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DISCUSSION PAPER SERIES

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ABSTRACT

Does Immigration Improve Quality of Care in Nursing Homes?*

The growing healthcare needs of baby boomers require significant increases in the number or productivity of healthcare workers. This paper explores how immigrants may fill these gaps in nursing homes. First, we show that immigrant inflows are associated with reduced wages of lower skilled nurses along with increases in their employment. We then show that more immigrant labor leads to fewer falls among residents and improvements in other measures of quality of care. We also find that only in competitive nursing home markets is there a link between immigrant inflows and the quality of care provided in nursing homes.

JEL Classification: J61, J14, I11, L13

Keywords: immigration, nursing homes, monopoly power

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1. Introduction

Because of declining fertility rates and the aging of baby boomers, 4.5 percent of the U.S. population is expected to be above age 85 by the year 2050, a tenfold increase from the corresponding share in 1950 (Congressional Budget Office (CBO) 2013). About two thirds of 85 and above year olds have a physical problem which makes it difficult to perform daily routine tasks such as eating, bathing, and dressing. While the majority of care for the elderly is provided informally by family members, about twenty percent of those requiring long term care reside in a nursing home (CBO 2013).¹ In 2018, 168.5 billion dollars were spent on nursing care facilities in the United States, and over half of this was paid for by Medicare and Medicaid (National Health Expenditure Accounts (NHEA) 2019). According to models constructed before the COVID-19 pandemic, expenditures on nursing homes are expected to increase by an average of 5.7 percent each year between 2020 and 2027 (Sisko et al. 2019). Given these trends, families and policy makers will either have to find additional sources of funding or limit the amount or quality of institutional care provided to the nation's elderly. In this context, it is important to examine whether immigration policy can be used to meet the rising demand for elderly care while reining in the cost. To this end, our paper analyzes the effects of immigration on the supply and wages of nurses of different skill levels and then goes on to examine the consequences of immigrant inflows into a local labor market on the quality of care in nursing homes located in that area. We also consider how competition in the nursing home market mediates the link between immigration and the quality of nursing home services.

There is reason to believe that greater availability of nursing staff results in improved care in nursing homes. Stevens et al. (2015) provide several pieces of evidence suggesting that a major explanation for the declines in mortality rates among the elderly during bad economic times is that nursing homes are able to hire and keep better workers when unemployment rates are high. Supporting this idea, Huang and Bowblis (2019) show that higher unemployment rates are associated with fewer

¹ The most recent estimates suggest that a 50-year-old has about a fifty percent chance of ever spending time in a nursing home (Hurd et al. 2013).

nursing home deficiency citations as well as improvements in other measures of quality of care, including decreases in pressure sores and the use of physical restraints.

Although not uncontroversial, there is substantial evidence that increases in the number of nurses in nursing homes improves the quality of care provided (Bostick 2006; Leland et al. 2012). Much of this literature is rather correlational in nature. However, exploiting plausibly exogenous variation in the relative pay of nurses across England, Propper and Van Reenan (2010) show that lower (relative) nurse wages result in fewer hospital-employed nurses and more hospital deaths among heart attack patients. Their results are consistent with a model in which regulated wages act like a price ceiling in certain markets that makes it difficult for hospitals to recruit and retain nurses, especially those of high quality. Also in line with the idea that more pay for nurses generates higher quality nursing services, Foster and Lee (2015) show that Medicaid pass-through subsidies—which provide additional funds earmarked for higher pay or more employment of staff—were associated with both increased staffing and decreased pressure ulcers among nursing home residents. Looking more directly at the impacts of nursing staff, Gruber and Kleiner (2012) find that nurse strikes substantially increase within-hospital mortality rates for patients admitted during a strike, despite largely unchanged patient characteristics or treatment intensities. Exploiting a different source of variation, Friedrich and Hackmann (2017) show that nursing shortages induced by a maternity leave program in Denmark increased both 30-day readmission rates in hospitals and mortality rates in nursing homes.

From a theoretical perspective, an exogenous inflow of immigrants to a location may improve the quality of care provided by nursing homes in that area for several reasons. First, if this increase in the supply of workers lowers equilibrium wages in nursing occupations, then nursing homes may respond by hiring more workers, reducing patient-nurse ratios, and thus improving the quality of care. This labor supply increase may arise from immigrants entering nursing professions themselves or from natives who are crowded out from other occupations (Peri and Sparber 2009). Second, even if the number of nurses does not change, foreign-born workers may provide higher quality care to nursing home patients. Using wages to measure quality, Cortés and Pan (2015a) show that Philippine-educated

nurses working in the U.S. tend to earn higher wages than observationally similar natives, potentially because of the strong positive selection into nursing in the Philippines. In other studies, these authors show that the equilibrium wages of registered nurses in fact do not respond strongly to inflows of foreign-born nurses (Cortés and Pan 2014), but in states with more foreign nurses, natives sitting for the nursing licensure exams tend to score higher marks (Cortés and Pan 2015b). It is possible that these findings extend to other, less skilled, types of nursing professions such as licensed practical nurses and nursing assistants (the latter are also known as nurse aides--we use the two titles interchangeably throughout the paper).²

Registered nurses (RNs) have higher educational attainments and are paid significantly higher wages than licensed practical nurses (LPNs) and nursing assistants (NAs). In 2019, RNs earned a median wage of \$35.24 per hour, LPNs \$22.83 per hour, and NAs \$14.25 per hour (Bureau of Labor Statistics 2020).³ In terms of tasks, RNs mostly coordinate patient care, LPNs provide basic nursing services, while NAs do most of the hands-on tasks of bathing, feeding, and dressing (Bureau of Labor Statistics 2020). Much of the previous literature on nurses has emphasized registered nurses working in hospital settings. However, in the context of nursing homes, nursing assistants may play a particularly important role given that they are likely to have more regular contact with residents over extended periods of time. As a result, nursing homes with a larger staff of nursing aides are likely to provide better care. Another reason to focus on nursing assistants is that immigrants are over-represented in this occupation. In our sample, immigrants account for 14% of the non-nursing labor force, but 18% of

² Using data from Western Europe, Esconce and Rocco (2018) estimate a positive relationship between immigrant inflows and the physical and mental health of elderly natives, a relationship they attribute to a greater availability of workers providing personal and household services (i.e. low-skilled workers). Exploiting variation in minimum wages across U.S. states over time, Ruffini (2020) shows that higher minimum wages, lead to fewer nursing home inspection violations as well as fewer pressure ulcers and even deaths among nursing home residents. She presents evidence that these changes are driven by labor supply decisions of nursing assistants. In contrast to these studies pointing to the importance of low-skilled workers, exploiting variation in minimum staff requirements across different U.S. states, Lin (2014) does not find any evidence that nursing assistants improve the quality of care in nursing homes but does find that registered nurse staffing has a large impact.

³ Registered nurses typically hold a bachelor's degree, licensed practical nurses complete a state-approved training program that typically takes about one year, while nursing assistants must complete a state-approved education program and pass a competency exam. Because these occupations require a license, undocumented immigrants are not eligible. For more details, see the Bureau of Labor Statistics (BLS) *Occupational Outlook Handbook* (BLS 2020).

nurse aides are foreign born. Immigrants are relatively less likely to work as licensed practical nurses than natives but they are about equally likely to work as registered nurses (see Table 1A).⁴

We make several contributions to the literature. First, while previous work has focused on high skilled registered nurses (RNs), we consider wage and employment impacts of immigrant inflows on less skilled types of nurses. Using Census data from 1980, 1990, and 2000 along with 2007-2011 American Community Survey (ACS) data (Ruggles et al. 2018), we show that immigration lowers the wages of nurse aides and, to a lesser extent, licensed practical nurses. At the same time, we find evidence of small positive effects on the wages of registered nurses consistent with estimates from some of the specifications in Cortés and Pan (2014). We also show that immigration disproportionately increases the supply of nurse aides suggesting that the wage reductions of nursing assistants are due to an increase in supply as opposed to a labor demand decrease.

Our main contribution, however, is to explicitly link immigrant inflows to a wide array of measures of the quality of care provided in nursing homes. Our nursing home data come from the Long Term Care Focus (LTCFocus) data repository (Shaping Long Term Care in America Project 2018), which we match with Census and American Community Survey data (U.S. Census Bureau 2016; Ruggles et al. 2018) on immigrant shares and other area-characteristics. Using two different, but both plausible, identification strategies, we show that larger foreign-born populations in a local area are associated with fewer falls among residents and improvements in several other measures of quality of care, including reductions in the decline of residents' ability to carry out activities of daily living (ADLs).

The last part of the paper is devoted to an exploration of how monopoly power mediates the relationship between immigration flows and nursing home quality. If health care markets are responsive to competitive pressures in general, then it is reasonable to expect that health care providers in more

⁴ Table 1A also presents median wages of nurses in our sample. The figures in Table 1A are slightly lower than those reported in BLS (2020) because they cover more years and have not been adjusted for inflation.

competitive markets will respond to cost reductions (or productivity increases) by either lowering prices or improving quality, as opposed to simply increasing profits. Because Medicare and Medicaid fund the bulk of nursing home care,⁵ quality of care may be more responsive than final prices. To test this hypothesis, we use county-level market concentration (Herfindahl) indices for nursing home providers and estimate an extended model including the interaction between the degree of concentration and the foreign-born share. Our estimates indicate that increases in immigration only lead to improvements in care quality in more competitive nursing home markets. Meanwhile, in highly concentrated markets, immigration may simply translate into higher profits for providers of elderly care. We also show that this link between market structure and the impact of immigrant inflows on nursing home quality only exists among for-profit nursing homes.

The remainder of the paper proceeds as follows. In Section 2, we explore the impacts of immigrant inflows on wages and employment of nurses of different types. Our main findings follow in Section 3 with an analysis of how immigration affects the quality of care provided in nursing homes, using resident falls as our preferred measure of care quality but also considering other outcomes. In Section 4, we consider how competition in the nursing home market affects the relationship between immigrant inflows to a local area and the quality of care provided by nursing homes in that area. Section 5 concludes.

2. Effects of Immigration on the Labor Markets of Nurses

2.1 Methodology and Data

To examine the effects of immigration on nursing labor markets, we follow Furtado (2016)'s analysis of the impact of immigration on the wages of child care workers. Using data from the 1980, 1990, and 2000 Censuses along with the 5-year 2007-2011 ACS sample all drawn from the Integrated Public Use Microdata Series (Ruggles et al. 2018), we estimate the following baseline model:

⁵ Together, Medicare and Medicaid regulate reimbursement rates for about three quarters of all nursing home residents (see Hackman 2019).

$$w_{zt} = \alpha_1 FB_{zt} + \alpha_2 X_{zt} + \gamma_z + \lambda_t + u_{zt} \quad (1)$$

where w_{zt} is the log of the median hourly wage of nurses in commuting zone z in year t . Commuting zones are similar to metropolitan statistical areas (MSAs) in that they are meant to reflect the geographic interrelationships between employers and labor supply, but unlike MSAs, they cover the entire United States—including rural areas. The U.S. is divided into 741 commuting zones. We follow Autor and Dorn (2013) in mapping individual observations in the Census and ACS data to commuting zones based on the individuals' country groups (in the 1980 Census) or Public Use Microdata Areas (PUMAs) (in the 1990 Census, 2000 Census and the ACS sample). We examine impacts separately for the three different types of nursing occupations: registered nurses (RNs), licensed practical nurses (LPNs), and nursing assistants (NAs). Since an influx of immigrants might mechanically reduce median wages through a compositional effect if their arrival results in more mass at the bottom of the wage distribution, we calculate median wages using a sample of natives along with only the immigrants living in the United States for at least 10 years.

The right-hand side of **equation (1)** contains the foreign-born share in the population (FB_{zt}) at the commuting zone level, and a set of control variables (X_{zt}). In some specifications, this set will include factors affecting the local demand for elderly care (e.g. share of the native population aged 65 or older, the share of this population living in an institution, and measures of aggregate income like the unemployment rate among the native-born), and availability of workers with high employment rates in nursing occupations (e.g. the share of blacks in the native population). Importantly, our specification also contains commuting zone and year fixed-effects. Thus, identification is based on variation over time within commuting zones.⁶

To address the potential endogeneity of the foreign-born share, we follow the shift-share instrumental-variables strategy commonly used in the immigration literature (Card 2001; Cortés and Tessada 2011; Farré, Gonzalez, and Ortega 2011; Furtado and Hock 2010; Barone and Mocetti 2011;

⁶ Regressions are population-weighted and standard errors clustered by commuting zone.

Furtado 2015, among many others). The instrument uses data on pre-existing immigrant enclaves to predict the geographical allocation of subsequent migrants (from the same countries of origin) across commuting zones. More specifically, the *predicted* foreign-born share is constructed using the following formula:

$$INST_{zt} = \left(\sum_b \frac{N_{z,1970}^b}{N_{1970}^b} \times N_t^b \right) / N_{zt}$$

For each country of birth, b , the first term in the numerator is the share of all immigrants from country b living in commuting zone z in 1970.⁷ The second term in the numerator represents the total number of immigrants from country b residing in the United States in year t . We then divide the product of these two terms by the commuting zone population in year t , and then sum over the different origin countries in each commuting zone.

The necessary assumptions for the instrument to be valid are very similar to those outlined by Cortés and Tessada (2011). First, the 1970 distribution of immigrants is required to be uncorrelated with *shocks* to local nursing labor markets 10 to 30 years later. In addition, nation-wide immigration inflows are assumed to be uncorrelated with shocks to local nursing labor markets. Because our focus is on a specific occupation, the exclusion restrictions are likely less restrictive here than in studies involving the whole labor market. It is worth noting, however, that Card and Lewis (2007) documented that since the 1990s, immigrants to the U.S. have been settling in new locations with no pre-existing immigrant enclaves, reducing the ability of the instrument above to predict immigrants' location decisions in more recent times. This point has also been investigated by Smith (2012).

2.2 Descriptive Statistics

We start by examining the foreign-born representation in the different nursing occupations. **Table 1A** shows—using the 2007-2011 5-year ACS data—that immigrants are overrepresented in the nursing assistant occupation but underrepresented as more highly skilled nurses. While the foreign born

⁷ To construct this term, we use the two metro samples of the 1970 Census (Ruggles et al. 2018) and again assign commuting zones based on Autor and Dorn's (2013) crosswalk between county groups and commuting zones.

comprise about 14 percent of the labor force in this period, they account for 17.5 percent of all NAs, 12.6 percent of all RNs, and 9.2 percent among LPNs. Thus, immigrant inflows are likely to have larger impacts on the low-skill tiers of the nursing occupation (i.e. nurse aides), and on the types of quality of care measures that are most likely to be affected by these workers (e.g. residents' falls).

2.3 Effects on the Wages of Nurses

Next, we examine the impact of immigrant inflows on the wages of nurses. We begin by focusing on the market for nurse aides. The results are collected in **Table 2**. Column 1 reports ordinary least squares (OLS) estimates on the basis of a specification that only contains commuting zone and year fixed effects, along with the foreign-born share in the commuting zone. Column 2 adds controls for the share of the population aged 65 or older and the share of blacks, which hardly affects the estimated coefficient for the foreign-born share.

Naturally, these estimates could suffer from endogeneity bias due to the non-random allocation of immigrants across commuting zones. Column 3 reports IV estimates of the model estimated in column 2.⁸ While the estimate of the foreign-born share coefficient loses precision, it remains negative and statistically significant, and actually increases in magnitude as we would expect if immigrants are attracted to areas with growing wages. Thus, the IV estimate confirms that immigration flows into a commuting zone lower the median wages of nurse aides. In column 5, we control for the unemployment rate among the native-born and the share of the population aged 65 or older in nursing homes. The point estimate on the foreign-born share remains almost unchanged, though we may be concerned that the additional controls in this specification may be potentially endogenous, and so they are not included in our preferred specification.

⁸ As shown in column 4 of Table 2, the shift-share instrument is a relevant predictor of the actual foreign-born share. According to the first-stage regression, a predicted 10 percentage-point increase in the share of foreign born is associated with a 2.5 percentage-point increase in the actual share, and the F statistic is 50. We provide a more in-depth discussion of the first-stage regressions later in the paper.

We now turn to the analysis of the effects of immigration on other nursing occupations as well as impacts on the various percentiles of the wage distribution for each of the three nursing occupations, in the spirit of Dustmann, Frattini, and Preston (2013). The results are collected in **Table 3**, which presents instrumental variables estimates of the effects of immigration.

The top panel refers to nursing assistants, as before, but broadens the scope by examining the effects of immigration along the whole wage distribution within the occupation. Column 2 simply reproduces the previous finding of a negative effect of immigration on the median wages of nurse assistants. More specifically, a 1 percentage-point increase in the share of foreign-born in a commuting zone leads to a 4.1 log-point reduction in the median wages of nurse assistants. This effect is fairly large, but despite being estimated rather imprecisely (s.e. 0.82), is still in the ballpark of estimates of the impact of immigration on childcare workers (Furtado 2016), another occupation which is difficult to substitute with technology or outsource to other countries.⁹ When examining the effects on the 25th and 75th percentiles we find similar point estimates, ranging between -3.2 and -2.9.

Let us now turn to the middle panel, which reports the effects of immigration on the wages of LPNs. The estimates in column 2 imply significant negative effects for the 25th and 50th percentiles, but the magnitudes are much lower than in the case of NAs. A 1 percentage-point increase in the immigration share leads to a roughly 1.3% wage reduction in the bottom half of the wage distribution for LPNs. In contrast, the point estimate on the 75th percentile of wages for LPNs is very small (-0.1) and not statistically different from zero. Our interpretation is that the most experienced LPNs are shielded from competition by immigrant workers thanks to their lower substitutability (Manacorda, Manning, and Wadsworth 2012; Ottaviano and Peri 2012).

⁹ Most of the immigration literature considers the wage impacts of immigrants on just the native born. Just like Furtado (2016), we include both the native and foreign born in our sample because we are not as much interested in the labor market impacts (on natives) as we are on the impacts of immigrant inflows on the ultimate quality of services provided by workers. Because we include both the foreign born and native born in our sample and wage impacts in general tend to be larger on the foreign born than the native born (National Academies of Sciences, Engineering, and Medicine 2017), it not surprising that our estimates are more negative than what is typically found in the immigration literature.

Last, we turn to the analysis of immigration on the wage effects of RNs, which is reported in the bottom panel of **Table 3**. The point estimates are now all positive and increasing in size as we move up along the wage distribution of RNs. A 1 percentage point increase in the share of immigrants is associated to a 1.4 log point increase in the upper half of the wage distribution for registered nurses. One plausible interpretation of this finding is that low and high skill nurses are complementary inputs in the production functions for elderly care. Immigration appears to entail an increase in the relative supply of low-skilled nurses (particularly, NAs), which has a positive effect on the wages of more skilled nurses (RNs). Cortes and Pan (2014) also find some evidence of positive impacts of immigration on native-born RN's wages, but their estimates are not statistically significant in their preferred specification. Another potential explanation is that foreign-born RNs are more productive than observationally equivalent native-born RNs. Consistent with this hypothesis, Cortes and Pan 2015a show that registered nurses educated in the Philippines earn significantly higher wages than U.S. born nurses. Since we include both the foreign-born and native-born nurses in our sample, we should expect our estimates to be more consistently positive than those in Cortes and Pan (2014).

2.4 Effects on the Employment of Nurses

To explore whether our estimated wage changes are most likely driven by labor supply or demand shocks, next we examine the effects of immigration on the employment, total hours of work, and share of immigrants in the three tiers of nursing occupations.

Table 4 reports instrumental-variable estimates of these effects for NAs (columns 1-3), LPNs (columns 4-6), and RNs (columns 7-9). As shown in column 1, a 100-person increase in the foreign-born population leads to a 5.7-person net increase in the employment of nurse aides and an 89-hour increase in the total hours worked by nurse aides in a year. Clearly, only a fraction of the new immigrant workers become employed as nurse aides, but this is an important occupation in terms of absorption of the increased number of workers. As shown in column 3, a 1 percentage-point increase in the share of

immigrants in the workforce leads to a 4.2 percentage-point increase in the share of immigrants among nurse aides.

It is interesting to compare these magnitudes to the effects of immigration on the supply of LPNs and RNs. As shown in columns 4-9, a 100-person increase in the foreign-born population leads to a 0.3 and 1.5 net increase in the employment of LPNs and RNs, respectively--the corresponding figures for annual work hours in the respective occupations are 7.6 and 33.6. Thus, even though immigration also increases the numbers of medium and high-skill nurse types, it does so to a much lesser extent than is the case for nursing assistants. This can also be seen in columns 6 and 9: while a 1 percentage-point increase in the share of immigrants in the workforce increases the immigrant share among nurse aides by 4.2 percentage-points, the corresponding increases for LPNs are 3 percentage points and 2.6 percentage points for RNs. Thus, immigration entails an increase in the *relative* supply of nurse aides.¹⁰ Standard general-equilibrium comparative statics in a model where the different types of nurses supply complementary inputs imply a reduction in the wages of NAs, which are now becoming more abundant, and wage increases for the more skilled RNs, which is precisely what we documented in the previous section.¹¹

3. Immigration and the Quality of Care in Nursing Homes

Our analysis of nursing labor markets is suggestive of negative welfare effects on native and previously arrived immigrant nurses of low (and to a lesser extent medium) qualification levels. However, a comprehensive welfare analysis requires taking into account the effects on the care received by consumers of nursing services. In this section, we explore the relationship between changes in the local immigrant share and the quality of care provided in nursing homes.

¹⁰ This finding partly reflects the skill distribution of the immigration flow, but it is also a function of the degree of displacement of natives toward other occupations. For instance, Cortés and Pan (2015) shows that for every foreign-trained registered nurse that migrates to a city, there is a reduction in employment of one to two native nurses in the city.

¹¹ The prediction on the sign of the change in the wages of the medium-skilled LPNs is less clear cut and depends on the specific details of the composition of the immigrant flow and the production function parameters.

3.1 Data and Methodology

To measure nursing home outcomes, we rely on the Long-Term Care Focus (LTCFocus) dataset developed as part of the Shaping Long-Term Care in America Project at Brown University. LTCFocus integrates data from the Online Survey Certification and Reporting System (OSCAR), the Minimum Data Set (MDS), and data from Nursing Home Compare. OSCAR data are collected during annual nursing home inspections by state survey agencies. The MDS is comprised of self-assessments by all Medicare- or Medicaid-certified nursing homes at regular intervals. As part of these assessments, information on each resident's health, physical functioning, mental status, and general well-being is collected and then aggregated at the nursing home level. The Nursing Home Compare data was developed by the Centers for Medicare & Medicaid Services (CMS) as a public service to allow consumers to easily compare the quality of care provided in different nursing homes. The information in the Nursing Home Compare data comes from several sources including CMS's health inspection database, Medicare Claims data, and MDS. Because of the multiple original data sources used to construct our LTCFocus data set, the time span and sample sizes vary somewhat across the different measures of nursing home quality we use in our analysis. In addition, there have been changes in the definitions of some of the variables (particularly in year 2011). Accordingly, we have standardized several of our variables.

Importantly for our purposes, the LTCFocus data includes information on each nursing home's county, which we merge with the commuting zone demographic characteristics data (including the foreign-born share) using the crosswalk for counties and 1990 commuting zones in Autor and Dorn (2013). We use LTCFocus nursing home data in the years 2000-2002, 2006-2008 and 2012-2014, merged by commuting zone with commuting-zone variables constructed from the 2000 Census Summary Tape Files (U.S. Census Bureau 2000), the (3-year) 2005-2007 ACS (U.S. Census Bureau

2005-2007), and the 2011-2013 annual ACS (U.S. Census Bureau 2011-2013).¹² We keep only those nursing homes with non-missing data on all of the variables used in our baseline specification.

Our main measure of the quality of care provided in a nursing home facility is the proportion of residents who have recently fallen. This measure of quality of care plays a prominent role in the literature because it has been shown to trigger health deterioration and even increased mortality with a fairly high probability (Kelly 2018; Rapp et al. 2008, 2009). Moreover, we know from the previous section that immigrants are highly represented among nursing assistants, and there is evidence that resident falls are particularly sensitive to nurse assistant staffing (Leland et al. 2012). This may be because nursing assistants are typically the ones present during toileting and transfers when many of the falls occur. As a result of their more hands-on care, they are also more likely to notice if residents are feeling anxious and nervous, another predictor of falls (Iinattiniemi, Jokelainen, and Luukinen 2009). For all of these reasons, we believe that if immigrants have an impact on nursing home quality, we should expect to see this impact on falls. From a practical perspective for the purposes of this study, the variable tracking falls among residents has wide coverage in the LTCFocus data.

From 2000 until 2010, we have information on the proportion of residents present on the 1st Thursday in April who have fallen *in the last 30 days*. LTCFocus constructed this variable by combining falls data from the Minimum Data Set (MDS) with nursing home population data retrieved from the Residential History File. After 2010, falls were measured as the proportion of residents who had fallen *since admission or prior assessment*. In order to use the more recent surveys along with the older surveys, we standardize the falls measure (by subtracting the yearly mean and dividing that by the corresponding standard deviation) and use this as our measure of how often nursing home residents fall.

We also exploit the breadth of information in this dataset by considering several additional indicators of quality of care in nursing homes that are closely connected to the tasks typically performed

¹² We aggregated the county-level data from these three sources downloaded from the American Factfinder website into commuting zones using the cross-walk in Autor and Dorn (2013).

by nurse aides. More specifically, we consider the share of residents who have experienced declines in their abilities to perform activities of daily living (ADLs), which provides a comprehensive measure of the evolution of the health of residents over time, and other more specific outcomes, such as the percent of residents reporting daily pain, the prevalence of pressure ulcers and urinary tract infections, and the use of catheters and restraints. While catheters and restraints are required for proper care of some residents, there is wide agreement that they produce more discomfort and are less preferred in general by residents to more labor-intensive alternatives that require the direct involvement of staff. Cawley et al. (2006) show that when wages increase, nursing homes tend to substitute away from labor-intensive methods of care to materials-based methods, specifically the use of psychoactive drugs, associated with worse outcomes for residents. We expect the opposite result in response to immigration-induced wage decreases.

Table 5 presents descriptive statistics of the variables we use in our analysis. By construction, our standardized measures of the prevalence of falls, rates of ADL decline, reports of daily pain, pressure ulcers, and use of catheters have mean zero and unit standard deviations. The table also reports the means of these variables for nursing homes located in commuting zones with a high foreign-born share (top 25 percent) relative to the rest of the nursing homes. In high-immigration areas, outcomes are better on average (i.e. negative mean values) for all of these indicators, with the exception of the prevalence of pressure ulcers, than in low-immigration areas. This suggests that immigration may be an important factor determining the quality of care provided in nursing homes, particularly in reference to the outcomes that rely more heavily on the labor of nurse aides. The table also contains summary statistics for some of the variables that we include as controls aimed at reducing unmeasured heterogeneity among nursing homes. Among these variables, we consider the percent of obese residents (21.8% on average), the total number of beds (165 on average), the acuity index average (a measure of the nursing needs of the nursing home's residents) (11.5 on average), a for-profit indicator (7 out of 10 on average), an indicator for being hospital based (3.2% on average), and the fraction of nursing homes that are part multi-facility nursing home firms (50% on average).

Turning now to our nursing home quality outcome y , our baseline empirical specification takes the form,

$$y_{ikt} = \beta_1 FB_{zt} + \beta_2 X_{zt} + \beta_3 H_{ikt} + \gamma_k + \lambda_t + u_{ikt} \quad (2)$$

where i denotes nursing home, z commuting zone, and t year. Foreign-born share, our variable of interest, is denoted FB , and varies by commuting zone and over time. Likewise, X is a vector of demographic and economic characteristics constructed using Census or American Community Survey (ACS) data, and H is a vector of nursing home characteristics. We include year fixed effects in all of our specifications. We will also consider alternative specifications with varying sets of fixed-effects, denoted γ_k , ranging from the most narrowly defined, where k refers to nursing home i , to the most broadly defined where k refers to state. Standard errors are clustered by commuting zone, and the total number of beds in the nursing home are used as weights.

3.2 OLS Estimates: Falls by Residents

Let us first examine least-squares estimates of variations on the model in **Equation (2)** where the dependent variable is the (standardized) proportion of residents that have recently experienced a fall. Column 1 reports the estimated coefficient of the foreign-born share in a model with simply year fixed-effects and no other controls. The point estimate is negative (-4.2) and is fairly precisely estimated (with standard error 0.5).

Next, we add controls at the nursing home level (acuity index, percent of obese residents, log of the number of beds, and for-profit and multi-facility indicators) and at the commuting zone levels (share of the population age 65 or older and share black). In choosing the nursing-home controls to include in our models, we followed the choices made by Cawley et al.'s (2006) analysis of the substitutions nursing homes make when labor becomes more expensive as a guide, with some adjustments dictated by data availability. Our most important control variable is the acuity index, which measures the average nursing needs of the nursing home's residents based on the number of residents needing different amounts of help with activities of daily living, the number of residents receiving

special treatments such as respiratory therapy or IV treatments, and the number of residents with diagnoses requiring more intense care such as dementia. As can be seen in column 2, the point estimate increases slightly (-3.3), and there is a substantial increase in precision (with standard error 0.3) in this model.

Clearly, there are many other factors that could affect nursing home falls that we are not able to control for. To mitigate this problem, we consider a variety of sets of fixed effects. Column 3 includes state fixed effects, which have practically no effect on the point estimate (-3.1) or precision of the coefficient of the foreign-born share. Column 4 incorporates commuting zone fixed effects, and 5 includes nursing home fixed effects. In these models, we exploit only the variation over time in the share of immigrants in a place as opposed to variation across different places. In the nursing home fixed effects specification, for example, this implies we are controlling for all time-invariant characteristics of specific nursing homes. Once again, the estimated coefficient for the foreign-born share remains fairly stable, ranging between -4.0 and -3.6, but the associated standard error increases substantially (to 2.0-2.2), rendering the point estimates only marginally significant. The robustness of the OLS point estimate is reassuring, indicating that a 1 percentage-point increase in the share of foreign-born in a commuting zone is associated with a 3 to 4 percentage point reduction in the standardized percent of falls in the nursing homes located in that commuting zone.

3.3 Instrumental Variable Estimates: Falls by Residents

While it is certainly comforting that our OLS analysis yields such robust estimates despite different sources of variation being used for identification, it remains possible that immigrants are more likely to settle in commuting zones either with better nursing homes to start or where nursing homes are improving in quality over time. If this is the case, then our results pointing to improvements in nursing home quality may not be indicative of causal impacts of immigrant labor. On the other hand, it is also possible that immigrants are attracted to commuting zones with better economic opportunities overall, and the quality of nursing home care is lower when there are better labor markets in other sectors

(Stevens et al. 2015; Propper and Van Reenan 2010). If this is the case, then we may view our OLS estimates as lower bounds of the causal impact of immigration on nursing home quality.

To address the concern that immigrants are overrepresented (or underrepresented) in areas with high wages and many job opportunities in health care sectors, we use the same instrumental variables approach that we used in our analysis of nursing labor markets. That is, we exploit the variation in immigrant shares arising from the pull influence of ethnic enclaves. It is important to keep in mind, however, that the LTCFocus data on nursing homes only start in the year 2000, and this may affect the relevance of our instruments. In creating the instrumental variable, we use the same 1970 shares discussed in the previous section, but we estimate the flows of immigrants from different countries as well as the commuting zone populations using data from the 2000 Census 5 percent sample, the 2006-2008 ACS 3-year sample, and the 2012-2014 ACS 3-year sample all drawn from the Integrated Public Use Microdata Series (Ruggles et al. 2018).

Columns 6-8 in **Table 6** report first-stage regression estimates. In all three cases the dependent variable is the foreign-born share in the commuting zone. Column 6 includes state fixed effects (along with year fixed effects, which are included in all specifications). The point estimate associated with the predicted foreign-born share is a precisely estimated 0.44 (with associated standard error 0.03), entailing an F statistic of 158.3, which allows for a clear rejection of the null hypothesis of weak instruments. Column 7 reports the estimates of a specification with commuting zone fixed effects. In this case, the coefficient of the predicted foreign-born share is now much lower (0.05) and only marginally significant, resulting in a 3.6 F statistic. Naturally, the problem is not solved by including the more demanding nursing home fixed effects (column 8 of Table 3).

In contrast to what we reported in the context of the labor market analysis (**Table 3**), the shift-share instrument fails the relevance requirement in models including commuting zone fixed effects. We believe the reason for this is the different sample period, 2000-2014, compared to the 1980-2011 time period used in the previous section. The diminishing ability of the ethnic enclaves established in the 1970s to explain the location decisions of immigrants arriving since year 2000 is well known and

has been discussed in several studies (e.g. Card and Lewis 2007). More specifically, Smith (2012) contains a detailed discussion of the devastating implications for the ability of the typical Card-type shift-share predictor to account for over-time changes in immigrant shares within commuting zones. To examine this issue further using our own data, we constructed first stage estimates for our nursing labor market analysis in the previous section using data in different years. **Appendix Table A1** presents these results. In models with commuting zone fixed effects (shown in columns 1-3), the F statistic falls below the commonly used threshold of 10 in specifications using only data starting in the year 2000 (column 3), the time period used in our nursing home analysis. In contrast, when the commuting zone fixed effects are replaced with state fixed effects (shown in columns 4-6), first stages are strong regardless of the time period used in the analysis.¹³

The bottom line in this discussion is that the shift-share instrument for the foreign-born share passes the relevance requirement in the context of specifications with state fixed-effects, but not in commuting-zone or nursing home fixed-effects models. Accordingly, the instrumental-variable estimates presented in column 9 are based on a model with state fixed-effects, analogous to the OLS estimates presented in column 3. The IV estimate of the coefficient associated with the foreign-born share is a precisely estimated -3.5 (standard error 0.3), which is very similar to the analogous OLS point estimate of -3.1. It is also very similar to the OLS estimate in the nursing home fixed effects model (column 5). We find it reassuring that the estimates are so alike regardless of whether the identification is coming from variation in immigrant share populations across commuting zones within states and over time (as is the case in column 3), variation in immigrant share across time but for the same nursing homes (as is the case in column 5), or variation in immigrant share within state across commuting zones stemming from ethnic enclaves in 1970 (as is the case in column 9). We view this robustness as evidence that the potential endogeneity bias in even the OLS estimates is negligible.

¹³ For our analysis of nursing homes, we also attempted to substitute the 1970 shares with 1990 shares in constructing the instrumental variable. Our first stage estimates did not improve considerably (results available upon request).

3.4 Other Measures of Quality of Care.

Let us now turn to other measures of the quality of care provided by nursing homes that are closely connected to the tasks usually conducted by nurses. **Table 7** presents OLS (top panel) and IV estimates (bottom panel) for a variety of outcomes. Analogous to column 9 in **Table 6**, all the estimates correspond to specifications that contain year fixed effects, state fixed effects and the set of controls discussed earlier. The dependent variable in the first column is our (standardized) measure of the rate of decline in ADL activities among residents in the nursing home. This is a comprehensive measure of the quality of care provided by nursing homes. Both the OLS and IV estimates of the coefficient associated with the immigrant share are negative (around -2) and statistically different from zero.

The remaining quality of care outcomes are sorted by sample size. The dependent variable in column 2 is the proportion of residents who are restrained (sample size 83,825). As discussed previously, restraints may be necessary for some residents, but by decreasing mobility, they can increase the risk of pressure ulcers, depression, mental and physical deterioration, and mortality (Cawley et al. 2006). As shown in column 2, the point estimates in both panels suggest that immigration reduces the use of restraints, but we are only able to reject the zero null hypothesis for the OLS estimate.

Column 3 corresponds to the (standardized) proportion of residents reporting pain. While only RNs and LPNs can administer pain medication, motivated and perceptive nursing assistants may call attention to the fact that a resident is experiencing pain before it becomes severe. As was the case in column 1, both OLS and IV estimates are negative, close in value (around -1.5) and statistically significant.

The results in columns 5 (percent with urinary tract infection) and 6 (standardized proportion using catheters) are similarly supportive of the hypothesis that immigration helps improve quality of care in nursing homes. Catheters can serve as a substitute for the more labor-intensive practice of toileting and changing diapers, but they often lead to urinary tract infections and even more serious issues such as complications such as bladder and renal stones (Cawley et al. 2006).

The only exception to this pattern of immigrants improving quality of care provided by nursing homes can be found in column 4. The point estimates in this column suggest that immigration is associated with increases in the (standardized) proportion of residents with pressure ulcers. We are unsure about the reasons for why the findings for pressure ulcers appear to go in the opposite direction than the findings for all other measure of quality. One possible interpretation is that pressure ulcers may go undetected in under-staffed nursing homes, more prevalent in low-immigration areas, but we have no way to investigate this claim further. It is also possible that this one estimate has the wrong sign as a result of sampling error. All in all, the estimates for the whole set of quality of care outcomes suggest that improvements in nursing homes located in commuting zones that have experienced increases in immigration.

4. Immigration, Quality of Care, and Competitive Environments

Our findings so far suggest that as a result of immigration, the wages of NAs fall substantially, the wages of LPNs fall moderately, and the wages of RNs increase by roughly the same amount. These findings are in line with the predictions of a competitive labor market equilibrium shocked by an increase in the relative supply of low-skill labor. However, perfectly competitive conditions in the labor market do not necessarily imply competitive conditions in the product market. Nursing home concentrations vary across counties and over time. Nursing homes with many viable competitors are likely to pass on their immigrant-induced cost savings to consumers either in the form of lower prices or improvements in service quality. In instances of high market power, the cost savings might instead result in higher profits.

There is a large literature examining the impact of market competition on health care quality. Market concentration of health care providers is generally associated with worse health outcomes, such as increased mortality from heart attacks (Kessler and McClellan 2000, Shen 2003). However, some studies find either no effects (Mukamel, Zwanziger, and Tomaszewski 2001) or even better health outcomes in more concentrated markets (Gowrisankaran and Town 2003). It is generally difficult to

interpret these relationships because high quality health care providers may be better able to deter new establishments from entering the market, and there may also be economies of scale. To address these issues, Gaynor, Moreno-Serra, and Propper (2013) examine the impact of a 2006 pro-competition policy in England on heart-attack deaths and, using a differences-in-differences design, conclude that competition saves lives without raising costs.¹⁴

Regardless of the direct impacts of competition on quality, competition may be a necessary condition for public policies intended to improve health-related quality to actually work. For example, Zhao (2016) shows that, while competition in general has little bearing on nursing home quality, when information about the quality of care provided by different nursing homes became more readily available (with the introduction of the Five-Star Quality Rating System in 2009), nursing homes in more competitive environments responded with larger improvements in the quality of care.

Our dataset allows us to examine how the degree of market concentration in the local nursing home market affects the relationship between immigration flows and quality of care. To measure monopoly power, we use the Herfindahl index computed on the basis of each nursing home's share in the number of beds relative to the rest of the county in each year. The Herfindahl index ranges from zero to one with values closer to one representing higher market concentration (i.e. monopoly power). As before, our preferred measure of quality of care is the proportion of falls among residents.

Table 8 presents instrumental variables estimates for specifications with state and year fixed effects, the full set of nursing home and commuting zone controls, and the level of the Herfindahl index in that commuting zone and year. For ease of comparison, column 1 reproduces the estimates for our baseline model (column 9 in **Table 6**). Column 2 adds the Herfindahl index along with the interaction between the index and the foreign-born share. The estimated coefficient for the interaction term is positive and highly significant. In other words, when market concentration is high, immigration reduces residents' falls by less than in more competitive, but otherwise similar nursing home markets. In fact,

¹⁴ Using a structural model, Hackmann (2019) shows, however, that although pro-competitive policies do yield small increases in nursing home quality (as measured by skilled nursing staff ratios), increases in Medicaid reimbursement rates are far more cost-effective ways to improve nursing home quality.

our point estimates suggest that in the case of a market with a single provider immigration may even result in an increase in the prevalence of falls (i.e. worse quality).

In order to investigate this channel further, we exploit the information in the LTCFocus data identifying which nursing homes are for-profit and which are not. Column 3 presents estimates of the previous column's model for the sub-sample of for-profit nursing homes only. The coefficient on the foreign-born share is almost unchanged, and the point estimate for the interaction term with the Herfindahl index remains positive and significant and has higher values than before, as we expected. Column 4 presents estimates for the sub-sample of not-for-profit nursing homes. In this case, the interaction between the market concentration index and the foreign-born share is not significant, confirming that the finding in column 2 is due to the for-profit nursing homes alone.

To explore the robustness of this finding we now switch to the more comprehensive measure of quality of care, the rate of ADL decline. As shown in column 5, the estimated coefficient for the interaction term between the Herfindahl index and the foreign-born share is positive and significant, as we saw before. Columns 6 and 7 also show that this finding stems exclusively from the for-profit nursing homes. Hence, we conclude that the link between immigration and improvements in quality of care requires competitive nursing home markets. Otherwise, quality of care does not improve and, presumably, the cost reductions associated with the lower wages or more attentive staff are soaked up by higher profits.

5. Conclusions

Taken together, our results are suggestive of improvements in the quality of care provided in nursing homes in areas with a higher share of immigrants in the population. As discussed previously, this may be because immigrants provide better care (Cortés and Pan 2014), perhaps because they have comparative advantage in more manual occupations (especially in the case of the nurse aide occupation). It may also be that the quality of care provided by natives improves in areas with more immigrants because of higher labor market competition (Cortés and Pan 2015). We also present

evidence that wages of low-skilled nurses decrease in areas with more immigrants. In response to these input cost decreases, nursing homes may respond by hiring more workers, and so even if foreign-born nursing staff were equally (or even less) productive than natives, the quality of care in nursing homes can improve as a result of lower patient to staff ratios. We do not distinguish between these mechanisms in this paper. We leave for future research a deeper exploration of the precise mechanism by which immigration improves care quality in nursing homes.

It is also noteworthy that while our study is limited to nursing homes, the foreign-born also play an even larger role as home care providers. If immigrant home care workers allow the elderly to live independently, as opposed to moving to nursing homes, this would be an additional benefit of immigration that we do not consider in this paper. In fact, if because of an increased availability of high-quality foreign-born home care workers, only the sickest and most disabled people live in nursing homes, then our estimates of the impact of immigrant inflows on the quality of care in nursing homes may underestimate the true effect.

Our analysis of how market concentration in the nursing home industry mediates the relationship between immigrant inflows and quality of care reveals that a decrease in the cost of providing quality care only translates into higher quality care in competitive environments. This finding is important not only for thinking about immigration policy but also for evaluating the likely impacts of any policy decreasing the costs of care for nursing homes (for example, increasing Medicaid reimbursement rates).

During the COVID-19 pandemic, mortality rates have spiked in nursing homes in many countries affected by the pandemic. Nursing homes that were understaffed may have been particularly badly hit (Harrington et al. 2020; Li et al. 2020). Our analysis suggests that one effective way to address staffing deficits is to increase immigration. Moreover, if immigrants have even stronger impacts on the quality of care provided by home care workers than they do on the quality of care in nursing homes, then they may enable the elderly to remain in their homes for more years. This would not only allow the elderly to retain more years of independence, but it might also be an effective way for society to

decrease the number of bacterial or viral infections among those most vulnerable, long after the COVID-19 pandemic has passed. We leave this for further research.

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Tables

Table 1A: Foreign-born shares and median wages by nursing occupation, Individual-level ACS data, 2007-2011

		Standard Deviation	Number of Observations
Percent foreign born ...			
Nursing Assistants	17.5%	38.0%	231,723
Licensed Practical Nurses	9.2%	29.0%	58,660
Registered Nurses	12.6%	33.1%	214,071
Non-Nursing Occupations	14.1%	34.8%	9,749,481
Median wage of ...			
Nursing Assistants	10.0	67.7	231,723
Licensed Practical Nurses	17.0	19.4	58,660
Registered Nurses	27.8	34.7	214,071
Non-Nursing Occupations	15.2	87.4	9,749,481

Notes: Created from individual-level data from the 2007-2011 5 year ACS (Ruggles et al. 2018). Our sample includes all individuals who are currently employed, work more than zero hours in a typical week, report a non-zero wage, and list an occupation.

**Table 1B: Descriptive Statistics by Share Foreign Born, Commuting-Zone Level
Data for all years**

	Total		High Foreign Born Share		Low Foreign Born Share	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Median wage of NAs	7.6	2.8	9.1	2.4	7.1	2.702
Median wage of LPNs	12.4	5.4	15.6	5.3	11.3	4.993
Median wage of RNs	19.1	9.1	25.3	9.8	17.0	7.892
Share foreign born	0.11	0.10	0.26	0.07	0.06	0.041
Native born: share age 65+	0.12	0.03	0.11	0.02	0.13	0.03
Native born: share black	0.13	0.10	0.15	0.07	0.13	0.111

Notes: Data from the 1980, 1990, and 2000 Censuses along with the 5-year 200-2011 ACS sample (Ruggles et al. 2018). High foreign-born share refers to commuting zones in the top 25th percentile of foreign-born share while low foreign-born share refers to those zones in the bottom 75 percent.

Table 2: Baseline Nursing Assistant (NA) Wage Regressions

Dependent Variable:	Log(Median NA Wage)			Share Foreign Born (First Stage)	Log(Median NA Wage)
	1	2	3	4	5
Estimation	OLS	OLS	IV	OLS	IV
Share foreign born	-0.579*** (0.199)	-0.552*** (0.153)	-4.144*** (0.820)		-4.959*** (1.200)
Native born: share age 65+		0.346 (0.502)	-3.092*** (0.920)	-0.743*** (0.143)	-3.202*** (1.053)
Native born: share black		1.053** (0.443)	1.057 (0.721)	0.249 (0.152)	0.993 (0.787)
Native born: unemployment rate					2.069** (0.843)
Share of 65+ in institution					-2.208** (1.017)
Predicted share foreign born (in CZ population)				0.241*** (0.034)	
Observations	2,964	2,964	2,964	2,964	2,964
R-squared	0.977	0.978	0.952	0.969	0.943
FE year	Yes	Yes	Yes	Yes	Yes
FE CZ	Yes	Yes	Yes	Yes	Yes
Dependent variable mean	6.485	6.485	6.485	0.0445	6.485
F statistic first stage			50.42		33.42

Notes: Data from the 1980, 1990, and 2000 Censuses along with the 5-year 2008-2012 ACS sample. Standard errors clustered by commuting zone. Log of median wages is the dependent variable in all columns except the forth Median wages are constructed using a sample of workers, including natives, who report working more than zero hours in a typical week or worked more than zero hours in the reference week and who had positive yearly wages in the previous year. *** p<0.01, ** p<0.05, * p<0.10

Table 3: Impacts of Immigration at Various Points of Wage Distribution. IV estimates

	25 th Percentile	50 th Percentile	75 th Percentile
Dep. Var.: Log wages	1	2	3
A. Nursing Assistants			
Share Foreign Born	-3.269*** (0.923)	-4.144*** (0.820)	-2.973*** (0.702)
Observations	2964	2964	2964
Mean wage	4.78	6.49	8.84
B. Licensed Practical Nurses			
Share Foreign Born	-1.262*** (0.405)	-1.313** (0.583)	-0.146 (0.743)
Observations	2964	2964	2964
Mean wage	8.136	10.41	13.06
C. Registered Nurses			
Share Foreign Born	0.651 (0.562)	1.372** (0.552)	1.391*** (0.509)
Observations	2964	2964	2964
Mean wage	12.11	15.78	19.57
FE year	Yes	Yes	Yes
FE CZ	Yes	Yes	Yes

Notes: Data from the 1980, 1990, and 2000 Censuses along with the 5-year 2007-2011 ACS sample ((Ruggles et al. 2018). All of the estimates shown in this table are constructed from separate 2SLS regressions. Each regression on 2964 observations (741 commuting zones x 4 time periods). All specifications include commuting zone fixed-effects. Standard errors clustered by commuting zone. Wages computed for a sample of workers, including natives, who report working more than zero hours in a typical week or worked more than zero hours in the reference week and who had positive yearly wages in the previous year. *** p<0.01, ** p<0.05, * p<0.10

Table 4: Employment. Instrumental Variables estimates with CZ Fixed Effects.

	Nursing Assistants			Licensed Practical Nurses			Registered Nurses		
	Number of NAs	Total Hours Worked by NAs Last Year	Share of NAs who are FB	Number of LPNs	Total Hours Worked by LPNs Last Year	Share of LPNs who are FB	Number of RNs	Total Hours Worked by RNs Last Year	Share of RNs who are FB
	1	2	3	4	5	6	7	8	9
Number Foreign Born	0.057*** (0.014)	89.320*** (27.887)		0.003*** (0.001)	7.612*** (1.173)		0.015*** (0.001)	33.602*** (2.194)	
Share Foreign Born			4.193*** (0.401)			3.063*** (0.264)			2.614*** (0.308)
Observations	2,964	2,964	2,964	2,964	2,964	2,964	2,964	2,964	2,964
R2	0.956	0.937	0.963	0.974	0.971	0.934	0.992	0.988	0.961
FE year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FE CZ	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Data from the 1980, 1990, and 2000 Censuses along with the 5-year 2008-2012 ACS sample. All specifications include commuting zone fixed-effects. Standard errors clustered by commuting zone. *** p<0.01, ** p<0.05, * p<0.1

Table 5: Descriptive Statistics

	Total		High Foreign Born Share		Low Foreign Born Share	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
A. LTCFocus Data						
Standardized falls	0	1	-0.6	0.9	0.2	0.9
Standardized ADL decline	0	1	-0.2	1.0	0.1	1.0
Standardized daily pain	0	1	-0.3	0.9	0.1	1.0
Standardized pressure ulcers	0	1	0.1	1.1	-0.1	1.0
Standardized catheters	0	1	-0.1	1.1	0.1	0.9
Percent with UTI	9.8	5.6	8.6	5.5	10.3	5.6
Percent with restraints	5.2	7.8	5.0	8.4	5.3	7.6
Percent obese	21.8	8.0	19.6	7.3	22.5	8.1
Total number of beds	165.0	107.7	211.1	155.4	149.7	80.4
Acuity Index	11.5	1.5	11.7	1.9	11.5	1.4
For profit	0.7	0.5	0.8	0.4	0.7	0.5
Hospital based	0.0	0.2	0.0	0.2	0.0	0.2
Multifacility	0.5	0.5	0.4	0.5	0.6	0.5
B. ACS Data						
Share foreign born	0.10	0.09	0.24	0.06	0.06	0.03
Share age 65+	0.13	0.03	0.12	0.02	0.14	0.03
Share black	0.13	0.10	0.14	0.07	0.12	0.11

Notes: High foreign born share refers to commuting zones with a share foreign born above the 75th percentile in my sample, and low foreign born share refers to all other commuting zones. Percent fallen refers to the proportion of residents in all facilities in the county on the 1st Thursday in April who have fallen in the last 30 days for years up until 2010. After 2010, this variable measures the percent who have fallen since admittance or prior assessment. The standardized falls variable standardizes this measure so that it is comparable across years. The average acuity index is a measure of the care needed by a nursing home's residents. Its calculation includes the number of residents needing various levels of activities of daily living (ADL) assistance, the number of residents receiving special treatments, such as respiratory therapy or IV treatments, and the number of residents with certain diagnoses, such as dementia. Panel A estimates are constructed from nursing home level data retrieved from LTCFocus. Panel B estimates are constructed at the commuting zone level from Census and ACS individual data. All estimates are weighted by the number of beds in the nursing home.

Table 6. The Effects of Immigration on Residents' Falls. OLS and IV estimates

	OLS					First Stage			IV
	Dependent Variable: (Standardized) Falls					Dependent Variable: Share Foreign Born			Regressions Dependent Variable: (Standardized Falls)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Share Foreign Born	-4.206*** (0.516)	-3.294*** (0.272)	-3.093*** (0.329)	-4.019* (2.197)	-3.626* (2.027)				-3.529*** (0.357)
IV: Predicted Foreign Born / CZ Population						0.438*** (0.035)	0.048* (0.025)	0.091** (0.041)	
Observations	55,046	55,046	55,046	55,046	55,046	55,046	55,046	55,046	55,046
R-squared	0.136	0.243	0.278	0.305	0.589	0.874	0.997	0.997	0.278
Year fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Area fixed-effects			State	CZ	Nursing Home	State	CZ	Nursing Home	State
F						158.3	3.581	4.995	158.3

Notes: Standard errors clustered by commuting zone. Estimated coefficients for control variables shown in the next page. *** p<0.01, ** p<0.05, * p<0.1

Table 6. The Effects of Immigration on Residents' Falls. OLS and IV estimates (Continued)

	OLS					First Stage			IV
	Dependent Variable: (Standardized) Falls					Dependent Variable: Share Foreign Born			Dep. Var.: (Stdzd) Falls
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Share Foreign Born	-4.206*** (0.516)	-3.294*** (0.272)	-3.093*** (0.329)	-4.019* (2.197)	-3.626* (2.027)				-3.529*** (0.357)
Acuity Index		-0.076***	-0.062***	-0.058***	-0.019***	0.000	0.000	0.000	-0.061***
Percent Obese		-0.010***	-0.011***	-0.012***	-0.006***	-0.000***	-0.000***	-0.000**	-0.011***
Log Number of Beds		-0.533***	-0.490***	-0.478***	-0.335***	0.007***	-0.000	0.003**	-0.480***
For Profit		-0.143***	-0.121***	-0.101***	0.018	0.005***	0.000**	0.000	-0.115***
Multifacility		0.013	0.000	-0.001	-0.001	-0.003***	-0.000**	-0.000	-0.003
CZ Share 65+		-3.364***	-1.965***	-2.828	-1.403	-0.647***	-0.304***	-0.284***	-2.302***
CZ Share Black		-1.715***	-0.962***	0.139	-0.107	0.027	0.092**	0.151***	-0.875***
IV: Predicted FBorn / CZ Population						0.438*** (0.035)	0.048* (0.025)	0.091** (0.041)	
Observations	55,046	55,046	55,046	55,046	55,046	55,046	55,046	55,046	55,046
R-squared	0.136	0.243	0.278	0.305	0.589	0.874	0.997	0.997	0.278
Year fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Area fixed-effects			State	CZ	Nursing Home	State	CZ	Nursing Home	State
F						158.3	3.581	4.995	158.3

Notes: Standard errors clustered by commuting zone. Standard errors on estimated coefficients control variables not shown to save on space. Available upon request. *** p<0.01, ** p<0.05, * p<0.1

Table 7: Other Measures of Nursing Home Quality

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Variables	ADL Decline	Use of Restraints	Reports of Pain	Pressure Ulcers	UTIs	Use of Catheters
Panel A: OLS						
Share Foreign Born	-1.730*** (0.186)	-6.313*** (2.061)	-1.431*** (0.178)	0.535*** (0.135)	-7.501*** (0.943)	-1.647*** (0.262)
Observations	60,726	83,825	59,540	47,487	24,362	17,078
R-squared	0.104	0.238	0.095	0.050	0.252	0.288
Panel B: IV						
Share Foreign Born	-2.106*** (0.209)	-2.889 (2.924)	-1.609*** (0.264)	1.081*** (0.188)	-9.535*** (1.581)	-1.591*** (0.290)
Observations	60,726	83,825	59,540	47,487	24,362	17,078
R-squared	0.103	0.238	0.095	0.049	0.252	0.288
State fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Dependent variable mean	0.00797	5.093	0.0476	-0.0303	10.05	-0.0204
F	109.5	120.6	110.5	121.4	223.3	244.1

Notes: All specifications include the nursing home and commuting zone level control variables shown in Table 6. Standard errors clustered by commuting zone. *** p<0.01, ** p<0.05, * p<0.1

Table 8: Immigration, market concentration and quality of care. IV estimates.

Sample of Nursing Homes:	Dependent Variable: Falls				Dependent Variable: ADL Declines		
	All	All	For Profit	Not for Profit	All	For Profit	Not for Profit
	1	2	3	4	5	6	7
Share foreign born	-3.529*** (0.357)	-3.834*** (0.375)	-3.642*** (0.491)	-3.674*** (0.355)	-2.310*** (0.203)	-2.284*** (0.263)	-1.765*** (0.235)
Share foreign born X Herfindhahl		7.001*** (1.892)	9.085*** (2.251)	0.228 (2.731)	5.060*** (1.395)	5.942*** (1.481)	1.108 (2.719)
Herfindhahl		-0.325*** (0.095)	-0.367*** (0.116)	-0.130 (0.147)	-0.143* (0.081)	-0.224** (0.089)	0.121 (0.147)
Observations	55,046	55,046	37,903	17,143	60,726	44,616	16,110
R-squared	0.278	0.280	0.265	0.336	0.106	0.118	0.090
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: All specifications include the nursing home and commuting zone level control variables shown in Table 6. Standard errors clustered by commuting zone. *** p<0.01, ** p<0.05, * p<0.1

Appendix Table A1: First Stages

	1	2	3	4	5	6
Dep. Variable: Share Foreign Born						
IV: Predicted share foreign born (divided by CZ population)	0.241*** (0.034)	0.657*** (0.176)	-0.039 (0.090)	0.518*** (0.063)	0.955*** (0.113)	0.462*** (0.068)
Native born: share age 65+	-0.743*** (0.143)	-0.838*** (0.232)	-0.283** (0.111)	-0.701*** (0.181)	-0.313*** (0.104)	-0.944*** (0.226)
Native born: share black	0.249 (0.152)	0.118 (0.443)	0.310*** (0.109)	0.143*** (0.040)	0.079*** (0.024)	0.133*** (0.046)
Observations	2,964	1,482	1,482	2,964	1,482	1,482
R-squared	0.969	0.983	0.997	0.843	0.882	0.851
Geographic Fixed Effects	CZ	CZ	CZ	State	State	State
Years Included	all	1980-1990	2000+	all	1980-1990	2000+
F	50.42	14	0.189	67.66	71.92	46.28

Notes: Data from the 1980, 1990, and 2000 Censuses along with the 5-year 2007-2011 ACS sample. Commuting zones sometimes cross state lines. To address this issue in constructing columns 4-6, we use a cross-walk which maps CZs to the states that comprise the largest share of a CZ's population (Autor and Dorn 2013). Standard errors clustered by commuting zone. *** p<0.01, ** p<0.05, * p<0.10