another example is Lexington's policy requiring developers install sewer lines, storm sewers, roads, and traffic signals in their developments or pay a fee to cover these costs. This helps ensure that infrastructure costs are reflected in the prices of the developed property rather than shifting these costs to the city.

Many cities have addressed development concerns by adopting urban growth boundaries (UGB), which designate where the cities may grow. UGB have many similarities to Lexington's urban service area. UGB are designed to preserve rural areas by directing where development may occur and minimize infrastructure costs by encouraging compact development.² Like Lexington, cities typically provide services such as sewer systems and solid waste collection to households and businesses located within the boundary, but not those outside the boundary. Oregon, Washington, and Tennessee have state laws requiring their local governments establish UGBs. Cities often draw these boundaries with sufficient land to accommodate growth for 20 years.

UGBs may help address concerns that private development does not adequately account for the value residents place on rural areas near the city by restricting development in these areas. Economic markets allocate resources to their highest and best use. Land is no exception, and indeed is often cited as the classic case (for an excellent treatment, see O'Sullivan, 2012). If the agriculture industry, and the accompanying green space, were the highest market use, this current allocation would be sustainable without any government intervention. There is certainly economic value to the agricultural business in Fayette County, as evidenced by Davis (2013), if economic value of the land use were the only criteria, no urban services boundary would be needed. To argue in favor of a boundary solely on the basis of the direct economic value of agriculture is simply not defensible. However, in this case there is a potential value to the land that is not captured in the economic markets: the amenity value to residents of Lexington. To put it simply, it is pretty and provides some value to residents.

Several studies have found evidence that homeowners value greenspaces and are willing to pay more for homes located near them. Nelson (1986) examined land prices from 1977 to 1979 in Salem, OR and found that urban land located at the city's urban growth boundary were worth \$1,200 more per acre than urban land 1,000 feet away from the boundary. This would be about

² Cho, Chen, and Yen (2008) note that Tennessee required its local governments establish UGBs partially due to annexation battles.

\$4,450 in current dollars. His results suggest that the greenbelt created by Salem's UGB provides an amenity that is reflected in the value of nearby houses. Anderson and West (2006) examined housing prices in the Minneapolis-St. Paul MSA. They found that prices were higher for houses located near neighborhood, national, and state parks. Asabere and Huffman (2009) found that houses near trails, greenbelts, and trails with greenbelts sold for 2, 4, and 5 percent more than other houses.

These studies demonstrate that residents value rural areas by showing they are willing to pay a premium for houses located near these rural areas. Residents located further from these areas may value them as well. Unfortunately, it is very difficult for researchers to determine how much residents value these areas, making it difficult for policymakers to know how much of an area should be protected. If local governments assume residents value rural areas more than they actually do, they may make policies too restrictive. This could prevent development where the total benefits exceed the total costs even after including those that accrue to other residents.

While urban growth boundaries can preserve rural areas, there are issues related to their use. These include how UGBs affect housing affordability and whether they contain development or simply shift it to other areas.

Nelson (1986) noted urban containment policies, like UGBs, can restrict the supply of land and increase housing prices. Ambrose and Gonas (2003) examined how changes in the urban service area affected house prices in Lexington, KY. They found that "there was upward price pressure in housing prior to the expansion, and that house prices did decline" shortly after the urban service area was expanded (p. v). Cho, Chen, and Yen (2008) may have found evidence of boundaries increasing prices in Knoxville Tennessee, where prices were higher for houses inside Knoxville's UGB. Knapp (1985) examined the impact of growth boundaries in two Oregon Counties. He found prices were affected in Washington County but not Clackamas County. He suggests that the lack of an effect in Clackamas County might have been due to its boundary being relatively flexible and weakly enforced. It is not clear whether the housing price increases observed in these studies was simply due to restricting housing supply. Prices might have also increased because the UGBs protect an amenity. The value of this amenity could then be reflected in housing prices. While higher housing prices can benefit property owners, as Furman (2015) noted, they also make housing less affordable for those looking to move into the city.

Mathur (2014) suggests that UGB do not necessarily have to restrict the housing supply and increase prices. He found that the UGB in King County, Washington increased prices for vacant land but decreased housing prices by 1.3 percent. He suggests that while the UGB increased the price of land by restricting its supply, policies encouraging high density housing resulted in sufficient development to prevent prices from increasing.³

The other concern with UGB is whether they contain development to desired areas or simply shift it to nearby cities. Dempsey and Plantinga (2013) found UGB in Oregon contained development in some cities. In others, development inside and outside the UGB was similar, suggesting the UGB did not restrict development to areas within the boundary. Cho et.al. (2007)

³ Lexington appears to have adopted similar policies to increase density when it expanded its urban service area in 1996.

found that Knoxville's UGB did not reduced urban sprawl. The authors indicated that the cause of development outside the city after adopting its UGB was not clear. However, limited policies discouraging development outside the UGB may be one factor. Cities with UGBs may lack authority to discourage growth outside their UGBs. While the Lexington-Fayette Urban County Government has jurisdiction throughout the county, this is not always the case for other cities. Land just outside the UGB may be under the jurisdiction of a county government, another city, or township. If officials in these local governments do not share the same goals as the city, they may not adopt policies discouraging development outside the city's UGB. We interviewed officials in several cities with UGBs. Often, there was relatively little difference in the land use policies inside and outside the UGB or the city boundaries. This may reduce the effectiveness of UGB in preserving rural land and reducing urban sprawl.

UGB may also fail to contain development to desired areas if homebuyers simply locate in nearby areas just beyond the restrictions. Kim (2013) notes that UGBs may constrain growth to designated areas within the city, but some of the development is likely to spill over into nearby cities. Jun (2004) found that Portland's UGB shifted residential development from the city into nearby Clark County, WA. Glaeser and Ward (2009) may have observed a similar effect when examining land use restrictions in the Boston area. They found towns that implemented land use restrictions such as minimum lot sizes limited the supply of housing in these towns. However, housing prices were not higher in the towns with the restrictions than in nearby towns without the restrictions. They attribute the lack of an effect on prices to the availability of similar housing in other towns. Homebuyers may have simply purchased houses in nearby towns to avoid the land use restrictions, which would tend to reduce any prices differences between the areas. If homebuyers locate in other towns due to the UGB, the policy might increase commuting costs for these individuals.

III. Effect of Lexington's Urban Service Area on Housing Prices

In this section, we examine three issues related to Lexington's land use policies. First, we examine the value of development by comparing the difference in price for farmland inside and outside Lexington's urban service area. Second, we examine whether Lexington and the Lexington-Fayette County MSA experienced greater housing price increases than other areas. Finally, we examine whether homebuyers pay more for houses located near rural areas along the city's urban service boundary. Willingness to pay higher prices for houses located near rural areas suggests that homebuyers assign a positive value to these areas.

Social Value of Development

In Section II, we discussed how properly functioning economic markets will allocate land to its most valued use. Owners of farmland would compare the returns they gain from selling the land for development to the returns they gain from farming the land. If the returns from farming exceed the returns from development, the landowner would have a strong incentive to continue farming the land. However, if potential homebuyers place a higher value on the land for homes, they would bid the price of the land to a point the landowner would gain from selling the land. This occurs as long as there are no restrictions on development. If development is the most valued use but policies prevent development, the selling price of land will likely be lower than it would be otherwise. Because Lexington's land use policies place fewer restrictions on the

development of farmland inside the urban service area than farmland outside the area, we might expect prices for farmland in these areas to differ. This difference should partially reflect the social value of development.

We focused on sales of property the PVA classified as farms. Farmland inside the urban service area sold for approximately \$46,000 per acre on average. Farmland outside the urban service area sold for approximately \$16,000 per acre on average.⁴ The difference in average prices might reflect a number of factors such as location and existing structures. However, restrictions on development likely explain a large portion of the difference. The difference suggests that the private value of the land when used for development exceeds the private value of land when used for farming. Owners of farmland outside the urban service area may incur a significant lost opportunity due to the development restrictions. This price difference may understate the value of development if farmland inside the urban service area is subject to additional restrictions that could potentially limit future development options. Although additional research would be need to more accurately measure this impact, our comparison suggests landowners could potentially lose as much as \$30,000 per acre due to the restrictions on development. By comparison, Lexington's Purchase of Development Rights program paid approximately \$3,100 per acre for development rights. These figures suggest that the PDR program might not fully compensate landowners for the development rights.

As discussed in Section II, one rationale for the urban service area is that private development decisions do not necessarily reflect the cost that development might impose on other residents. Private development decisions generally depend on whether the private returns exceed private costs. By ignoring cost that development imposes on other residents, private development decisions can result in a level of development where the total costs imposed on society exceed the benefits generated. In these cases, policies that restrict development can improve total social welfare. However, if these policies become too restrictive, they can prevent development that creates more value for the city than the costs it imposes. In these instances, the restrictions reduce social welfare.

Policymakers' decision on the size of the urban service area largely involves a trade-off between the value of development and the value of preservation. The difference between the prices of farmland in and out of the urban service area suggest the market places a higher value on land when used for development. A 1997 study by Ready, Berger, and Blomquist, found that households do value preservation of horse farms and would be willing to pay approximately \$0.0061 to \$0.0069 per household per year to preserve an acre of horse farm.⁵ Applying this value to the number of households in Fayette County, suggests that Fayette County residents would pay approximately \$765 to \$871 per year to preserve an acre of horse farm. On a present value basis, this is equivalent to a willingness to pay \$19,100 to \$21,800 to preserve an acre of land used for horse farming.⁶ This is somewhat lower than the \$30,000 development value estimated above—suggesting that Lexington's land use policies might be too restrictive. However, both figures have limitations. The figure on the development value of farmland might

⁴ We focused on farms sold through arms-length transactions and that did not appear to be used primarily as a residence.

⁵ Figures are stated in 2016 dollars.

⁶ Present values were calculated assuming the amount would be paid in perpetuity and was discounted using a four percent discount rate.

capture other differences between these properties that we cannot adequately account for in this study. The figures from the Ready, Berger, and Blomquist study were based on data collected in 1990. Their figures also represent the value of preserving horse farms. Households' willing-to-pay to preserve other types of farms might be lower. Additional research on these issues would provide better insights as to whether the current restrictions on development are adequate or too restrictive.

Effect of Urban Service Area on Lexington Housing Prices

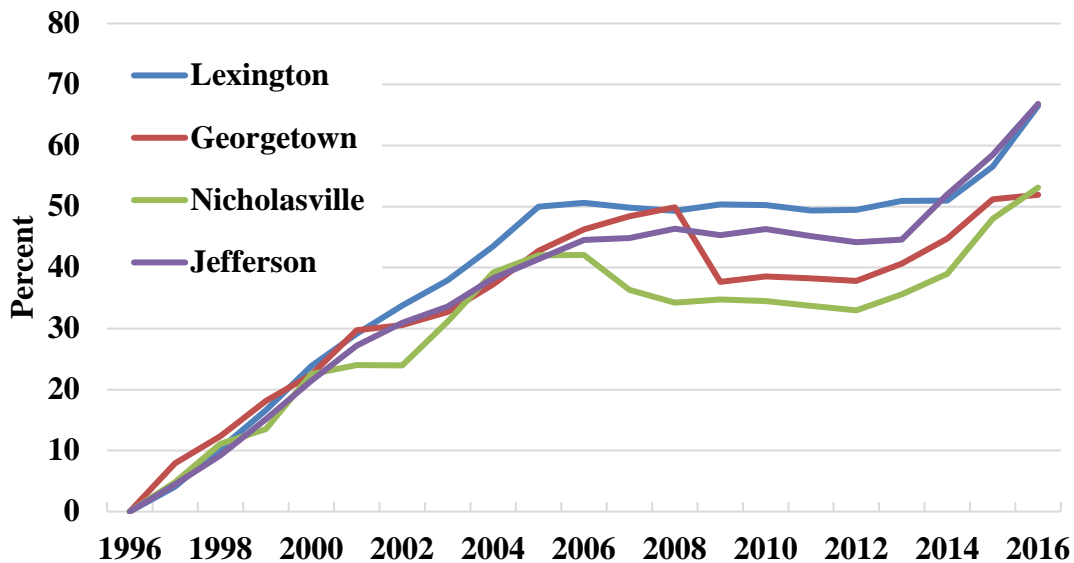
Lexington's land use policies might affect housing prices if they significantly restrict the supply of developable land. If Lexington's policies restrict the housing supply, prices in Lexington and the surrounding area would be expected to increase relative to other markets. Likewise, expanding the urban service area in 1996 might have eased housing prices.

Figure B shows changes in single-family home prices from 1996 to 2016 for Lexington, Georgetown, Nicholasville, and Louisville. While this measure shows prices for individual cities, 1996 is the earliest data available. The trends show three distinct periods: increasing prices from 1996 to 2005; little change or decreases from 2005 to 2012; and increases since 2012. Table 1 shows the percentage change in prices over these periods. Over this entire period, prices in Lexington increased more than in Nicholasville and Georgetown. This is largely due to Lexington experiencing larger price increases up to 2005. Lexington saw smaller decreases from 2005 to 2012. Since 2012, prices have increased faster in Nicholasville and Louisville than Lexington.

Two periods are of particular interest for examining Lexington's land use policies. The first period consists of the years following the 1996 expansion. From 1996 to 1997, Lexington's housing prices rose by 4.1 percent—lower than what Georgetown, Nicholasville, and Jefferson Counties experienced. However, by 1998, Lexington's prices began to increase faster than the other three cities. The expansion might have contributed to the slower price increases in 1997; however, its effect appears to have been limited to roughly a year.

The second period of interest covers recent years. If the urban service area constrains Lexington's housing market currently, prices in Lexington should be increasing at a relatively fast rate. Prices have increased in each of the cities. However, Lexington's increases do not appear to be unusually high relative to the other three cities. This suggests that while the housing market is starting to pick-up after several years, the urban service area is not currently contributing to unusually high price increases.

Figure B
Cumulative Percent Changes in Single-family Home Prices
1996 to 2016



Source: Zillow Home Value Index. Single-family Homes Time Series.

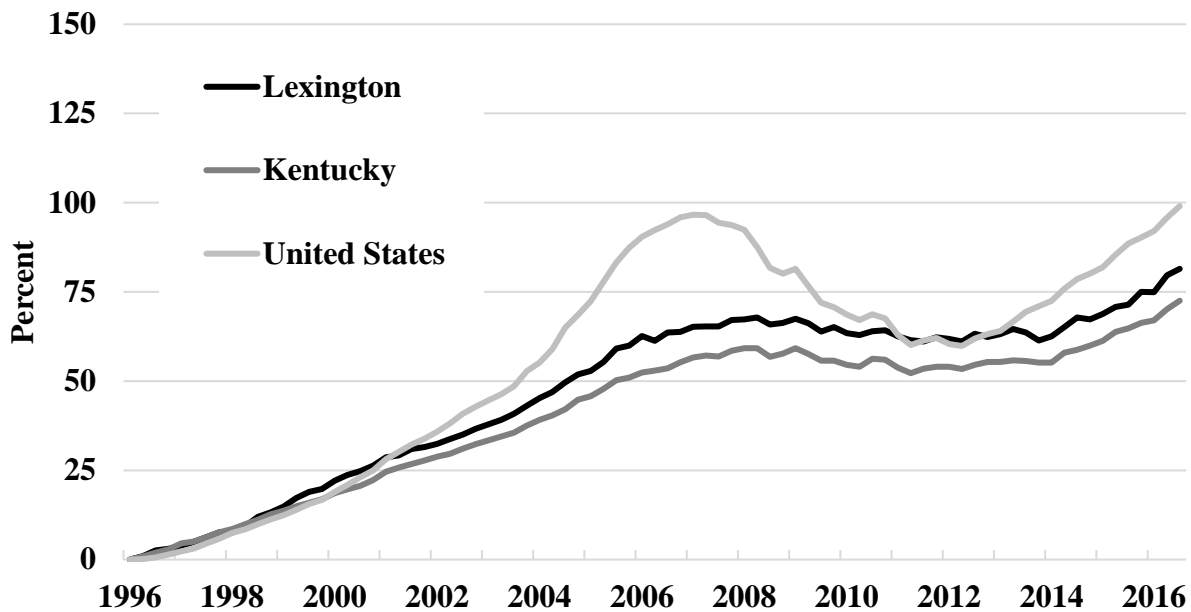
Table 1
Percentage Changes in Single-family Home Prices

Period	Lexington	Georgetown	Nicholasville	Louisville
1996 to 2005	50.0%	42.7%	42.0%	41.4%
2005 to 2012	-0.3	-3.5	-6.4	2.0
2012 to 2016	11.4	10.3	15.1	15.7
1997 to 2016	60.0	40.8	46.0	59.7

Source: Zillow Home Value Index. Single-family Homes Time Series.

Figure C compares trends in the Federal Housing Finance Agency’s Housing Price Index for the Lexington-Fayette County MSA, Kentucky, and the nation. For each area, the quarterly index is stated as a percent of the area’s index in the first quarter of 1996. Prices in all three areas increased steadily during the late 1990s and early 2000s. Kentucky and the Lexington area did not experience as rapid an increase in prices leading up to the recession, but also did not experience as large of a decrease during the recession. In recent years, prices in all three areas have increased. From the 3rd quarter of 2012 to the 3rd quarter of 2016, prices increased by 11.1 percent in the Lexington-Fayette MSA; 11.6 percent in Kentucky; and 23 percent nationally. These trends indicate that even with the urban service boundary, Lexington is experiencing considerably less upward pressure on prices than the nation as a whole.

Figure C
Housing Price Index
Lexington-Fayette MSA, Kentucky, United States



Source: United States. Federal Housing Finance Agency. Housing Price Index.

Table 2 compares the housing price index for the Lexington-Fayette MSA to the MSAs for 18 comparison cities. The comparison cities are discussed in more detail in section IV. From 1996 to 2016, housing prices in the Lexington-Fayette MSA increased by 75.8 percent. Prices increased faster in five of the comparison MSAs and slower in 13. Since 2012, prices in the Lexington-Fayette MSA increased by 10.2 percent. However, this increase was slow relative to price increases in the comparison MSAs—13 of the comparison MSAs experienced larger increases. While price increases in the Lexington-Fayette MSA were low relative to the other MSAs considered, MSAs that include cities with growth boundaries generally experienced larger price increases than those without. This suggests that growth boundaries might put upward pressure on housing prices. The Lexington-Fayette MSA may have experienced a smaller increase in housing prices due to the availability of land in counties surrounding Lexington.

As we discussed in the review of the past research, restricting the supply of developable land is can lead to higher land and housing prices. Our analysis suggests that Lexington’s land use policies have not significantly affected housing prices in Lexington relative to the state, nation, and comparison areas in recent years. The availability of land surrounding Fayette County may be one reason for this. However, as these areas grow and commuting costs increase, Lexington’s housing prices could begin to rise more quickly. This appears to have occurred in other cities with growth boundaries and warrants monitoring in Lexington. If Lexington were to expand its urban service area, housing prices might decrease slightly, or rise at a slightly slower rate. However, the impact on housing prices would likely be temporary.

Table 2
Percentage Change in
Housing Price Index from 1996 to 2016
Lexington-Fayette MSA and MSAs for Comparison Cities

MSA	1996 to 2005	2005 to 2012	2012 to 2016	1996 to 2016
Ann Arbor, MI	70.4	-24.7	30.5	67.3
Bloomington, IN	40.1	10.6	10.6	71.5
Charlotte-Concord-Gastonia, NC-SC	41.9	-0.2	23.1	74.3
Chattanooga, TN-GA	52.6	3.1	11.6	75.4
Columbia, MO	41.6	5.9	11.4	67.0
Columbia, SC	48.4	0.9	7.8	61.4
Durham-Chapel Hill, NC	46.6	6.2	15.4	79.7
Eugene, OR	64.2	-4.9	23.5	92.8
Greenville, NC	37.4	0.4	1.6	40.1
Knoxville, TN	47.4	8.1	9.8	74.9
Lafayette-West Lafayette, IN	22.3	-1.0	11.9	75.8
Lansing-East Lansing, MI	60.0	-27.6	17.7	36.3
Lexington-Fayette, KY (Rank: 1=Largest Increase in Price)	54.3 (10)	3.4 (7)	10.2 (14)	75.8 (6)
Little Rock-North Little Rock-Conway, AR	42.8	8.1	6.3	64.1
Louisville/Jefferson County, KY-IN	48.9	0.9	13.3	70.2
Madison, WI	64.7	-2.5	12.4	80.4
Salem, OR	51.3	-6.1	30.4	85.2
Spokane-Spokane Valley, WA	46.5	4.0	16.1	76.8
Springfield, MO	34.4	-0.4	9.6	46.8

Source: United States. Federal Housing Finance Agency. Housing Price Index.

Effect of Urban Service Area on Housing Prices Along Boundary

Most of the urban service area's boundary runs through Fayette County. Land outside this portion of the urban service area is generally zoned for agricultural use. The minimum lot size for residential housing in the rural area is 40 acres. As a result, this land is mostly rural. The rest of the boundary runs along the Fayette/Jessamine County line. Land located outside this portion of the urban service area is under either Jessamine County's or Nicholasville's jurisdiction. Some of these areas have already been developed. The difference in land use policies and development between these areas creates an opportunity to examine whether home buyers pay a premium for houses located near rural areas established by Lexington's urban service area. If home buyers value living near rural areas, prices in these areas should be higher than homes located further from the urban service area or along the Fayette/Jessamine County line.

We obtained sales and property tax data from the Fayette County Property Valuation Administrator (PVA). The PVA maintains records on the sale of property within the county and the characteristics of property such as the type of building, square footage, and lot size. The data

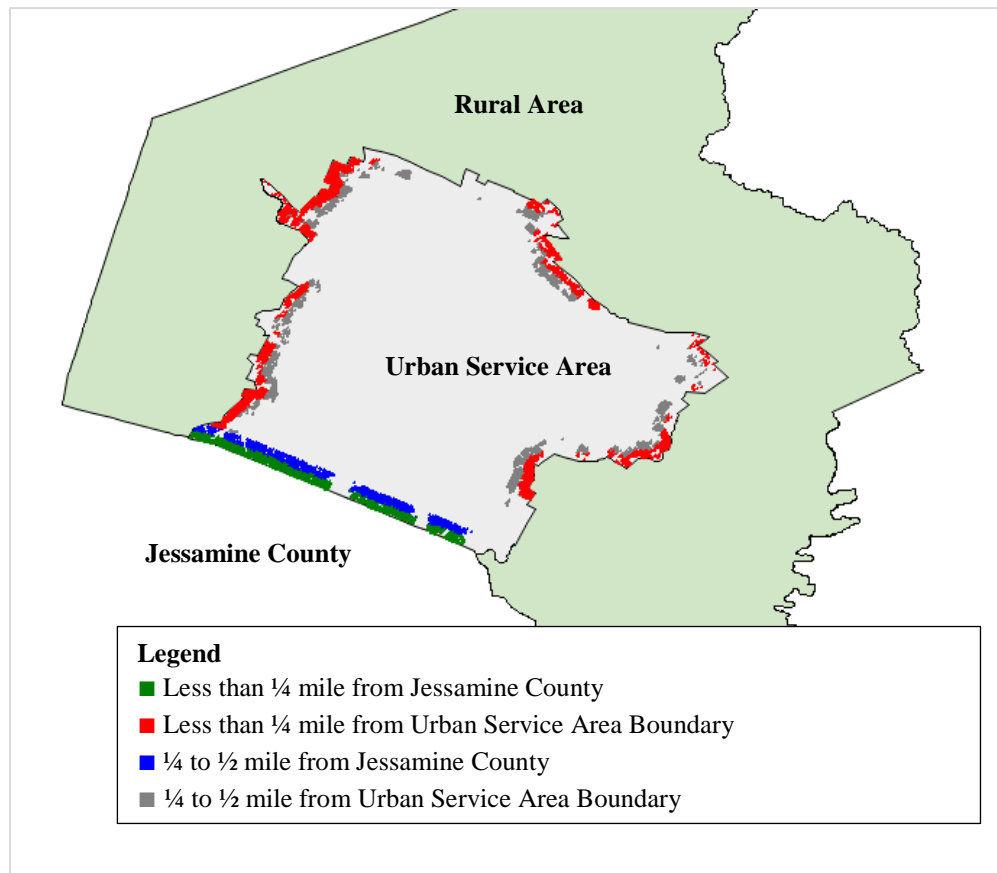
covers sales made from 2003 to 2016. We restricted our analysis to single-family homes sold through arms-length transactions. Other types of transactions were excluded because their prices might not reflect market prices for these properties.

House sales within the urban service area were divided into four groups:

- sales located less than $\frac{1}{4}$ mile from the Fayette/Jessamine County line,
- sales located between $\frac{1}{4}$ and $\frac{1}{2}$ mile from the Fayette/Jessamine County line,
- sales located less than $\frac{1}{4}$ mile from the rural portion of the urban service area, and
- sales located between $\frac{1}{4}$ and $\frac{1}{2}$ mile from rural portion of the urban service area.

House sales further than a half mile inside the urban service area were not included in this analysis. Figure D shows the location of sales for each group. If home buyers value living near the rural areas established by Lexington's land use policies, prices for homes located along this area (red) should be higher than for similar homes further from the rural areas (gray). Because Jessamine County and Nicholasville do not have similar land use policies, the prices for homes located along the Fayette/Jessamine County line (green), should not be higher than similar homes further from the county line (blue).

Figure D
Home Sales ½ Mile Inside Lexington’s
Urban Service Area



Source: Staff analysis of data from the Fayette County PVA.

Table 3 summarizes the characteristics of the housing sales included in each of the four groups. Houses located near the Fayette/Jessamine County line were slightly larger and located on larger lots than those near the rural portion of the urban service area. They also were less likely to be all brick but more likely to have a fireplace. Houses located within ¼ to ½ mile of either Jessamine County or the rest of the urban service area were older than those with ¼ mile.

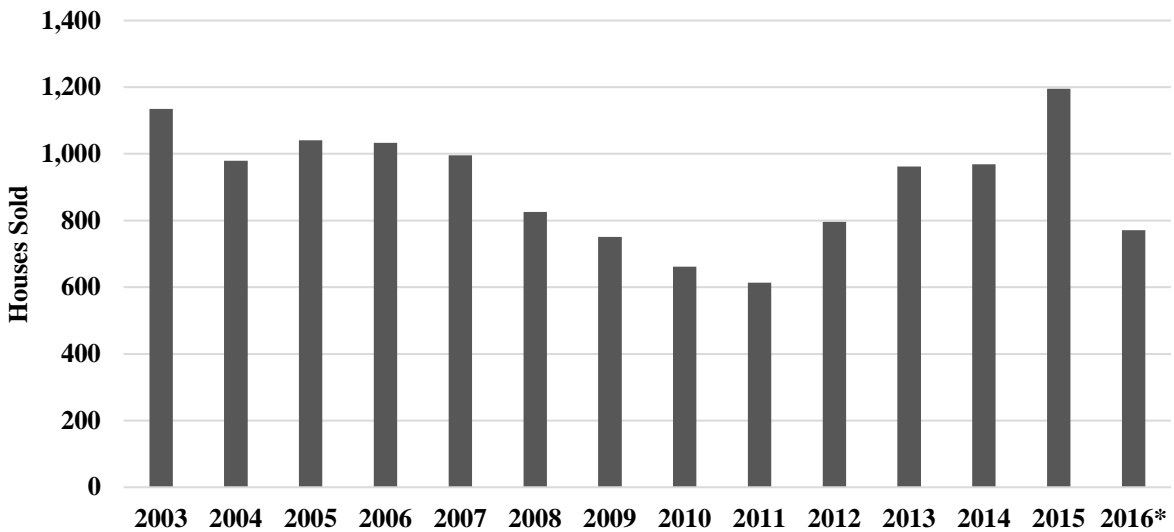
Table 3
Characteristics of Houses Sold within ½ Mile of Urban Service Area

	Sales Near Fayette/Jessamine County Line		Sales Near Rural Portion of Urban Service Boundary		All Houses Sold
	0 to ¼ mile	¼ to ½ mile	0 to ¼ mile	¼ to ½ mile	
Average					
House Size (sq ft)	2,041	2,118	1,872	1,826	1,930
Lot Size (sq ft)	9,793	9,560	9,290	9,370	9,444
Age (Years)	13.8	14.5	13.7	17.7	15
Distance to Park (miles)	0.64	0.53	0.63	0.53	0.59
Full Baths (#)	2.1	2.1	2.1	2.0	2.1
Half Baths (#)	0.7	0.71	0.55	0.49	0.59
Percentage					
All Brick	19	20	24	34	25
Partial Brick	71	68	64	58	64
Fireplace	87	89	66	69	74
Number of Sales	2,244	2,093	5,028	3,365	12,730

Source: Staff analysis of data from Fayette County PVA.

Figure E shows the timing of home sales. From 2003 through 2006, roughly 1,000 single-family homes sold in the study area each year. Housing sales declined from 2007 to 2011 but have since returned to similar levels as prior to the recession. Data for 2016 represents only a partial year of sales.

Figure E
Number of Single-Family Houses Sold Annually
within ½ Mile of Urban Service Area



*2016 represents a partial year of home sales.

Source: Staff analysis of data from the Fayette County PVA.

Simply comparing prices across these areas is not sufficient to determine whether Lexington's land use policies affect prices. Price differences could be caused by differences in the characteristics of houses between these areas. For example, Table 3 showed that houses sold within ¼ mile of the urban service area were newer on average than houses from ¼ to ½ mile. A simple comparison of average prices might lead us to incorrectly conclude that housing prices are higher close to the urban service area because of the proximity to rural land, when they might have higher prices simply because these houses were on average four years newer. To address these issues, we use regression analysis to evaluate whether prices were higher along the urban service area. Regression analysis is a tool that helps us isolate the individual effects each characteristic has on price.

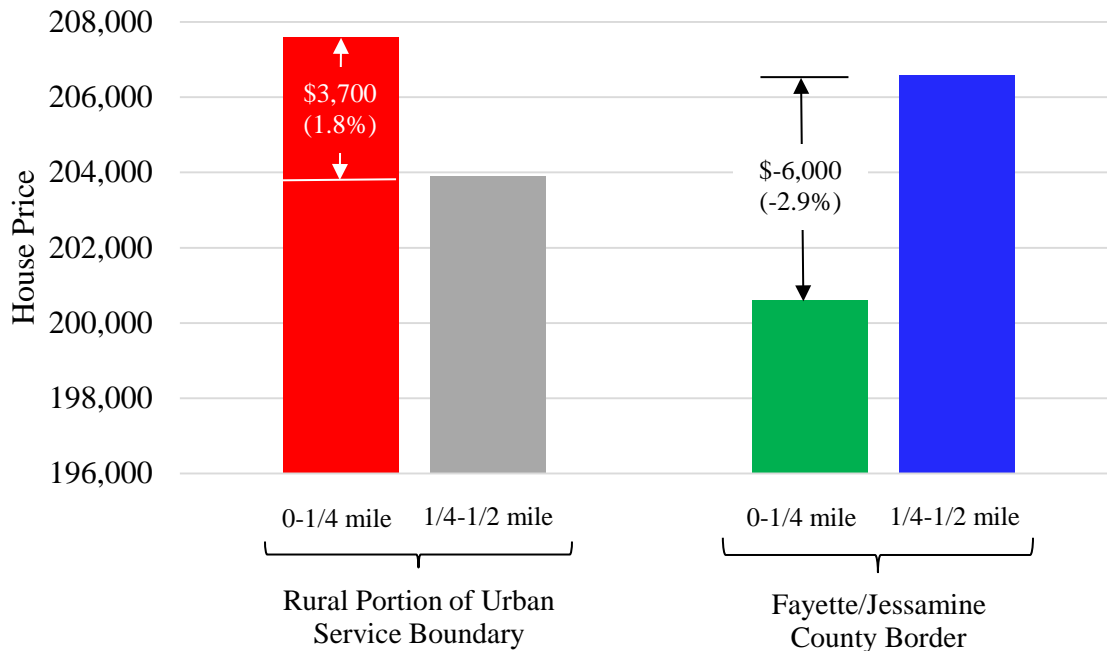
Using this tool, we were able to account for differences in building square footage, lot size, number of bathrooms, distance to the nearest park, age, exterior material, whether the house had a fireplace, and year the house was sold.⁷ As expected, we find that prices were higher for larger houses and houses with larger lots. Houses with all brick exteriors sold for approximately 8.8 percent more than frame houses. For a \$200,000 house, this would add about \$17,600 to the selling price. Partial brick exteriors added nearly two percent to a house's price. Houses with fireplaces sold for 2.6 percent more than those without. A second full bathroom added nearly nine percent of the house's value. Appendix A provides additional details of this analysis.

Figure F describes the results that relate to proximity to the urban service area. The analysis indicates that buyers paid 1.8 percent more for houses located within ¼ mile of the rural portion of the urban service boundary than for houses within ¼ to ½ mile of the same area. This price difference was statistically significant at the 10 percent level.

To illustrate the price difference for houses in these areas, we estimated the prices of houses given the average characteristics of houses in the study region. The only difference is the proximity to the rural portion of the urban service boundary. An average house located within ¼ mile of the rural portion of the urban service boundary would be approximately \$207,600. The same house located slightly further—¼ to ½ mile—from the rural portion of the boundary would be \$203,900. This amounts to a \$3,700 premium for homes located near rural areas.

⁷ We also accounted for other geographic factors that did not change during the study period by controlling for the Census Tract in which each house was located. Census tracts are small geographic areas defined by the US Census Bureau.

Figure F
Effects of Proximity to Urban Service Boundary on Price of a Single-family House
with Average Characteristics of Houses Sold in Study Area



Source: Staff analysis of data from the Fayette County PVA.

The opposite was observed for houses along the Fayette/Jessamine County line. Buyers paid nearly three percent less for houses that were within ¼ miles from the Fayette/Jessamine County line than for house ¼ to ½ miles. The price for an average house is \$200,600 if located within ¼ mile of Jessamine County and \$206,600 if located ¼ to ½ miles from the county. This is a \$6,000 reduction in price for homes located close to the county line. The decrease in prices close to the county border might be due to a greater supply of houses in Jessamine County or greater traffic congestion. Google Maps can be used to estimate the morning and evening commutes along the major traffic arteries from the county line to downtown (Table 4). The morning commute, arriving—downtown at 8 a.m.—along Nicholasville Rd. ranged from 16 to 40 minutes. This was slightly longer than commutes along Winchester Rd., Georgetown Rd, Paris Pike, Versailles Rd., and Harrodsburg Rd. The evening commute—leaving downtown at 5 p.m.—was longer for Nicholasville Rd and Harrodsburg Rd.

Table 4
Commute Times from Fayette County Line to Downtown Lexington

	Morning Commute (Minutes)	Evening Commute (Minutes)
Nicholasville Rd	16 – 40	18 – 50
Harrodsburg Rd	16 – 35	16 – 45
Paris Pike	20 – 36	24 – 40
Georgetown Rd	16 – 35	14 – 30
Versailles Rd	18 – 30	14 – 30
Winchester Rd	16 – 30	22 – 35

Note: Morning commute was based on a commuter arriving downtown by 8 a.m.

Evening commute was based on commuter leaving downtown at 5 p.m.

Source: Google Maps.

The results indicate that homebuyers are willing to pay an additional 1.8 percent more to locate near rural areas. For a house with average characteristics, this amounts to an additional \$3,700 in the price of the house or \$27 per month if financed for 15 years at four percent interest. These results suggest that Lexington’s rural areas provide an amenity that residents value. The value of this amenity is specifically observed in the prices home buyers are willing to pay for houses located near rural areas. The results also suggest that the amenity value of rural land differs from the amenity value of parks. Being located near parks did not have a statistically significant effect on prices. While parks may provide some positive amenities, they can also contribute to negative amenities such as increased noise and traffic.

Residents living throughout Lexington might also value its rural areas. While we cannot measure this value, we can estimate the upper bound of their total valuation. Those who pay a premium for houses near the rural area are likely to place the highest net value on Lexington’s rural areas. They pay roughly \$27 per month or \$324 per year to be located near these areas. There are approximately 126,000 households in Fayette County. If each household placed a similar value on the rural areas, the total value of Lexington’s rural area would be \$40.7 million annually. This represents an upper bound, as some residents might value these areas less.

Some portions of Jessamine County along the Fayette/Jessamine line have been developed and others have not. We examined whether prices for Fayette County houses across from the undeveloped portions of Jessamine County were higher than those across from developed portions of Jessamine County. While we might have expected houses across from the undeveloped portions of Jessamine County to be higher, we found no statistically significant difference. Homebuyers might be anticipating that these areas will be developed in the near future and unwilling to pay a premium to locate near a temporary open space.

Homebuyers might also value greenspaces associated with parks and schools. In our analysis, distance to a park did not have a statistically significant effect on housing prices. This might occur because different types of parks provide different benefits and costs for area residents. While some parks provide greenspaces that can increase property values, others increase vehicle and pedestrian traffic, which might decrease values of nearby homes. We did not explicitly examine whether distance to schools affect housing values. If houses located near schools sell for

higher prices, the higher prices might reflect the value of greenspace, but might also reflect the convenience of living near a school for families with children.

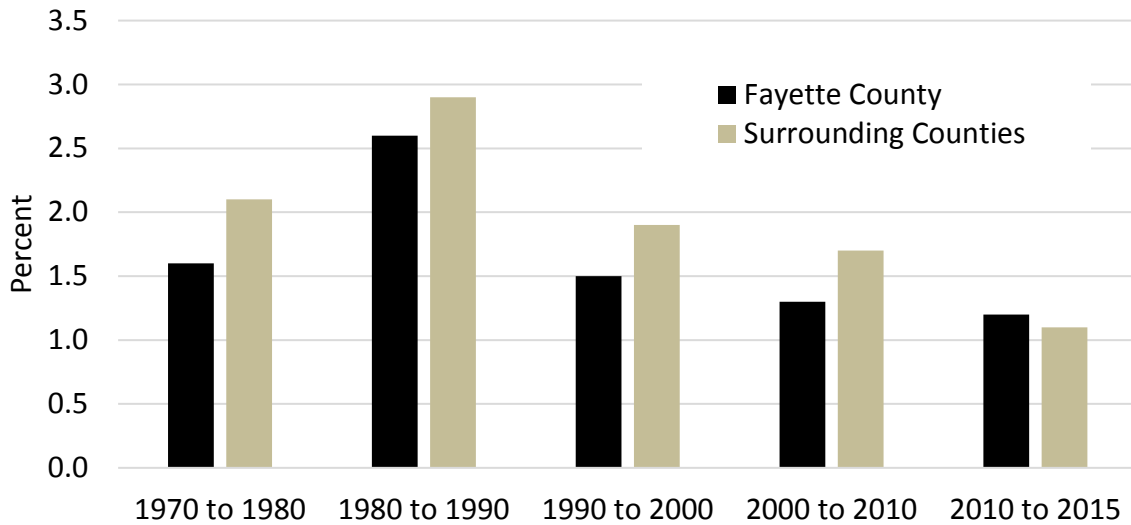
We examined whether there might be a similar effect on prices of commercial and retail property. Proximity to the urban service area is unlikely to create an amenity that raises the value of commercial property as with residential property. The value of commercial property is primarily based on the level of future income the property can generate. The urban service area might affect property values if it limits a business' customer base. Consider two restaurants: one located along the urban service boundary and the other located within the urban area's interior. The restaurant near the boundary may have fewer customers nearby. We examined property sales for restaurants and retailers. However, there were too few sales along the urban service boundary to provide meaningful analysis.

IV. Effect of Urban Service Area on Population and Employment Growth

One of the major concerns expressed regarding Lexington's land use policies is that they could reduce the city's population and employment growth. Lexington's land use policies restrict the amount of land that may be developed. As land within the urban service area becomes scarce, residents and businesses might locate in surrounding areas or other cities. If this occurs, Lexington's employment might grow more slowly than it would otherwise. To examine whether Lexington's land use policies have affected its growth, we compared population, employment, and commuting trends in Lexington, the surrounding area, and 18 other cities.

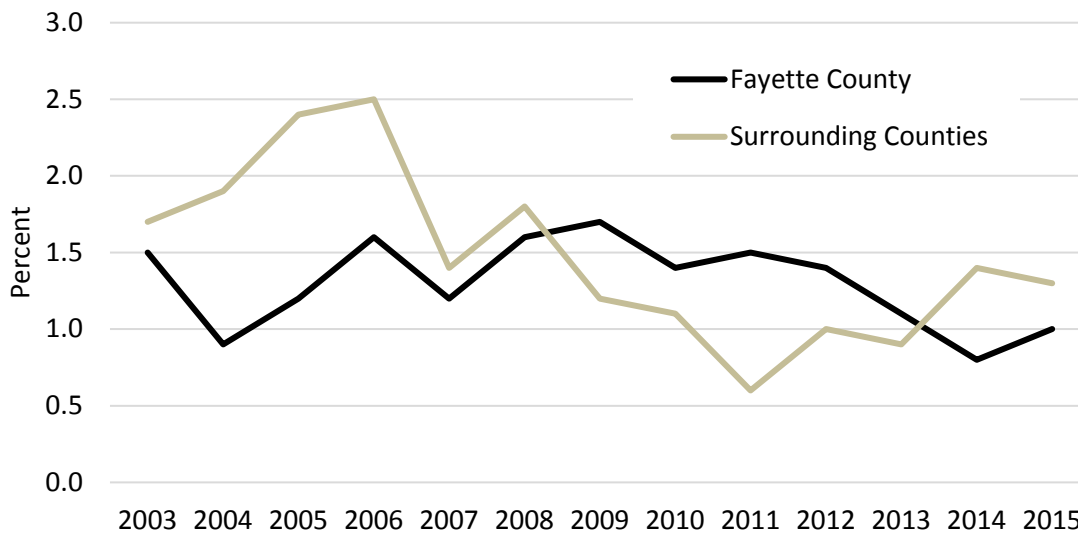
Figure G shows population growth for Fayette and its surrounding counties from 1970 to 2015. The surrounding counties, as a whole, grew faster than Fayette County from the 1970s through the 2000s. The faster growth in these counties was largely driven by growth in Jessamine and Scott Counties. While Figure G showed long term population trends, Figure H shows annual population growth since 2003. Surrounding counties generally grew faster than Fayette County. However, from 2009 through 2013, Fayette County grew faster. Cumulatively, the surrounding counties grew 19 percent since 2003, while Fayette County grew somewhat slower at 16.5 percent.

Figure G
Annual Population Growth Rates Fayette and Surrounding Counties
1970 to 2015



Source: Kentucky State Data Center.

Figure H
Population Growth Fayette and Surrounding Counties
2003 to 2015



Source: Kentucky State Data Center.

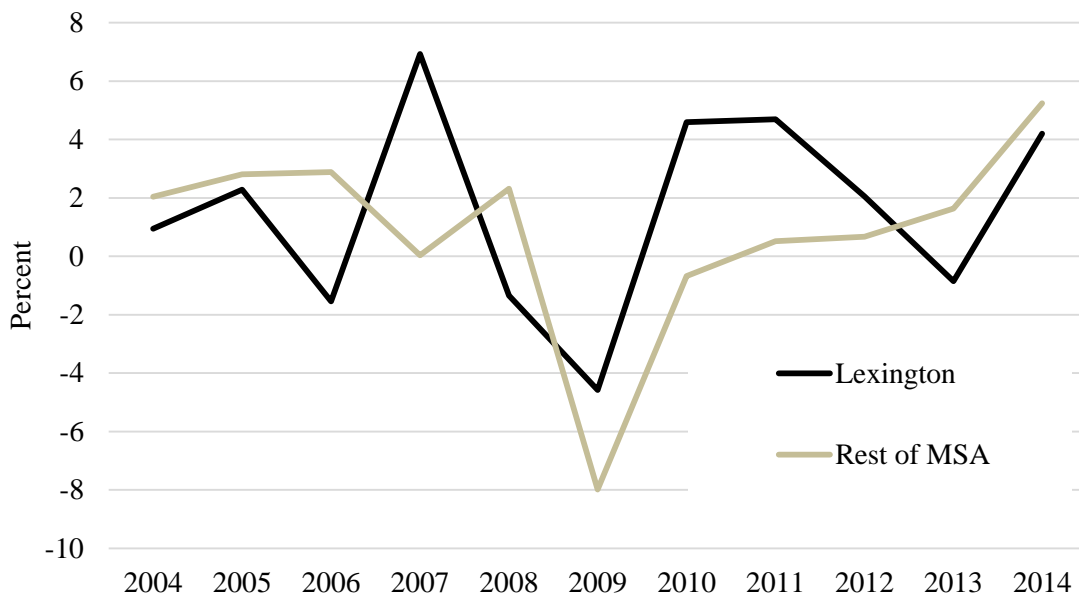
Figure I shows annual change in employment for Lexington and the rest of the Lexington-Fayette KY Metropolitan Statistical Area (MSA). The MSA consists of Fayette, Bourbon, Clark, Jessamine, Scott, and Woodford Counties.⁸ The measure of employment used in Figure I includes wage and salaried workers but does not include those who are self-employed.

⁸ Madison County is not included in the Lexington-Fayette Kentucky MSA.

Employment grew faster in Lexington in five of the 11 years shown and slower in six. However, it is difficult to determine which area grew faster overall by examining only the annual changes.

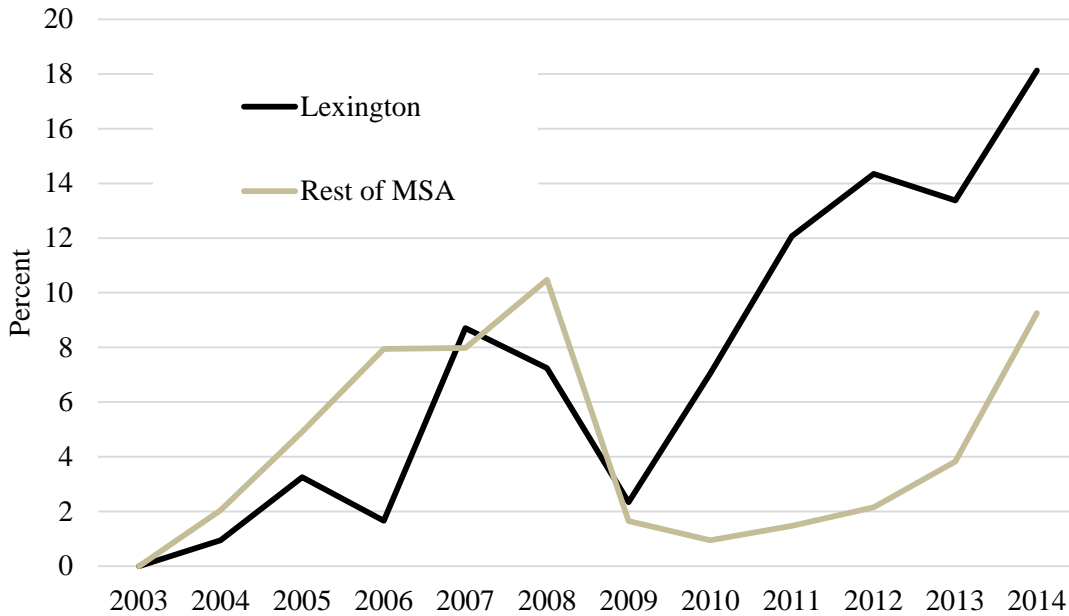
Figure J shows the same employment data but each year is stated as a percent of employment in 2003. This shows how employment has changed cumulatively during this period. From 2003 through 2008, employment grew faster in the rest of the MSA than in Lexington. Since the recession ended in 2009, however, Lexington's employment grew faster. By 2014, Lexington's employment had increased by 29,500 jobs, or 18 percent, from its level in 2003. Employment in the rest of the MSA increased by nearly 6,100, or nine percent, from its level in 2003. The data suggests that Lexington's employment has more than kept pace with employment in the rest of the MSA.

Figure I
Annual Percentage Change in Employment Lexington
and Rest of Lexington/Fayette County MSA



Source: United States. Census Bureau. Longitudinal Employer-Household Dynamics.

Figure J
Annual Employment as a Percent of Employment in 2003
Lexington and Rest of Lexington/Fayette County MSA



Source: United States. Census Bureau. Longitudinal Employer-Household Dynamics.

Another way to evaluate the effect of Lexington’s land use policies is to compare its employment growth to that of other cities. Table 5 shows the annual employment growth rates from 2003 to 2014 for Lexington and its MSA to the growth rates for 18 other cities and their respective MSAs. For the comparison, we selected cities with major universities and medium sized populations.

The comparison cities are primarily located in southeastern states, states bordering Kentucky, and other nearby states. However, Eugene, OR; Salem, OR; and Spokane, WA were included because both the Oregon and Washington state legislatures enacted legislation requiring their cities to develop urban growth boundaries. Including cities with growth boundaries or service areas may indicate whether cities with these types of restrictions grow slower than those without. Tennessee also requires its cities to develop urban growth boundaries. Durham, NC has an urban service area similar to Lexington’s. Columbia, MO established an urban service area in 2013. However, it is unlikely to have affected the city’s employment during the time period examined by Table 5.

Urban growth boundaries function differently across cities. Oregon and Washington State require their cities design UGBs to accommodate 20 years of population growth. Cities may adjust their boundaries over time as needed. For example, Metro Council, which serves residents in the Portland, Oregon area, expanded its UGB by 3,500 acres in 1998; 380 acres in 1999; 18,867 acres in 2002; 1,956 acres in 2004; 345 acres in 2005; and 2,015 acres in 2011 (Metro). According to Cho, Chen, and Yen (2008), Tennessee required its cities to establish urban growth boundaries partially to address annexation battles between local governments. These UGBs

designate areas where Tennessee cities may annex land. They do not necessarily prohibit growth outside the boundary. The extent to which growth occurs outside the UGB depends on the policies adopted by the local governments that have jurisdiction for the area and the services these governments provide to the areas.

From 2003 to 2014, Lexington's employment grew by 1.5 percent annually. Lexington grew slower than five of the 18 comparison cities; faster than all five of the cities with an urban growth boundary; and faster than six of the cities without a growth boundary. Lexington also grew faster than Madison and slightly faster than Durham, which have urban service areas.⁹ Employment grew slower in cities with growth boundaries than in other cities examined. This result suggests that boundaries that direct where the city may grow might reduce employment growth.

If Lexington's land use policies shifted employment growth to its surrounding areas, growth would be relatively more concentrated in the rest of its MSA than in the city. As shown in Table 5, employment growth has actually been more concentrated in Lexington than its MSA. Lexington grew 1.5 percent annually, while the Lexington-Fayette County MSA grew by 1.3 percent. It is useful to see how the concentration of employment growth in Lexington compares to other cities and their respective MSAs. To examine this, Table 5 also shows the ratio of each city's employment growth rate to its MSA's employment growth rate. A ratio above one indicates employment growth was concentrated in the city. A ratio below 1 indicates growth was concentrated in the rest of the MSA. Comparing these ratios across cities indicates whether Lexington's employment growth was more or less concentrated than its comparison cities.

Lexington's ratio was 1.15, indicating the city grew 15 percent faster than its MSA. The same five cities that grew faster than Lexington, also experienced faster growth in the city than their respective MSAs. In two, growth was more concentrated in the city than it was for Lexington. In three, the growth was less concentrated in the city than Lexington. Employment in Chattanooga and Ann Arbor grew substantially faster than their MSAs. However, these cities were growing slightly while the rest of their MSAs declined. Overall, the data does not appear to suggest that Lexington's urban service area shifted employment growth significantly from Lexington to its surrounding counties relative to what was experienced in other cities.

⁹ The difference between Lexington's and Durham's growth is small and might not be statistically significant.

Table 5
Annual Employment Growth Rate
Lexington and Comparison Cities
2003 to 2014

City	Urban Growth Boundary or Service Area	Growth in City	Growth in MSA	Ratio of City Growth Rate to MSA Growth Rate
Spokane, WA	UGB	0.0%	0.5%	0.05
Lansing, MI		0.1	-0.4	-
Bloomington, IN		0.1	0.1	0.69
Salem, OR	UGB	0.3	0.9	0.33
Columbia, SC		0.3	1.0	0.30
Eugene, OR	UGB	0.4	0.5	0.68
Knoxville, TN	UGB	0.5	0.8	0.60
Little Rock, AR		0.6	0.8	0.70
Madison, WI	USA	0.8	1.0	0.78
Chattanooga, TN	UGB	0.8	0.2	4.24
Louisville, KY		1.1	1.1	1.00
Ann Arbor, MI		1.1	0.3	4.09
Durham, NC	USA	1.4	1.5	0.89
Lexington, KY	USA	1.5	1.3	1.15
Greenville, SC		1.7	0.8	2.13
Lafayette, IN		2.0	1.2	1.60
Charlotte, NC		2.0	1.8	1.14
Springfield, MO		2.1	1.9	1.08
Columbia, MO	USA*	2.2%	2.1%	1.02

Source: Staff analysis of data from the US Census Bureau. Longitudinal Employer-Household Dynamics.

*Columbia, MO adopted an urban service area in 2013.

While Lexington's land use policies do not appear to have significantly affected its employment growth relative to the comparison cities, there could be differences within industries. As noted, the population of the surrounding counties, particularly Scott and Jessamine Counties have grown faster than Fayette County. Businesses that need to be located near their customers such as grocery stores and restaurants might follow this population growth. Table 6 shows how employment has changed from 2003 to 2015 by industry. The change in employment is shown in terms of the number of jobs and in percentage terms. While Table 6 shows the cumulative employment change over this period, it does not show how much employment changed between these years. This detail is provided in Appendix B.

Table 6
Change in Employment From 2003 to 2014
Lexington and Rest of Lexington/Fayette County MSA
By Industry

Industry	Change in Number of Jobs		Percentage Change	
	Lexington	Rest of MSA	Lexington	Rest of MSA
Health Care and Social Assistance	7,467	1,490	30.9	34.4
Educational Services	4,900	528	25.6	9.1
Accommodation and Food Services	4,806	2,054	31.7	53.4
Administrative and Support and Waste Management and Remediation Services	3,930	2,435	43.2	60.5
Transportation and Warehousing	2,759	601	52.8	42.0
Retail Trade	1,126	992	5.2	12.9
Information	1,040	-254	21.6	-33.5
Professional, Scientific, and Technical Services	1,029	1,215	10.0	100.9
Arts, Entertainment, and Recreation	621	-77	22.4	-6.2
Other Services (except Public Administration)	524	58	11.1	5.2
Management of Companies and Enterprises	357	-62	17.8	-8.5
Mining, Quarrying, and Oil and Gas Extraction	103	-9	69.1	-7.3
Wholesale Trade	78	652	1.2	28.7
Utilities	-58	-67	-19.4	-17.0
Agriculture, Forestry, Fishing and Hunting	-110	269	-6.0	13.0
Real Estate and Rental and Leasing	-190	-124	-6.5	-23.5
Construction	-280	-350	-3.2	-11.1
Public Administration	-366	702	-5.9	30.6
Finance and Insurance	-408	92	-7.0	8.1
Manufacturing	-2,997	-2,755	-19.2	-13.1

Source: Staff analysis of data from the US Census. Quarterly Workforce Indicators.

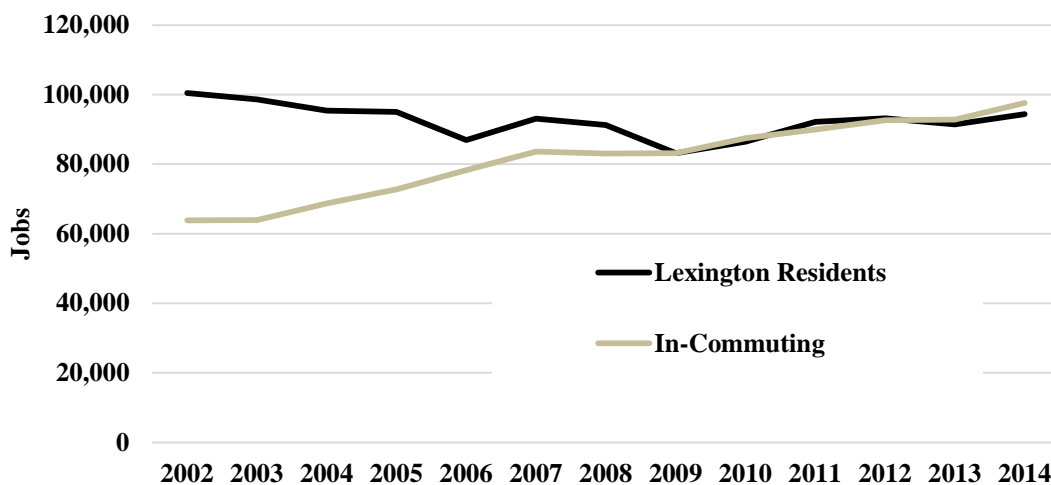
Employment in nine industries grew faster in the rest of the MSA than in Lexington. Of these, many are industries that serve customers directly such as retail trade; accommodation and food services; and health care and social assistance. Surrounding counties also gained more professional, scientific, and technical services jobs than Lexington. Data from the 2014 County Business Patterns indicates that slightly more than half of the firms in this industry that are located in surrounding counties provide legal, accounting, tax preparation, architectural, and engineering services. Many of the jobs in these industries likely follow population trends as well. If Lexington's land use policies contribute to the population shifting to surrounding counties, employment in these industries might shift as well.

Employment growth in educational services; transportation and warehousing; and information grew much faster in Lexington than the rest of the MSA. Manufacturing employment declined in both Lexington and the rest of the MSA. However, manufacturing jobs in surrounding counties have increased slightly since the recession ended.

Although Lexington’s land use policies do not appear to significantly affect its employment, they might affect where households locate and their commuting patterns. For example, Jun (2004) found that Portland’s UGB caused development to spill over into another county. To determine whether this occurred in Lexington, we examine commuting patterns for Lexington’s workers.

Figure K shows the number of jobs in Lexington that were filled by residents and in-commuters. In-commuters are individuals who live in another county but work in Lexington/Fayette County. In 2002, just over 100,000 jobs in Lexington were filled by residents. This represented 61 percent of Lexington’s jobs. The remaining 64,000, or 39 percent, of Lexington’s jobs were filled by in-commuters. By 2014, the number of jobs filled by Lexington residents decreased slightly to 94,000. Jobs filled by commuters, however, increased to 98,000 and accounted for approximately half of jobs in Lexington.

Figure K
Number of Lexington Jobs Filled by
Lexington Residents and In-commuters
2002 to 2014

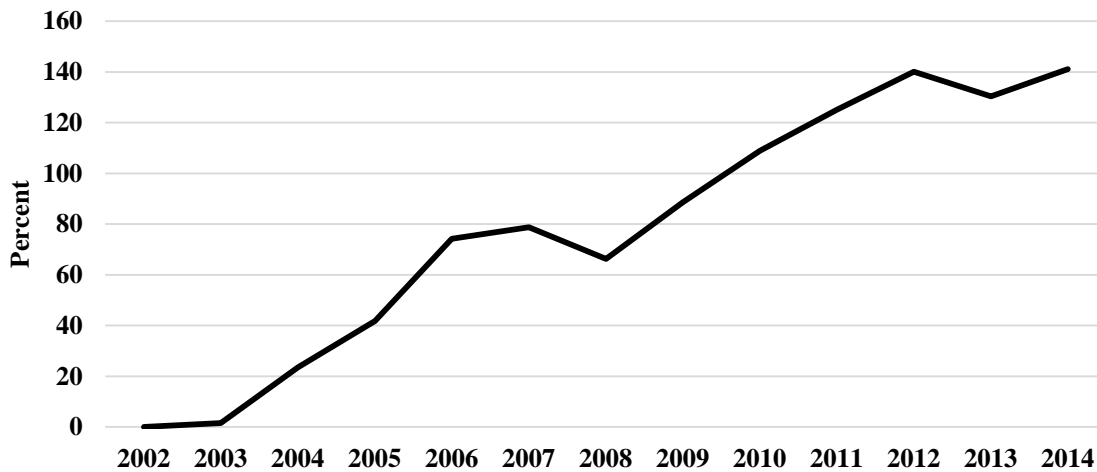


Source: Staff analysis of data from the US Census. Longitudinal Employer-Household Dynamics.

While the number of Lexington jobs filled by in-commuters increased, the number of jobs outside Lexington that were filled by Lexington residents has not changed much over this time period. In 2002, approximately 40,500 jobs outside Lexington were filled by Lexington residents. In 2014, this figure had only increased to 41,400.

Net commuting is the difference between Lexington’s in-commuting and out-commuting. When in-commuting grows faster than out-commuting, net commuting increases. An increase in net commuting indicates the city is drawing more workers in than it sends out. Figure L shows how Lexington’s net commuting has changed since 2002. Because in-commuting has grown much faster than out-commuting, net commuting has increased. Net commuting grew from 23,300 jobs in 2003 to 56,200 jobs in 2014. This represents an increase of 32,900 jobs, or 141 percent.

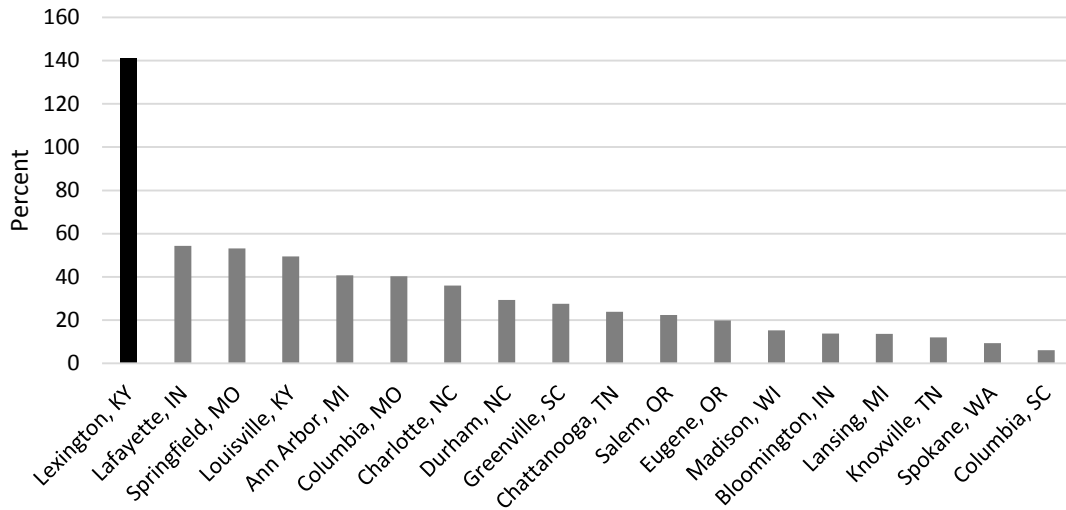
Figure L
Percent Change in Net Commuting Since 2002
Lexington



Source: Staff analysis of data from the US Census. Longitudinal Employer-Household Dynamics.

In-commuting also grew faster than out-commuting for the comparison cities. However, Lexington’s increase in net commuting is significantly higher than what the comparison cities experienced. Figure M summarizes the change in net commuting for the comparison cities. Lexington’s net commuting increased by 141 percent. Lafayette, IN experienced the next largest increase at 54 percent.

Figure M
Percentage Change in Net Commuting Since 2002
Lexington and Comparison Cities



Note: Net commuting is the difference between the number of workers commuting into the city and the number of workers commuting out of the city. A positive number indicates more workers commuted into the city than out. Data for Little Rock, AR was not available.

Source: Staff analysis of data from the US Census. Longitudinal Employer-Household Dynamics.

Table 7 shows the residence of workers who commute to jobs in Lexington. Approximately half of Lexington’s jobs are filled by Lexington residents. Workers from surrounding counties—Jessamine, Madison, Scott, Clark, Woodford, and Bourbon Counties—filled nearly 19 percent of Lexington’s jobs. In 2003, approximately 26,200 of the jobs in Lexington were filled by workers in these counties. By 2014, this number had increased by nearly 11,000 jobs, or 41 percent. The remaining jobs were filled by workers from other areas of the state or from other states. Workers from individual communities generally accounted for a small share of Lexington’s jobs, but together account for a substantial portion.

Table 7
Lexington Jobs by Workers' Residence

Area	2003	2014	Change	Percent Change	Share of 2014
Fayette	98,628	94,338	-4,290	-4.3%	49.1%
Jessamine	6,887	9,271	2,384	34.6	4.8
Madison	5,829	7,873	2,044	35.1	4.1
Scott	4,307	7,637	3,330	77.3	4.0
Clark	4,049	5,211	1,162	28.7	2.7
Woodford	2,928	4,692	1,764	60.2	2.4
Bourbon	2,218	2,692	474	21.4	1.4
Other Kentucky County	34,582	53,880	19,298	55.8	28.1
Out-of-state	3,084	6,383	3,299	107.0	3.3
Grand Total	162,512	191,977	29,465	18.1%	100.0%

Source: Staff analysis of data from the US Census. Longitudinal Employer-Household Dynamics.

Those who commute to jobs in Lexington face additional travel costs. Table 8 provides estimates of the commuting costs for those who commute from counties surrounding Fayette County. These costs include the value of commuters' travel time, fuel costs, and local pollution. To estimate travel time, we used Google Maps to determine the distance and travel time from the center of Census Tracts in each county to the urban service boundary. We used travel times during the weekday morning and evening commutes. Low and high estimates are provided to reflect the variability in commute times. The value of time traveled was based on the after tax average earnings for residents living in the Census Tract.¹⁰ Fuel costs were estimated assuming an average gas mileage of 25 miles per gallon and a gas price of \$2.20 per gallon. Local pollution costs are based on past research of the social costs of automobile use, which estimated the cost of local pollution to be \$0.0225 per mile driven (Boardman et al 2011).

Our estimates of the annual commuting costs incurred by workers from surrounding counties range from approximately \$2,400 to \$3,100 per commuter. This includes the value of their time and fuel costs.

If those who commute to Lexington instead lived in Lexington, these commuting costs would not be completely eliminated. Consider a family with one member who commutes to Lexington. If the family lived in Lexington the member who commutes would likely face lower commuting costs. However, the other family members could add to traffic congestion, which would increase travel costs for other residents as well. As a result, the commuting costs shown in Table 8 do not represent the net gains that could be achieved if commuters from surrounding communities lived in Lexington.

¹⁰ We assumed a marginal tax rate of 31.2 percent, which consists of 15 percent federal income tax, 6.2 percent for Medicare Tax, 1.45 for Social Security Tax, 5.8 percent state income tax, 2.25 percent local occupational license fee, and a 0.5 percent school occupational license fee.

Table 8
Commuting Costs from Counties Surrounding Fayette County

Cost Category	Annual Commuting Costs per Person	Total Annual Costs (\$ millions)
Value of Travel Time		
Low	\$1,802	\$67.4
High	2,541	95.0
Fuel	446	16.7
Local Pollution	113	4.2
Total		
Low	2,361	88.3
High	\$3,100	\$115.9

Source: Staff analysis of data from Google Maps; United States. Census Bureau. American Community Survey 5-year Estimates 2015; and United States. Census Bureau. Longitudinal Employer-Household Dynamics. Commuting costs are based on distances from the center of each Census tract to the urban service area.

Note: Figures are in 2016 dollars.

Lexington’s employment has generally exceeded the rest of its MSA and most of its comparison cities. It is possible that Lexington’s employment might have grown faster in the absence of the urban service area and the minimum 40-acre lot size in the rural areas. However, overall, the analysis suggests there is no evidence Lexington’s land use policies have significantly impeded the city’s employment growth relative to other cities. The number of workers who live outside Lexington but commute to jobs in Lexington increased significantly more than in any of the comparison cities. The increase in commuting is also one sided—as the number of workers who live in Lexington but commute to jobs outside the city changed very little over the years. While Lexington’s land use policies did not appear to have much effect on total employment, it may have contributed to where household decide to locate. Commuting trends show that workers are increasingly accepting jobs in Lexington but choosing to live in other communities. Lexington’s land use policies could contribute to this trend by reducing the availability and affordability of housing in Lexington.

An important question is whether Lexington can maintain its employment growth as its available land is developed. To address this question, we examined employment growth in several cities that have relatively little or no undeveloped land available. These cities are not intended to be similar to Lexington, but to show whether cities with relatively little land available for new development experience slower employment growth. Table 9 shows the cities and their employment growth rates.

As shown in Figure J, Lexington’s employment grew by 18 percent from 2003 to 2014. Employment growth in the cities shown in Table 9 varied significantly. Employment declined in Cincinnati, OH and St. Louis, MO and grew at a relatively slow rate in Milwaukee, WI and Providence, RI. However, employment in Raleigh, Charlotte, Manhattan, and Philadelphia grew faster than employment in Lexington. Employment growth in these cities, which face constraints on the amount of available land, suggests employment can continue to grow at high rates even

with relatively little developable land. Manhattan is an extreme example of employment growth in an area with significant land constraints.

These cities appear to have become employment centers for their regions with a large share of workers commuting to the city from neighboring areas. For example, 73 percent of jobs in Raleigh, NC were filled by workers who commute from outside the city. Lexington seems to be following a similar pattern with households choosing to live in nearby areas and commute to jobs located in the city.

Table 9
Percentage Change in Employment Growth
for Select Cities with Little or No Vacant Land
2003 to 2014

City	City		MSA		Percent of Jobs Filled by Workers from Outside of City (2014)
	Growth	2014 Employment	Growth	2014 Employment	
Raleigh, NC	37.9%	323,609	47.0%	626,782	73.3%
Charlotte, NC	22.1	515,092	21.1	1,086,271	57.8
Manhattan	21.8	2,204,190	-	-	-
Philadelphia, PA	19.1	663,663	9.9	2,721,621	47.5
Portland, OR	16.1	422,284	17.8	1,071,652	58.7
Atlanta, GA	12.7	448,939	13.6	2,434,605	82.9
Dallas, TX	9.0	792,115	28.0	3,271,371	71.7
Providence, RI	5.5	112,763	55.6	676,287	78.2
Milwaukee, WI	1.0	269,489	3.5	835,310	57.3
St. Louis, MO	-0.01	233,310	3.7	1,305,364	74.8
Cincinnati, OH	-9.8%	211,915	4.5%	1,003,565	76.9%

Source: Staff analysis of data from the US Census Bureau. Longitudinal Employer-Household Dynamics.

The experiences of these cities suggest that while developable land is an important input into a city's economic growth, it is not the only factor contributing to growth. It is difficult to predict how employment will grow in Lexington over the next 10 or 20 years. However, the limited supply of developable land within the city does not necessarily indicate that employment growth will slow dramatically.

V. Analysis of Lexington's Vacant Land

LBAR asked CBER to examine the amount of vacant land in the urban service area and estimate when all of this land might be developed. There are two sources of information available on vacant land in Lexington: the city's comprehensive plan and the PVA's property records.

When developing the city's comprehensive plan, the Division of Planning estimates the amount of vacant land available for development within the urban service area. To make this estimate, division staff analyze aerial photographs of the city to identify land that has not been developed.

The division considers land to be vacant if there are no permitted urban structures such as a home or business on the land or there were no certificates of occupancy for structures on the land. For example, a farm with a home and a barn would not be considered vacant, but a farm with only a barn would be considered vacant. Sensitive land such as land located in floodplains is excluded from the division’s analysis.¹¹

The 2007 and 2013 Comprehensive Plans include vacant land estimates for 2000, 2005, and 2011. These estimates are shown in Table 10. These estimates indicate the amount of vacant land available decreased by more than 50 percent from 2000 to 2011. The rate at which vacant land was developed changed during this time. The division estimated the rate at which vacant land was developed was 880 acres per year from 2000 to 2005; 278 acres per year from 2006 to 2010; and 588 acres per year over this entire period. The slower development of vacant land after 2005 may be largely due to the recession, which ran from December 2007 to January 2009. If vacant land is developed at a rate similar to what occurred from 2000 to 2010, the 6,715 acres of vacant land could be developed by approximately 2022. The division also estimated that—based on the amount of vacant land and vacant housing units available at the time—the urban service area would reach its population capacity in 12 to 17 years. Figure N shows the location of the vacant land.

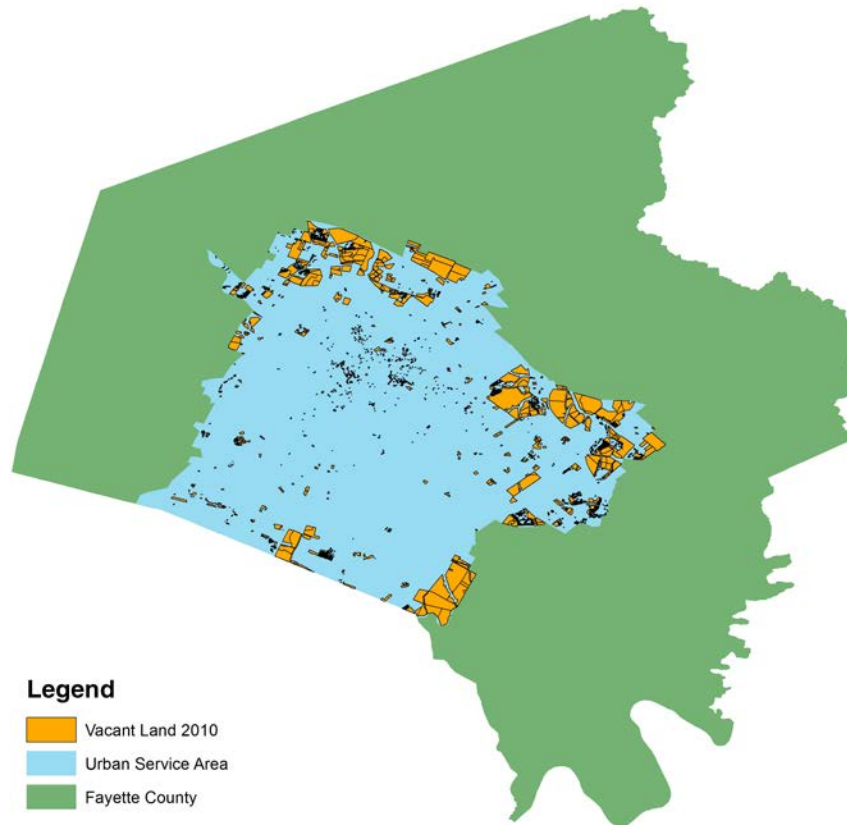
Table 10
Estimates of Vacant Land within the Urban Service Area
Lexington/Fayette Urban County Government, Division of Planning

Year	Vacant Acres
2000	14,008
2005	8,959
2011	6,715

Source: Lexington-Fayette Urban County Government.
Division of Planning. 2013 Comprehensive Plan and 2007
Comprehensive Plan.

¹¹ The city has purchased the development rights (PDR) for some land in Fayette County. Data on the program show that property currently protected by PDR, are all located outside of the urban service area. As a result, these properties are also not included in the division’s estimates of vacant land. This has been confirmed by the Director of the Division of Planning.

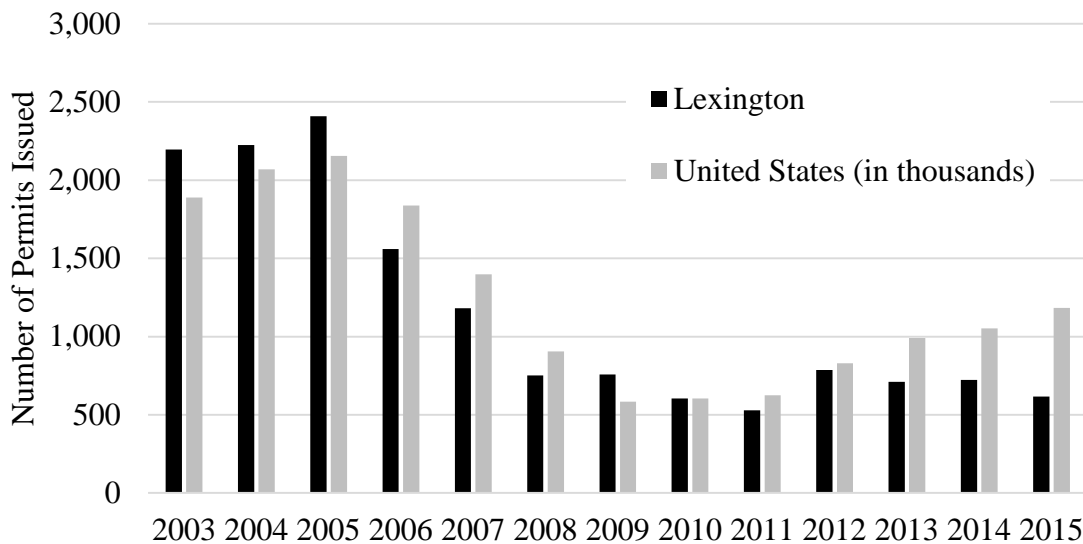
Figure N
Location of Vacant Land Identified by Division of Planning 2010



Source: Lexington-Fayette Urban County Government. Lexington's Open Data Portal.

Residential building permits and population growth suggest that development since 2011 may be relatively slow. As shown earlier in Figure H, Lexington's population growth slowed slightly after 2011. In addition, the number of residential buildings permits issued in Lexington decreased during the recession (Figure O). Since 2011, the number has increased only slightly. This is similar to the trend observed nationally. Nationally, the number of residential building permits issued increased slightly in recent years, but also remain low compared to numbers prior to the recession. The national figures for 2014 and 2015 might be somewhat higher due to more permit issuing agencies reporting data to the US Census Bureau. These trends suggest development has not increased much since the division's last estimate was developed.

Figure O
Number of Residential Buildings Permits
Lexington and United States

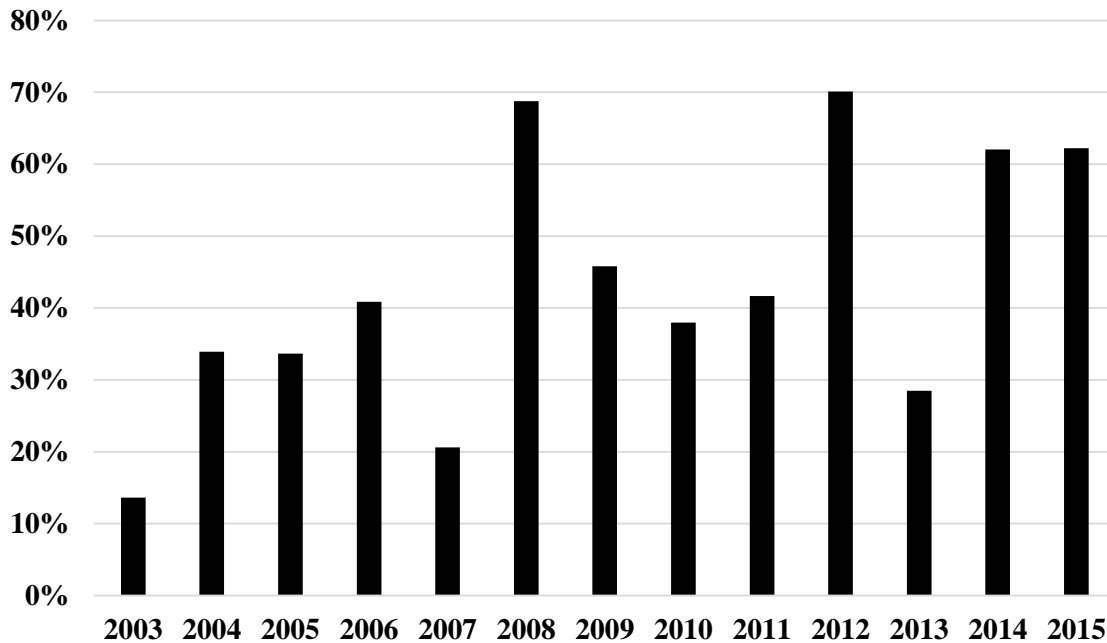


Source: Staff analysis of building permit data from Lexington-Fayette Urban County Government, Division of Building Inspections and the US Census Bureau, Building Permits Survey.

As vacant land within a city becomes scarce, development typically changes in two ways. First, households increasingly locate in surrounding areas and commute to jobs in the central city. Our commuting analysis indicates Lexington is currently experiencing this type of change. Second, developers might shift from single family houses to townhouses, condominiums, and apartments. Essentially, development will become more compact and potentially is built upward rather than outward. Lexington’s building permit data suggest this type of shift has already occurred to some extent. A larger share of the housing units for which permits were issued were for multi-family housing in recent years (Figure P). From 2012 to 2015, 60 percent of housing units were for multi-family housing. From 2003 to 2011, only 36 percent of units were multi-family. The shift to higher density housing could increase the city’s population capacity over time—accommodating additional workers as the city’s economy grows. Over time, Lexington will likely develop along the lines of Louisville, Charlotte, and Indianapolis. By excluding land in the rural service area, Lexington will see these changes sooner than it might otherwise.

Both of these changes involve a cost to residents. Households locating in surrounding areas will experience higher commuting costs. Building upward would typically involve greater construction costs. While the urban service area does not appear to restrict employment growth relative to comparison cities, the exclusion of land from development likely accelerates the shifting of population to nearby counties and the transition to more compact development.

Figure P
Multi-family Housing Units as a Percent of All Residential Housing
Units for Which Building Permits Were Issued
Lexington 2003 to 2015

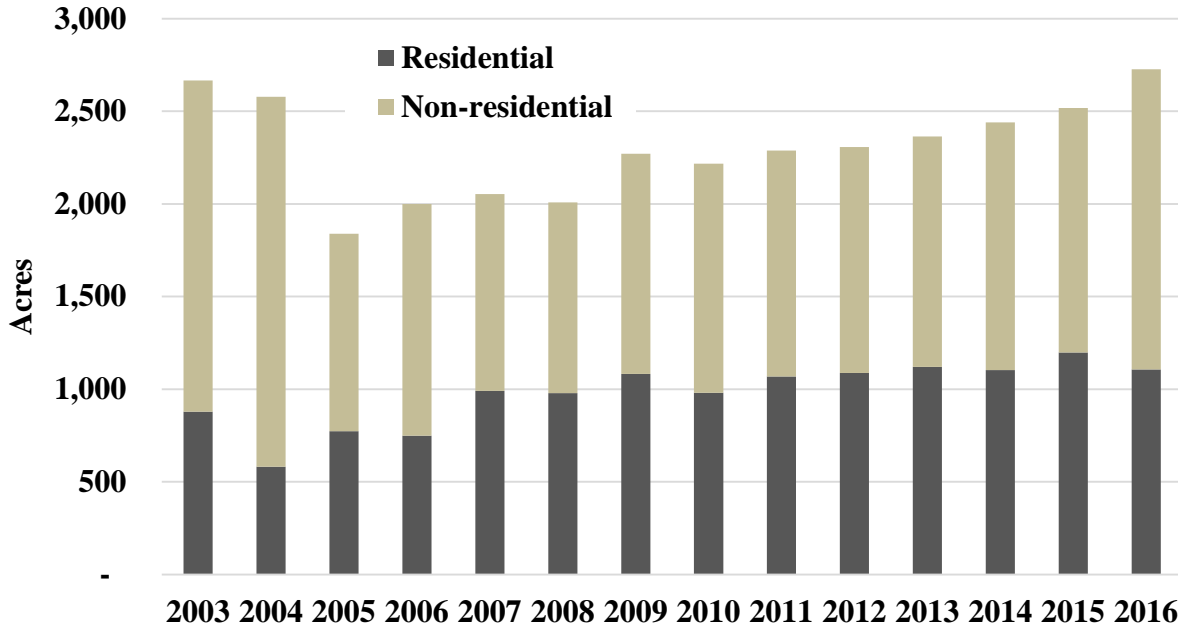


Source: Staff analysis of building permit data from Lexington-Fayette Urban County Government, Division of Building Inspections.

The Fayette County PVA is the second source for data on Lexington’s vacant land, however, the PVA’s definition of vacant land differs from the one used by the Division of Planning. When the PVA assesses the value of a property, an assessor records whether the property is vacant. Assessors consider property with no improvements, or structures, to be vacant. This is an important difference from what the division considers vacant. For example, while the Division of Planning would consider a farm with a barn as vacant, the PVA would not.

Figure Q shows the acres of vacant land as reported in the Fayette County PVA’s property records. The amount of vacant land increased generally since 2005. In 2016, there were approximately 2,700 vacant acres in the urban service area. Of these, roughly 1,100 acres were in residentially zoned areas. The amount of vacant property changes as structures on a property are demolished or new structures are added. The amount may also be affected by property owners dividing large parcels into multiple lots for development. These lots would meet the PVA’s definition of vacant until developers build structures them. A portion of the increase observed might reflect more property in this stage of development. While the data does not indicate the reason lots are vacant or owners’ future plans for the vacant lots, the increase in the amount of vacant land suggests more land within the urban service area is being made available for development or infill. From 2005 to 2015, the amount of vacant non-residential land increased by 254 acres. In 2016, it increased by 300 acres. Non-residential land within the urban service area includes business, industrial, office, and some agricultural zones.

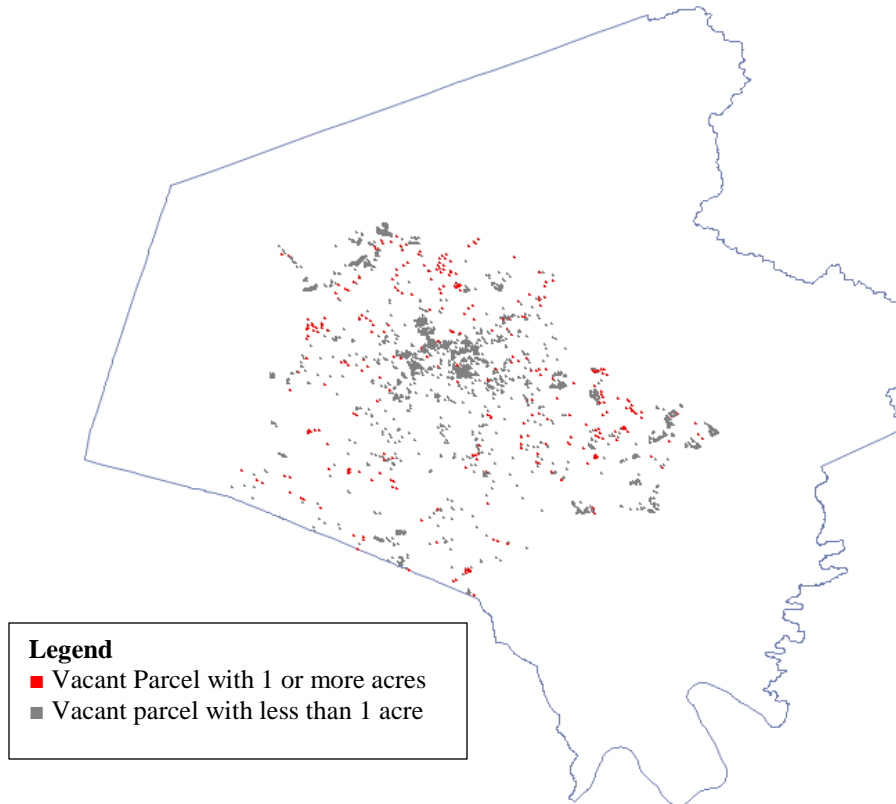
Figure Q
Estimates of Vacant Land within the Urban Service Area
Using the Fayette County Property Valuation Administrator Property Records



Source: Staff analysis of property tax records from the Fayette County Property Tax Administrator.

While vacant land identified by the Division of Planning tends to be larger tracks of land that are grouped together, vacant land in the PVA records tend to be relatively small lots scattered throughout the city. Figure R shows the location of lots that were coded as vacant in 2016. Some clusters of vacant lots may represent ongoing developments.

Figure R
Location of Vacant Lots within the Urban Service Area



Source: Staff analysis of Fayette County PVA property records.

Note: Each dot represents the location of a vacant parcel, not the size of the parcel. Areas that appear as clusters do not necessarily represent contiguous vacant parcels.

VI. Fiscal Analysis of Expanding the Urban Service Area

Expanding Lexington's urban service area would increase both the city's revenue and its costs to provide services. The net fiscal impact is uncertain and is affected by numerous factors such as the expansion's size and location and city officials' policy decisions. This section discusses these issues and some of the ways an expansion could affect the city's finances. The purpose of this section is not to provide an estimate of the fiscal impact of an expansion. This cannot be done accurately until details of a proposed expansion are determined. Instead, the purpose of this section is to provide guidance as to the types of fiscal impacts the city could experience. For some fiscal impacts, we can provide more specific information. For others, we can only discuss the impacts generally.

A fiscal analysis should compare the city's revenues and costs in two scenarios: with an expansion and without an expansion. One significant source of uncertainty is how Lexington's employment and population growth would change if the urban service area is expanded. The analysis of Lexington's employment and population relative to surrounding counties and comparison cities suggests that the urban service area may have affected where population growth occurred but might not have significantly slowed employment growth in the city. That is,

even with the urban service area, job growth in Lexington has been relatively healthy. However, a greater share of the workers who filled these jobs have chosen to buy homes in surrounding counties and commute to Lexington.

An expansion would create more housing for these workers to locate in Lexington. The main employment effects would likely be construction jobs from development in the expansion area and jobs created by businesses providing goods and services to residents who would live in the expansion area.

Revenues

While an expansion could affect many of the city's revenue sources, this analysis focuses on the real property, tangible property, insurance premium, and motor vehicle property taxes; and the franchise, and occupational and business license fees. These revenue sources account for approximately 88 percent of the city's general and urban fund revenues and are the revenue sources that would be most directly affected by an expansion. To illustrate how these revenues could be affected, we assumed that a new expansion would be similar in zoning and current property values as the 1996 expansion.

Lexington's real property taxes are projected to generated approximately \$54.7 million in FY 2017. Real property consists of land located in the city and any improvements on the land such as homes or other buildings. The city's real property taxes consist of up to four different tax rates depending on the level of services provided to an area. These rates are shown in Table 11.¹² All property owners pay the general service tax rate. This rate has been \$0.08 per \$100 of taxable property since FY 2004. The rates for solid waste collection, street lights, and street cleaning apply only to property in areas that receive these services. The rates have changed over the years—decreasing in some and increasing in others. For this analysis, it is assumed that the city would apply rates for all services in a new expansion area and would set the rates at the same level as in FY 2016. Therefore, owners of property located in the expansion would pay a rate of \$0.2538 per \$100 of taxable value to the city.

¹² The city's property taxes are only a portion of the taxes real property owners pay. Property owners also pay the state, school, LexTran, health department, and extension service property taxes.

Table 11
Lexington-Fayette Urban County Government
Real Property Tax Rates
FY 2016

Category	Rate Per \$100 of Taxable Value
General Fund	0.0800
Refuse Collection	0.1431
Street Lights	0.0210
Street Cleaning	0.0097
Total	0.2538

Source: Lexington-Fayette County Urban County Government. FY 2017 Ad Valorem Tax Rates.

Our analysis of property records from the Fayette County Property Valuation Administrator (PVA) indicates that the median taxable value for real property located in the 1996 expansion area was approximately \$1.42 million per acre in FY 2016. This figure excludes land classified by the PVA as farm, vacant, or tax exempt. The \$1.42 million per acre figure would be roughly equivalent to six houses valued at \$237,000 located on one acre of land. The taxable value of farmland located in zone A-R, agricultural rural, averaged \$8,000 per acre. The difference between these values represents the increase in the tax base that could occur if an acre of farmland were developed. Applying the city’s full real property tax rate to the difference yields an estimate of \$3,584 per acre in additional potential revenue annually.

The amount collected would likely be less due to the homestead exemption and the property tax discount. Under the homestead exemption, property owners who are over the age of 64 or disabled may receive a deduction of \$36,900 in taxable value from the calculation of the tax they owe on their primary residences. Under the property tax discount, all real property owners may receive a 2 percent discount on their property taxes if they pay their tax bill by November 1st. After accounting for these factors, we estimate the city could collect approximately \$3,354 per acre in additional revenue.

To estimate the potential effects of an expansion on the other taxes and fees, we examined the amount of revenue collected from each source relative to amount collected from the real property tax for the past six fiscal years.¹³ For example, from FY 2010 to FY 2015, Lexington collected approximately 3.3 cents in tangible property taxes for every \$1 collected in real property taxes.¹⁴ The city’s tangible property tax rate is \$0.09 per \$100 of the value of property such as inventories, office equipment, and raw materials. The ratio is applied to the amount of additional real property taxes projected per acre for an expansion. Given the projection of \$3,354 in real property taxes, an expansion is projected to generate approximately \$111 per acre in tangible property taxes. Table 12 summarizes this analysis.

¹³ The data for this analysis comes from Lexington’s Certified Annual Financial Reports for FY 2010 to FY 2015.

¹⁴ This includes \$18.2 million in the General Fund and \$33.2 million in the Full Urban Services Fund. Both figures are net of the property tax discount.

Lexington’s motor vehicle property tax is \$0.088 per \$100 of value. This tax also generated approximately 3.4 cents for each \$1 the real property tax generated. We project that this tax would increase by approximately \$114 per acre expanded.

Lexington applies a franchise fee of four percent on the utilities bills of its residents and businesses. Over the past six fiscal years, this fee yielded 33 to 46 cents for every dollar collected in real property taxes. On average, it generated approximately 39 cents per dollar from the real property tax. We estimate this fee would generate approximately \$1,298 per acre expanded.

Lexington’s insurance premium tax is five percent on premiums earned from health, life, property, and liability insurance sold in the city (Commonwealth. Department of Insurance). From FY 2010 to FY 2015, this tax generated nearly 50 cents for every dollar generated by the real property tax. We project the tax would increase by approximately \$1,664 per acre of expansion.

Table 12
Impact of Expanding Lexington’s Urban Service Area
on Lexington/Fayette County Urban Government’s Major Revenue Sources

Revenue Source	Recurring Revenues	Revenues per Acre
Real Property Tax	Yes	\$3,354
Tangible Property Tax	Yes	111
Motor Vehicle Property Tax	Yes	114
Franchise Fee	Yes	1,298
Insurance Premium Tax	Yes	1,664
Occupational & Business License Fees		
From Economic Impact of New Residents	Yes	4,230
Total Recurring Revenues		10,771
Occupational & Business License Fees		
From Construction	No	\$19,125

Notes: Assumes \$1.42 million in taxable value per acre with an expansion compared to \$8,000 in taxable value if land is used for agricultural purposes.

Lexington’s occupational and business license fees are 2.25 percent of workers’ wages and salaries and businesses’ profits. In FY 2015, these fees totaled nearly \$213 million and accounted for 66 percent of the city’s revenues. An expansion could affect these revenues in two ways.

First, an expansion would increase the amount of construction activity. During construction, developers would earn profits and workers would earn wages, which would be subject to the city’s occupational and business license fees. Construction activities in the expansion would include building houses, retail and commercial space, and public infrastructure such as roads and sewers. Earlier, it was assumed that the value of property constructed in an expansion area would be \$1.42 million per acre. We estimate that this construction activity would generate the equivalent of 16 annual jobs, approximately \$850,000 in wages and salaries per acre and

\$19,125 in additional occupational and business license taxes per acre developed.¹⁵ This figure may overstate the actual increase in revenues as it assumes the full \$1.42 million represents construction activity. Some portion of this, would actually represent the value of the land.

While an expansion would affect property taxes every year the property is in place, construction activity would only affect revenues while construction occurs. Once completed, there would be no additional revenues from construction.¹⁶ The long term impacts of construction activity on Lexington's revenues would depend on the size of the expansion and the speed at which it is developed.

The second way an expansion could affect occupational and business license fees is through spending at local businesses that would provide services for the residents of the expansion area. An expansion would likely result in more people locating in Lexington rather than its surrounding counties. In the absence of an expansion, these individuals would spend some portion of their income at stores, restaurants, and other businesses located in surrounding counties. To the extent an expansion allows more of these individuals to locate in Lexington, that spending would occur in the city rather than surrounding counties.

To estimate the additional occupational and business license fees from this spending shifting to Fayette County from other counties, we assumed that each acre would provide housing for 6 households. Data from the U.S. Census Bureau's American Community Survey indicate that that households living in and near the 1996 expansion area earn approximately \$90,000.¹⁷ As residents spend this income, it translates into approximately 4.3 annual jobs and \$188,000 in additional wages, salaries, and proprietors' income.¹⁸ Given the 2.25 percent fee, this represents \$4,230 in fees per acre. This estimate likely overstates the true impact as some of these households moving to Fayette County likely already spent some portion of their income within the county.

The analysis above does not include additional occupational license fees generated from the income of families who might locate in the expansion. This is because it is not clear that their wages would be new to the city. Consider individuals who are employed in Lexington but reside in Clark County. Because they work in Lexington, their wages are subject to the occupational license fee. If an expansion results in these individuals choosing to reside in Lexington, they would not contribute any more to the city's occupational license fees. The analysis on population and employment suggests that Lexington's land use policies contribute to more people purchasing homes in surrounding counties but commuting to jobs in Lexington. Therefore, the impact on occupational license fees will primarily occur through the construction activities and the spending from new residents.

¹⁵ This estimate was obtained using IMPLAN, which is a model of a region's economy. It estimates how a change in spending in an industry within the region affects various measures of the region's economy such as income and employment.

¹⁶ After construction, there may be long term effects on the occupational and business license tax as owners maintain their property.

¹⁷ The estimates were derived using the 2014 American Community Survey 5-year Estimates of median household income for census blocks that overlapped the 1996 expansion area. The estimate is the average of the medians for each census block weighted by the number of households in the census block adjusted for inflation.

¹⁸ The estimate of wages and salaries was obtain using IMPLAN.

Expenditures

There is a considerable amount of uncertainty associated with an expansion's effect on expenditures. There are two main reasons for this uncertainty.

First, expenditures depend partially on city leaders' budgeting decisions. City officials develop a budget by allocating projected revenues and resources to various public services. They consider their constituents' demand for services, set priorities, and determine funding levels. An expansion would clearly increase the demand for many services such as fire and police protection. However, the extent to which expenditures for these services will actually increase would depend on how much city leaders appropriate for these services. They might choose to appropriate sufficient funds to maintain similar levels of services. However, if they are faced with budget constraints, they could also appropriate fewer resources, which could result in a lower level of services.

Another reason for uncertainty is the expansion's size. A small expansion might require simply an increase in personnel and operating costs. A large expansion might require building additional infrastructure. For example, the city might be able to provide fire protection services to an expansion of 100 acres by simply adding personnel and equipment. However, to provide fire protection to an expansion of 1,000, the city might have to build an additional fire station and purchase additional fire trucks.

To illustrate how an expansion could affect costs, we calculated the amounts appropriated per capita to provide various services in the city's FY 2017 budget. We focused on Lexington's major budget areas—or divisions—and those that would most likely be affected directly by an expansion. These areas consist of police; fire and emergency services; waste management; water quality; parks and recreation; traffic engineering; and streets and roads. Other areas of the city's budget are likely to experience at least some additional demand for the services that are provided. If the city chose to increase the budgets of these areas due to the expansion, there would be additional costs that are not reflected in this report.¹⁹

The city's budget consists of specific appropriations for various types of expenses within each division. For example, within the Police Department, the budget specifies the amounts appropriated for salaries, vehicle repairs and maintenance, and software. An expansion would likely increase some expense but not all. For each budget area, we had to decide which appropriations to include. Generally, we included appropriations for personnel and operations. Appropriations for capital and appropriations funded with bond proceeds were excluded. If an expansion were sufficiently large it could result in additional capital expenses. These costs are discussed later. Appropriations for certain services, such as \$2 million appropriated to the Division of Parks and Recreation for extended school programs, were also excluded. The funds for these programs are generated from fees charged to those using the programs. Revenues generated from these programs were not included in the revenue estimates above and the costs of these programs are not included in this analysis. Within the Division of Water Quality, \$119 million was appropriated to upgrade Lexington's sanitary sewer system to meet EPA guidelines.

¹⁹ Examples of budget areas that might experience increased costs are public health, corrections, and social services.

This is an appropriation to address current deficiencies and would not necessarily be associated with an expansion. For each area, Table 13 shows the total amount appropriated, total selected appropriations, and selected appropriations per capita.²⁰ Note that the cost per capita include personnel and operating costs for all types of property not just residential.

Table 13
Appropriations Per Capita
FY 2017

Division	Total (millions)	Selected for Analysis (millions)	Per Capita
Police	\$71.9	\$69.1	\$215
Fire and Emergency	75.6	68.9	214
Waste Management	29.3	23.8	77
Water Quality	151.6	22.9	71
Traffic Engineering	12.1	12.0	37
Streets and Roads	21.4	15.4	48
Parks and Recreation	\$28.4	\$23.0	\$71

Notes: Per capita amounts are based on a population estimate of 322,000. The per capita amount for Waste Management is based on an estimate of 309,000 as the city only collects solid waste within the urban service area.

Source: Staff analysis of FY 2017 Budget data provided by the Lexington-Fayette County Urban Government, Division of Budgeting.

So the effects on costs may be compared to the effects on revenues, Table 14 shows the cost estimates per acre. Because costs will depend partially on the expansion's population density, Table 14 provides estimates assuming 10 people per acre. Population density varies considerably within the 1996 expansion area. Some parts of the area are undeveloped and have low densities. Where development has occurred population densities are much higher. Data from the US Census Bureau indicates that the median population density in and along the 1996 expansion is approximately 10 people per acre.

The additional population growth an expansion could accommodate depends on the number of acres included and the housing density permitted in the expansion. If Lexington were to expand its urban service area by a similar size and housing density as in 1996, the city would accommodate an additional 50,000 people. Larger expansions could accommodate more population growth but might also allow for lower density housing. Therefore, the additional population capacity might differ depending on the details of an expansion. This could affect the costs to provide some government services.

For the city to maintain the same level of per capita funding for the Police Department's personnel and operating budget, it would need to appropriate approximately \$2,145 per acre. To

²⁰ The appropriations selected for the analysis mostly come from the city's general services and full urban services funds. These funds include a small amount of intergovernmental transfers from the federal and state governments. The transfers account one-tenth of one percent and are unlikely to affect the analysis.

maintain the per capita funding for personnel and operating expenses across all selected divisions, the city would need to appropriate just over \$7,330 per acre.²¹

Table 14
Effects of Expanding Lexington’s Urban Service Area
on Select Personnel and Operational Cost

Division	Assuming 10 People Per Acre
Police	\$2,145
Fire and Emergency	2,139
Waste Management	770
Water Quality	711
Traffic Engineering	374
Road Maintenance	477
Parks and Recreation	714
Total	\$7,330

Notes: Costs only include personnel and operating costs.
Source: Staff analysis of the Lexington-Fayette Urban
County Government. Adopted Budget FY 2017.

Fiscal Impact of Redevelopment

The fiscal impact of redevelopment, or infill, might differ from that of new development. Both types of development will need city services, but the additional cost for some services might be lower for redeveloped areas. For example, both would increase the city’s solid waste collection costs, but it might cost less to provide solid waste collection to redevelop if it does not require additional routes. New development and redevelopment could also affect revenues differently. Both increase the property value and, therefore, increase property tax revenues. However, the increase in property value would likely differ. Both include the additional value of a building. However, in the case of new development, the land might have been taxed at its agricultural value before the development and at its market value after the development. This additional increase in taxable value might not occur with redevelopment if the land was already taxed at its market value. While there are reasons to expect redevelopment and new development to have different fiscal impacts, the magnitude of the difference is not clear.

Infrastructure Costs Associated with New Development

Table 14 addresses personnel and operating costs, which would likely increase even with a relatively small expansion. However, the city would also require additional infrastructure as well, particularly for a large expansion. Some areas of the city’s budget would be able to

²¹ If Lexington continues to develop as an employment center, the demand for government services may change somewhat. Residents likely value many different types of government services such as community parks, social services, and residential solid waste collection. In-commuters might place less value on these services and more value on services that directly affect them such as roads allowing access to Lexington employers.

accommodate some level of expansion without an increase. However, if the expansion is sufficiently large, costs for these areas could increase as well. For example, a large expansion might require the city to build a new fire station to maintain its response time. According to city officials, building and equipping a typical fire station costs approximately \$5.3 million. The costs for major capital projects are often funded by issuing bonds. Therefore, the city would spread these costs over the life of the bond.

Our analysis does not include costs for infrastructure such as sewer lines, roads, and traffic signals to serve an expansion. Lexington addresses many of these needs by requiring developers install the infrastructure in new developments or pay an exaction fee to cover these costs. These costs are ultimately incorporated into housing prices in the developments rather than being borne by the city. The city does assume responsibility for maintaining this infrastructure after the development is completed.

Net Effects

Our analysis indicates an expansion could increase recurring revenues by approximately \$10,771 per acre. Personnel and operating costs for the seven divisions most directly affected by an expansion could increase by approximately \$7,330 per acre. That is, 68 percent of the additional recurring revenues would be needed to maintain per capita spending levels for personnel and operating costs of seven of the city's divisions. Additional costs for infrastructure, corrections, and social service programs could easily account for the remaining 30 percent of recurring revenues. Because Lexington must maintain a balanced budget, its costs to provide services will be roughly similar to the revenues it collects. It is not surprising then that the cost to provide services to an expansion would be roughly equivalent to the revenues collected from the expansion. The only way this might not occur is if the households that would locate in an expansion were paying more in taxes than it costs to provide them with city services. This seems unlikely for a large expansion, which would tend to be diverse and more representative of the city's existing population.

The net fiscal impact of an expansion is unknown. However, given the close margin for what can be measured and the level of uncertainty related to other costs, an expansion should not be viewed as a means to improve the city's long-run fiscal situation. Other local government entities would likely experience similar fiscal effects. These include the Fayette County Public Schools, LexTran, and the Fayette County Health Department.

An expansion might result in additional revenues during the construction phase. These revenues are not recurring and would only continue until construction is complete. An expansion could generate roughly \$19,000 per acre in occupational license fees during construction. To put this in perspective, assume the city authorized an expansion of 1,000 acres and that it would take five years to develop completely. The additional revenues from construction would add approximately one percent annually to the city's revenues during this 5-year period. These additional revenues might be needed to address additional infrastructure needs such as an additional fire station.

VII. Conclusions

This report has seven main findings:

1. Past research has shown that land use policies can serve an important purpose for a city's residents. City officials can use land use policies to address costs that private development might impose on the city's residents such as loss of rural land valued by residents.
2. Our estimates suggest that the value of land inside the urban services boundary is approximately \$30,000 per acre higher due to the development restrictions. This represents the social value of development.
3. Lexington's housing prices have increased in recent years, but these increases do not appear to significantly faster than other areas analyzed.
4. Rural areas of Lexington that are preserved by its land use policies creates value for residents living close to the rural areas. Homebuyers pay a premium of 1.8 percent for houses located near these rural areas.
5. Lexington's land use policies appear to have shifted population growth to neighboring counties.
6. The region's employment growth has been concentrated in Lexington. As a result, the number of workers who commute into Lexington has increased.
7. Expanding the urban service area would increase the city's revenues, but would also increases its costs to provide services. The net fiscal impact is uncertain but likely to be small. As a result, an expansion should not be viewed as a means to improve the city's fiscal situation.

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Appendix A

Regression Analysis of Housing Prices Along Lexington's Urban Service Area

The data used to analyze the urban service area's effect on housing prices comes from the Fayette County Property Value Administrator. The PVA maintains records on property transfers and property characteristics for tax purposes. The data included sales from 2003 through 2016. We restricted our analysis to arms-length sales of single-family houses located $\frac{1}{2}$ mile inside Lexington's urban service area.

The dependent variable used in the regression is the natural log of sale price. Controls include distance to the nearest park, log of house size, log of lot size, the age of the home at time of sale, and age squared. Dummy variables were used to control for the type of exterior (frame, all brick, or partial brick); number of additional full baths (two, three, or more) and half baths (one, two, or more). In addition, Census tract fixed effects and year fixed effects were also included. Home sales within the urban service area were divided into four groups:

- sales located less than $\frac{1}{4}$ mile from the Fayette/Jessamine County line,
- sales located between $\frac{1}{4}$ and $\frac{1}{2}$ mile from the Fayette/Jessamine County line,
- sales located less than $\frac{1}{4}$ mile from the rural portion of the urban service area, and
- sales located between $\frac{1}{4}$ and $\frac{1}{2}$ mile from rural portion of the urban service area.

Dummy variable were created for each category.

Table A.1 shows the regression results. Column (A) includes all houses within $\frac{1}{2}$ mile of the urban service area. The coefficient for houses located within $\frac{1}{4}$ mile of the rural portion of the urban service area was positive and statistically significant at the 10 percent level (p-value = 0.077). However, the coefficient for houses located $\frac{1}{4}$ mile from Jessamine County was not significant.

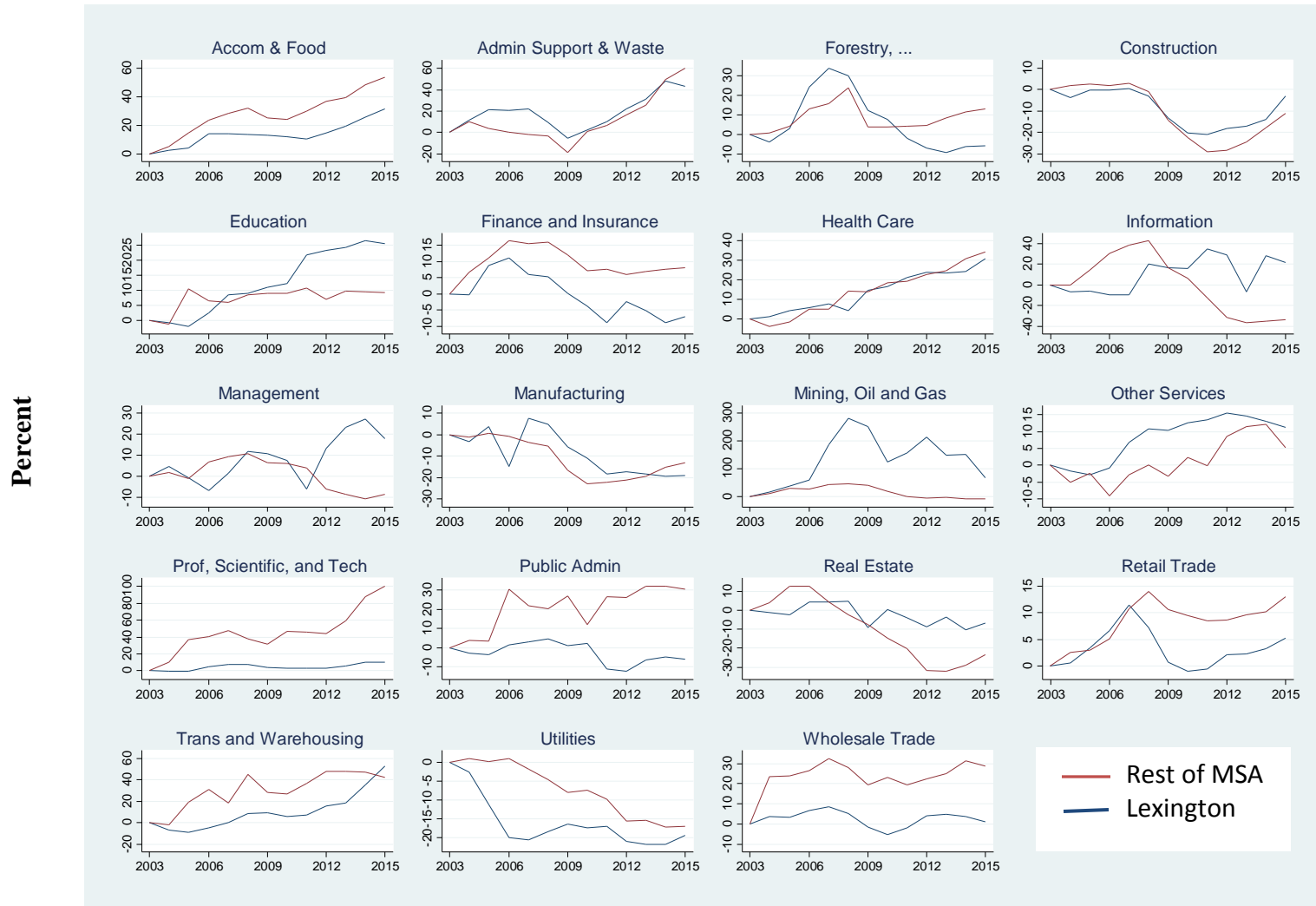
The regression shown in column (B) includes only homes located within $\frac{1}{2}$ mile of Jessamine County. Along the Fayette/Jessamine County line, some areas are developed while others are not. Column (B) examines whether prices in this area differ depending on whether they are located along a developed part of Jessamine County or an undeveloped portion. The results indicate there was no statistically significant difference in price based on whether the house was located across from a developed portion of Jessamine County.

Table A.1
Regression Results

Dependent Variable = Ln(Price)	(A) Houses Within ½ Mile of Urban Service Area	(B) Houses Within ½ Mile of Jessamine County Line
Distance to Closest Park	-0.017 (0.68)	0.123 (3.05)***
Ln(House Size in sqft)	0.611 (20.92)***	0.619 (16.87)***
Ln(Lot Size in sqft)	0.141 (10.75)***	0.102 (7.55)***
All Brick	0.085 (5.28)***	0.106 (5.28)***
Partial Brick	0.019 (1.69)*	0.038 (2.90)***
Fireplace	0.026 (3.32)***	0.043 (2.26)**
Age	-0.009 (10.61)***	-0.010 (5.09)***
Age Squared	0.000 (3.45)***	0.000 (2.25)**
2 Full Baths	0.085 (4.93)***	0.058 (2.90)***
3 Full Baths	0.241 (12.70)***	0.197 (8.81)***
4 or More Full Baths	0.395 (10.51)***	0.371 (12.34)***
Half Bath	0.016 (1.69)*	0.027 (2.22)**
2 Half Baths	0.144 (8.47)***	0.161 (6.16)***
3 or More Half Baths	0.067 (2.43)**	0.061 (3.39)***
Within ¼ mile of Jessamine County (Dummy)	-0.016 (0.35)	-0.038 (4.69)***
¼ to ½ mile of Jessamine County (Dummy)	0.013 (0.30)	
Within ¼ mile of Urban Service Area (Dummy)	0.018 (1.78)*	
Near Developed Portion of Jessamine County		-0.008 (0.40)
Intercept	6.050 (24.81)***	6.476 (18.22)***
R^2	0.92	0.85
N	12,730	4,357

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

Appendix B Cumulative Percentage Change in Lexington's Employment from 2003 to 2014 By Industry



Source: Staff analysis of data from the US Census Bureau, Quarterly Workforce Indicators.