Unauthorized Immigration Regulation and Labor Productivity: Evidence from Establishment-Level Data

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ABSTRACT

We examine the impact of undocumented immigrants on labor productivity at the establishment level by employing the 2007 Legal Arizona Worker Act (LAWA), which prohibits businesses from knowingly or intentionally hiring "unauthorized aliens," as a plausibly exogenous shock. We find a significant increase in labor productivity in Arizona establishments compared to establishments in other states after the passage of the LAWA. The increase is more pronounced in low-skilled industries and industries with low labor mobility. Production-related waste per employee remains unchanged after the LAWA becomes effective, which suggests that restrictive immigration regulation does not increase production efficiency significantly. Rather, establishments in Arizona incur higher incidences of work-related injuries and illnesses. Our results suggest that strong immigration laws increase labor productivity at the expense of worker welfare.

Keywords: Immigration Regulation, Labor Productivity, Production-Relation Wastes, Workplace Safety

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1. Introduction

Immigration issues and policies have spurred substantial interest among economists in the past few decades, but the vast majority of the economic literature on the influences of immigration or unauthorized immigration dwells on broad areas such as native displacement (Dinardo and Card, 2000; Peri and Sparber, 2011; Kerr, Kerr, and Lincoln, 2015; Foged and Peri, 2016), labor markets (Card, 2001; LaLonde and Topel, 1991; Scheve and Slaughter, 2001, Palivos and Yip, 2010; Reed and Danziger, 2007; D'Amuri, Ottaviano, and Peri, 2010), wages (Butcher and Card, 1991; Cortes, 2008; Card, 2009; Peri and Sparber, 2009; De Silva, McComb, Moh, Schiller, and Vargas, 2010; Peri, 2014), welfare state (Borjas, 1999; Myers and Papageorgiou, 2000; Nannestad, 2007; Palivos, 2009), et cetera. To date, there is very little documentation on how local policies affect the employment of unauthorized immigrants at the establishment/business level despite that unauthorized immigrants contribute in no small share of the labor force in the United States.[1]

Our study addresses this overlooked area and examines how local law enforcement regarding undocumented immigrants in the United States affects establishment-level labor productivity. We develop the following three hypotheses on the impact of undocumented immigration on labor productivity and production efficiency. The *labor market friction* hypothesis predicts that stringent local

[1] The Bureau of Labor Statistics (BLS) reports that "in 2017, there were 27.4 million foreign-born persons in the U.S. labor force, comprising 17.1% of the total." (see https://www.bls.gov/news.release/pdf/forbrn.pdf). Pew Research Center reported in 2017 "…7.8 million immigrant workers are unauthorized immigrants, the first time since 2006 that the number was significantly below 8 million. They alone account for 4.8% of the civilian labor force, a dip from their peak of 5.4% in 2007." (http://www.pewresearch.org/fact-tank/2018/11/30/key-findings-about-u-s-immigrants/ accessed on 01/13/2019).

immigration laws reduce labor productivity. Bohn, Lofstrom, and Raphael (2014) find that the 2007 Legal Arizona Workers Act might decrease the population of foreign-born residents in Arizona.[2] More stringent immigration regulation could deter the entry of potential employees into the local labor market and/or force existing undocumented immigrants out, which will result in greater labor market frictions and production disruptions.[3] An observable consequence would be deteriorating labor productivity in businesses relying on unauthorized workers.

The *human capital* hypothesis suggests that a decrease in the unauthorized labor supply due to strict immigration enforcement could rebalance the bargaining power between employers and authorized/native workers, enhance the job matching process, reduce employee turnover, and improve the interest alignment between employers and workers.[4] Thereby, both employers and workers will be more willing to make more human capital investment and increase production efficiency and labor productivity.

The *employee welfare* hypothesis conjectures that employers can maintain or increase labor productivity at the expense of employee welfare. Employers could pressure employees to work overtime and/or perform tasks that are deviating from employees' skill sets so that they could recover lost productivity due to stringent immigration regulation.[5] Employee fatigue, unfamiliarity with new equipment and production process, and increased workloads can cause more violations of labor

[2] As the number of unauthorized immigrants is not available, Bohn, Lofstrom, and Raphael (2014) use the Current Population Survey (CPS) data to assess the potential effect of the 2007 Legal Arizona Workers Act on the population of unauthorized immigrants based on the number of foreign-born residents.

[3] Even though businesses could replace low-skilled unauthorized workers with authorized workers, the supply of low-skilled immigrants is limited due to the cap on the number of immigrant visas subject to the U.S. immigration law (see Hanson, Liu, and McIntosh, 2017).

[4] The supply of unauthorized labor could distort free competition in the labor market due to pay inequality. Borjas and Cassidy (2019) find the wage penalty for unauthorized immigrants is about 35% higher than for authorized immigrants.

[5] Labor costs are crucial determinants of profit margin for some industries, such as construction, transportation, manufacturing, et cetera. Overtime is a common practice to achieve expected performance when projects carry time constraints. The impact of overtime depends on many other factors that affect labor productivity simultaneously and is inconclusive based on existing studies. For example, Collewet and Sauermann (2017) suggests that overtime decreases labor performance for call center agents and increases worker fatigue.

policies on work-related injuries and illnesses. It is also possible that employers allocate fewer resources to workplace safety investments due to increased operating and compliance costs.

A challenge to analyzing the influences of undocumented immigrants on business performance is the lack of accessible records for undocumented immigrants at the firm/establishment level. To overcome this limitation, we exploit changes in state regulations that prohibit businesses from hiring "unauthorized aliens." The 2007 Legal Arizona Workers Act (LAWA), known as the "Employer Sanctions Law," was signed into law by Governor Janet Napolitano on July 2, 2007, and became effective on January 1, 2008. The law requires all Arizona employers, both public and private, to verify the employment eligibility of all new hires using the federal Basic Pilot/E-Verify program.[6] Employers that knowingly or intentionally fail to comply with the law will face sanctions.[7] Therefore, the 2007 LAWA offers a quasi-natural experiment setting in which we explore a plausibly exogenous variation in the unauthorized (likely low-skilled) labor market; that in turn allows us to study how unauthorized immigration affects labor productivity.

We use establishment-level data from the Walls & Associates National Establishment Time-Series (NETS) Database for the sample period 2003–2013. Though corporations are governed by laws in their headquarter states, subsidiaries or divisions must conform to specific regulations and laws in their resident states. Accordingly, the advantage of using the NETS database is that it identifies business locations more precisely in our research setting and allows us to explore establishment-level variation in labor productivity and other performance measures. Another prominent advantage of using establishment-level data is that it allows us to make inferences on labor productivity, if any, based on organic business growth rather than mergers and acquisitions (See Faccio and Hsu, 2017).

[6] Though several states such as Colorado and Georgia passed similar legislation before the 2007 LAWA, the majority of them regulate unauthorized immigrants in the public sector only. Arizona is the first state to enact comprehensive immigration legislation that targets all employers, including those in the private sector.

[7] The E-Verify system is a free online service offered by the Department of Homeland Security. Enrolled employers can use it to verify whether employees or potential hires are eligible to work in the United States. Businesses in Arizona violating the law are subject to license suspension upon the first offense and revocation upon the second.

To estimate the average effect of the 2007 LAWA and address concerns about establishment-level omitted variables, we adopt a difference-in-differences (DID) research design that estimates net changes in the labor productivity, production efficiency, and workplace safety before and after the enactment of the 2007 LAWA for establishments in the "treatment" state (Arizona) and in the "control" states (other states in the United States other than Arizona). We also present an additional analysis based on establishments located in Arizona and control states along the Mexico border.

We first examine how the 2007 LAWA affects employee growth rates and labor productivity at the establishment level. We measure employee growth rate using the annual change in the number of employees, and we measure labor productivity using the natural logarithm of sales per employee at the establishment level. Our result from the DID estimation shows that the number of employees in Arizona establishments increased substantially after the 2007 LAWA, implying that regulation of unauthorized immigration in Arizona does not reduce employment growth at local businesses.

Furthermore, contrary to popular belief, we find a significant increase in labor productivity among establishments in Arizona after the state passed a rigorous law on undocumented immigration, relative to labor productivity among establishments in control states. Labor productivity in Arizona establishments after the adoption of the 2007 LAWA is about 3.7% higher than before the legislation, relative to the control group. The result is consistent with the human capital or employee welfare hypothesis and supports state-level evidence on the relation between immigration and total factor productivity in Peri (2012). Supplemental evidence shows that the increase in labor productivity is more pronounced for establishments in industries with low labor mobility and in industries employing a high number of low-skilled workers. This finding implies that stringent immigration policies have a more profound productivity effect on industries that are more likely to employ unauthorized workers.

Given this evidence on how unauthorized immigration affects labor productivity, we next attempt to identify some potential channels. Specifically, we examine production efficiency and working conditions. We use production-related waste, which is the sum of toxic and recycled waste reported by the U.S. Environmental Protection Agency, as a proxy for production efficiency. We find limited evidence to support the human capital hypothesis, which predicts an increase in labor efficiency among Arizona establishments after the passage of the 2007 LAWA. Our results show no significant decrease in production-related waste per employee, but there is a decrease (significant at the 10% level) in total production-related waste at the establishment level. Thus, although stringent immigration policies may improve labor productivity, it seems that they do not improve production efficiency significantly.

Next, we find that the Occupational Safety and Health Administration (OSHA) is more likely to investigate and fine establishments in Arizona for work-related injuries and illnesses after the 2007 LAWA, consistent with the employee welfare hypothesis. Because enforcing the 2007 LAWA could disrupt normal business operations, increase compliance costs, and aggravate labor market frictions in Arizona, establishments could push existing and new hires with employment eligibility to work overtime and assume tasks unmatched with their skills. Our findings collaborate with Caskey and Ozel (2017), which finds that work-related injury rates are higher when firms are under pressure to meet earnings expectations. An important implication is that the increase in labor productivity after the enactment of the 2007 LAWA may occur at the expense of employee welfare.

We further conduct sensitivity analyses as a final set of tests by confining our sample to establishments that are in states bordering Mexico, to establishments in counties within 50 miles of state borders, to a more restrictive sample period surrounding the passage of the 2007 LAWA, and using different fixed-effects model specifications. The results still show a significant increase in labor

productivity in Arizona after the enactment of the 2007 LAWA, consistent with our baseline findings. Furthermore, we find an increase in sales growth for establishments in Arizona.

Our study complements economic research on the relationship between immigration and productivity/innovation. Kerr and Lincoln (2010), for example, is among the earliest to study data on H-1B visa admissions and investigate how high-skilled immigration affects innovation at the firm level. Hunt and Gauthier-Loiselle (2010) show that college-graduate immigrants have a positive contribution on innovation measured using patents per capita in the United States, and their innovation advantage over native workers is explained by the large share of immigrants with science and engineering degrees. Peri, Shih, and Sparber (2015) find that the employment of immigrants with science, technology, engineering, and mathematics (STEM) skills positively contributes to total factor productivity growth in the United States. Sequeira, Nunn, and Qian (2019) study European immigration to the U.S. and find immigration is related to higher income in the short turn, greater educational attainment today, and productivity and innovation in the long run. Peri (2012) provides evidence that immigration has a positive impact on total factor productivity via a state-level analysis of each Census year between 1960 and 2000 and in 2006. Our study extends Peri (2012) by exploring the economic channels using establishment-level data.

Our study also contributes to the research on firm productivity. Lichtenberg and Siegel (1990), for instance, show that leveraged buyouts have a positive impact on firm productivity. Schoar (2002) suggests that corporate diversification is significantly associated with a firm's total factor productivity. Additionally, Garmaise (2008) demonstrates that financial constraints make it more difficult for firms to replace low-quality workers and that financial constraints thus decrease labor productivity. Giroud and Mueller (2011) find that weak corporate governance inhibits labor productivity. Bloom, Draca, and Van Reenen (2016) suggest that Chinese import positively contributes to technological changes and total factor productivity within firms and affects labor reallocation towards more technologically

advanced firms. Our study, on the other hand, provides evidence that state regulations regarding unauthorized immigrants also affect labor productivity. Moreover, our findings suggest that establishments can increase labor productivity by sacrificing employee welfare.

Given the importance of human capital in productivity and growth, the body of literature on the relationship between labor and corporate finance is growing. For example, Agrawal and Matsa (2013) analyze the impact of labor unemployment risk, proxied by unemployment insurance benefits, on corporate financing decisions. Dou, Khan, and Zou (2015) find that firms engage less in earnings management when unemployment insurance benefits increase. Cohn and Wardlaw (2016) show that work-related injury rates are significantly related to a firm's financial constraints. Bradley, Kim, and Tian (2017) find that the presence of labor unions reduces firms' R&D investments and innovation outcomes. However, studies of how low-skilled labor affects corporate finance are scarce. This study thus makes an important contribution to the research by examining whether a component of the low-skilled labor force – unauthorized immigrants – influences labor productivity, production efficiency, and workplace safety at the establishment level.

Immigration issues are always in the spotlight during elections in the United States, and they often stir heated public sentiment given the large presence of unauthorized immigrants. As Borjas (2017) reports, "the Department of Homeland Security (DHS) estimates that 11.4 million undocumented persons reside in the United States (as of January 2012)." However, Opinions on immigration reform have always been highly polarized. Even though debates on immigration policies might be political camouflage for other profound social issues, many people believe that immigration, especially unauthorized immigration, has conspicuous economic and fiscal impacts that require politicians to prioritize policymaking on immigration issues (see Camarota, 2004).[8] For example,

[8] Unauthorized immigration imposes a significant fiscal burden on federal, state, and local governments when unauthorized immigrants receive public services such as welfare, education, Social Security, law enforcement, and Medicare benefits that are funded with taxpayer money.

Edwards and Ortega (2017) show a 3.1% annual GDP contribution in the private sector by unauthorized immigrant workers. Our study provides politicians and policymakers with valuable insights into immigration regulations.

The rest of this paper proceeds as follows. Section 2 presents the literature review and hypotheses. Section 3 presents the data and the model. Section 4 investigates the impact of Arizona's 2007 LAWA in multivariate settings. Section 5 provides sensitivity analyses, and section 6 concludes.

2. Literature Review and Hypotheses

2.1 Literature Review on Immigration

Extant literature documents how immigration, especially low-skilled immigration, affects wages and the labor market in the United States. For example, LaLonde and Topel (1991) suggest that the impact on the labor market from immigration waves in the 1970s and 1980s is small. Card and DiNardo (2000) investigate whether immigrant inflows result in native outflows by analyzing different skill groups across Metropolitan Statistical Areas (MSAs) and suggest that labor-demand shocks on specific skills cannot explain flows of native workers. Card (2001) finds that immigration inflows impair local low-skilled labor market outcomes such as wages and employment rates. Reed and Danziger (2007) show that immigration has adverse effects on wages and employment of low-skilled native workers for whom they are substitutes. De Silva, McComb, Moh, Schiller, and Vargas (2010) arrive at a similar conclusion in their study of immigration flows driven by the plausibly exogenous shock of Hurricane Katrina. In addition, Card (2009) concludes that immigration has a minimal effect on native wage inequality. Kerr and Kerr (2011) summarize studies on the economic impact of immigration on host countries and document a difference in the research focus between U.S. literature and European literature. Their study shows that U.S. literature focuses on how immigration

affects wages, while European literature mostly discusses immigration assimilation. A new study by Borjas (2017) implies that the labor market of unauthorized immigrants is inelastic, and the supply of authorized labor is not responsive to wage changes.

One common belief is that immigration negatively affects the economic welfare of native workers. Borjas (1999), for example, suggests that immigrants self-select into states that provide the highest welfare benefits. In a theoretical framework, Myers and Papageorgiou (2000) argue that unauthorized immigration is economically detrimental to native residents if unauthorized immigrants receive redistributive public services. Nannestad (2007) documents that immigration is more advantageous to immigrants rather than native residents in general. Palivos and Yip (2010) analyze how unauthorized immigration affects the wealth distribution of a host country and find that wealth inequality increases when the number of unauthorized immigrants increases. Very few studies such as Liu (2010) find that unauthorized immigration has a positive economic effect on native residents.

Many other recent studies dissect skilled immigration. Kerr and Kerr (2013), for example, suggest that immigrants account for a significant portion of the science, technology, engineering, and mathematics (STEM) workforce. They find that immigration makes employment transitions more difficult for STEM workers, albeit causal evidence is lacking. Based on Kerr, Kerr, and Lincoln (2015), skilled immigrants "accounted for 29% of the growth in this workforce during the 1995–2008 period." In addition, Kerr, Kerr, and Lincoln (2015) show a positive relationship between hiring young skilled immigrants and an overall increase in the employment of skilled workers, but they show limited evidence that employing young skilled immigrants displaces old skilled workers. Furthermore, Kerr and Lincoln (2010) explore H-1B visa reforms and find that immigrants make significant contributions to innovation and the employment of science and engineering (SE) workers.

Given the dominant role human capital plays in innovation and firm growth, finance researchers are also paying more attention to the role of immigrants in firms; however, these studies

mainly focus on skilled immigrants. For instance, Xu (2018) exploits the 2003 policy change on the H-1B visa program regarding hiring foreign workers who need employment sponsorship from U.S. employers. That study finds that firms decrease capital investments when they are unable to hire skilled workers. Bourveau, Stice, Stice, and White (2018) find that newly hired foreign accountants on H-1B visas earn significantly less than their native peers with similar office locations, positions, and time of hire. Studies on immigration, especially unauthorized immigration, are still new in the finance literature. In an audit industry setting, Aobdia, Srivastava, and Wang (2018) suggest that immigrants take undesirable positions because they have less bargaining power, but skilled immigrants are complementary to their native counterparts in specialized assignments, especially when human capital is constrained.

2.2 Low-Skilled Labor

There is a widespread misperception that automation decreases the demand for low-skilled labor. However, based on published statistics, employment in low-skill and high-skill occupations has increased substantially in the past three decades, and employment in middle-skill occupations has decreased sharply (Ernst, 2015). Such secular shifts in labor demand are known as "job polarization" (Autor, 2010; Autor and Dorn, 2013; Tuzemen and Willis, 2013).

Tuzemen and Willis (2013) analyze household survey data from the U.S. Current Population Survey (CPS) and find that the proportion of low-skilled occupations in the labor market increased from 15% in 1982 to 18% in 2012, but the proportion of middle-skilled occupations decreased from 59% in 1982 to 45% in 2012. A study by the Organization for Economic Cooperation and Development (OECD) in 2017 shows similar findings in the United States with a more recent sample period.[9] Thus, it appears that artificial intelligence and technology advancements pose much greater

[9] The study can be accessed here: https://www.oecd.org/els/emp/wcms_556984.pdf.

threats to middle-skilled workers than to low-skilled and high-skilled workers. Furthermore, David (2015) argues that automation will not make jobs obsolete and is complementary to labor. Although automation can replace routine and codifiable jobs, workers with creativity, adaptability, and problem-solving skills have "comparative advantage" and are still needed in the labor market.

An increasing number of baby boomers – people born between mid-1946 and mid-1964 – are reaching retirement age and leaving the workforce. Given the size of the baby boomer cohort, the shrinking of its population may have a sizable effect on labor supply and economic growth (Colby and Ortman, 2014). The Bureau of Labor Statistics (BLS) predicts that about 9.8 million new jobs will be added to the economy during 2014-2024; however, the labor force is expected to grow by only 7.9 million.[10] Some of those jobs require little education and training and are less appealing to natives; thus, embracing immigration of low-skilled workers could be one solution to America's aging workforce.[11] Even though a high-skilled labor force is the cornerstone of innovation and development, low-skilled workers are also critical for economic growth (Jorgenson, Ho, and Samuels, 2017).

Additionally, the gig economy continues to expand and has created new employment opportunities for both high-skilled and low-skilled workers. In an earnings conference call on May 23, 2017, Intuit CEO Brad Smith said, "There's just a secular trend of the gig economy. It's now estimated to be about 34% of the workforce and expected to be 43% by the year 2020." According to the prospectus filed by Lyft under rule 424(b), the company contracted with 1.8 million drivers and served 30.7 million riders in 2018. Berger, Chen, and Frey (2018) find that the labor supply of self-employed drivers increased by more than 50% on average after the introduction of Uber. The gig economy is

[10] See BLS articles here: https://www.bls.gov/opub/mlr/2015/article/occupational-employment-projections-to-2024.htm and https://www.bls.gov/opub/mlr/2015/article/labor-force-projections-to-2024.htm.
[11] https://immigrationforum.org/article/immigrants-as-economic-contributors-they-are-the-new-american-workforce/.

fueled by immigrants due to its low entry barrier (Berger, Frey, Levin, and Danda, 2019).[12] Together with workers' low bargaining power and limited access to employee benefits, the growth of the gig economy may inspire new regulations regarding worker rights and verification of employment authorization.

2.3 Hypotheses

The past decade has witnessed a surge in immigration-related legislation and resolutions targeting areas such as law enforcement, employment, budget, public benefits, and education at the state and local levels. Many immigration laws take a neutral stance on immigration, but some, such as Arizona's 2007 LAWA, have drawn nationwide attention and triggered criticism due to their restrictiveness. Strict state immigration policies aim to protect the jobs and welfare status of native workers; however, it is unclear how these regulations affect labor productivity and business risks at the establishment level. Our study explores this research question.

Neoclassical economic theory suggests that immigration has a competitive effect on the domestic labor market. The empirical findings in Borjas (2003) support this. Inflows of unauthorized immigrants who are starving for employment opportunities could distort competition in the low-skilled labor market and drive down wages and hiring costs, affecting native employees with equivalent skills (see Card, 2001; Reed and Danziger, 2007; De Silva, McComb, Moh, Schiller, and Vargas, 2010). In particular, unauthorized immigrants increase the supply of low-skilled labor and could thus benefit firms in industries such as manufacturing, construction, and agriculture, which rely heavily on low-skilled workers. In turn, this could reduce barriers to entry for new establishments needing low-cost labor and intensify competition among businesses that provide labor-intensive goods and services.

[12] https://www.theatlantic.com/technology/archive/2018/06/the-immigrants-fueling-the-gig-economy/561107/

Strict immigration laws could also drive unauthorized immigrants out of the U.S. labor market, however. Gordon (2018) suggests that one contributor to slowed economic growth, while innovation is accelerating in the United States, is the declining number of authorized and unauthorized immigrant workers. Bohn, Lofstrom, and Raphael (2014), for example, find that the 2007 LAWA decreases the local population of immigrants most likely to be unauthorized to work in the United States.[13] A decrease in the supply of undocumented immigrants who are more willing to accept lower wages can help restore competition in the labor market and raise the bargaining power for native job seekers. Under such circumstances, it may take longer to fill vacant positions with employees who have needed skills unless employers are willing to raise wages and offer better employment terms. Consequently, operating expenses such as wages and salaries are more likely to increase.

If unauthorized workers have skills that are not easily transferable, labor productivity may decrease following stringent immigration laws. Extant labor economic literature finds that labor productivity is negatively associated with the level of outside job opportunities (Kale, Ryan, and Wang, 2016) and the level of employment protection labor unions provide against job termination (Bradley, Kim, and Tian, 2017). Because authorized native employees could enjoy more employment protections under the new immigration regulation, they might have more incentives to shirk at work. Thus, we conjecture that labor productivity decreases when stringent immigration policies increase. We therefore derive our first hypothesis, the labor market friction hypothesis:

Hypothesis 1: Stringent immigration laws decrease labor productivity.

Labor productivity can increase after the 2007 LAWA in several ways. First, production efficiency could increase from the human capital perspective. Industries that employ low-skilled immigrants tend to experience high employee turnover (see Grey, 1999; Rosson, 2012). Accordingly,

[13] The Pew Research Center suggests that the population of unauthorized immigrants decreased by about 40% from 2007 to 2012.

businesses relying on unauthorized immigrants tend to face tremendous uncertainties due to the possibilities of sudden employee departures and changes in immigration regulations. High employee turnover can impose significant pecuniary and nonpecuniary costs on businesses and reduce labor productivity. However, employee turnover likely decreases when businesses discharge unauthorized immigrants, either voluntarily or involuntarily, following the enforcement of strict immigration policies and the deployment of enhanced screening tools such as E-Verify.[14]

Assimilation of authorized immigrants into the workforce could also mitigate cultural frictions (Konya, 2007) and foster a more collaborative culture between native workers and authorized immigrants.[15] We expect that interest alignment between employers and workers may also improve if cultural friction and agency problems decrease in the workplace (LaLonde and Topel, 1991; Daneshvary, Herzog, Hofler, and Schlottmann, 1992; Konya, 2007). Hence, unauthorized/native workers could be more willing to make human capital investment due to higher job mobility and their right to receive unemployment insurance benefits (Chiswick, 1989; Eriksson, 1991; Hansen and Lofstrom, 2003; Belot, Boone, and Van Ours, 2007).[16] Peri (2012) also suggests that task specialization could explain the positive effect of immigration on total factor productivity. Meanwhile, firms will also be more inclined to invest in their employees and implement incentive mechanisms that motivate authorized/native employees, thereby reducing employee turnover (Jovanovic, 1979). These factors would likely increase production efficiency after the 2007 LAWA in Arizona. We propose the second hypothesis – the human capital hypothesis as follows:

Hypothesis 2: Stringent immigration laws increase production efficiency and labor productivity.

[14] We expect tough immigration legislation to target unauthorized immigrants. Immigrants with legal status are likely to stay at a firm longer due to visa constraints.

[15] Guiso, Sapienza, and Zingales (2015) show that the relationships between managers and employees affect firm performance. Hasan, Hoi, Wu, and Zhang (2017a, 2017b) find that social capital affects a firm's tax policy and loan contracting.

[16] Duleep and Regets (1999) suggest immigrant workers are more likely than native workers are to invest in their skills if their opportunity cost is lower or their expected earnings are higher.

Secondly, employers could maintain or increase labor productivity at the expense of employee welfare. Job matching is not frictionless when businesses dismiss unauthorized workers and fill those vacancies timely with eligible workers in order to comply with new immigration policies. Managers could pressure existing employees to work overtime and/or perform tasks that do not match their skills in order to make up for lost productivity or to increase income. Employee fatigue, unfamiliarity with new equipment and production process, and increased workloads can increase violations on labor policies on work-related injuries and illnesses (Caruso et al., 2006). The enforcement of unauthorized immigration regulation could also increase employers' financial constraints and make employers invest less in workplace safety. We hence put forward the employee welfare hypothesis:

Hypothesis 3: Stringent immigration laws increase labor productivity.

3. Data and Model

3.1. Data

To carry out our empirical tests, we compile data from multiple sources. We first obtain establishment-level data from the Walls & Associates National Establishment Time-Series (NETS) Database for 2003 to 2013. The NETS database provides detailed information about annual (estimated) revenue, number of employees, Standard Industrial Classifications (SIC) code, credit score (e.g., Paydex score), bankruptcy status, and organization type (e.g., standalone, headquarters, or a branch). More importantly, the database also provides establishment addresses, including zip code, city, and state. A challenge of studies in geographical finance is that popular databases such as Compustat only provide headquarters information. Corporations do usually make business decisions at the headquarter level; however, the majority of their production takes place in facilities outside the headquarters. Those subsidiaries and branches must follow the laws and regulations of their resident

states, including immigration laws. The NETS database thus provides a perfect setting for us to test our hypotheses.

From the United States Environmental Protection Agency (EPA), we collect data on the quantity of toxic and recycled wastes produced at the establishment level.[17] Section 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA) includes a Toxics Release Inventory (TRI) program that records toxic chemical releases and pollution-prevention activities at industrial and federal facilities. Facilities meeting the TRI reporting criteria must report to the TRI program annually and submit TRI forms to the EPA and their respective states. The TRI report contains detailed information regarding facility name, location, industry categories, chemical types, and production-related waste. We use the total amount of waste after production, including both toxic and recycled waste, as a proxy for an establishment's production efficiency.[18]

We obtain information on workplace injuries and illnesses from the Occupational Safety and Health Administration (OSHA). Employees are entitled to a safe workplace under the U.S. constitution.[19] The Occupational Safety and Health Act of 1970, which stipulates and enforces protective workplace safety and health standards, created OSHA. OSHA has jurisdiction over approximately seven million worksites. Usually, OSHA compliance safety and health officers perform inspections without advance notice in order to investigate recent accidents, investigate employee complaints, investigate cases referred, investigate cases captured by monitoring, or conduct planned business. OSHA issues citations and penalties within six months of finding a violation of OSHA standards or serious hazard. It also provides brief information on accident investigations, which includes textual descriptions and details regarding related injuries and fatalities.

[17] https://www.epa.gov/toxics-release-inventory-tri-program/tri-basic-data-files-calendar-years-1987-2017.
[18] A more detailed description of production-related waste data is in Kim, Wan, Wang, and Yang (2019).
[19] See https://www.osha.gov/workers/.

We use the number of citations and the dollar amount of penalty assessments from OSHA inspections at the establishment level to gauge workplace safety.[20] By combining the three aforementioned datasets, we not only can focus on establishments in manufacturing industries that tend to employ less-skilled workers, but also we limit our analyses to those often dealing with hazardous substances. They are more likely to be subject to OSHA inspections due to the nature of their risky businesses.

State macroeconomic information such as GDP growth rate is from the Bureau of Economic Analysis. We obtain state-level right-to-work laws from the National Conference of State Legislatures. Innovation data are from the Patent Network Dataverse offered by the Harvard University.[21] We calculate industry-level capital expenditures using information from Compustat. We winsorize continuous variables at the top and bottom 1% to eliminate potential outliers.

3.2. Research Design and Model

Our research design utilizes a plausibly exogenous shock in the unauthorized labor market — the 2007 LAWA in Arizona — as a natural experiment. As the first and most comprehensive state-level immigration legislation in history, the 2007 LAWA provides a natural setting in which to explore the causal relationship between variation in the local unauthorized labor supply and labor productivity.

We expect to see large outflows of unauthorized immigrants after the legislation becomes effective. Accordingly, we adopt the difference-in-differences (DID) estimation method, which compares differences in labor productivity, production-related waste, and labor safety for treatment establishments and control establishments before and after the implementation of the 2007 LAWA.

[20] Detailed information regarding OSHA inspection is at: https://www.osha.gov/OshDoc/data_General_Facts/factsheet-inspections.pdf. Bulk data download can be accessed at https://enforcedata.dol.gov/views/data_summary.php.
[21] https://dataverse.harvard.edu/dataset.xhtml?persistentId=hdl:1902.1/15705

Our treatment group includes establishments in Arizona, and our major control group includes establishments in other states.

It is unlikely that businesses require the legislative department of Arizona to implement more stringent immigration policies to improve labor productivity. Immigration issues in Arizona mainly originate from its geographical characteristics. Arizona, with its remote and dangerous deserts, is an entry point favored by many unauthorized immigrants.[22] Debates on unauthorized immigration policies in Arizona tend to revolve around how they affect personal incomes of authorized/native workers.[23] California, New Mexico, and Texas are relatively immigrant friendly. For example, California and Texas enacted the Dream Act in 2001, which allows undocumented immigrants to pay in-state tuition. Thus, we are less concerned about whether unobserved common characteristics endogenous to the 2007 LAWA implementation simultaneously affect labor productivity and unauthorized immigration. Our sample spans the 2007-2008 recession, which could undermine our analysis. The DID estimation could address such concern.

We perform all multivariate analyses in this study in the DID setting to draw causal inferences. The difference-in-differences (DID) model takes the following form:

$$Y = \beta_0 + \beta_1 AZ + \beta_2 POST + \beta_3 AZ * POST + \gamma X + \varepsilon \qquad (1)$$

where *Y* represents dependent variables from either the treatment group or the control group. The treatment group consists of establishments in Arizona after the 2007 LAWA, and the control group consists of establishments in other states. We control for the establishment and year fixed effects in the OLS regressions. The establishment fixed-effects model enables us to capture within-establishment changes in labor productivity. Standard errors are cluster corrected at the state level to

[22] Nearly half of illegal border entries occur along the Arizona border with Mexico. See https://www.fairus.org/issue/societal-impact/immigration-arizona and https://www.cbp.gov/frontline/border-security.

[23] It is estimated that unauthorized immigration costs taxpayers in Arizona more than $1.3 billion per year. https://www.fairus.org/issue/publications-resources/costs-illegal-immigration-arizonans-2004.

absorb potential serial correlations in unobserved factors that affect labor productivity at different establishments in the same state.

The dependent variables for our main research question include labor growth and labor productivity. We calculate labor growth, *EmpGrow*, as the annual rate of growth in employee headcount at a given facility. We use establishment-level data to measure labor productivity as *Ln(SaleEmp)*, which is the natural logarithm of sales divided by the number of employees. This measure of labor productivity is in many studies, such as Chang, Fu, Low, and Zhang (2015); Bennedsen, Tsoutsoura, and Wolfenzon (2018); and Guthrie (2001), among others. Our next group of dependent variables includes two facility-level measures of production-related waste. The first is *Ln(Waste)*, which is the natural logarithm of total production-related waste (in pounds), including both toxic and recycled waste. The second is *Ln(WasteEmp)*, which is the natural logarithm of total waste divided by the number of employees at a facility.

We use two measures of workplace safety based on data provided by OSHA following Mendeloff and Gray (2005) and Caskey and Ozel (2017). *Citation* is the number of OSHA citations received after onsite inspections due to violations of OSHA standards involving work-related injuries and illnesses for a given establishment and year. *AvgPenalty* is the average dollar value of penalty assessed per citation. *AZ* is an indicator variable that equals 1 if the establishments are in Arizona after the 2007 LAWA; it equals zero for establishments in other states. *POST* equals 1 for the years after the implementation of the 2007 LAWA and zero otherwise. Our key variable of interest is the interaction term, *AZ*× *POST*, which captures how enforcement of the 2007 LAWA mandates affect labor productivity in the post-regulation period for treatment firms relative to control firms.

X is a vector of control variables on the establishment, macroeconomic, and state characteristics that could affect labor productivity. These control variables are lagged by one period. *EmpGrow* is the annual rate of change in the number of employees. S*aleGrow* is the annual rate of

growth in revenue. *Headq* equals 1 if the establishment is the headquarters; it equals zero otherwise. *Public* equals 1 if an establishment belongs to a public parent firm (or is a standalone public firm); it equals zero otherwise. *Govt* equals 1 if the establishment wins government contracts; it equals zero otherwise. *PayScore* measures an establishment's ability to pay its vendors. *Innov* is the cumulative number of patents over the past five years in a given industry, where an industry is defined by the first two digits of the SIC code. A reduction in the supply of unauthorized labor could motivate firms to adopt technology to maintain productivity (Lewis, 2011). Thus, we include *Innov* to control for the impact of technology advancement on productivity. *StateGDP* is state-level gross domestic product (GDP). It is less likely that economic adversity prompts tough immigration policies. Regardless, we include *StateGDP* to control local macroeconomic status. *Rightwork* equals 1 if a state where an establishment resides has a right-to-work law; it equals zero otherwise.

4. Main Results

4.1 Summary Statistics

Table 1 provides summary statistics for establishment-year observations for 2002 to 2013. Our final sample includes about 304,432 establishment-year observations, of which 3,958 belong to Arizona. Average annual sales per establishment are about $33 million. Headcount is about 183 on average, and the median is 80. The mean (median) revenue per employee is about $209,000 ($143,000). Figure 1 plots the time trend of labor productivity, which is the natural logarithm of total revenue over the number of employees of a facility for Arizona and other states, respectively. We see an overall rise in labor productivity across all states. However, labor productivity in Arizona surpasses other states starting in 2011.

< Insert Figure 1 about here>

The average amount of production-related waste per facility is about 0.51 million pounds annually. Figure 2 shows that both total waste production and waste per employee are much higher in Arizona than in other states. The average number of OSHA citations is 0.20, with a standard deviation of 1.77. The mean penalty for each citation is $76, with a standard deviation of approximately $756. Our unreported statistics show that the highest number of citations an establishment receives is 151, and the highest penalty is $70,000. Figure 3 shows that facilities in other states receive more citations and penalties than those in Arizona. The plots also show a sharp decrease in the number of OSHA citations and penalties after 2010, but facilities in Arizona experience large increases from 2002 to 2003 and from 2009 to 2011.

< Insert Figure 2 about here>

< Insert Figure 3 about here>

The average increase in the number of employees per year is less than 1%. The mean sales growth rate is 2.6%, but the median is -3.2%. About 22.5% of establishments are headquarters locations, and about 27.5% are public companies. Approximately 10.1% of our sample establishments are government contractors.

The Walls & Associates NETS database provides Dun & Bradstreet PAYDEX scores, which "reflects how a company has paid — or failed to pay — its bills each month for the past 24 months…. Companies receive a score between 1 and 100, where a higher number represents a greater likelihood that a business will pay its debts on time."[24] The mean (median) PAYDEX score (*PayScore*) in our sample is 68 (69), implying that these establishments pay bills between 15 and 20 days beyond terms.

Around 89% of our sample observations are in right-to-work states, and 15% are in southern states. About half (49%) of our sample facilities are in industries with low labor mobility, where labor

[24] Information regarding the D&B PAYDEX score is here: https://www.dnb.com/perspectives/finance-credit-risk/scores-db-business-credit-profile.html.

mobility is defined based on Donangelo (2014). Facilities that employ low-skilled workers account for 6% of our sample observations.[25] Few (0.3%) of our sample observations filed bankruptcy or relocated to another state.

<Insert Table 1 about here>

4.2 Univariate Analysis

Table 2 presents our univariate analysis and compares our key variables of interest for the pre-LAWA and post-LAWA periods in Arizona and other states, respectively. The first column shows business characteristics in Arizona. The average number of employees (*EMP*) is 193 pre-LAWA and 145 post-LAWA, with a mean difference of -48; in turn, the average number of employees per establishment (*EMP*) decreases by 48 after enactment of the 2007 LAWA. The growth rate in employee headcount is 1.20% pre-LAWA and 1.22% post-LAWA, showing an increase in employment growth after the 2007 LAWA. The univariate analysis also shows a significant increase in labor productivity (*Ln(SaleEmp)*) in Arizona. However, the amount of production-related waste (*Ln(Waste)*) and the waste per employee(*Ln(WasteEmp)*) decrease significantly post-LAWA. The number of citations (*Ln(Citation)*) is also much lower after the passage of the 2007 LAWA in Arizona; however, the amount of penalty due to OSHA violations (*Ln(AvgPenalty)*) is significantly higher than pre-LAWA.

The second column presents information for establishments in other states (control states). The average number of employees per establishment decreases by about 27 from 198 to 171, but the decrease is much smaller than in Arizona. The mean employee growth rate also sees a significant decrease of 0.69% from pre-LAWA to post-LAWA in other states. However, a notable difference in the change in labor productivity (*Ln(SaleEmp)*) for establishments in control states is that labor

[25] Based on Hanson, Liu, and McIntosh (2017), the following industries employ a high share of low-skilled labor: agriculture, construction, eating and drinking establishments, nondurable manufacturing, and personal services.

productivity falls at a much smaller rate (5.55%) on average compared to Arizona (8.01%). We also notice a substantial decrease in the number of OSHA citations and penalties in control states.

The univariate analysis provides a big picture of the changes in business characteristics due to the enactment of the 2007 LAWA in Arizona, compared to control states. We do not draw any direct conclusions from the univariate findings here, because firm characteristics and state-level macroeconomic characteristics could contaminate the results. In the next section, we conduct a multivariate analysis and control for various firm characteristics, state-level macroeconomics, and the establishment and year fixed effects.

<Insert Table 2 about here>

4.3 Labor Productivity

In this section, we explore our main research question, which is whether strict immigration laws have a significant impact on labor productivity at the establishment level. On one hand, when unauthorized workers are dismissed due to stringent immigration laws, firms lose certain productive skills. Businesses may experience extended job-matching processes due to the increased bargaining power of authorized workers, who might demand higher wages for the same position. In particular, unemployment costs are lower for authorized workers due to their eligibility for unemployment benefits (Acemoglu and Shimer, 1999). Alternatively, businesses can train authorized employees for new skills to fill vacant positions. That imposes extra costs on businesses that depend more on unauthorized immigrants and would reduce labor productivity after the passage of the 2007 LAWA.

On the other hand, Grey (1999) and Rosson (2012) suggest that industries that employ low-skilled immigrant workers encounter high employee turnover. Many businesses have employee-retention strategies to reduce the costs of turnover. For example, Oyer and Schaefer (2005) and Aldatmaz, Ouimet, and Van Wesep (2018) find that employee stock options can improve retention and reduce employee turnover. Guthrie (2001) finds a positive relationship between employee

retention and productivity. Therefore, we expect that employee turnover will decrease after the enactment of strict immigration laws if firms need to dismiss unauthorized workers and retain/hire authorized employees. The enhanced job security could incentivize employees to engage more in human capital and organizational capital (like culture) investments, and consequently, labor productivity could improve in Arizona after the enactment of the 2007 LAWA.

Table 3 presents our finding from difference-in-differences (DID) with establishment and year fixed effects and state clustering following equation (1). Again, our key variable of interest is the DID estimator *AZ x Post*. In column (1), we present findings for *EmpGrow,* which is the employee headcount growth rate at a facility. The results show that the coefficient on *AZ x Post* is positive and significant at the 10% level, implying that the 2007 LAWA has a positive impact on headcount on average. The average number of employees per establishment increases by 40 basis points in Arizona after the LAWA. In column (2), we replace employee growth rate (*EmpGrow*) with the natural logarithm of the number of employees (*Ln(Emp)*). Our results show similar evidence of an increase in the number of employees per facility in Arizona.

In column (3), we estimate labor productivity using the natural logarithm of sales per employee. Consistent with our second hypothesis, the coefficient of *AZ x Post* is positive and significant at the 1% level, implying that labor productivity in Arizona establishments improves significantly after the 2007 LAWA. Labor productivity increases by 3.6% after the enactment of the 2007 LAWA in Arizona, and the economic magnitude of the increase is relatively large. Additionally, we find that both *Ln(Emp)* and *EmpGrow* are negatively and significantly related to labor productivity (*Ln(SaleEmp)*). It seems that the scale of production does not drive the increase in labor productivity for establishments with an enlarged employment base.

On a separate note, the coefficient of *Ln(PayScore)* is positive and significant, suggesting that establishments with better bill-paying capabilities also have higher labor productivity. Firms can

replace human capital by adopting technology and incorporating innovation in the production process, which will increase production efficiency. Thus, we also control for innovation commitment (*Innov*). The coefficient of *Innov* is positive and significant, which is consistent with the view that technological innovation improves labor productivity.

<Insert Table 3 about here>

4.4 Labor Mobility and Labor Skills

Hall, Greenman, and Yi (2018) suggest that labor mobility is limited in the unauthorized labor market, and unauthorized employees are prone to being "trapped" in their jobs. Industries with high labor mobility may thus face fewer constraints in finding replacements for unauthorized employees when their states enact stringent immigration policies. Therefore, we expect the 2007 LAWA to have a large impact on labor productivity for facilities with low labor mobility in Arizona, and vice versa.

Authorized immigrants are often well educated and can obtain employment authorization through H-1B programs sponsored by employers. Many of them self-select into high-skilled industries due to H-1B visa restrictions and the demand for high-skilled workers in certain sectors. However, unauthorized immigrants, especially those not in the Deferred Action for Childhood Arrivals (DACA) program, often find jobs in the low-skilled labor market in order to avoid scrutiny of their background and legal documents.[26] Furthermore, the demand for low-skilled unauthorized immigrants has increased over time because natives generally have higher levels of education than unauthorized immigrants and are preferred for middle-skill and high-skill positions (Passel, 2005). Thus, we expect immigration policies to have a stronger impact on industries that have less-skilled workforces.

In table 4, we provide difference-in-differences-in-differences (DDD) analyses on labor productivity based on labor mobility and skills. Column (1) presents an estimation of how the 2007

[26] Many schools and universities offer education to students in the Deferred Action for Childhood Arrivals (DACA) program.

LAWA affects facilities with low labor mobility in Arizona. Our key variable of interest is the triple interaction term *Industry x Post x AZ*, where *Industry* equals one if an industry's labor mobility is lower than the industry median; it equals zero otherwise (Donangelo, 2014). The coefficient of *Industry x Post x AZ* is positive and significant at the 1% level, suggesting that labor productivity increases significantly in facilities with high labor mobility in Arizona after the enactment of the 2007 LAWA.

Column (2) presents our findings from regressions on labor productivity for facilities employing low-skilled workers. The coefficient of *Industry x Post x AZ* is also positive and significant, where *Industry* is an indicator variable for low-skilled industries including agriculture, construction, eating and drinking establishments, nondurable manufacturing, and personal services (Hanson, Liu, and McIntosh, 2017). These findings are consistent with our conjecture that immigration regulations have a more substantial impact on industries with low labor mobility and industries employing more low-skilled workers.

<Insert Table 4 about here>

4.5 Production-Related Wastes

The agency theory in Jensen and Meckling (1976) proposes that contractual relations exist between employers and employees, and thus the problems of agency costs and monitoring are unavoidable. Core and Guay (2001) suggest that companies use employee stock options as one mechanism to attract or retain employees who are value creators. John, Knyazeva, Knyazeva, (2015) argue that incentives between employees and shareholders are better aligned when employees' objective functions incorporate firm value. Strong labor rights ensure job security and hence can also boost production efficiency and labor productivity.

However, it is difficult to align the interests of employers and unauthorized employees due to the lack of incentive mechanisms. Low job security and low access to benefits such as retirement plans and health insurance may decrease commitment among unauthorized employees. Thus, operational

efficiency is more likely to decrease when the reliance on unauthorized labor increases. In turn, we expect production efficiency to increase for Arizona facilities after the enactment of the 2007 LAWA, which would be a benefit from employing authorized employees whose interests are better aligned with those of the employers.

To examine our conjecture that increased productivity after the 2007 LAWA in Arizona is driven by hiring authorized employees who can work more efficiently, we use production-related waste as a proxy for labor efficiency. We expect production-related waste for facilities in Arizona to decrease after the 2007 LAWA. Our model follows equation (2) except that we replace the dependent variable with two measures of production-related waste. We control for innovation in our model, as an alternative explanation could be that firms replace unauthorized immigrants with technology such as automation and robots, which can also increase production efficiency.

Table 5 provides our findings. In column (1), the dependent variable *Ln(Waste)* is the natural logarithm of total annual production-related waste in pounds for a given facility. The interaction term, *Post x AZ*, is negative and significant at the 10% level. In column (2), the dependent variable *Ln(WasteEmp)* is the natural logarithm of the total annual production-related waste scaled by number of employees in a given facility. The interaction term, *Post x AZ*, is negative but insignificant. The proxy for technology advancements, *Innov*, is not significantly related to production-related waste in both columns. Our evidence suggests that production efficiency has limited contribution to increased labor productivity in Arizona after the LAWA. Therefore, our evidence is inconclusive to support the human capital hypothesis.

<Insert Table 5 about here>

4.6 Workplace Safety

It is reasonable to speculate that business owners make up for lost productivity after firing unauthorized employees by extending work hours and workloads or assigning tasks not matched with

employee skills. Caskey and Ozel (2017) suggest that firms attempt to meet earnings expectations in a similar fashion by sacrificing employee welfare, and work-related injuries are significantly higher in firms that are under stronger pressure to meet earnings targets.

Another explanation is that businesses reduce their investments in employee safety and welfare because of increased operating expenses and compliance costs. After the rollout of strong immigration regulations, they may allocate fewer financial resources toward improving workplace safety. For example, Cohn and Wardlaw (2016) show that financial constraints hurt firms' investments in workplace safety. Moreover, Bohn, Lofstrom, and Raphael (2015) find no evidence that the 2007 LAWA improves the labor market outcomes for authorized low-skilled workers. Thus, it is plausible that businesses in Arizona attempt to increase labor productivity at the expense of employee welfare.

Table 6 presents our findings estimated following equation (1) with establishment and year fixed effects. Standard errors are cluster-corrected at the state level. We measure workplace safety using OSHA data. Specifically, we use the natural logarithm of the number of OSHA citations, *Ln*(*Citation)*, and the natural logarithm of the monetary penalty per citation, *Ln*(*AvgPenalty)*. Columns (1) and (2) present results for *Ln*(*Citation)* and *Ln*(*AvgPenalty)* separately. In column (1), the coefficient of *AZ x Post* is positively associated with the number of workplace safety citations, *Ln*(*Citation)*, and is significant at the 10% level, which conflicts with our univariate finding. Column (2) presents the model of the average penalty for workplace safety violations and shows that the interaction term, *AZ x Post*, is positive and significant at the 1% level. Our overall results show that work-related injuries and illnesses increase significantly after the 2007 LAWA. Though it is possible that inexperience or unfamiliarity among new hires drives the safety violations, the evidence, together with our findings in section 4.2, implies that businesses in Arizona sacrifice employee welfare in order to increase labor productivity or make up for lost productivity when they need to comply with immigration regulations.

Our findings are consistent with Caskey and Ozel (2017), which also finds more work-related safety problems in firms chasing expected earnings.

<Insert Table 6 about here>

5. Robustness Checks

In table 7, we conduct a dynamic DID analysis and examine the timing of changes in labor productivity, production-related waste, and workplace safety issues around the adoption of the 2007 LAWA in Arizona. We expect the most potent effect of the 2007 LAWA to occur after its adoption rather than before. We include in our models the following variables: *AZ(t=-2)*, *AZ(t=-1)*, *AZ(t=0)*, *AZ(t=+1)*, and *AZ(t>=+2)*, which equal 1 if an establishment is in Arizona two years before it adopts the LAWA, one year before it adopts the LAWA, the year it adopts the LAWA, one year after it adopts the LAWA, and two years or more after it adopts the LAWA, respectively; it equals zero otherwise. Column (1) suggests that the 2007 LAWA starts to affect labor productivity in 2007. We see that the effect lingers into 2009 and following years, which can be explained by the long-term impact of immigration regulations in Arizona.

A surprising finding is that *AZ(t=-1)* is also significant and positive. We argue that the increase in labor productivity before the 2007 LAWA could be driven by the Comprehensive Immigration Reform of 2006 and the Secure Fence Act of 2006 in the United States. Column (2) and column (3) show that the 2007 LAWA has no significant effect on production-related waste after it was enacted. In column (4) and column (5), the coefficients of *AZ(t=-2)*, *AZ(t=-1)*, *AZ(t=0)*, and *AZ(t=+1)* are all negative; however, the coefficient of *AZ(t>=+2)* is positive and significant, implying that establishments in Arizona are inundated with workplace safety issues two years after the LAWA becomes effective. This finding is not surprising, as it might take time to expose and detect workplace safety issues.

<Insert Table 7 about here>

In Table 8, we perform several sensitivity tests to validate our arguments. One of our biggest concerns in the study is sample selection, because a facility does not randomly choose its location. To address sample-selection bias, we conduct a couple of robustness tests. First, Peri (2012) suggests that the U.S.-Mexico border is the main point of entry for Mexican immigrants to the United States, and Bohn and Lofstrom (2012) show that the 2007 LAWA has a significant impact on noncitizen Hispanic men only. We restrict our sample to include establishments in states adjacent to Mexico and report our results in column (1). The interaction term, *AZ x Post*, is still positive and significant for labor productivity. Second, we restrict our sample to establishments in counties within 50 miles of state borders. Column (2) shows consistent results on the impact of the 2007 LAWA. Our results are consistent with Sequeira, Nunn, and Qian (2019) showing no spillover effect from immigration due to the reallocation of economic activities. Based on these two tests, we conclude that sample-selection bias has little impact on our baseline results. Third, to address concerns about confounding effects from subsequent regulations or other factors, we limit our sample period to three years before and three years after the 2007 LAWA. We report the results in column (3). Column (4) and column (5) present different model specifications for including industry-year paired fixed effects and year fixed effects separately; the results are consistent. In column (6), we replace labor productivity with the annual change in establishment revenue and find that the coefficient of the interaction term, *AZ x Post*, is positive and significant at the 10% level. These findings support our argument that strict immigration regulations have a sizable economic impact on labor productivity.

<Insert Table 8 about here>

6. Conclusion

This paper explores whether regulating the low-skilled labor market matters in corporate finance and firm performance. We explore a plausibly exogenous shock in the low-skilled labor market via state

regulations on unauthorized immigrants, who are a significant component of the low-skilled labor force. Specifically, we examine whether the implementation of the 2007 Legal Arizona Worker Act (LAWA), the most stringent state-level immigration regulation at the time, affects labor productivity. Using a difference-in-differences (DID) research design, our findings suggest that businesses in Arizona do experience significant improvements in labor productivity after the law takes effect. The increase is more pronounced in industries with low labor mobility and low labor skills.

We next explore how state immigration policies affect labor productivity. Our evidence provides limited support for the notion that the increase in labor productivity comes from higher production efficiency among authorized workers. We find that establishments in Arizona receive more OSHA citations and face higher penalties after the 2007 LAWA takes effect. This suggests that businesses may increase labor productivity or make up for lost productivity at the expense of employee welfare. Overall, our evidence implies that state regulations on unauthorized immigration could be a double-edged sword. Our study also provides important policy implications for immigration regulations and employee welfare protections.

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Figure 1

Time-Series Labor Productivity

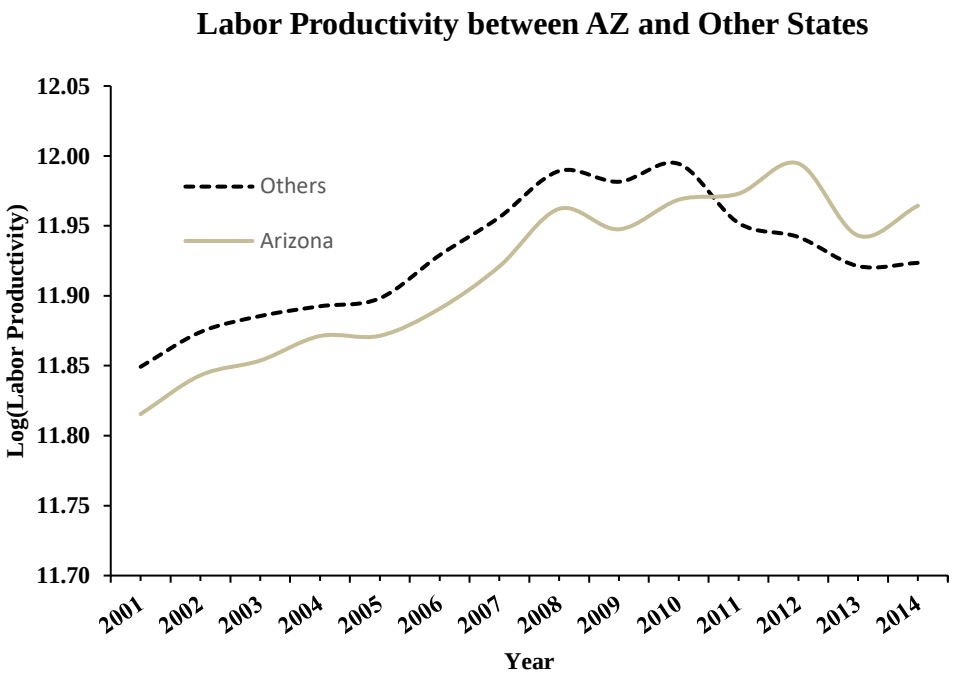
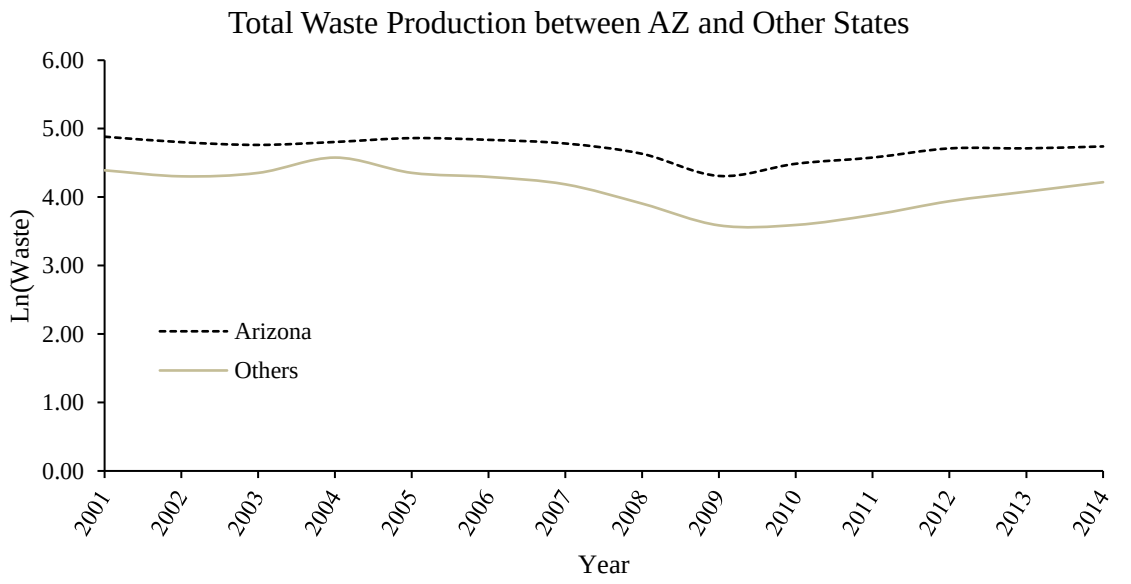


Figure 2

Time-Series Waste Production



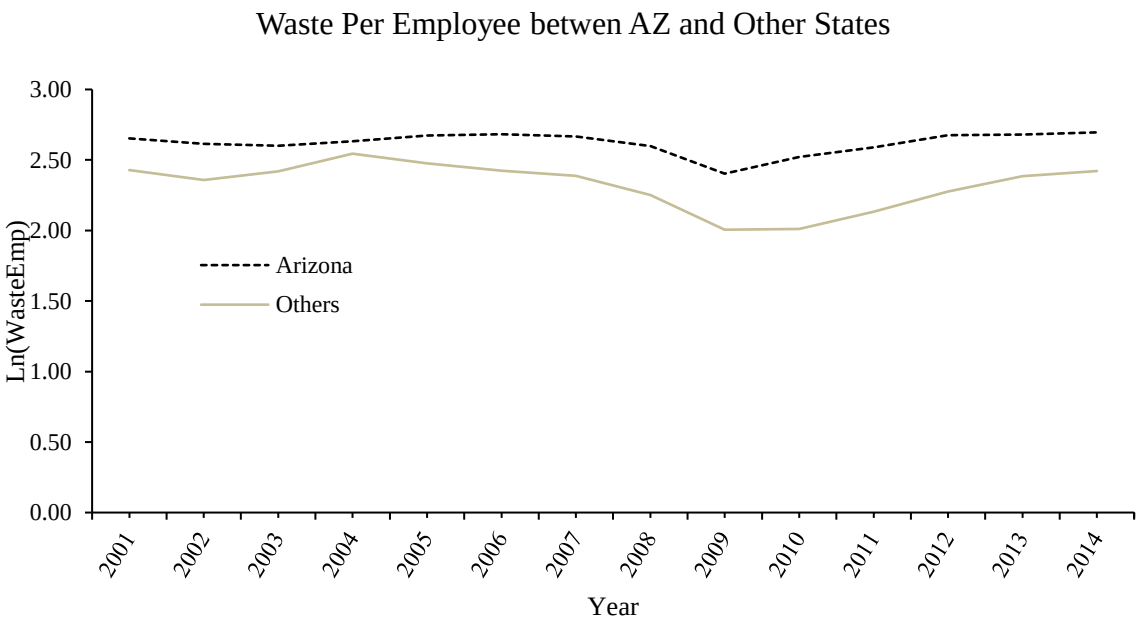
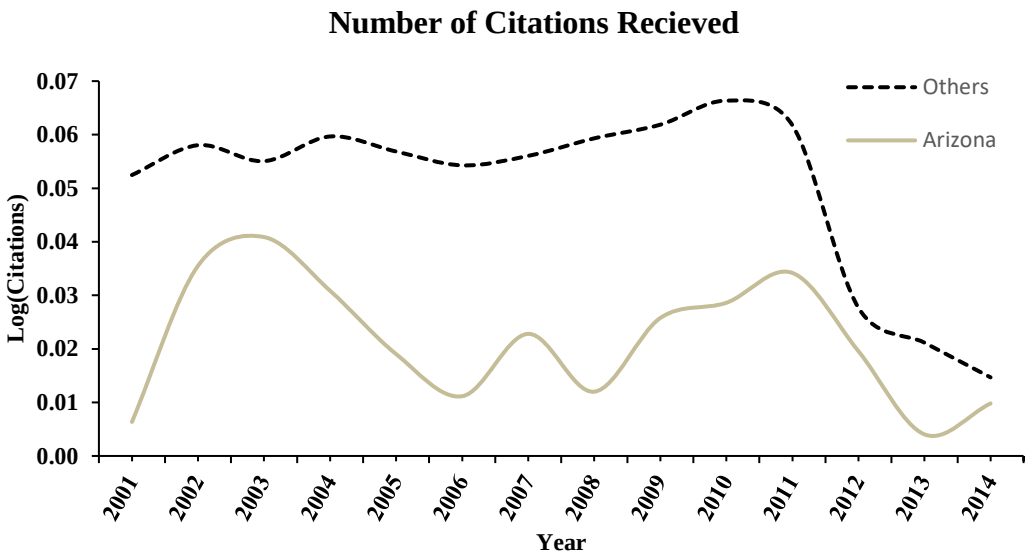


Figure 3

Time-Series Workplace Safety Violations



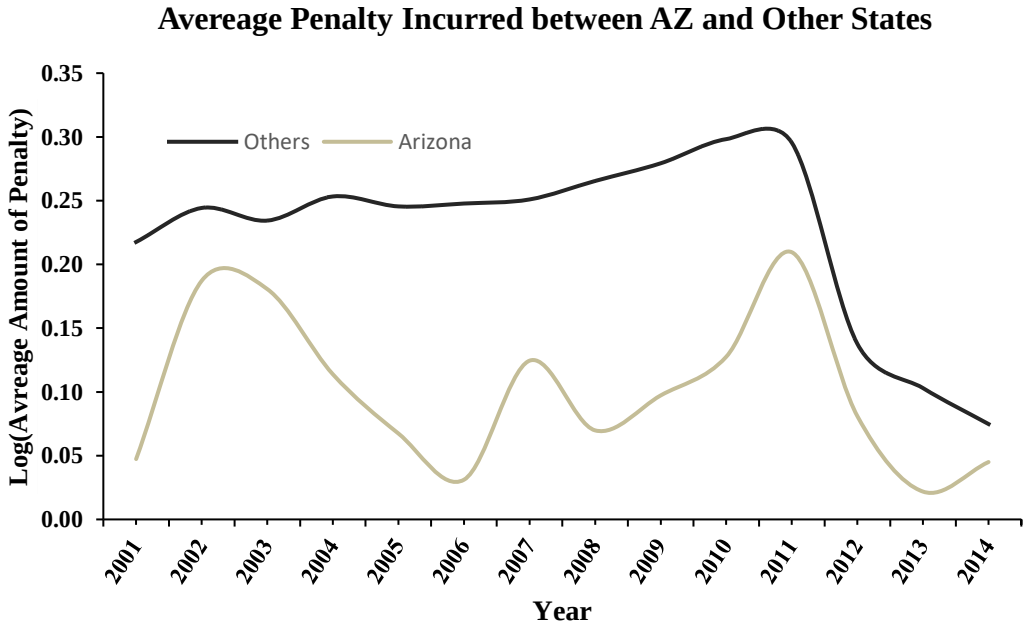


Table 1
Summary Statistics

AZ equals 1 if an establishment is in Arizona and zero otherwise. *Post* equals 1 for years after 2007 and zero for years before. *Post x AZ* is the interaction term of *AZ* and *Post*. *Sale* is total revenue. *Emp* is the total number of employees of an establishment. *SalesEmp* is revenue per employee. *Ln(SalesEmp)* is the log-transformed value of *SalesEmp*. *Ln(Waste)* is the natural logarithm of total waste after production, including both toxic and recycled wastes. *Ln(WasteEmp)* is production-related waste per employee. *Citation* is the number of citations received for OSHA violations regarding work-related injuries and illnesses in a given establishment and year.[27] *AvgPenalty* is average dollar penalty per citation. *EmpGrow* is the annual rate of growth in employee headcount. *SaleGrow* is the annual rate of growth in revenue. *Headq* equals 1 if the establishment is a headquarters and zero otherwise. *Public* equals 1 if an establishment is part of a public firm and zero otherwise. *Govt* equals 1 if government contracts are awarded and zero otherwise. *PayScore* measures an establishment's ability to pay vendors. *Capx* is industry-level capital intensity, measured as capital expenditure divided by assets (from Compustat). *Innov* is the cumulative number of patents over the past five years in a given industry, where an industry is defined by the first two digits of the SIC code. *StateGDP* is state-level gross domestic product (GDP). *Rightwork* equals 1 if an establishment's home state has a right-to-work law and zero otherwise. *LowMobil* equals 1 if an industry's mobility is lower than the industry median and zero otherwise. *LowSkilled* equals 1 if an industry has a higher share of low-skilled labors and zero otherwise. Industries reliant on low-skilled labor are agriculture, construction, eating and drinking establishments, nondurable manufacturing, and personal services (Hanson, Liu, and McIntosh, 2017). *Outbus* equals 1 if an establishment files bankruptcy in a given year and zero otherwise. *Outstate* equals 1 if an establishment moves to another state in a given year and zero otherwise.

	N	Mean	Median	25th Pctl.	75th Pctl.	Std. Dev.
AZ	304,432	0.013	0.000	0.000	0.000	0.112
Post	304,432	0.524	1.000	0.000	1.000	0.499
AZ x Post	304,432	0.007	0.000	0.000	0.000	0.082
Sale	304,432	33.049	12.396	4.571	31.500	87.537
EMP	304,432	183.431	80.000	30.000	200.000	403.210
Ln(Emp)	304,432	4.334	4.382	3.401	5.298	1.322
SaleEmp	304,432	0.209	0.143	0.103	0.217	1.172
Ln(SaleEmp)	304,432	11.945	11.870	11.547	12.289	0.587
Waste	304,432	0.507	0.000	0.000	0.023	6.365
Ln(Waste)	304,432	4.678	0.000	0.000	10.053	5.465
Ln(WasteEmp)	304,432	2.608	0.000	0.000	5.437	3.420
Citation	304,432	0.203	0.000	0.000	0.000	1.769

[27] https://enforcedata.dol.gov/views/data_summary.php

Ln(Citation)	304,432	0.056	0.000	0.000	0.000	0.324
AvgPenalty	304,432	76.233	0.000	0.000	0.000	755.504
Ln(AvgPenalty)	304,432	0.251	0.000	0.000	0.000	1.332
EmpGrow	304,432	0.007	0.000	0.000	0.000	0.169
SaleGrow	304,432	0.026	0.000	-0.032	0.049	0.265
Headq	304,432	0.225	0.000	0.000	0.000	0.417
Public	304,432	0.275	0.000	0.000	1.000	0.447
Govt	304,432	0.101	0.000	0.000	0.000	0.301
PayScore	304,432	67.608	69.000	63.000	75.000	10.224
Capx	304,432	0.046	0.042	0.036	0.051	0.038
Innov	304,432	3.439	0.000	0.000	9.241	4.960
StateGdp	304,432	0.525	0.385	0.218	0.597	0.493
Ln(StateGDP)	304,432	12.797	12.861	12.293	13.299	0.883
RightWork	304,432	0.892	1.000	1.000	1.000	0.310
South States	304,432	0.151	0.000	0.000	0.000	0.358
LowMobil	259,364	0.492	0.000	0.000	1.000	0.500
LowSkilled	304,358	0.061	0.000	0.000	0.000	0.239
Outbus	272,669	0.003	0.000	0.000	0.000	0.052
Outstate	302,182	0.003	0.000	0.000	0.000	0.057

Table 2
Univariate Results

This table presents the mean value and differences in the number of employees (*EMP*), employee growth (*EmpGrow*), labor productivity (*Ln(SaleEmp)*), total production waste (Ln(*Waste*)), production waste per employee (Ln(*WasteEmp*)), number of citations received (*Ln(Citation)*), and average penalty due to safety-related violations in the workplace (*Ln(AvgPenalty)*) for Arizona and the other 49 U.S. states. *PreLAWA* (or *PostLAWA*) is years prior to 2008 (or after 2007), the year the Legal Arizona Worker Act was enforced. *PostLAWA – PreLAWA* reports the mean difference in variables between *PostLAWA* and *PreLAWA*. ***, **, and * indicate significance at the 1% 5%, and 10% levels, respectively.

	Arizona			Other States		
	PreLAWA	PostLAWA	[1] (PostLAWA - PreLAWA)	PreLAWA	PostLAWA	[2] (PostLAWA - PreLAWA)
EMP	193.2126	144.7884	-48.4242***	197.5609	170.9803	-26.5806***
EmpGrow	0.0120	0.0122	0.0002***	0.0110	0.0041	-0.0069***
Ln(SaleEmp)	11.8963	11.9764	0.0801***	11.9157	11.9712	0.0555***
Ln(Waste)	4.3641	3.8092	-0.5550***	4.8129	4.5698	-0.2430***
Ln(WasteEmp)	2.4569	2.1728	-0.2840***	2.6528	2.5757	-0.0771***
Ln(Citation)	0.0257	0.0203	-0.0055***	0.0599	0.0530	-0.0069***
Ln(AvgPenalty)	0.1023	0.1048	0.0025***	0.2618	0.2439	-0.0179***

Table 3
LAWA and Labor Productivity

This table presents the results of a difference-in-differences (DID) and dynamic regressions. The dependent variables are *EmpGrow* and *Ln(SalesEmp)*. *EmpGrow* is the annual rate of employee headcount growth. *SalesEmp* is sales per employee. *Ln(Emp)* is the log-transformed number of employees at an establishment. *Ln(SalesEmp)* is the log-transformed value of *SalesEmp*. *AZ* equals 1 if an establishment is in Arizona and zero otherwise. *Post* equals 1 for years after 2007 and zero for years before. *Post x AZ* is the interaction term of *AZ* and *Post*. All regressions include establishment and year fixed effects, but we omit coefficients. The numbers in parentheses are *t*-values clustered at the state level. ***, **, and * indicate significance at the 1% 5%, and 10% levels, respectively.

	(1)	(2)	(3)
	EmpGrow	*Ln(Emp)*	*Ln(SaleEmp)*
AZ	0.040**	-0.289	-0.003
	(2.05)	(-1.64)	(-0.06)
Post	-0.005	-0.056**	-0.125***
	(-1.12)	(-2.15)	(-11.04)
AZ x Post	0.004*	0.021*	0.036***
	(1.92)	(1.88)	(11.87)
Ln(Emp)	0.101***	--	-0.013***
	(50.53)	--	(-5.49)
EmpGrow	--	0.572***	-0.020***
	--	(63.64)	(-7.98)
Ln(PayScore)	-0.001	0.023***	0.007**
	(-0.44)	(3.04)	(2.03)
Ln(StateGDP)	-0.001	-0.001	0.000
	(-0.09)	(-0.05)	(0.02)
RightWork	0.002	0.002	0.008
	(1.18)	(0.22)	(1.23)
Capx	0.007	0.017	-0.004
	(1.09)	(0.58)	(-0.30)
Innov	0.001	-0.000	0.008***
	(1.15)	(-0.04)	(8.58)
Constant	-0.422***	4.256***	11.981***
	(-5.19)	(15.93)	(128.25)
Year FE	YES	YES	YES
Establishment FE	YES	YES	YES
Observations	304,432	304,432	304,432
Adj. R-Squared	0.084	0.915	0.883

Table 4
Subsample Analyses: Labor Characteristics

The table presents results of subsample analyses by industry memberships. *LowMobil* equals 1 if an industry's mobility is lower than the industry median and zero otherwise (Donangelo, 2014). *Low-skilled* equals 1 if an industry has a higher share of low-skilled labor and zero otherwise. Industries with low-skilled labor include agriculture, construction, eating and drinking establishments, nondurable manufacturing, and personal services (Hanson, Liu, and McIntosh, 2017). *AZ* equals 1 if an establishment is in Arizona and zero otherwise. *Post* equals 1 for years after 2007 and zero for years before 2007. *Post x AZ* is the interaction term of *AZ* and *Post*. All regressions include establishment and year fixed effects, but we omit coefficients. The numbers in parentheses are *t*-values clustered at the state level. ***, **, and * indicate significance at the 1% 5%, and 10% levels, respectively.

	(1)	(2)
	Ln(SaleEmp)	
	Industry=LowMobil	*Industry=LowSkilled*
Industry x Post x AZ	0.028***	0.013*
	(6.31)	(1.84)
Industry x AZ	-0.011	--
	(-1.42)	--
Industry x Post	-0.010***	0.032***
	(-2.88)	(4.72)
Post x AZ	0.026***	0.029***
	(6.42)	(9.26)
AZ	-0.007	-0.002
	(-0.10)	(-0.03)
Post	-0.094***	-0.110***
	(-7.00)	(-9.64)
Industry	-0.004	--
	(-0.86)	--
Ln(Emp)	-0.012***	-0.014***
	(-4.38)	(-5.54)
EmpGrow	-0.020***	-0.020***
	(-6.89)	(-7.91)
Ln(PayScore)	0.007*	0.007**
	(1.84)	(2.01)
Ln(StateGDP)	-0.003	-0.001
	(-0.44)	(-0.08)
RightWork	0.002	0.008
	(0.40)	(1.23)
Capx	-0.002	-0.006
	(-0.14)	(-0.49)
Innov	0.008***	0.009***

	(7.40)	(9.94)
Constant	12.002***	11.968***
	(127.18)	(126.78)
Year FE	YES	YES
Facility FE	YES	YES
Observations	259,364	304,358
Adj. R-Squared	0.879	0.883

Table 5
LAWA and Production Waste

This table presents the results of a difference-in-differences (DID) and dynamic regressions. *Ln(Waste)* is the natural logarithm of the total amount of waste after production, including toxic and recycled wastes. *Ln(WasteEmp)* is waste per employee. *AZ* equals 1 if an establishment is in Arizona and zero otherwise. *Post* equals 1 for years after 2007 and zero for years before 2007. *Post x AZ* is the interaction term of *AZ* and *Post*. All regressions include establishment and year fixed effects, but we omit coefficients. The numbers shown in parentheses are *t*-values clustered at the state level. ***, **, and * indicate significance at the 1% 5%, and 10% levels, respectively.

	(1) *Ln(Waste)*	(2) *Ln(WasteEmp)*
AZ	2.051*	1.502*
	(1.79)	(1.86)
Post	-0.286**	-0.223***
	(-2.54)	(-2.96)
AZ x Post	-0.116*	-0.058
	(-1.68)	(-1.41)
Ln(Emp)	0.295***	-0.327***
	(11.94)	(-14.32)
EmpGrow	-0.164***	-0.089***
	(-5.34)	(-4.55)
Ln(PayScore)	0.546***	0.307***
	(9.38)	(8.30)
Ln(StateGDP)	0.267	0.138
	(1.30)	(1.07)
RightWork	-0.028	-0.018
	(-0.43)	(-0.47)
Capx	0.378**	0.230**
	(2.29)	(2.28)
Innov	-0.013	-0.001
	(-1.25)	(-0.21)
Constant	-2.281	0.997
	(-0.84)	(0.60)
Year FE	YES	YES
Facility FE	YES	YES
Observations	304,432	304,432
Adj. R-Squared	0.803	0.818

Table 6

LAWA and Workplace Safety

This table presents the results of the difference-in-differences (DID) regressions. *Citation* is the number of OSHA citations for violations of OSHA standards on work-related injuries and illnesses in a given establishment and year. *AvgPenalty* is the average penalty dollar value. *AZ* equals 1 if an establishment is in Arizona and zero otherwise. *Post* equals 1 for years after 2007 and zero for years before 2007. *Post x AZ* is the interaction term of *AZ* and *Post*. All regressions include establishment and year fixed effects, but we omit coefficients. The numbers in parentheses are *t*-values clustered at the state level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)
	Ln(Citations)	*Ln(AvgPenalty)*
AZ	-0.025	-0.097*
	(-1.54)	(-2.00)
Post	-0.053***	-0.220***
	(-6.25)	(-5.91)
AZ x Post	0.006*	0.040***
	(1.81)	(2.79)
Ln(Emp)	0.003*	0.009
	(1.88)	(1.26)
EmpGrow	0.000	-0.009
	(0.05)	(-0.47)
Ln(PayScore)	0.005	0.013
	(1.36)	(1.00)
Ln(StateGDP)	-0.006	-0.012
	(-0.94)	(-0.49)
RightWork	0.025***	0.128**
	(3.95)	(2.55)
Capx	0.003	0.030
	(0.48)	(0.86)
Innov	0.001*	0.004
	(1.75)	(1.35)
Constant	0.081	0.215
	(0.99)	(0.69)
Year FE	YES	YES
Establishment FE	YES	YES
Observations	304,432	304,432
Adj. R-Squared	0.054	0.068

Table 7
Dynamic Effect

This table presents the results of the dynamic regressions. *AZ(t= -2, -1, 0, +1, or ≥+2)* equals 1 if an establishment is in Arizona two years before it adopts the LAWA, one year before it adopts the LAWA, the year it adopts the LAWA, one year after it adopts the LAWA, and two years or more after it adopts the LAWA, respectively. All regressions include control variables used in table 3 and establishment and year fixed effects, but we omit coefficients. The numbers in parentheses are *t*-values clustered at the state level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)
	Ln(SaleEmp)	*Ln(Waste)*	*Ln(WasteEmp)*	*Ln(Citations)*	*Ln(AvgPenalty)*
AZ(t=-2)	-0.002	0.154*	0.114**	-0.014***	-0.072***
	(-0.81)	(1.73)	(2.20)	(-5.63)	(-7.30)
AZ(t=-1)	0.006***	0.038	0.067	-0.005	0.010
	(2.97)	(0.53)	(1.46)	(-1.33)	(0.71)
AZ(t=0)	0.016***	0.036	0.066	-0.018***	-0.051***
	(4.78)	(0.45)	(1.40)	(-5.30)	(-3.39)
AZ(t=+1)	0.006**	0.058	0.051	-0.013***	-0.040**
	(2.13)	(0.85)	(1.16)	(-3.08)	(-2.55)
AZ(t≥+2)	0.054***	-0.047	0.007	0.012***	0.069***
	(13.18)	(-0.70)	(0.17)	(3.00)	(3.79)
Controls	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
Establishment FE	YES	YES	YES	YES	YES
Observations	304,432	304,432	304,432	304,432	304,432
Adj. R-Squared	0.883	0.803	0.818	0.054	0.068

Table 8
Sensitivity Analyses

Column (1) reports the results of a sample that includes establishments in states adjacent to Mexico only. Column (2) reports the results from a sample of establishments in counties within 50 miles of state borders. Column (3) reports the results from a sample of establishments within three years before and after 2007. Column (4) reports the result from the *industry x year* fixed-effects model. Column (5) reports the results from the firm fixed-effects model. The dependent variable is *Ln(SalesEmp)* in columns (1) – (5). Column (6) reports the results that replace the dependent variable with sales growth (*SalesGrow*). All regressions include a different dimension of fixed effects, but we omit coefficients. The numbers in parentheses are *t*-values clustered at the state level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1) Only States Adjacent to Mexico	(2) Only Counties within 50 Miles of State Borders	(3) Only within -3 and +3 Years	(4) Industry x Year Fixed Effect	(5) Firm Fixed Effect	(6) *SaleGrow* as a Dependent Variable
AZ	-0.154***	-	0.012	0.006	0.000	0.003
	(-3.24)	-	(0.42)	(0.14)	(0.01)	(0.11)
Post	-0.081**	-0.347**	0.026***	-	-	-0.005
	(-2.39)	(-2.78)	(17.29)	-	-	(-1.21)
AZ x Post	0.034***	0.032*	0.009***	0.033***	0.029***	0.003**
	(7.51)	(2.03)	(3.76)	(10.93)	(8.54)	(2.10)
Controls	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Year x Industry FE	NO	NO	NO	YES	YES	NO
Firm FE	NO	NO	NO	NO	YES	NO
Establishment FE	YES	YES	YES	YES	NO	YES
Observations	45,990	988	171,505	304,432	304,432	304,432
Adj. R-Squared	0.896	0.920	0.947	0.886	0.740	0.576

Appendix A
LAWA and Business Risks

Bohn, Lofstrom, and Raphael (2014) find that the 2007 LAWA has a negative impact on the local population of immigrants who are most likely to be unauthorized, implying that the 2007 LAWA could reduce the supply of unauthorized immigrants in the low-skilled labor market. Strict immigration regulations also can increase barriers to entry for labor-intensive businesses or force them to relocate. In turn, businesses could incur greater business risks, such as bankruptcy risk and relocation risk, due to labor market frictions.

If unauthorized immigrants have skills that are not transferrable and that authorized workers cannot provide, we expect that businesses relying on these unauthorized immigrants in Arizona increase their business risks. The probability of bankruptcy or relocation to another state where such immigrant policies do not exist will rise. Higher operating costs due to replacing unauthorized immigrants could also amplify financial constraints for businesses in Arizona, leading to higher business risks. However, Bohn and Lofstrom (2012) suggest that the 2007 LAWA has no significant impact on compensation rates for most workers, except noncitizen Hispanic men with high school diplomas or less in Arizona. Furthermore, unauthorized immigrants are a large percentage of the low-skilled labor market, where labor skills in demand are usually transferrable through training and teaching. Therefore, we do not expect to see substantial changes in business risks for establishments in Arizona.

Our proxies for business risks are the probability of bankruptcy filing, *Outbus,* and the probability of relocating to another state, *Outstate*, respectively. *Outbus* equals 1 if an establishment files bankruptcy in a given year and zero otherwise. *Outstate* equals 1 if an establishment moves to another state in a given year and zero otherwise. To test our conjectures, we conduct the DID test using a logistic model that estimates the probability of bankruptcy and the likelihood of relocating to another state, respectively. We include industry and year fixed effects, and we cluster standard errors at the state level in our model specification. Table B1 presents our findings. Our key variable of interest is *AZ x Post* — the DID estimator. Column (1) presents the logit estimation of a business' probability of going bankrupt. *AZ x Post* is statistically significant at the 1% level, suggesting that the 2007 LAWA makes a difference in the probability of bankruptcy. The coefficient of *Public* is positive and significant, suggesting that public establishments are more likely to go bankrupt perhaps due to additional

regulations and scrutiny. Government contractors are less likely to go bankrupt. Businesses with lower Dun & Bradstreet PAYDEX scores have a higher likelihood of bankruptcy.

Column (2) presents the logit estimation of a business' likelihood of relocating to another state. Similar to column (1), *AZ x Post* is not significant. Thus, the 2007 LAWA has no significant impact on an establishment's probability of leaving Arizona. Interestingly, we observe that *Ln(Emp)* is negative and significant, suggesting that firms that depend more on employees are less likely to relocate. *Headq* is positive and significant, suggesting that headquarter establishments are more likely to relocate. *Ln(PayScore)* is negative and significant, suggesting that businesses with lower Dun & Bradstreet PAYDEX scores are also more likely to relocate. Overall, our findings in table 2 suggest that the 2007 LAWA has no significant impact on the business risks of establishments in Arizona.

Table A1

The LAWA and Business Risks

This table presents the results of logistics regressions where the dependent variables are proxy variables of business risks, *Outbus* and *Outstate*. *Outbus* equals 1 if an establishment files bankruptcy in a given year and zero otherwise. *Outstate* equals 1 if an establishment moves to another state in a given year and zero otherwise. *AZ* equals 1 if an establishment is in Arizona and zero otherwise. *Post* equals 1 for years after 2007 and zero for years before 2007. *Post x AZ* is the interaction term of *AZ* and *Post*. All regressions include industry and year fixed effects, but we omit coefficients. The numbers in parentheses are *t*-values clustered at the state level. ***, **, and * indicate significance at the 1% 5%, and 10% levels, respectively.

	(1)	(2)
	Pr(Outbus=1)	*Pr(Outstate=1)*
AZ	0.360***	-0.223**
	(4.52)	(-2.13)
Post	-0.996	0.819*
	(-1.38)	(1.92)
AZ x Post	0.365***	0.012
	(2.97)	(0.12)
Ln(Emp)	0.000	-0.190***
	(0.01)	(-6.04)
EmpGrow	-0.214	0.013
	(-0.91)	(0.05)
Headq	-0.042	0.862***
	(-0.43)	(10.43)
Public	0.232***	0.443***
	(3.08)	(5.32)
Govt	-0.713***	-0.228*
	(-5.07)	(-1.74)
Ln(PayScore)	-1.432***	-0.636***
	(-22.40)	(-6.46)
Ln(StateGDP)	0.053	-0.063
	(1.31)	(-0.67)
RightWork	0.233*	-0.048
	(1.95)	(-0.45)
Capx	0.601	-2.460
	(1.10)	(-0.67)
Innov	0.030	0.007
	(0.47)	(0.21)
Constant	-9.612***	-8.995***
	(-11.93)	(-8.39)

Year FE	YES	YES
Industry FE	YES	YES
Observations	272,669	302,182
Adj. R-Squared	0.170	0.0433