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THE U.S.-MEXICO BORDER AND HOUSING PRICES: UNDERSTANDING THE IMPACT OF BORDER FENCING ON PROPERTY VALUES

by
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ABSTRACT

THE U.S.-MEXICO BORDER AND HOUSING PRICES: UNDERSTANDING THE IMPACT OF BORDER FENCING ON PROPERTY VALUES

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Building a barrier on the US-Mexico border has been a hot-button issue for a couple of decades. Not only do people disagree on the effectiveness of walls and fences, but there has also been debate on whether they generate positive or negative externalities on localities. Using data on construction of the US-Mexico border fence, as well as housing data for Yuma County, Arizona, I attempt to identify the treatment effect of fence construction on nearby housing prices, which may serve as an indicator of some of the external impacts of walls and fences. Mine is the first study to quantify the effect of the US-Mexico border fence on local residential property values. With a hedonic difference-in-differences model, I find that construction of border barriers has a large positive effect on housing prices within 0.5 miles of the border between 2007 and 2011 relative to the price of homes further away. The finding of a large effect is important, especially since economic theory gives reason to expect both positive and negative influences. My results could inform policy on the US-Mexico border, taking into account possible economic tradeoffs that may occur when the barrier on the border is expanded.
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I. Introduction

While various barriers have been built on the US-Mexico border for the past few decades, the recent administration of President Trump amplified national attention on border security. The promise of a border wall was a significant aspect of his candidacy, and while much of the construction that occurred during his administration focused on repairs rather than building new segments of the wall, his emphasis on border control raised questions about the impacts of building walls or other barriers (Brandys et al 2019). Building a barrier on the border can lead to a variety of potential economic ramifications, many of which are uncertain. In particular, changes to property values are an important potential economic effect. Economic theory suggests that a border barrier could cause both positive and negative externalities, which would be reflected in local property values. Many potential externalities are supported by anecdotal observation and related academic research, but much empirical and econometric research remains to be done to better understand the causal effects of border walls and fences.

For example, building barriers along the border often requires acquiring private property. Taking property for public use through the power of eminent domain can impact the value of the original landowner’s remaining property, often in a negative way (Brandys et al 2019). Additionally, living close to a barrier may be somewhat unpleasant, not only because of its appearance, but also because local residents may perceive that the need for a barrier signifies danger (Trapasso 2017). Further, many urban areas in the United States near the Mexican border have a sister city just across the border in Mexico. Examples include Yuma, Arizona and San Luis Rio Colorado, Mexico; San Ysidro, California and Tijuana, Mexico; and El Paso, Texas and Ciudad Juarez, Mexico. The
economic activities in these communities are closely intertwined, and this could be severely interrupted by a barrier between them. As one resident of Brownsville, Texas (close to Matamoros, Mexico), said, “The reality of it is we’re really one community, and our river happens to run through it” (Trapasso 2017). Building a physical barrier may severely limit trade by raising transactions costs, making housing in these locations less valuable. Further, many people live in Mexico and commute to the United States for work (or vice versa), which would be made much more difficult by a border wall (Wasterlain 2016).

Conversely, building a border barrier can introduce beneficial economic activity to a neighborhood, as well as make people feel safer through both real and perceived reductions in crime. For example, some areas experience an initial economic boom as construction begins and more people travel to the area (Trapasso 2017). Economic activity may go down once the barrier is complete, but this cycle is still an important effect. Additionally, security of a neighborhood – or perhaps more importantly, a sense of security – is an important factor in property values (Trapasso 2017). It is possible that a wall on the border may make people feel safer, especially if they felt that an unsecured border was putting them in danger. In the early 2000s when most of the US-Mexico border was unsecured, there were many reports of chaotic flows of drugs and illegal migrants across the border (Duke 2017). Additionally, in the Yuma Sector before most fencing was built, there were many anecdotal claims of illegal migrants trespassing in backyards or even houses just over the border (Brand and Chadwick 2006). Thus, as seen in both national and local newspapers, fencing was welcomed by many people in the area.
because they felt there was a strong need for physical barriers to protect them.\footnote{The \textit{Yuma Sun} is Yuma’s primary local newspaper. Throughout my research, I read many of its articles on border control, fence announcements and constructions, the effectiveness of increased security, and general public perception of these events. I accessed articles from 2006-2011 at \url{https://newspaperarchive.com/}.} Given this situation, it is probable that building a fence would cause smuggling activity to decrease somewhat, or at least to appear likely to decrease. Furthermore, Yuma County is moderately conservative, with 56.63\% voting Republican in the 2008 election (\textit{GeoStat} 2019). This provides a further indication that many people likely supported building a fence, which could influence its economic impact.

While looking at property values may not fully capture all the possible economic repercussions that occur, they can provide a valuable indicator of what happens economically in border towns in the years after a fence segment is built on the US-Mexico border. Several externalities resulting from the fence have been studied, but my study is the first to attempt to identify the changes in local housing prices. This paper analyzes the effect of constructing border fence segments on local property values using locational fence construction data and panel housing data from Yuma County, Arizona. I use a hedonic difference-in-differences model to estimate the average treatment effect of fence construction, primarily construction resulting from the Secure Fence Act of 2006. Since the Yuma Border Patrol Sector had less than 10 miles of fencing before this act was passed, construction in the years following likely was a significant shock to the area. I compare the effect of the fence on housing prices closest to the border to trends in housing prices further away from the Arizona-Mexico border. Due to the wide variety of potential externalities, I began the project with \textit{a priori} uncertainty about what I expected the results to be; if anything, I had a slight expectation for fencing to have an overall
negative effect on housing prices. However, I find that the construction of border fences has a large positive effect on housing prices 0.5 miles from the border in the few years immediately after major construction projects began. This large effect is a particularly important finding, especially since this topic has not yet been directly studied, and predictions from economic theory are ambiguous.

II. Literature Review

Much of the literature so far on border walls has focused on their effectiveness in achieving their stated purposes, or on economic externalities other than property value changes. The US-Mexico border barrier’s official purposes include curbing illegal migration and human smuggling, as well as fighting drug trafficking and related violence (Kourtit et al. 2021). However, most researchers agree that these stated purposes are best fulfilled by policies other than building physical barriers. For example, an ethnographic study on residents near barriers on the Turkey-Syria border found that these barriers did not decrease human smuggling, but rather made it more organized (Arslan et al. 2020). Most quantitative economic research has concluded that not only is there little evidence that border barriers are effective in curbing smuggling and violence, but that security is improved by loosening border restrictions and implementing policies that promote economic growth (Kourtit et al. 2021). Researchers at the Cato Institute found that constructing border barriers had “no appreciable effect” on violent or property crime. However, these researchers also found that property crime decreased during the construction period in some border areas, including the area around Yuma, Arizona (Abman and Foad 2020). Even though the amount was small relative to the cost of building the fences, this effect could still possibly manifest in local housing prices.
Residents in Yuma have certainly claimed to notice a reduction in crime; one Yuma sheriff reported that new fencing led to a 91% reduction (Garcia 2019). Even if the true reduction was not as extreme as it may seem from anecdotal claims, this perceived difference indicates that many people in Yuma felt safer with the fencing.

Research has also found that barriers are not as effective as they may seem in reducing smuggling of illegal goods. A study on border walls in Israel adds further insight to this by demonstrating that illicit trade is reduced in areas with border walls, but that it is because the wall redistributes trade rather than reducing the trade overall. When walls were gradually erected in Israel in response to terrorism, trade of stolen cars decreased in areas with walls and increased in areas that did not yet have a wall (Getmanski et al 2019). Additionally, while many barriers are designed to curb certain types of illicit trade, research has found that trade of legal goods is affected as well. For example, an econometric study found that barriers tend to curb all types of trade. The authors use a gravity model of trade that finds a negative relationship between border walls and cross-border trade flows (Carter and Poast 2019). Since barriers can hurt legal as well as illegal trade, this creates a negative externality by reducing the gains from trade and specialization on either side of the border (Kourtit et al 2021). However, many have also argued that border fences can improve legitimate trade by asserting rule of law.

Border barriers have caused many other negative externalities besides reductions in legal trade. A study on welfare effects found that border wall expansion created welfare gains for U.S. low-skilled workers equivalent to a per capita income increase of 0.28, but it created welfare losses for Mexican workers and high-skilled U.S. workers (Allen et al 2018). This reduces welfare overall, but it could still possibly raise prices
near the border, since people who live closest to the American side of the border tend to be low-skilled workers. Other costs include isolation resulting from dividing cultural communities, an environment of distrust that can foster terrorism, and damage to lands and wildlife (Kourtit et al 2021). Barriers can also increase locals’ exposure to clashes between border agents and migrants or illegal smugglers. Additionally, researchers have documented cases in which increased local employment opportunity is promised, but this promise fails to materialize (Arslan et al 2020). However, in cases where employment does increase, this could be a significant positive externality. It seems that this was likely the case in Yuma, since the local newspaper contained advertisements recruiting construction workers.

Furthermore, the success of border barriers often depends on how they are perceived by locals. Constructing barriers is a form of signaling behavior, allowing the government to make a public gesture whether or not it is making a real difference (Kourtit et al 2021). If people believe a barrier is ineffective or harmful, this can weaken perceived efficacy of government and show it is out of touch with citizens’ true needs (Arslan et al 2020). However, it seems that for the most part, this was not the case in Yuma, Arizona. The signal of fence construction was generally perceived well, which could have a positive effect on home prices. For example, some supporters of barriers say that they send a strong message in support of rule of law (Dierker 2018). Further, the Yuma Sector is often praised as a model sector that quickly gained control over its part of the border, increasing its security and ability to track migrants. Not only is there abundant anecdotal evidence of its success, but the U.S. Border Patrol stated that illegal alien apprehensions decreased from 138,438 in 2005 to 5,833 in 2011 (Garcia 2019). In 2017,
then-Secretary of Homeland Security Elaine Duke also commented that Yuma had been overwhelmed with drug and human smuggling before fencing was built, but that the fences had restored order and security (Duke 2017). Further, if fences truly are successful in restricting illegal immigration, this could benefit the area by reducing the economic burden on governments. When there is an influx of illegal immigrants, state and local governments usually bear the cost of providing increased social services while receiving less in taxes from the immigrants. This effect diminishes as immigrant families assimilate and their children grow up, but the fact remains that a fence could spare a local government from several years of increased costs (Zaretsky 2017).

There is not a lot of existing literature on barriers that directly considers property values, but most studies so far have determined that they are lowered by barriers (Kourtit et al 2021). For example, one study looked at the effects of building physical divides in cities along ethnic lines, although it had more of a political than an econometric approach. In cities with fences or walls, property values tended to fall closer to the barrier, largely due to a perception of danger that surrounds the barrier, whether justified or not (Calame 2012). Additionally, many have expressed concern that the need to acquire property to build fences can have a negative impact on remaining private property, although empirical research still needs to be done on this issue (Brandys et al 2019). While it is reasonable to hypothesize that a barrier along the US-Mexico border could have similar effects as found in existing research in other areas, there are also reasons to believe that these results may not have external validity, especially in an area such as the Yuma Sector. As discussed above, there is a lot of evidence that fencing in Yuma was particularly successful in reducing crime, smuggling, and illegal immigration.
At the very least, the general public in Yuma strongly believes in this success, possibly enough for this perception alone to manifest in higher property values.

Moreover, border barriers often cause increases in property values, at least in the short term, due to an influx of migrant laborers during the construction phase (Kourtit et al 2021). In addition to increased economic activity during construction, property values may increase close to the fence since construction materials and labor may be diverted towards building it. This could lower the number of new residences being built, and the resulting effect on supply could raise housing prices (Wasterlain 2016). Furthermore, home values could rise if a barrier protects private property on the American side of the border from migrants passing through, who may trespass or even commit theft (Brand and Chadwick 2006). Overall, it is clear that there are many reasons to expect that the border fence will either raise or lower housing prices, and much research remains to be done on this topic. My research will be the first to empirically analyze the effect of building US-Mexico border barriers on nearby residential property values.

III. Data Description

As of 2017, there were 654 miles of primary fencing, with about 50 additional miles of pedestrian fencing behind this primary fencing along the US-Mexico border. The border wall has not been completed to the extent that former President Trump had planned, and data on the most recent segments built during the Trump administration is difficult to obtain. However, construction of barriers began long before the call to “build the wall,” and many of these could be used to study the economic effects of a barrier on the border. The first fencing was completed in 1993 on a 14-mile stretch between San Diego and Tijuana, but physical barriers on the border remained very sparse until
President George W. Bush signed the Secure Fence Act of 2006. This legislation doubled funding for border security and authorized hundreds of miles of new vehicle and pedestrian fencing (Brandys et al 2019). Approximately 613 miles of new fencing had been built on the US-Mexico border by April 2009, and by May 2011, the Department of Homeland Security stated that 649 out of the 652 planned miles of fencing had been complete.

In particular, the Yuma Border Patrol Sector experienced significant changes as a result of the Secure Fence Act. The Yuma Sector includes 126 miles of the US-Mexico border stretching from the Imperial Sand Dunes in California to the Yuma-Pima county line in Arizona. Most of the border area in the Yuma Sector is encompassed by Yuma County, including a 17-mile stretch along the Colorado River. The county had a population of 212,128 as of 2018. Using articles from the *Yuma Sun*, I constructed a timeline for announcements and completion dates. In fall 2006, articles began to announce the Secure Fence Act and subsequent plans. In 2007, news articles announced several new construction projects in the Yuma Sector, stating that projects funded by the Secure Fence Act were aiming to be complete by the end of 2008. President Bush dedicated the Yuma Sector Border Patrol Station in April 2007. Between 2008 and 2010, several newspaper articles provided updates on how much fencing had been completed in the Yuma Sector and in Arizona, sometimes specifying type of fence as well (vehicle or pedestrian). In 2010 and 2011, multiple local newspaper articles appeared praising the Yuma Sector’s transformation over the last few years. In a short period of time, it had gone from almost completely unsecured to becoming the only sector on the southern border with “operational control” over its jurisdiction, according to a chief patrol agent.
Apprehensions of illegal aliens had dramatically decreased, and the Yuma Sector agents became much better able to deter illegal entry attempts and catch those who did attempt to enter.

I use publicly available GIS data on sections of the US-Mexico border fence, which includes segments completed between the early 1990s and 2011. This dataset contains information on variables such as type of barrier (vehicle, pedestrian, etc.), date completed, location, and length. The completion dates in this data set are corroborated by the timeline constructed from local newspapers, as well as tactical infrastructure reports from the Department of Homeland Security. From this set, I use observations located in the Yuma Sector, and I overlay this with housing data on transactions in Yuma County. The residential property transactions in this set take place between 2003 and 2011 inclusive. I initially restrict observations to houses within 50 miles of the US-Mexico border. This dataset includes housing characteristics such as lot size, square footage, year built, and number of rooms, although much of the data is missing for several of these variables. Houses in this dataset are located the following cities with the indicated 2018 populations: Yuma (population 97,908), San Luis (33,490), Somerton (16,491), Wellton (3,030), Roll (938), Tacna (761), Dateland (488), and Gadsden (441). The largest cities comprise a more densely populated area near the Colorado River, while most of the smaller towns are situated along Interstate 8, stretching to the east into more rural areas just north of the Sonora Desert. These cities can be seen in the following map.

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2 Data provided by the America’s Wall project conducted by San Diego news organizations KPBS and inewsource, which obtained files from Customs and Border Patrol. See https://data.world/inewsource/us-mexico-border-fencing-shapefiles.
3 These reports were obtained by searching the sites https://www.dhs.gov/ and https://www.cbp.gov/.
4 Data provided by Professor Pope and Zillow through the Zillow Transaction and Assessment Dataset (ZTRAX). More information on accessing the data can be found at http://www.zillow.com/ztrax. The results and opinions are those of the author(s) and do not reflect the position of Zillow Group.
The Yuma metropolitan area’s Mexican sister city, San Luis Rio Colorado, can be seen just across the border from San Luis, Arizona.

**Figure 1: Map of Cities in Yuma County**

Notes: Gadsden, not labeled, is in the highlighted area between Somerton and San Luis along Route 95.

Additionally, the maps below show the locations of fencing in the Yuma Sector along with the houses described above, including construction dates and estimated announcement dates. Constructing a timeline of announcement dates was somewhat complex; many articles announced large projects that would take place over a long time, rather than localized segments. Some sections were announced to the public in the planning stages, while others were announced upon completion. Additionally, many announcements specify the number of miles to be built in the Yuma Sector, but do not provide a location within the sector. Thus, the maps below summarize estimated timeframes of when the public became aware of different sections of the border barrier. Figure 2 shows all Yuma Sector fencing along with houses within 50 miles, while Figure 3 zooms into the urban area near the Colorado River.
Notes: Dark blue segments were constructed by 1995.
Light blue and orange segments were constructed in January-June 2007.
Black segments were constructed in July-December 2007. These segments appear to have been announced towards the end of their construction, in approximately December 2007.
Light green segments were constructed in April-June 2008.
Red segments were constructed in July-September 2008, and magenta segments were constructed in October-December 2008. The portions along the Colorado River were announced in approximately June 2008.
Yellow segments were constructed in 2009.
The announcement and construction dates for these segments may serve as significant shocks to their respective areas. However, since most fencing above was funded and prompted by the Secure Fence Act of 2006, the announcement of this act in Yuma could also serve as a shock. The shock may have occurred in fall 2006, when the public became aware of the act, or in January 2007, when large-scale, long-term projects began to be announced. To focus on the effect of fencing from this legislation, I drop the few observations built in the 1990s. However, some segments that had existed since the 1990s overlapped with new fencing in the data built due to the Secure Fence Act. This is likely due to the fact that following this legislation, the Yuma Sector built multiple fence layers at certain ports of entry (Dinan 2017).

After combining fencing and housing data, I obtain a new housing data set in which each observation contains a variable for distance to the closest fence segment. Looking at the raw housing data indicates that several observations have sale prices significantly higher or lower than the others. To prevent these outliers from skewing the results, I drop housing observations with sale prices in the top and bottom 2% of the housing price distribution, leaving homes priced above $21000 and below $600000. I also overlay census tract data for Yuma County to better understand geographic variation within the county. Since the southwestern region (near the Mexico border) is much more urban than the rest of the county, and since I want to study effects immediately near the border, I restrict my data to houses within seven census tracts that are on the border and that encompass Yuma County’s urban area, as shown in the figures below.
Figure 4: Yuma County Urban Census Tracts with Fencing

Notes: The dark blue line indicates the US-Mexico border fence. The light blue area immediately around it indicates the zone within 0.5 miles of the fence, while the lighter blue surrounding area indicates the zone within 2 miles.

Figure 5: Yuma County Urban Census Tracts with Fencing and Housing
Additionally, Table 1 below shows summary statistics for Yuma County houses:

<table>
<thead>
<tr>
<th>Distance from fence (miles)</th>
<th>All houses</th>
<th>Within 0.5 miles</th>
<th>Beyond 0.5 miles</th>
<th>0.5-2 miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sale price</td>
<td>700.13.18</td>
<td>6483.99</td>
<td>7544.45</td>
<td>657.98</td>
</tr>
<tr>
<td>(6347.99</td>
<td>(5858.43)</td>
<td>(6593.14)</td>
<td>(4954.24)</td>
<td></td>
</tr>
<tr>
<td>Lot Size (acres)</td>
<td>0.2220641</td>
<td>0.1395043</td>
<td>0.3086916</td>
<td>0.1662468</td>
</tr>
<tr>
<td>(1.223432)</td>
<td>(0.0818901)</td>
<td>(1.744578)</td>
<td>(0.2907365)</td>
<td></td>
</tr>
<tr>
<td>Square footage</td>
<td>1327.941</td>
<td>1334.344</td>
<td>1321.224</td>
<td>1260.794</td>
</tr>
<tr>
<td>(356.3322)</td>
<td>(262.633)</td>
<td>(433.9006)</td>
<td>(383.0107)</td>
<td></td>
</tr>
<tr>
<td>Stories</td>
<td>1.02894</td>
<td>1.018261</td>
<td>1.040146</td>
<td>1.036481</td>
</tr>
<tr>
<td>(0.167048)</td>
<td>(0.1323749)</td>
<td>(0.1964809)</td>
<td>(0.1933287)</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>1123</td>
<td>575</td>
<td>548</td>
<td>466</td>
</tr>
</tbody>
</table>

Notes: This table summarizes data used for homes sold in Yuma County between 2003 and 2011 inclusive, comparing the treatment group and potential control groups to the entire sample. The houses within 0.5 miles serve as the treatment group, while the houses 0.5-2 miles away from a fence, as well as all houses in the sample beyond 0.5 miles, serve as a control group in their respective regressions.

Within the seven urban census tracts of Yuma County that are the focus of my analysis, housing prices are lower on average closer to the Mexican border. However, home prices and other characteristics are relatively similar between the 0-0.5 mile and 0.5-2 mile bands, which I use as the treatment and control groups in my primary analysis. I will discuss this choice in more detail in the next section.

IV. Identification Strategy

I use a hedonic pricing model to assess the effect of building sections of the border fence on local housing prices. Rather than using the strategy of early traditional hedonic models, which used cross-sectional data to identify the implicit price of property in a certain location, I will use a newer hedonic technique, which is a quasi-experimental approach that looks at differential outcomes across space before and after a temporal shock (see for example Pope and Pope 2015). The traditional, cross-sectional method of hedonic pricing had a high risk of omitted variable bias, but this method is often better able to difference away omitted variables by using a strategy similar to difference-in-differences models. In my initial regressions, January 2007 will serve as the temporal
shock of interest. This month is when specific projects prompted by the Secure Fence Act began to be announced in Yuma, and the first construction began. Since construction occurred relatively quickly and comprehensively in the area in the two years following, it appears from my study of local news articles that Yuma County residents likely saw the fencing as part of one large initiative, rather than disparate projects. Furthermore, while there were some news stories about the Secure Fence Act in the latter part of 2006, I think early 2007 is likely to be the best temporal demarcation of the shock because this is when residents learned of more detailed plans of the scope of construction and saw that construction was truly beginning. In other words, residents likely recognized by early 2007 that the new fence was not simply an empty promise from the government.

In my difference-in-differences model, I define the price of a property i in year t as \( p_{it} \). I define \( x_i \) as an indicator for the treatment group and \( y_i \) as an indicator for the housing transaction taking place after January 2007. \( \eta_t \) indicates year fixed effects, and \( \alpha_j \) indicates spatial fixed effects for each census tract j. Including spatial fixed effects is crucial for accounting for unobserved housing and fencing characteristics that could introduce bias. I also define \( h_{it} \) as a set of characteristics for each home, namely lot size, square footage, and number of stories. I would have liked to include more housing characteristics such as number of bedrooms and bathrooms, but I omitted them because these variables were sparsely populated in the assessor data. However, the spatial fixed effects will likely help account for this omission. Additionally, since some fencing in my dataset overlaps with preexisting fencing, and since fences include multiple types such as vehicle and pedestrian, spatial fixed effects can help control for this variation, as well as characteristics that are unobservable. These variables are included in the following model
that will yield the average treatment effect on local prices of a constructed border fence segment if the standard parallel trends assumption in a difference-in-differences regression holds:

\[
\log(p_{it}) = \beta_0 + \beta_1(x_i \times y_t) + \beta_2x_i + \beta_3\eta_t + \beta_4\alpha_j + \beta_5h_{it} + \epsilon_{it}
\]

\(\beta_1\) yields the average treatment effect, \(\beta_0\) is the intercept, and \(\epsilon_{it}\) is the error term.

Choosing the treatment group posed some difficulty, since all the homes in my data set arguably received some treatment from the fence construction along their county border. Thus, I take a highly localized approach, defining my treatment group so I can study the impact of living very close to a border barrier. Many of the possible issues and benefits discussed above with constructing a barrier apply primarily to houses very close by, enough to visually see the border or easily walk to it from the property. For example, the value of a home from which the barrier is visible could be affected if people consider the barrier an eyesore, or conversely if the fence provides some visual variety in the desert or reminds the person of the increased security it might bring. Additionally, as described above, Yuma Sector residents have complained that illegal migrants enter the homes closest to the border, sometimes stealing items (Brand and Chadwick 2006). Thus, a barrier could reduce susceptibility to this crime, or at least increase peace of mind by making people perceive their environment to be safer. However, perception of safety could also decline with the increased presence of security facilities and personnel. Furthermore, residents closest to the border are probably the most likely to venture into Mexico for regular errands instead of traveling to urban centers within Arizona. These residents would be the most affected by a barrier that limits cross-border mobility.
The area within 0.5 miles of the fence seems to best capture the area in which these effects would be relevant. I have not personally seen the border fence, but from observing it through the street view on Google Maps, it appears that the fence and its related security equipment are visible up to approximately 0.5 miles away. Furthermore, while people differ in their views of what constitutes “walking distance,” 0.5 miles seems to be an adequate metric. In the public transit industry, 0.5 miles is the de facto standard for the radius of a station’s catchment area, since this is the maximum distance most people seem willing or able to walk (Cervero and Guerra 2013). Hence, 0.5 miles likely includes most homes where the residents would be within walking distance and line of sight from the fence. Additionally, some previous literature that uses a hedonic price technique to measure the impact of a shock to a neighborhood uses the area within 0.5 miles of the new amenity as the treatment group as well. For example, a paper on the effect of new Walmart stores on housing prices finds a treatment effect within 0.5 miles of a new store (Pope and Pope 2015). While a Walmart store is by no means the same as a border fence, both are large neighborhood features that may affect a large surrounding area, and that also serve as a significant shock to homes immediately around them. Thus, due to precedent from background literature and my understanding of the area around Yuma, I chose homes within 0.5 miles of a fence as my treatment group. Given this treatment group, to optimize balance of covariates as seen in Table 1, I chose the band 0.5-2 miles from the border as the primary control group.

One possible factor that could cause a violation of the parallel trends assumption is that my analysis takes place during the housing crisis that prompted the 2008 recession.

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5 This can be accessed at https://www.google.com/maps.
The United States experienced a boom in housing prices beginning in approximately 2001 and continuing for several years. This housing bubble began to burst in 2006, leading to a recession starting in 2008. These major changes take place around the same time as the shocks to Yuma County from new border fencing. This will not be a problem for estimation if we can assume that homes closest to the fence in our treatment group, as well as those further away in the same census tracts that act as our controls in the data, followed the same trends through the housing boom and bust. While this may be reasonable given the relatively small size and close proximity of the data points, the assumption is less plausible the further away our control group observations reside. Some assessment for the validity of the parallel trends assumption can be seen in the graphs below, which plot average sales price by year for both the treatment and control group. Figure 6 considers all houses beyond 0.5 miles from the fence to be the control group, while Figure 7 uses houses between 0.5 and 2 miles as the control group.
Notes: These graphs average home sale price by year. The vertical line on 2007 indicates the initial shock. While these trends do not follow each other perfectly, the graphs show a lot of parallel movement prior to 2007. If anything, the trend for housing prices in the control group was a bit more positive than in the treatment group. Both groups increase in average price, likely due to the housing boom. In 2007, prices in the treatment group increase while prices in the control group decrease. The trends are much more divergent following the shock. Interestingly, prices in the treatment group generally continue to rise, while prices in the control group experience a sharp drop, which is more consistent with what one would expect during this time period. This could indicate that there were similarities in the way that the treatment and control group experienced the housing boom, and that differences in price trends following the bust could be at least partially attributed to proximity to new fencing on the border.
To better check the parallel trends assumption, the figures below plot residuals over time by treatment group. These plots were produced by running the regression used in my primary specification without the treatment and interaction indicators. Figure 8 considers all houses beyond 0.5 miles from the fence to be the control group, while Figure 9 uses houses between 0.5 and 2 miles as the control group.
Trends in the residuals of the treatment and control group prior to 2007 are clearly not perfectly parallel, but they do follow similar trends during 2006. Additionally, residual levels converge at a couple points in time prior to the shock in early 2007. Following the shock, the residuals become much more divergent. This is a promising indication that trends following the shock could be attributed partially to the construction of a border barrier, not only to the recession. Moreover, the inclusion of spatial fixed effects, as well as controls for house and lot size, will hopefully mitigate bias that could result from the housing crisis. We should also note that as seen in Figure 9, residuals in the treatment group and primary control group begin to converge again in 2010. This indicates that the shock of new fencing may have caused significant changes in the housing market near the Yuma fence, but that these effects may not have long-term persistence beyond a few years past the construction period.
V. Results

Table 2 shows results from the regressions I conduct as part of my analysis.

<table>
<thead>
<tr>
<th></th>
<th>(1) Cross-sectional</th>
<th>(2) Difference-in-difference (DD)</th>
<th>(3) DD w/ housing characteristics</th>
<th>(4) DD w/ control group within 2 miles</th>
<th>(5) DD w/spatial fixed effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance from fence</td>
<td>-0.0577558*</td>
<td>0.3841493***</td>
<td>0.3452906***</td>
<td>0.2934656***</td>
<td>0.2701894***</td>
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<tr>
<td></td>
<td>(0.0420608)</td>
<td>(0.1191417)</td>
<td>(0.1156962)</td>
<td>(0.1114585)</td>
<td>(0.0887731)</td>
</tr>
<tr>
<td>Within 0.5 miles</td>
<td>-0.2561659***</td>
<td>-0.2050399***</td>
<td>-0.0749558</td>
<td>-0.0911044*</td>
<td>-0.0526601</td>
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<td>(0.0626215)</td>
<td>(0.0663109)</td>
<td>(0.0647045)</td>
<td>(0.00526601)</td>
<td>(0.0526601)</td>
</tr>
<tr>
<td>Lot Size (acres)</td>
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<td>0.7369634***</td>
<td>0.1284109</td>
<td>0.1543975</td>
<td>0.011044</td>
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<td>(0.1284109)</td>
<td>(0.1284109)</td>
<td>(0.1543975)</td>
<td>(0.011044)</td>
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<tr>
<td>Square Footage</td>
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<td>-0.0000532</td>
<td>-0.0000532</td>
<td>-0.0000532</td>
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<td>(0.0000838)</td>
<td>(0.0000838)</td>
<td>(0.0000697)</td>
<td>(0.0000697)</td>
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<tr>
<td>Stories</td>
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<td>0.5519677***</td>
<td>0.2741345**</td>
<td>0.2741345**</td>
<td>0.2741345**</td>
</tr>
<tr>
<td></td>
<td>(0.1738378)</td>
<td>(0.1891197)</td>
<td>(0.1344995)</td>
<td>(0.1344995)</td>
<td>(0.1344995)</td>
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<tr>
<td>Year fixed effects</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Spatial fixed effects</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R-squared</td>
<td>0.0089</td>
<td>0.0596</td>
<td>0.1024</td>
<td>0.1086</td>
<td>0.4762</td>
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<tr>
<td>Observations</td>
<td>1123</td>
<td>1123</td>
<td>1123</td>
<td>1041</td>
<td>1041</td>
</tr>
</tbody>
</table>

Robust standard errors in parentheses

* Significant at the 10% level. ** Significant at the 5% level. *** Significant at the 1% level

Notes: These regressions show the effect of fence announcements and start of construction in January 2007 on local housing prices. All except column (1) are difference-in-differences regressions. In columns 2-5, the interaction term "Within 0.5 miles * after beginning construction" is defined as a home within 0.5 miles of a border fence that was sold after January 2007.

I first conduct a naïve cross-sectional analysis using observations sold after January 2007, and I find that building a fence segment a mile further from a house lowers its value by 5.78%, as seen in column (1) of Table 2. However, because of omitted variable bias it would be a stretch to attribute anything causal to this estimate. Next, I estimate several difference-in-differences (DD) specifications, which are likely to be much better at addressing possible omitted variable bias. The first two of these DD regressions use all houses in my selected census tracts beyond 0.5 miles as the control group. Column (2) shows results for a basic difference-in-differences model with no controls, which finds that constructing a fence segment within half a mile of a home raises its value on average by 38.41%. Column (3) shows results of this same regression
with additional controls for lot size, square footage, and number of stories. This regression finds that building a fence segment within half a mile of a home raises its value on average by 34.53%. All of these treatment effect coefficients are statistically significant at the 1% level.

For my next regressions, I use my primary definition of the control group. In the data set, 1375 out of 1508 of the observations (almost 92%) were within two miles of the border, and several tracts did not include any houses outside two miles, so the houses beyond two miles could be considered outliers. Moreover, the sample between 0.5 and 2 miles from a fence has better balance of average home prices with the treatment group, as seen in Table 1. Thus, all of the subsequent regressions use this sample as the control group. Column (4) shows results for the same regression used in Column (3) with this new control group. This regression finds that building a fence within half a mile of a home raises its value by 29.35%. Finally, column (5) shows results for the regression using the full model with spatial fixed effects. As seen in the R-squared values reported in Table 2, each modification thus far increased the amount of variation captured by the model, but none so drastically as spatial fixed effects. With this complete model, I find that construction of a fence segment within half a mile of a home increases its value on average by 27.02 percent. Each of these results are significant at the 1% level.

After obtaining these primary results, I perform several sensitivity checks. The results are listed in Table 3 below.
While January 2007 likely served as a significant shock to urban Yuma County border areas, it is possible that this is not the only shock that should be considered. Barriers along the southern desert border near San Luis were primarily built and announced in 2007, while barriers along the western Colorado River border were primarily built and announced in 2008. Thus, I conduct one more analysis with two treatment periods, one for each region. Like the last several regressions, this again uses the observations between 0.5 and 2 miles from the border fence as the control group. In Figures 10 and 11 below, census tracts in green are given the original treatment date of January 2007, and tracts in pink are given a treatment date of July 2008, since this is when major construction projects along the Colorado River began.

Table 3: Sensitivity Checks

<table>
<thead>
<tr>
<th></th>
<th>(1) DD with two control groups</th>
<th>(2) DD from 2004-2010</th>
<th>(3) DD treatment w/in 0.4 miles</th>
<th>(4) DD treatment w/in 0.6 miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within 0.5 miles</td>
<td>0.2721856***</td>
<td>0.2341449**</td>
<td>0.1472374*</td>
<td>0.3045293***</td>
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<tr>
<td>Lot Size (acres)</td>
<td>(0.861869)</td>
<td>(0.0952797)</td>
<td>(0.0827731)</td>
<td>(0.09738)</td>
</tr>
<tr>
<td>Square Footage</td>
<td>-0.0896305*</td>
<td>-0.0515192</td>
<td>0.0012807</td>
<td>-1.565392**</td>
</tr>
<tr>
<td>Stories</td>
<td>(0.0518293)</td>
<td>(0.0578846)</td>
<td>(0.0415139)</td>
<td>(0.068948)</td>
</tr>
<tr>
<td>Year fixed effects</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Spatial fixed effects</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.4765</td>
<td>0.3143</td>
<td>0.4727</td>
<td>0.4778</td>
</tr>
<tr>
<td>Observations</td>
<td>1041</td>
<td>887</td>
<td>1041</td>
<td>1041</td>
</tr>
</tbody>
</table>

Robust standard errors in parentheses

* Significant at the 10% level. ** Significant at the 5% level. *** Significant at the 1% level

Notes: In column 1, the interaction term is defined as a home within 0.5 miles of a border fence sold after January 2007 in a census tract along the southern border, or sold after July 2008 in a census tract along the Colorado River border.

In columns 2-4, the interaction term is defined the same as in previous regressions.
I use the same model used in the previous regressions with a modification: I instead define $y_i$ as an indicator for the housing transaction taking place after either January 2007 or July 2008, depending on the census tract. As seen in column (1) in Table 3, I find that construction of a fence within half a mile of a home increases its value on average by 27.22 percent, where this is again statistically significant at the 1% level. This
result is very similar to the previous result in column (5) of Table 1, indicating that the treatment effect is not significantly affected by considering the additional shock date.

For my next check, I return to the strategy of treating January 2007 as the shock date for all census tracts included in the analysis. I improve the temporal balance of my data by narrowing the window of observation to three years before and after the shock, which includes February 2004 to January 2010. As seen in column (2) of Table 3, I find that constructing a house within half a mile of a home increased its value on average by 23.42%. This result is significant at the 5% level. For the average priced home in my sample, this translates into approximately a $15,000 increase in housing value for homes within 0.5 miles of where these fences have been built relative to houses sold between 0.5 and 2 miles from the fences.

Columns (3) and (4) show the results of a sensitivity check in which I slightly adjust the definition of the treatment group. In column (3), the treatment group is defined as houses within 0.4 miles of the border fence, and in column (4) it includes houses within 0.6 miles of the border fence. Both checks define all other houses up to 2 miles away as the control group. The first of these checks finds that within 0.4 miles, building a border fence raises housing prices by 14.72% on average. This result is significant at the 10% level. The second check finds that within 0.6 miles, building a fence raises housing prices by 30.45% on average. This result is statistically significant at the 1% level. The treatment effect found in column (3) is considerably lower than the estimate in my previous regressions, while the effect in column (4) is a bit higher. However, the presence of a large positive effect remains. This could suggest that living very close to a fence
does have a significant large effect, but that the appropriate definition of “very close” is a little larger than I had initially thought.

All these regressions show that in the few years following the beginning of major border construction projects, home values near the border increased. This result is interesting given that there are a priori arguments for the border fence to have positive or negative externalities on those living near a barrier. It should be noted that these results could be partially explained by several factors specific to Yuma County. First, as discussed earlier, the Yuma Sector was particularly successful in quickly securing its border, a point of pride for many locals. This likely reduced both perceived and actual crime near the border. Researchers studying crime along the entire US-Mexico border found that during the short-term construction period following the Secure Fence Act, property crime decreased in Yuma County by 0.34 per 1000 (Abman and Foad 2020). Second, and related to the first reason, is the fact that according to local newspapers, public perception of border barrier construction was generally positive and supportive. This indicates that people may have at least thought that living near a fence would be beneficial to them (or not harmful). These reasons make it likely that the estimate of a positive effect on localized housing prices has internal validity in Yuma, Arizona. However, it is not clear how externally valid this estimate would be in other places along the US-Mexico border.

Another possible mechanism driving this positive effect is the interaction of border fence construction with residential building and development. My understanding of Yuma County suggests that residential property very close to the border would not have been very desirable before the Secure Fencing Act. However, since border
construction was generally supported and received positively, this could have made it more desirable to build houses very close to the border after construction began. Evidence for this could be found in the raw data if many houses in my treatment group were built in 2007 or later. However, there is no clear pattern in the data indicating that this is occurring, since almost half of the homes in my treatment group were sold in 2006 or earlier. Thus, it is possible that changes in development patterns drove some of the treatment effect, but it is not apparent simply looking at the raw data whether or not this was a major factor.

VI. Conclusion

In this paper, I examine the effect of building border fences following the 2006 Secure Fence Act on local property values in Yuma County. I use a hedonic difference-in-differences model to try and estimate the causal effect of the construction projects following this legislation, which built fencing along most of the Yuma Sector border within approximately two years. This model uses January 2007, an early announcement and construction date, as the temporal shock. Due to the abundance of positive and negative externalities that could result from fence construction, there was reason to expect either a positive or negative result. My regressions find that border fences have a large positive effect on property values within half a mile of the border in the few years following construction. These results can likely be explained by widespread local support for building a barrier, as well as by reports of the Yuma Sector fencing’s distinctive success in securing the border and lowering the number of apprehensions.

To address possible problems with omitted variable bias, I included spatial fixed effects to account for housing characteristics that are unobservable or missing in the data.
However, despite my best efforts to come up with a reasonable identification strategy to address the question of this paper, there are usually accepted limitations to this type of analysis. One key challenge has been the overlap of the before and after fence building periods with the housing crisis. By focusing on a very localized area, I have done my best to mitigate the potential bias, but I recognize that it may not be perfect. Another challenge endemic to these types of analyses is that while local newspaper articles indicate that fence construction was a major event in the area at the time, it is impossible to be completely certain that there were no other contemporaneous shocks that would cause problems for the difference-in-differences identification strategy and invalidate a causal interpretation of the estimates. It is also important to point out that even if we accept the results as causal, the graphical evidence suggests that the positive effect on housing prices was transitory. Not only do the regressions only cover up to 2011, but as seen in Figure 9, residuals converge again in 2010 after diverging following the shock. Nonetheless, these regressions provide interesting results that can be expanded on in future research.

Furthermore, since the number of houses for sale in any given year is only a fraction of the homes existing in the area, calculating the aggregate increase in home values in my selected census tracts can help indicate the overall change in the housing market. Between February 2004 and January 2010, approximately 15.84% of homes in my selected census tracts sold. Multiplying this by the 23.42% treatment effect, these census tracts experienced an approximately 3.71% aggregate increase in home values within 0.5 miles of the border. This translates to an increase of about $2,405 on average, or $13.47 million in total. By comparison, each mile of the border fence cost about $3.9
million on average, which amounts to about $265.2 million in total in Yuma County by 2010. Thus, even though the treatment effect is large and positive, it is important to remember that it comes with tradeoffs, since the cost of building fencing is enormous.

Future research on this topic would benefit from studying border areas with more complete housing data available that includes reliable statistics for characteristics such as number of bedrooms and bathrooms. Additionally, conducting similar research on fence construction in a later time period would not only provide interesting additional insight, but it would be more likely to circumvent bias from coterminous shocks in the housing market. Although data on more recent barriers is not widely accessible, this could still be an important future project when more fencing data becomes available. Furthermore, my research takes a local approach that zooms in on areas very close to the border, but studies that take a more global approach would be beneficial for finding an effect across all counties on the US-Mexico border. This type of analysis would also likely provide clearer treatment and control groups, since it could include areas not very close to the border. However, studying a more widespread geographic area would make it more likely that houses in the data would follow different trends, making it especially crucial to use an identification strategy that can control for this. In any case, it is clear that many complex factors go into understanding the impact of building border walls on local housing prices and localities in general, and my research adds to the academic knowledge about how local communities are impacted.
References


