NBER WORKING PAPER SERIES

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Working Paper 27928
http://www.nber.org/papers/w27928

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
October 2020

We thank Pat Kline, Enrico Moretti and Michael Reich for useful suggestions. We are grateful to Jon Piqueras for outstanding research assistance. Lindner acknowledges financial support from the Economic and Social Research Council (new investigator grant, ES/T008474/1). Dube acknowledges financial support from the Russell Sage Foundation. The views expressed herein are those of the authors and do not necessarily reflect the views of the National Bureau of Economic Research.

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NBER Working Paper No. 27928
October 2020
JEL No. J01,J18,J2,J23,J3,J31,J38,J8,J88

ABSTRACT

Cities are increasingly setting their own minimum wages, and this trend has accelerated sharply in recent years. While in 2010 there were only three cities with their own minimum wages exceeding the state or federal standard, by 2020 there were 42. This new phenomenon begs the question: is it desirable to have city-level variation in minimum wage polices? We discuss the main trade-offs emerging from local variation in minimum wage polices and evaluate their empirical relevance. First, we document what type of cities raise minimum wages and we discuss how these characteristics can potentially impact the effectiveness of city-level minimum wage policies. Second, we summarize the evolving evidence on city-level minimum wage changes and provide some new evidence of our own. Early evidence suggests that the impact of the policy on wages and employment to date has been broadly similar to the evidence on state and federal-level minimum wage changes. Overall, city-level minimum wages seem to be able to tailor the policy to local economic environment without imposing substantial distortions in allocation of labor and businesses across locations.

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1 Introduction

To date, 42 cities in the United States have instituted minimum wages above the state or federal level. Out of these cities, 22—including San Francisco, Seattle, Los Angeles, and Washington D.C—have a minimum wage that is $15.00 per hour or more, a level that was unthinkable just a few years ago. Moreover, these policies have also had a broader impact by changing the general political landscape for minimum wage policies. First, these campaigns saw advocates moving their focus from state and federal government to city councils, mayors and voters via ballot initiatives. Subsequently, state legislatures in states like California or Washington responded to the city-wide minimum wages by passing large state-wide increases of their own. In contrast, in some conservative-leaning states, state legislatures passed laws pre-empting the city-wide mandate. Overall, city-wide minimum wages have played an important role both by changing wages in some of the largest and most dense labor markets in the US, and by likely re-shaping the policy terrain more broadly.[3]

The growing number of cities with minimum wages naturally begs the question: is local variation in minimum wage polices a good idea? While there is an extensive literature on economic consequences of minimum wages, most of the literature to date has focused on state or federal-level changes. This gap is noteworthy because city-level minimum wage changes can have potentially different implications than changes that affect a whole state or the country. For instance, city boundaries are porous, and for many businesses it might be easy to relocate to a few miles outside of the city boundaries. As a result, the same type of distortion that may be present to some extent for state-level minimum wages could be much larger for minimum wage changes that are restricted to cities.

[3] While we mainly focus here on US evidence, city or local minimum wages are also present in other countries. There are 15 countries (besides the US) with some type of geographical differentiation in minimum wages: Bangladesh, China, India, Indonesia, Japan, Pakistan, Philippines, Vietnam, Portugal, Switzerland, Burundi, Canada, Malawi, Tanzania and Kenya. Among these Bangladesh, China, India, Indonesia, Burundi and Kenya has city-level minimum wages. Paki/stan has a different minimum wage in Islamabad Capital Territory, which is federal territory (like DC). Portugal has different minimum wage for (archipelagos) Azores and Madeira. Malawi's minimum wage differentiates between urban versus rural. Tanzania's minimum wage differentiates between mainland and (archipelago) Zanzibar. The rest of countries have state/province variation. Switzerland has two cantons (Jura and Neuchatel) and the canton of Geneva just passed a law to introduce minimum wage. Therefore, around 6-10 countries has city minimum wages depending on the definition (Tijdens and van Klaveren, 2019).

On the other hand, local variation in the level of minimum wages can better tailor the policy to local circumstances. For instance, in high wage cities like San Francisco, state-level minimum wage policies are often not very binding; to push up wages of workers living (or working) in these cities, higher minimum wages are needed. The same minimum wage that might raise concerns about unintended consequences in rural areas in California could at the same time be too low for San Francisco given the very high cost of living in the city.

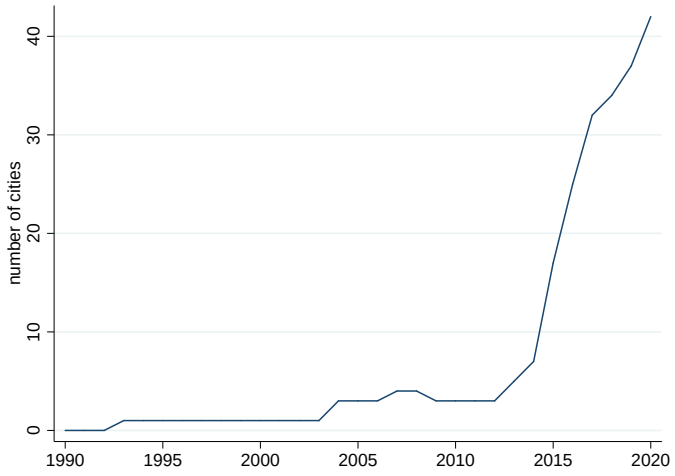
To evaluate these trade-offs, we begin with some descriptive evidence on the evolution of city-level minimum wage policies. We examine what type of cities have instituted minimum wages, and discuss how these characteristics can potentially impact the effectiveness of city-level minimum wage policies. In the second part of the paper, we summarize the evolving evidence on city-level minimum wage changes and provide some new evidence of our own. By combining the existing evidence from cities, with some additional insights obtained from the literature on state and federal-level changes, we provide an overall (if tentative) evaluation on what city-level minimum wages do. The weight of evidence suggests city mandates (especially in larger cities) have been successful in raising wages in the bottom quartile of the wage distribution, with limited impact on employment prospects for low-wage workers. At the same time, the evidence base is still limited, and for this reason we identify some key areas where further research can be particularly helpful.

2 Some Basic Facts About City Minimum Wages

The first city-level minimum wage in the United States was instituted more than 25 years ago in 1993 in Washington, DC. However, city-level minimum wages remained a rather rare phenomenon until about seven years ago. To be sure, there were some isolated attempts and even some successes starting at the turn of the century. In 2002, New Orleans attempted to raise the minimum wage by $1 above the federal standard when a majority of voters supported it on a ballot initiative. However, the state of Louisiana pre-empted the legislation by barring local governments from setting the minimum wage. The next attempts came in 2004, when two cities—San Francisco

and Santa Fe—introduced local minimum wage ordinances. Both of these cities were located in states that already had higher standards than the federal one, but these cities decided to go further. In San Francisco's case, the policy came out of a ballot initiative which was backed by more than 60% of the voters.

Figure 1: The Number of City-level Minimum Wage Changes over Time

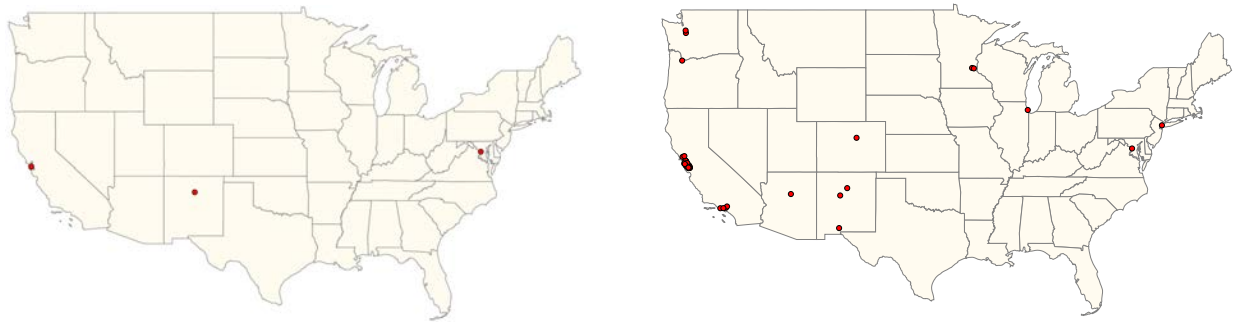


Notes: The figure shows the number of cities having minimum wages above the state-level one in each year between 1990 and 2020.

While popular with the voters, these initial city minimum wage campaigns remained isolated, and did not produce further policy changes. As a result, by 2010 still only these three cities had city-level minimum wage. Yet ten years later, 42 cities had minimum wages higher than the state or the federal standards, including some of the biggest cities in the country.[4] The dramatic increase in the numbers of cities with minimum wages over time is shown in Figure 1. On average, five more cities introduced their own local ordinances every year between 2013 and 2020.

[4] There are also some counties with minimum wages above the state-level one: Cook County in Illinois; Montgomery County and Prince George's County in Maryland; Los Angeles county in California; Bernalillo County in New Mexico. New York state also set a separate minimum wage for "downstate" counties (Nassau, Suffolk, and Westchester counties) and Oregon has introduced a three-tiered minimum wage where the wage floor varies across rural, non-rural, and Portland metro counties. While such a large variation across U.S. counties is also a recent phenomenon, we will focus in this paper on the minimum wage changes that are introduced at the city level. Nevertheless, county-level minimum wage changes are likely to have similar implications as the city-level ones.

Figure 2: City-level Minimum Wages across the United States



(a) 2010 b) 2020

Notes: The figure shows the cities having minimum wages above the state-level one in 2010 and in 2020.

Figure 2 shows a map with the cities with minimum wage across the United States. In 2010 only Washington, DC., San Francisco, and Santa Fe had minimum wages exceeding the state or the federal one. By 2020, city-level minimum wages had spread across the country including major cities such as New York, Chicago, Los Angeles, Seattle, Denver, and Minneapolis. At the same time, these 42 cities implementing these increases were all located in only 9 states, showing significant regional concentration. Moreover, of these 42 cities, 29 were located in California, and in turn, 24 of these are cities in the San Francesco Bay Area. So even as city minimum wages have spread to some of the largest metropolises in the country, the reach of the policy is far from uniform.

In most cases, these local minimum wages affect all low-wage workers working within the city limits. A notable exception is SeaTac in Washington state, where only workers in the hospitality and transport sector are bound by the law (the law notably excludes the SeaTac international airport, the largest employer in the city). There are also some cities with separate minimum wages for tipped workers (e.g. New York City). Finally, in many cases the local ordinance allows for small businesses to set somewhat lower wages.

What fueled this swelling of city-wide minimum wages over the past 7 years? A natural starting point is to consider the legal setting—changes in laws that enable city-wide wage standards. In general, the United States Constitution does not explicitly recognize local governments and

considers them essentially as subdivisions of states. Cities can pass laws on specific issues for which they have explicit permission from the state. Some cities also have independent law-making authority over local affairs; so they can pass laws within a broader category of issues as long as they are not specifically pre-empted by state or federal laws.

However, there has not been any major recent changes in this legal environment that would facilitate city-wide minimum wages. Instead, the reason for the recent increase in city-level minimum wages seems to be related to the current political environment. With Congress gridlocked, and many state legislatures being dominated by Republicans who are opposed to increasing the minimum wage, local governments have become an important avenue to push progressive agendas (Rapoport, 2016). Beginning in 2012, a set of key unions (especially the Service Employees International Union) and progressive advocates helped launch the "Fight for Fifteen". In November 2012, groups of workers from many fast food chains walked off their jobs in New York City, demanding a minimum of $15/hour and other workplace rights. This spread across various cities and built the momentum behind city-wide minimum wage campaigns around the country. In 2014, SeaTac and then Seattle successfully passed ordinances mandating city-wide minimums. Other cities followed, building on these early successes and having a national-level organizing infrastructure in place. It is this social movement aspect of the campaigns that likely led to the spread of the policy in this recent period as compared to the early 2000s—when the campaigns were very much localized.

In response to these local ordinances, a growing number of states passed laws prohibiting local governments from setting minimum wages higher than the state minimum wage. As discussed earlier, pre-emption legislation in Louisiana barred New Orleans from setting its own minimum wage in 2002. A more recent, and significant, example comes from St. Louis, Missouri. In 2015, the city approved a minimum wage increase, which went into effect in 2017 following nearly two years of litigation. However, the state quickly passed a new law pre-empting cities in Missouri from setting minimum wages. As a consequence, the wage floor fell back to the state level just after three months into its first implementation. In the end, states have the power to decide whether city-level minimum wages should take place (Briffault, 2018). By 2018, 28 U.S. states had pre-

emption legislations banning city-level minimum wages within their jurisdiction (EPI, 2018).[5] This is why city minimum wages are almost certain to remain a "blue state" phenomenon in the near future.

So what are the levels of minimum wages that these cities have enacted? Table 1 shows the 10 largest cities with local ordinances. It's noteworthy that the three largest U.S. cities – New York, Los Angeles and Chicago – all had city-level minimum wages in place as of January 2020. Among the top 10 largest cities with minimum wages, four have a minimum wage that is at least $15 per hour. By 2022 two other large cities will pass the $15 per hour threshold.

Needless to say, in nominal levels, minimum wages in these large cites surpass the state-level minimum wages. For example, currently the highest state-level minimum wage is in Washington state at $13.5/hour; in contrast, 6 of the 10 largest cities with minimums have levels exceeding $13.5/hour. At the same time, large cities also tend to be areas where wages are generally higher for everyone, and this should be taken into account when assessing the level of the minimum wage.

To better gauge the bite of the city minimum wages, we first calculate the median wage for each city using the latest wave of American Community Survey, and look at the ratio of the minimum to median wage—the so-called Kaitz index. The (unweighted) average Katiz index in the top largest cities is around 0.58. This average is substantially higher than the average state-level Kaitz index, which is 0.48. This implies that the top 10 largest cities introducing minimum wages went substantially further in their minimum wage policies than the average U.S. state, even after accounting for differences in overall wage levels.

Table 1 also reports the top 10 cities with the highest nominal minimum wages. The two highest nominal minimum wage cities—Seattle and SeaTac—are both located in Washington state, while the rest of cities which made it to the list are all in California. The top 10 highest nominal minimum wage cities are on average small (the average population is around 230,000). Interestingly, among

[5] One of these is Oregon, which does not allow city-level minimum wages; however, in 2016, the Oregon legislature established a three-tiered minimum wage plan. The highest minimum wage tier established a wage floor for the Portland Urban Growth Boundary. This is effectively a Portland city-level minimum wage, which we include in our analysis below.

the three cities that have a long tradition of minimum wages—Washington D.C., Santa Fe, San Francisco—only San Francisco is in the top 10 list.

Table 1: List of Cities with Minimum Wages

Cities	Population	MW in 2020	Kaitz index	Planned nominal MW in 2022
Panel A: Largest cities with minimum wages above the state-level one				
1. New York City	8,398,748	15.00	0.66	15.00
2. Los Angeles	3,990,469	14.25	0.75	15.72
3. Chicago	2,705,988	13.00	0.65	13.60
4. San Jose	1,030,119	15.25	0.56	16.20
5. San Francisco	883,305	15.59	0.45	17.05
6. Seattle	744,949	16.39	0.57	17.19
7. Denver	716,492	12.85	0.58	15.87
8. Washington, D.C.	702,455	14.00	0.48	14.50
9. Portland	652,573	12.50	0.56	14.75
10. Albuquerque	560,234	9.35	0.55	9.60
Mean of top 10				
Unweighted	2,038,533	13.82	0.58	14.95
Pop weighted		14.33	0.64	15.04
Panel B: Highest (nominal minimum wage) as of 2020:				
1. Seattle	74,4949	16.39	0.57	17.19
2. SeaTac*	28,925	16.34	0.67	16.79
3. Emeryville	11,724	16.30	0.65	17.92
4. Mountain View	83,377	16.05	0.34	17.05
5. Sunnyvale	15,3175	16.05	0.39	17.05
6. Berkeley	121,654	15.59	0.60	17.15
7. San Francisco	883,305	15.59	0.45	17.05
8. Los Altos	30,588	15.40	0.33	16.40
9. Palo Alto	66,655	15.40	0.33	15.85
10. Santa Clara	129,489	15.40	0.43	15.85
Mean of top 10				
Unweighted	225,384	15.85	0.48	16.83
Pop weighted		15.89	0.49	16.98

Notes: Kaitz index is the minimum wage divided by the median wage. The median wages of all workers are calculated from the 2018 wave of the American Community Survey and are measured in 2020 dollar value.

** Minimum wage only applies to transportation and hospitality workers within SeaTac city. We report the city-level Kaitz index, where we calculate the industry share weighted average of the minimum to median wage.*

All of the cities in Panel B have minimum wages exceeding $15/hour. At the same time, many of the cities also have generally high wages. As a result, in some cases the Kaitz index is rather modest: for example, cities of Los Altos and Palo Alto in the Bay Area have a Kaitz index of only 0.33—which is lower than the current Kaitz index of the federal minimum wage of 0.37. The average Kaitz index among the top 10 highest nominal minimum wage cities is 0.48, which is the same as the average Kaitz index among the U.S. states. This highlights that top-line nominal minimum wage numbers can provide a misleading picture of the economic content of minimum wage polices.

Besides their size and location in Democratic-leaning states, what are other important attributes of cities that have instituted minimum wages? Table 2 summarizes the basic characteristics of all cities with minimum wages as of January 2020. We calculate city-level characteristics using the 2018 American Community Survey, the most recent data available. In the first two columns, we report statistics for cities with minimum wages. The first column shows population weighted averages for cities with less than 100,000 residents, while column 2 shows the statistics for cities with more than 100,000 residents as of 2018. For comparison, in column 3 we report the same statistics for all U.S. cities with at least 100,000 residents, but no city-wide minimum wages. In column 4 we further reweight the non-minimum wage cities to match the population of the minimum wage cities with at least 100 thousand residents.

As expected, the nominal minimum wage is substantially higher in the cities with minimum wage (columns 1-2), than in the cities where only the state or the federal minimum wage is applied (columns 3-4). The difference in the nominal level of the minimum wage is substantial—around $4-$6 (or 50-75%) depending on the comparison group. However, minimum wage cities also have around 20-80% larger average and median wages than other cities. As a result, the economic bite of the policy is substantially smaller than the headline nominal numbers would indicate. For smaller cities, the minimum-to-median-wage ratio is very similar to other cities without any minimum wage (0.50 in column 1 vs. 0.52 in column 3). However, the differences in the minimum-to-median-wage ratio is sizable if we compare larger cities with and without city-wide minimums (0.63 in column 2 versus 0.46 in column 4). Furthermore, the cost of living is also much higher in

minimum wage cities; using the regional price parities at the MSA level, we estimate that minimum wage cities have around 16% higher costs of living even after accounting for city size.[6] Accounting for cost of living suggests that the real value of the minimum wages in large cities with ordinances is around 35-50% larger than in cities without.

Table 2: Basic Characteristics of Cities with and without Minimum Wages

	(1)	(2)	(3)	(4)
	Cities with MW		Cities without a MW	
	Pop < 100k	Pop > 100k	Pop > 100k Raw	Pop > 100k Reweighted
Number of cities	20	22	249	249
Population (in thousand)	55.2	1034.4	266.9	1031
Nominal MW in 2020	14.57	14.27	9.44	8.24
Planned MW by 2022	15.71	15.07		
Mean wage	42.31	31.42	24.58	25.62
Median wage	31.26	22.47	18.04	17.31
Cost of living index (RPP)	122.9	117.1	100.2	101.2
MW to mean wage	0.36	0.45	0.38	0.32
MW to median wage	0.50	0.63	0.52	0.46
Share Democrats	0.73	0.76	0.55	0.56
College share	0.47	0.38	0.30	0.29
Unemployment rate	3.84	5.61	5.45	5.54
Industry shares:				
Restaurants	0.06	0.07	0.08	0.08
Retail	0.09	0.09	0.11	0.10
Manufacturing	0.09	0.06	0.08	0.08
Construction	0.05	0.05	0.06	0.09
Health and social care	0.12	0.14	0.13	0.12
Professional services	0.15	0.11	0.07	0.08

Notes: Own calculations based on the 2018 American Community Survey. Cost of living index is the MSA level RPP measured in 2017. The share of democrats in the 2016 presidential election is obtained from McGovern (2016). Each row (except the one for population) reports population weighted averages. Column 5 reweights cities without minimum wage to match the population size of cities with minimum wages using an entropy balancing reweighting.

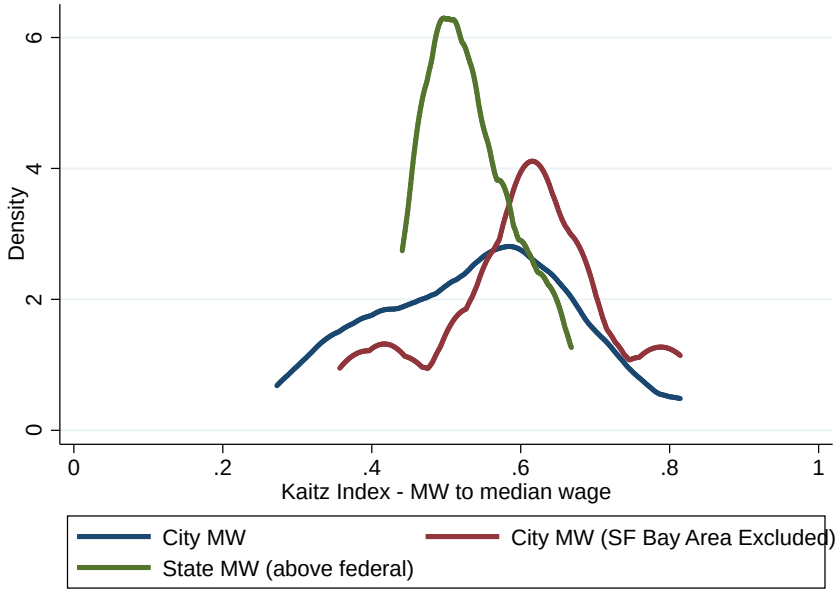
[6] Note that the differences in cost of living are at the MSA level and not at the city level. That is why the differences in median and average wages are substantially larger than the differences in cost of living. This also implies that we may be underestimating the differences in cost of living across cities.

Table 2 also highlights that in cities with minimum wages, the population has higher levels of education, and workers are more likely to be employed in high-paying industries such as professional services. Furthermore, and not surprisingly, cities with minimum wages also have more progressive electorates: in the 2016 presidential election, 76% voted for Democrats while in other larger cities without minimum wage the vote share was only 56%. Finally, the local unemployment rate seems to be very similar between cities with and without minimums, at least for cities with a population exceeding 100,000.

It is also worth comparing the levels of the city minimum wages to those of state minimum wages. Figure 3 plots the distribution of Kaitz index (minimum wage to median wage) for all cities with minimum wage together with the Kaitz for state-level minimums. For the states, we only consider minimum wages when they are above the federal one. The figure shows that the Kaitz index is more dispersed for cities than for states. Many cities went beyond the highest state-level Kaitz, even after differences in median wage across locations are taken into account. On the other hand, there are many high wage cities where the Kaitz index is quite low even for the ones with higher minimum wages.

In Figure 3, we also plot the city-level minimum wages excluding the 24 city minimum wages instituted in the San Francisco Bay Area, which all have very high levels of overall wages and cost of living. The figure shows that if we exclude the Bay Area, the dispersion in the city-level Kaitz indices is more comparable to the state-level one, though the average value of the Kaitz index is considerably higher in cities. Notably, the Kaitz index exceeds 0.65 in a substantial portion of cities, value which is essentially never seen at the state level.

Figure 3: Distribution of Kaitz Index for U.S. Cities and States



Notes: The figure shows the distribution of Kaitz index (minimum wage to median wage) for cities with minimum wages (blue and red line) and for all U.S. states where a minimum wage above the federal one applied (green line).

To summarize, cities passing minimum wages are typically large, with high overall wages and cost of living. These differences mean that comparisons based on nominal minimum wages may exaggerate the differences in binding minimum wages across cities. At the same time, even after accounting for these, the city-wide minimum wages appear to have pushed the wage standards to be more binding than they have from state-level policies alone.

3 What determines the effectiveness of city-level minimum wages?

The growing variation in local level minimum wages raises the question: is the variation in minimum wages across locations desirable? Just as economists have considered what the optimal design of place based-policies is, we can ask: what is the optimal place-based minimum wage policy? To answer this question, we need to assess the trade-offs that emerge for any place-based policies.

The first natural question to ask is whether minimum wage should target places or people. If the primary goal of the policy is to raise income at the bottom of the wage distribution then the policy should simply target workers with the lowest wage across the country and so there is no need to vary the level of the minimum wage across locations. However, this argument does not take into account the large differences in housings costs and costs of living across the United States (Albouy, 2009). A proper minimum wage policy should take into account that workers with the same nominal wage are substantially "poorer" in locations with high costs of living. As a result, redistribution to the bottom of the real wage distribution can be potentially better achieved if the level of the minimum wage takes into account local differences in the cost of living. This is not a hypothetical issue. We find that the cities that have enacted city-wide minimum wages had, on average, 16% higher cost of living as measured by the (MSA-level) regional price parity index than other cities. At the same time, recent evidence by Kline, Gaubert, Yagan (2020) suggests that the U.S. electorate favors raising the nominal income of identical households in distressed rather than in thriving areas (Gaubert, Kline, Yagan, 2020)

Furthermore, local variation in the policy may also be beneficial if the primary intention is to redistribute resources from consumers to low-wage workers. A large body of empirical studies suggest that minimum wages are passed on to consumers via higher output prices (Lemos, 2008; MaCurdy, 2015; Harasztosi and Lindner, 2019). Since most minimum wage workers are employed in local non-tradable sectors (e.g. restaurants or retail stores), this redistribution mainly takes place among local consumers and local minimum wage workers. Table 2 shows that cities with minimum wages have a larger share of high-skilled workers, a larger share of workforce in professional service sector, and therefore a richer consumer base. In these types of cities, redistribution from local consumers to local low-wage workers may be more desirable.[7]

Differences in minimum wages across cities may also be justified if the main goal of minimum wages is to alleviate pre-existing distortions caused by imperfect competition in the labor market. If firms' market power in the labor market creates a wedge between the marginal product of labor

[7] Diamond (2016) shows that high-skilled workers do not just get higher wage premium in some cities, but they also enjoy higher amenities. This would provide an additional reason to redistribute resources from high skilled workers to low skilled ones in those cities.

and wages, then minimum wages can potentially push wages and employment closer to the competitive equilibrium. However, the competitive wage is likely to vary by the productivity of the location; so in highly productive cities, higher minimum wages are needed to achieve this goal. Furthermore, the wedge between marginal products and wages may vary by local areas, and so higher minimum wages may be more beneficial in some areas. As an example, recent evidence by Azar et al. (2019) highlights that there are large potential benefits in varying minimum wages by labor market concentration.

The local variation in minimum wages can be also beneficial if the potential negative impact of the policy varies by the local composition of jobs or by labor market tightness. Harasztosi and Lindner (2019) and Cengiz et al. (2019) document a negative effect of state-level or country level minimum wages on jobs in the tradable sector. Aaronson and Phelan (2019) find drops in cognitive routine occupations after minimum wage hikes, while Lordan and Neumark (2018) document a drop in automatable jobs. Clemens and Wither (2014) suggest that minimum wage increases had a negative effect on jobs in the Great Recession.[8] Leaving aside the validity of any individual study, these findings raise the possibility that the optimal level of the minimum wage may depend on the local composition of jobs and on the local unemployment rate—which in principle allow policymakers to adapt the policy to local conditions. However, in practice, such considerations do not seem to have played a major role in setting of city-level minimum wages. For instance, the share of non-tradable sectors such as restaurants and retail or the share of tradable jobs such as manufacturing are similar in cities with and without minimum wages; similarly unemployment rates don't differ (see Table 2).

Finally, variation in minimum wages across cities can better reflect citizens' preferences (Tiebout, 1956). Cities with more progressive electorates may prefer higher minimum wages even if the policy is accompanied by some loss in economic efficiency. Citizens can also vote with their feet and choose a city that better reflects their preferences and beliefs about the desired level of minimum wages. Table 2 highlights considerable differences between the electorates in cities with and without minimum wages. This suggests that city-level minimum wages can be used to better align public polices with the preferences of the electorate.

[8] At the same time the evidence from the Great Recession is not settled, given contrary findings in Zipperer (2016).

While there are obvious benefits of tailoring minimum wages to local economic conditions, local variation in the level of minimum wages can also create distortions. For instance, city-level minimum wages can affect allocation of low skilled labor across locations and potentially lead to misallocation of labor. Such a misallocation was found to be important in other contexts (see e.g. Fajgelbaum et al. 2019). Nevertheless, it is unclear that the uniformity of the minimum wage policy should be in "nominal" or "real" terms and whether the reallocation of business from some high wage cities to lower wage ones is necessarily bad from the public perspective (Albouy, 2009). The creation of new jobs outside of the urban core may affect a relatively disadvantaged part of the country.

The employment and wage responses may also differ between localized minimum wage changes and state or federal-level ones. City boundaries are more porous than state boundaries. Businesses can simply move a few miles away to avoid minimum wage changes. Workers can seek higher wages or better employment opportunities by changing their commuting patterns. In general, given the density of highways in commuting zones, labor mobility is much greater across cities than across states. As a result, it is important to directly assess the effect of the minimum wage on both employment and business reallocation across city boundaries. In the next section, we discuss the existing empirical evidence on these issues.

4. Evidence on the impact of city-level minimum wages

While there is an extensive literature studying the impact of state and federal-level minimum wage changes, the existing evidence on city-level ones is limited. We begin by reviewing the evidence on the effects of these polices on wages and employment.

Estimates on employment and wages. Three studies provide evidence on the early waves of city minimum wage changes. Dube et al. (2007) study the effect of introducing the minimum wage in San Francisco in 2004 using two waves of a survey of restaurants and using aggregate level data from Quarterly Census of Employment and Wages. They use a difference-in-differences approach using a variety of control groups including firms outside of San Francisco, and smaller firms

unaffected by the wage mandate within San Francisco, as well as higher wage firms within San Francisco. They find that the policy increased worker pay and compressed wage inequality, but did not create any detectable employment loss among affected restaurants. Potter (2006) focuses on the other early example of city-level minimum wage changes: Santa Fe, New Mexico. Potter shows that the 65% increase in the minimum wage in 2004 did not had a negative impact on employment—if anything, Santa Fe actually did better than the nearby Albuquerque without any minimum wage.

Schmitt and Rosnick (2011) study the impact of the minimum wage in three cities using firm-level administrative data from Quarterly Census of Employment and Wages: San Francisco, Santa Fe and Washington D.C. Schmitt and Rosnick (2011) find that average earnings increased in San Francisco and Santa Fe, but not in Washington D.C. They, too, use a difference-in-difference approach using alternative control groups (similar to Dube et al. 2007). Their estimates on employment vary considerably across specifications, making it difficult to draw a definitive conclusion. Nonetheless, the estimates are clustered around zero—suggesting that the impact on employment was likely limited.

The early consensus on city-level minimum wage changes has been challenged recently by an influential study from Seattle. Jardim et al. (2017) study the introduction of the Seattle Minimum Wage Ordinance, which raised the minimum wage from $9.47 to $13 per hour in 2016. The study makes an important improvement relative to existing evidence as they utilize high quality administrative data on hourly wages. The paper documents a dramatic drop in the number of jobs below $25 in Seattle relative to other areas in Washington state. Their point estimate on employment elasticity with respect to own wage—which is the labor demand elasticity in the competitive model—is -2.14. Such an elasticity is out of the range of existing estimates in the literature exploiting state or country level variation in the minimum wage (see Figure 4B of Dube 2019) and suggests that the policy did considerable harm to low-wage workers in Seattle.

The Seattle study received considerable attention since Jardim et al. (2017) used a credible empirical strategy that created a synthetic control for Seattle from other cities in Washington, and combined it with a unique administrative data on hourly wages. Nevertheless, there are some

features of the Seattle experiment that should lead us to a cautious interpretation of the findings. First, the Seattle labor market evolved quite differently than the cities in the comparison group around the introduction of the local ordinance. There was a substantial increase in the number of jobs and wages especially at the top of the wage distribution in Seattle. Since it is unlikely that the minimum wage has a substantial impact on jobs at the top of the wage distribution[9], such divergence between Seattle and the comparison group suggests that other shocks also affected the Seattle labor market around the policy change. The "Seattle boom" might have shifted the whole wage distribution, which could explain why low-wage jobs disappeared and many more high wage jobs were created. While the authors are careful in constructing a control group, given the generally greater wage growth in major cities during this period, it may just not be feasible to construct a counterfactual using places in Washington state outside of Seattle (which is the data the authors are using).

Furthermore, in a follow-up paper, Jardim et al. (2018) examine the employment trajectories of workers with jobs before the introduction of the minimum wage. The employment estimates for that subgroup are substantially lower: the implied employment elasticity with respect to own wage is 0.03 and the confidence intervals rule out even moderate-sized disemployment effects.[10] While these estimates do not take into account the potential drop in new entrants, they are also less affected by the overall shift of the wage distribution. As a result, it is unclear whether these estimates are biased upward or downward.

A recent paper by Allegretto et al. (2018b) study the impact of city-level minimum wages on employment in the restaurant sector in six large cities. They use QCEW data aggregated at the county-by-industry level. While their analysis is based on less rich data than the one in Jardim et

[9] The neoclassical model predicts that low skilled workers will be replaced by high-skilled ones in response to the minimum wage. Since the share of minimum wage workers in total production is low, we expect limited effects on the upper tail employment under reasonable values of labor-labor substitution (see Appendix B in Cengiz et al., 2019 for the details). Nevertheless, even with perfect substitution, we do not expect that overall employment increases in response to the minimum wage as one low-wage workers would be replaced with less than one high-wage one. Therefore, the overall increase in employment (relative to the synthetic control) suggests that other major shocks were also in action around the time of the reform.

[10] Jardim et al. (2017, 2018) report separate estimates on the effect of the minimum wage on total hours and on employment. We focus here on the head count estimates as that is more comparable to the existing literature. Jardim et al. (2017, 2018) find a significant drop in total hours, which amplify the negative consequences of minimum wage changes. We discuss the change in hours results below.

al. (2018), they can use all counties without minimum wages to find the best comparison group. Given that the cities with minimum wages are quite unique, going outside of a given state (e.g. Washington) may be important to find a better comparison group. Allegretto et al. (2018b) find considerable increases in wages and modest, statistically insignificant, disemployment effects. Interestingly, Allegretto et al. (2018b) also study the employment changes in Seattle and find no indication for negative disemployment effects in the restaurant sector.[11]

Table 3 summarizes the key estimates in the literature on the impact of city-level minimum wages on own wages and employment. Since it is hard to interpret the findings on employment in absence of any wage responses to the policy, we only report estimates with statistically significant wage effects. Column 5 reports the employment elasticity with respect to own wage.

Table 3 highlights that the employment elasticity estimates are centered around zero, which suggests that city-level minimum wages have no discernible effect on employment. Out of the 11 estimates, 7 have positive point estimates and 4 have negative sign for employment. Only two point estimates exceed an employment elasticity of one (in magnitude), thereby implying that the total wage bill collected by low-wage workers falls after the policy change as a results of job losses. Nevertheless, individual estimates are quite noisy even if we consider 90 percent confidence intervals. Only two estimates can rule out that employment is unaffected by the policy: the Jardim et al. (2017, 2018, 2020) aggregate-level one finds a statistically significant negative employment effect, while Allegretto et al. (2018b) in Oakland finds a statistically significant positive estimate on employment. Six estimates in the literature can rule out large negative employment effects (employment elasticity is less than -1) and four estimates can rule out medium sized negative employment responses (employment elasticity is less than -0.4).

[11] Jardim et a. (2018) also provide separate estimates for restaurants. Similarly to Allegretto et al. (2018b), they confirm that the overall number of jobs did not fall in the restaurant sector. Nevertheless, they find some drop in employment for jobs below $25. Again, it is unclear whether the decline in low-wage jobs reflects a genuine negative impact of the policy on low skilled restaurant workers or it is simply driven by the shift of the wage distribution. In addition, Nadler et al. (2019) show that small industrywide employment elasticities are inconsistent with highly elastic labor demand for low-wage workers with plausible elasticities of substitution across skill groups.

Table 3: Existing Estimates on City-level Minimum Wage Changes

Paper	City	Wage	Employment	Own-Wage Elasticity
Allegretto et al. (2018b) - restaurants	Average of 6 cities	0.02 [0.01,0.03]	-0.01 [-0.02,0.01]	-0.23 [-0.78,0.32]
	Oakland	0.10 [0.06,0.14]	0.07 [0.03,0.11]	0.71 [0.20,1.22]
	San Francisco	0.06 [0.04,0.09]	0.01 [-0.05,0.07]	0.14 [-0.83,1.11]
	San Jose	0.11 [0.06,0.15]	0.00 [-0.06,0.06]	-0.02 [-0.5,0.53]
	Seattle	0.04 [0.02,0.07]	0.01 [-0.05,0.07]	0.20 [-1.16,1.57]
Dube, Naidu, Reich (2007) - restaurants	San Francisco	0.14 [0.06,0.22]	0.04 [-0.12,0.2]	0.29 [-0.34,0.91]
Jardim et al. (2017, 2018, 2020) - jobs below $19	Seattle, worker level	0.15 [0.14,0.17]	0.01 [-0.01,0.02]	0.03 [-0.04,0.11]
	Seattle, aggregate level	0.03 [0.03,0.03]	-0.07 [-0.14,-0.01]	-2.18 [-4.14,-0.22]
Moe, Parrott, Lathrop (2019) - full service restaurants	New York City	0.10 [0.03,0.16]	0.02 [-0.16,0.21]	0.25 [-2.89,3.38.]
Schmitt and Rosnick (2011) -fast food	San Francisco	0.10 [0.05,0.14]	0.00 [-0.33,0.34]	0.03 [-3.45,3.5]
	Santa Fe	0.07 [0.02,0.12]	-0.08 [-0.29,0.13]	-1.20 [-4.36,1.96]

Notes: We report the estimated impact of city-level minimum wages on wages (column 3), on employment (column 4), and on employment elasticity with respect to own wage – the labor demand elasticity in the competitive model. We only report estimates where positive wage effects have been detected in the data. When the elasticity with respect own wage was not directly reported (Allegretto et al., 2018b; Dube et al., 2007; Jardim et al. 2017, 2018, 2020; Moe, Parrott, Lathrop, 2019), we calculated the elasticity by dividing the employment effect with the wage effect. The corresponding standard errors were calculated by using the delta method. All estimates report the 90 percent confidence intervals. We infer the standard errors from the reported p-values for the aggregate estimates in Jardim et al. 2017. We calculate the standard errors in Moe, Parrott, Lathrop (2019) using Randomization Inference.

Therefore, the evidence on city-level minimum wages is consistent with the growing body of evidence suggesting that moderate levels of minimum wage increases have a relatively low impact on the employment of the affected workers (Cengiz, Dube, Lindner and Zipperer, 2019, Belman and Wolfson, 2014). At the same time, it is important to point out that there is sizable uncertainty around the existing estimates. As a result, there is plenty of room for additional research to glean important information on this question.

Overall impact of city-wide minimum wages. Almost all studies on the impact of city-level minimum wage changes focus on a particular city and a particular minimum wage hike. Nevertheless, inference based on one particular case study is inherently difficult. Furthermore, estimates based on a single experiment may be easily contaminated by other shocks, as we saw in the case of Seattle.

A notable exception is Allegretto et al. (2018b) who report event-study estimates exploiting six prominent minimum wage hikes. Nevertheless, there are many more city-level minimum wage changes that could be used for identification. In fact, studies on the combined evaluation of city-level minimum wage changes are noticeably missing. This is in stark contrast to the literature on state-level minimum wage changes that has moved from a case-by-case analysis (e.g. Card and Krueger, 1994) to combined evaluation of many state-level minimum wage shocks early on (e.g. Neumark and Wascher, 1992; Dube, Lester and Reich, 2010; Cengiz et al., 2019). Moreover, Allegretto et al. (2018b) only look at restaurants, and therefore cannot fully resolve the concerns raised by Jardim et al. (2020).

Here we aim to fill this hole in the literature by providing an overall assessment of the city-level minimum wage changes instituted as of 2018. We have three specific objectives. First, we wish to evaluate the full set of major cities instituting or raising the city-wide minimums during the recent period. Second, we wish to consider the *overall* impact of these policies on low-wage jobs in the spirit of Cengiz et al. (2019) and Jardim et al. (2017, 2020), as opposed to focusing on particular sectors or groups. Third, having shown how selective the minimum wage cities are, we wish to address concerns about invalid counterfactuals by comparing these cities with other large cities with similar characteristics that did not raise their minimum pay standard.

For this exercise, we use the American Community Survey (ACS) between 2012 and 2018 that has data on wages and employment at the city level. The ACS provides the geographic granularity needed to hone in on specific cities, something not feasible with other publicly available data. We start with a sample of all cities with a population of at least 100,000 in 2018 (last year of our sample). This leaves us with 21 cities with minimum wage changes.

We estimate the following regression using ACS samples from 2012, 2013, 2017 and 2018:

$$y_{ct} = \beta_0 + \beta_1(Treat_c \times Post_t) + \beta_2\left(X_{c,2012} \times Post_t\right) + \mu_c + \tau_t + e_{ct} \qquad (1)$$

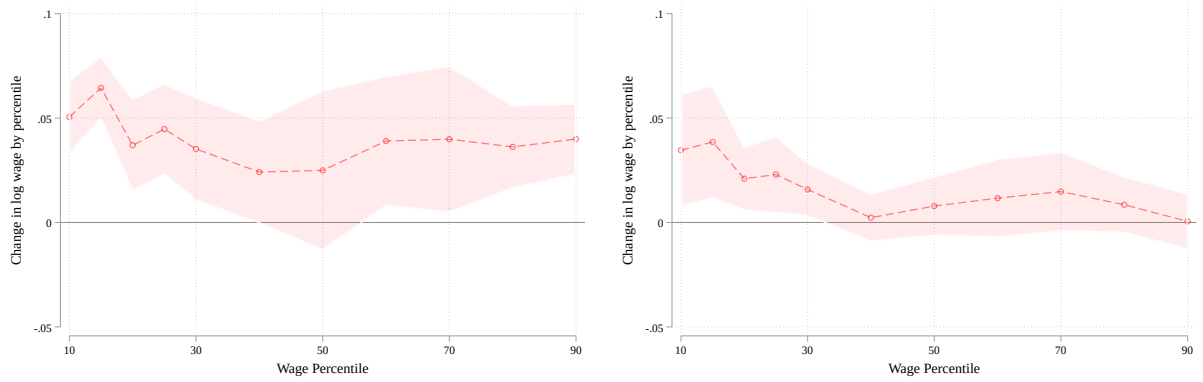
where y_{ct} is the outcome (wage percentile, employment) at city *c* at time *t*, $Treat_c$ is dummy for cities with minimum wage as of 2018, $Post_t$ is a dummy for years 2017 and 2018, μ_c are city fixed effects taking out time-invariant unobserved heterogeneity, and τ_t control for year effects. Given the differences between cities introduced minimum wages and those that are not, we control for the interaction of a dummy for *Post* with a set of 2012 covariates $X_{c,2012}$ on cost of living, employment to population ratio, average wage, the 10th, 25th, 50th, 75th and 90th wage percentiles, shares of employment below wage cutoffs ($15, $20, $25, $30, $50), and 1-digit level sectoral shares. These controls matter. As we will see below, controlling for pre-treatment city characteristics produces much more sensible results on the upper tail of the wage distribution, a key falsification test for both wage and employment effects (see Autor, Manning and Smith, 2016 and Cengiz et al., 2019)). We weight the regressions by population and cluster the standard errors at the state level.

Figure 4 studies the contribution of city minimum wages on inequality in spirit of Autor, Manning and Smith (2016). We report the estimated β_1 coefficient from equation (1) where the outcome variable is various percentiles in log hourly wages. We compute hourly wages as (annual) salary income divided by hours per week times number of weeks worked.[12]

[12] The specific variables that we use from the ACS are: "Salary income in the last 12 months"; "Usual hours worked per week in the last 12 months"; "Weeks worked during the last 12 months". Given that the weeks variable is intervalled (6 categories), we take the midpoint of each interval in all categories but the last one (50 to 52 weeks) where we assign a value of 52.

Panel a) in Figure 4 shows the estimates from equation (1) without controls. As expected, there is a clear increase in wages at the bottom of the wage distribution in cities with minimum wages relative to cities without minimum wages. However, wages *also* increase significantly for all percentiles (including the very top) throughout the wage distribution. Since minimum wages are unlikely to have a huge impact on wages at the very top, the no controls results here highlight that simply comparing cities with and without minimum wages can lead to misleading results.

Figure 4: Impact of City Minimum Wages on Inequality



a) Without controls b) With Controls

Notes: This figure shows the change in log wages for each wage percentile from our regression analysis (see equation 1) exploiting 21 city-level minimum wage changes between 2012-2018. The shadowed area shows for each percentile the 95% confidence intervals around the estimates. Panel a) shows the estimates without controls, while Panel b) controls for 2012 values of cost of living, employment to population ratio, average wage, wage percentiles, shares of employment below wage cutoffs, and 1-digit level sectoral shares. Results are weighted by the population size of the city.

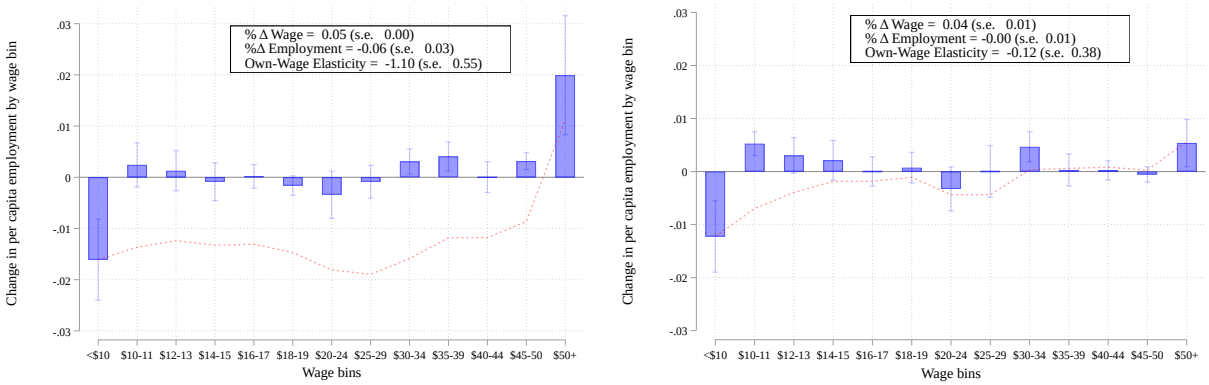
Panel b) in Figure 4 controls for baseline differences in cities with minimum wage. The results with controls show a clear change at the bottom of the wage distribution that fades out around the 30th percentile of the wage distribution. Such spillover effects are broadly similar to the estimates in Autor, Manning and Smith (2016) who find a similar pattern for state-level minimum wage changes.

The evidence suggests that the city minimum wages have had a clear impact on workers' pay at the bottom of the wage distribution and have compressed wage inequality. At the same time, the magnitudes of the likely causal effects are more modest than one may imagine. If we estimate the regression in equation (1) with an outcome of log minimum wage, we find that the policy increases minimum wages by 23% (s.e. 1.6%), which is substantially larger than the roughly 4% increase in wages at the bottom of the distribution. This likely reflects two considerations: 1) as documented, treated cities were experiencing generally higher wage growth throughout the distribution, 2) the increasing tightness in the labor market across all areas during this period additionally led to wage growth at the bottom of the distribution even in cities that did not increase in the minimum wage. These two factors likely limited how binding these minimum wage changes were, and thereby attenuated the inequality reducing impact of the city minimum wage policies.

These qualifications notwithstanding, city-wide minimum wages did reduce wage inequality through greater wage growth at the bottom. This raises the question whether this wage growth came at the expense of weaker job growth at the bottom of the wage distribution in the minimum wage cities. We assess the employment effects of the minimum wage by using the distributional approach developed in Cengiz et al. (2019). By studying the effect of the minimum wage on employment for each wage bin separately, we can calculate the missing number of jobs at the bottom of the wage distribution and compare it to the excess number of jobs higher up.[13] The approach also allows us to study the changes in the upper part of the wage distribution. Large changes there would suggest that the employment estimates are potentially contaminated by other shocks.

[13] This approach is also closely related to the Jardim et al. (2017, 2020) aggregate estimate, where they consider changes in employment below thresholds (e.g. $19/hour). This allows us to consider how similar the findings are when we pool across multiple minimum wage events, and also when we use other large cities as controls (instead of rural and suburban Washington state).

Figure 5: Impact of City Minimum Wages on Employment



a) Without Controls b) With Controls

Notes: The figure shows the bin-by-bin employment changes from our regression analysis (see equation 1) exploiting 21 city-level minimum wage changes between 2012-2018. The blue bars show, for each wage bin, the estimated average employment changes in that bin relative to the total employment in the city in 2012. The error bars show the 95% confidence intervals. The red line shows the running sum of employment changes up to the wage bin it corresponds to. Panel a) shows the estimates without controls, while Panel b) controls for 2012 values of cost of living, employment to population ratio, average wage, wage percentiles, shares of employment below wage cutoffs, and 1-digit level sectoral shares. Results are weighted by the population size of the city.

Panel a) in Figure 5 shows the bin-by-bin employment estimates from equation (1) without controls. There is a clear drop in employment at the bottom of the wage distribution (jobs under $10) in cities with minimum wage, which is in line with a binding policy. There is no apparent increase in the number of jobs higher up in the wage distribution, except at the very top where there is a large increase in the number of jobs. The red line shows the running sum of jobs below the corresponding wage bin. The missing number of jobs under $10 only recovers once jobs above $50/hour are incorporated. In fact, overall employment increased in cities with minimum wage, even if at the bottom of the wage distribution there are large job losses. When we consider jobs up to $20/hour, Panel a) suggests affected workers' wages rose by around 5% while their employment fell by around 6%. The implied dis-employment is quite pronounced: the estimated own-wage employment elasticity of -1.10 (s.e. 0.59) is statistically significant at the 95 percent confidence level.[14]

[14] We calculate the percentage change in employment and wages as in Cengiz et al. (2019). In particular, the percentage change in affected employment is the change in employment below $19 (relative to pre-treatment total employment) divided by the (sample average) share of workforce below the new minimum wage. To calculate the wage changes,

However, the story is very different when we control for baseline differences in treatment and control cities. Panel b) of Figure 5 shows that once we control for observable baseline differences, the dramatic change at the upper part of the wage distribution disappears. Similar to the version without controls, we continue to find that cities with minimum wages have some missing jobs under $10. At the same time, we find that excess number of jobs emerge at jobs between $11-$19, once we control for baseline characteristics. The upper part of the wage distribution is more or less stable, which is consistent with a relatively low impact of the minimum wage at that part of the wage distribution. Our estimates suggest affected workers experienced a 4% additional wage gain, but the employment changes were negligible. The implied employment elasticity with respect to wage is -0.12 (s.e. 0.38). The 90 percent confidence interval rules out own-wage employment elasticities more negative than -0.75 (including the point estimate of -1.1 from the specifications without controls). These estimates are quite similar to the overall minimum wage literature to date. For example, the median own-wage employment elasticity in the literature is around -0.17, while it is around -0.04 when restricting attention to broad-based groups (Dube, 2019). At the same time, the confidence interval here also rules out some other prominent negative estimates from the minimum wage literature. Importantly, the aggregate own-wage employment elasticity in Jardim et al. (2020) of -2.2 is far outside of our confidence interval.

The differences between the two panels in Figure 5 can help shed light on the controversy surrounding the Seattle minimum wage studies. First, the findings in Panel a) are strikingly similar to the aggregate-level findings in Jardim et al. (2020, see Appendix Figure 7). In Seattle, too, there was an apparent drop in jobs below the new minimum wage and those jobs did not recover if only jobs below a certain threshold (e.g. $20, $25 or $30) are considered. Nevertheless, similar to our results here, Jardim et al. (2020) find an overall increase in jobs in Seattle that mainly came from an unusual job creation above $50. These employment patterns are observed even though Jardim

we use equation 2 in Cengiz et al. (2019). It is worth mentioning that Jardim et al. (2017, 2020) calculate the employment elasticity somewhat differently: they divide the percentage change in employment below $19 by the percentage change in average wage below $19. This approach dilutes the wage effects, since the change in wages of the workers close to the $13 minimum wage is compared to higher wage workers earning just below $20. As a result, the Jardim et al. (2017) estimates overstate the employment elasticity. If we calculate the employment elasticity using their approach we get -1.65 (s.e. 0.84). See the Online Appendix for details.

et al. (2020) are careful to construct a synthetic control; however, as we pointed out before, all of their control areas come from Washington state.

Jardim et al. (2020) interpret the drop in employment at the bottom of the wage distribution as evidence for the negative effect of the minimum wage. They argue that employment changes in different labor market segments can be studied in isolation, and so it is natural to attribute the employment drop in the low-wage segment to the minimum wage and the employment change at the top segments to other demand shocks. Our interpretation is different. First, demand shocks at the top of the wage distributions can affect low-wage jobs through indirect channels. For instance, an increase in high-skilled jobs may drive up rental prices or change the composition of demand for local tradable goods, which can drive out lower paying, low quality services. This can affect low-wage jobs even if labor markets are fully segmented.

Second, focusing on jobs below a certain threshold can be quite misleading when the whole wage distribution is shifted as we saw in Panel a) of Figure 4. What we document here is that such a shift in the wage distribution is not just specific to the Seattle experiment, but it is a general pattern among larger cities with minimum wages. The cities with minimum wage are often unique in terms of economic structure, cost of livings, and wage and employment growth trends, and it might be possible that within a state it is hard to find comparable cities with similar characteristics. Importantly, when we compare major minimum wage cities to other similar large cities that did not implement such policies, we find no indication that the whole wage distribution is shifted (Panel b of Figure 4), nor do we find a significant drop in the number of low-wage jobs (Panel b of Figure 5).

To sum up, finding a relevant comparison group is crucial to assess city-level minimum wages. At the same time, existing evidence including the one shown here does not indicate that city-wide minimum wages differ substantially from state-level ones in terms of wage and employment responses.

Besides the effect of the policy on inequality, wages and employment it is worth studying other aspects of minimum wage polices and how those differ from the state-level minimum wage changes.

Reallocation. Businesses may be able to avoid city-level minimum wages by shifting their production outside of city boundaries. Such a shift in employment would create positive wage spillovers at neighbouring cities and counties. Unfortunately, we are not aware of any studies that directly assess the presence of such spillover effects in the city-minimum wage context. Schmitt and Rosnick (2011) present estimates relative to own suburbs and to other nearby cities. If the effect of the minimum wage spills over on own suburbs, but not nearby cities we would expect that the wage effects are smaller in the own suburb estimates and the employment effects are larger than the estimates on nearby cities. There is no such tendency found in Schmitt and Rosnick (2011), which suggest that such spillover effects may be limited. Furthermore, the fact that much of the existing estimates on employment are centered around zero suggests that business reallocation must be limited. At the same time, more precise documentation of when and how much such spillovers occur would be useful for future research to investigate.

Firm Entry and Exit. Another interesting aspect of minimum wage policies is how firm dynamics is affected by the policy change. The existing evidence on firm's closure is somewhat inconclusive. Dube, Naidu and Reich (2007) do not detect any increase in the rate of business closure. On the other hand, Jardim and van Inwegen (2019) finds that the Seattle Minimum Wage Ordinance accelerated exit of firms with a higher share of low-wage jobs. Luca and Luca (2018) exploit Yelp data to show that firm's exit rate increases in response to the minimum wage, especially for those firms providing low quality services (measured by low Yelp ratings on the website). Such increase in business exit rate might reflect within city reallocation of workers from lower paying, lower quality firms to higher paying, higher quality ones – a channel that is found to be important in responding to the introduction of the minimum wage in Germany (Dustmann et al., 2020).

The evidence on firm's entry is more limited. Jardim and van Inwegen (2019) find no effect on rate of business entry, though they document a change in the composition of the entering firms towards less labor-intensive businesses.

Hours worked and Other Benefit. So far, we have mainly focused on the impact of the policy on the number of jobs. Jardim et al. (2017, 2018, 2020) find a substantial decrease in hours worked for jobs below $19. It is unclear whether the drop in hours reflects the shift of the wage distribution discussed above or the genuine effect of the minimum wage. Contrary to the findings in Seattle, Dube, Naidu and Reich (2007) find (if anything) a positive effect on hours worked. The discrepancy between these two studies might be explained by the different data sources used in the analysis. Jardim et al. (2017, 2018, 2020) exploit administrative data on hours, while Dube, Naidu and Reich (2007) relies on survey data. It is possible that some firms avoid compliance to the minimum wage by underreporting hours worked, a practice that was found to be important in Germany (see Caliendo et al., 2018). Such underreporting might affect the results based on administrative data sets, but not the results that are based on surveys asking about actual hours worked.

Dube, Naidu and Reich (2007) also study whether the impact of pay increase is offset by cutting non-cash benefit. They find no indication for cutting health insurance benefits and document an increase in the proportion of workers receiving tips.

Output Prices. A key channel of absorption for minimum wages is passing prices through to consumers. However, if the city minimum wage only applies to a subset of an integrated metro-area-wide product market, price pass through may be difficult. On the other hand, if the demand for products is tightly linked to the city itself, it may be possible for prices to exhibit sharp differences near city boundaries. Additionally, as we have seen, cities raising minimum wages tend to have residents with higher incomes and these consumers may be more willing and able to absorb an increase in prices of minimum wage intensive services and goods.

The findings on this front are somewhat varied. Dube, Naidu and Reich (2007) find that output prices increase especially for the fast food sector, particularly when comparing within versus outside of San Francisco. On the other hand, Jardim and van Inwegen (2019) study the effect of the minimum wage on output prices in Seattle and find somewhat inconclusive evidence.

The most persuasive evidence on price responses comes from Allegretto and Reich (2018a) who study the impact of the San Jose minimum wage changes on Internet-based restaurant menus inside and outside of the city boundaries. Allegretto and Reich (2018a) find clear and positive price effects in response to the minimum wage that are consistent with the large body of evidence on state-level minimum wage changes. What is particularly telling is that Allegretto and Reich (2018a) document a sharp drop on output prices just a mile from the San Jose city boundary. Therefore, otherwise similar restaurants operating within a few miles of each other—but facing differential shocks to labor costs—seem to be able to set different consumer prices. This suggests that there is a very sharp segmentation of markets, even when the boundary is as porous as it is between San Jose and adjacent areas like Sunnyvale and Milpitas. Overall, the sharp reduction in prices indicates that spillover effects of the policy are limited even in context of the San Francisco Bay Area with highly interlinked cites.

Worker Turnover. A particularly interesting aspect of the minimum wage policies involves how they affect labor market flows. A reduction in worker turnover at the bottom of the wage distribution is consistent with models of frictional labor markets where employers have some wage setting power: a higher minimum wage improves the relative quality of the lowest-paying jobs and increases retention (Portugal and Cardoso, 2006; Dube, Lester and Reich, 2016). The decrease in turnover can lead to potential cost savings that can explain how the minimum wage is absorbed without a substantial drop in employment. Such a mechanism seems to play some role in the context of city-level minimum wages. Dube, Naidu and Reich (2007) find an increase in worker tenure for a typical worker in the context of the San Francisco minimum wage increase, though they do not detect a reduction in overall separation rate. Jardim et al. (2020) find statistically significant reductions in separations following the Seattle minimum wage changes. Overall, the evidence from city minimum wages offer a qualified similarity to the broader literature suggesting reduced worker turnover is likely to be one of the channels of adjustment.

5. Conclusion

A growing number of cities have recently instituted their own minimum wages above the state or the federal one. Local variation in minimum wages allows better tailoring of the policy to the local economic and political environment. At the same time, city-level minimum wages may be more distortionary as relocating businesses outside of city boundaries may be easier than relocating outside of the state or the country. While the literature on city-level minimum wages is still at an early stage, existing evidence does not indicate that the employment and wage responses differ substantially from the responses to state-level changes. Overall, the weight of the evidence is consistent with these policies having moderately raised wages at the bottom without a large change in employment probabilities. Much of the adjustment seems to have been similar to state and federal-level increases: through slightly higher consumer prices which in this case is mostly borne by middle and higher income consumers, and through some reductions in turnover costs. At the same time, there is considerable uncertainty around these estimates, and more research is needed to provide a definitive conclusion.

We expect a growing number of case studies will emerge soon that will summarize the impact of the policy in large cities such as Los Angeles and Minneapolis. Nevertheless, the literature can also benefit from exploiting combined analysis of the city-level minimum wage changes. An analogy is useful here. The new minimum wage literature rose to prominence from studying one particular minimum wage increase in New Jersey (Card and Kruger, 1994); however, the recent literature has exploited hundreds of minimum wage increases (e.g., Cengiz et al., 2019). Even if the data limitations make the analysis of city-level minimum wage changes more difficult, we see much value in exploiting more than single events to identify the effect of the policy. Our analysis presented in this paper provides an initial attempt at such a synthetic analysis; we hope to see much more. One additional point merits a mention: while use of state-specific administrative data can be of great help if there are credible control groups present within the state, the costs of relying on one state may exceed the benefits if proper control groups are not available. Furthermore, there is scope to learn from use of public-use data (like from QCEW, QWI, or the ACS) that are available widely. This was a conclusion reached in Cengiz et al. (2019) who showed the CPS wage data had

comparable accuracy in many cases as administrative hourly wage data sources. We think a similar lesson may apply to the city-wide context as well, at least for some questions.

Finally, there is surprisingly little research devoted to some important aspects of city-wide minimum wages. Direct evidence on business reallocation across city boundaries would be important to assess the key trade-off emerging from introducing local variation in the policy. It would be also valuable to learn the welfare implications coming from the potential reallocation of business from the core of the city to the more deprived areas. Additional evidence on rental and housing prices would also help to understand the welfare implications of the policy. We hope these gaps in the literature will be filled in the next wave of research on city-level minimum wages.

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ONLINE APPENDIX

1 Additional Tables

Table 2: Basic Characteristics of Cities with and without Minimum Wages – Unweighted by Population

	(1)	(2)	(3)	(4)	(5)
	Cities with Minimum Wage			Cities without a MW	
	All	Pop < 100k	Pop > 100k	Pop > 100k Raw	Pop > 100k Reweighted
Number of cities	42	20	22	249	249
Population (in thousand)	568.1	55.2	1034.4	266.9	1031.0
Nominal MW in 2020	14.31	14.74	13.92	9.79	9.01
Planned MW by 2022	15.53	15.94	15.16		
Mean wage	38.05	42.58	33.92	24.63	25.03
Median wage	28.00	31.10	25.17	18.38	17.80
Cost of living index (RPI)	120.1	123.5	117.1	101.2	100.9
MW to mean wage	0.39	0.36	0.42	0.40	0.36
MW to median wage	0.54	0.50	0.57	0.53	0.50
Share Democrats	0.73	0.73	0.73	0.54	0.55
College share	0.45	0.46	0.44	0.30	0.30
Unemployment rate	4.40	3.94	4.81	5.30	5.46
Industry shares					
Restaurants	0.06	0.06	0.07	0.08	0.08
Retail	0.09	0.09	0.09	0.11	0.11
Manufacturing	0.08	0.09	0.08	0.09	0.08
Construction	0.05	0.05	0.05	0.06	0.07
Health and social care	0.12	0.11	0.12	0.14	0.13
Professional services	0.14	0.14	0.14	0.07	0.07

Notes: This table reports the statistics reported in Table 2, but without population weights.
Own calculations based on the 2018 American Community Survey. Cost of living index is the MSA level RPP measured in 2017. The share of democrats in the 2016 presidential election is obtained from McGovern (2016). Column (5) reweights cities without minimum wage to match the population size of cities with minimum wages using an entropy balancing reweighting.

Table 3: Cities with Minimum Wage in 2020

Cities	MW in 2020	Planned nominal MW in 2022	Kaitz index
1. Seattle, WA	16.39	17.19	0.57
2. SeaTac*, WA	16.34	16.79	0.67
3. Emeryville, CA	16.30	17.92	0.65
4. Sunnyvale, CA	16.05	17.05	0.39
5. Mountain View, CA	16.05	17.05	0.34
6. Berkeley, CA	15.59	17.15	0.60
7. San Francisco, CA	15.59	17.05	0.45
8. Santa Clara, CA	15.40	15.85	0.43
9. Palo Alto, CA	15.40	15.85	0.33
10. Los Altos, CA	15.40	16.40	0.33
11. Redwood, CA	15.38	15.87	0.42
12. San Mateo, CA	15.38	16.32	0.39
13. El Cerrito, CA	15.37	16.31	0.64
14. Cupertino, CA	15.35	16.35	0.27
15. San Jose, CA	15.25	16.20	0.56
16. South San Francisco, CA	15.00	15.90	0.53
17. Richmond, CA	15.00	16.40	0.75
18. Petaluma, CA	15.00	15.90	0.62
19. Milpitas, CA	15.00	16.50	0.50
20. Menlo Park, CA	15.00	15.90	0.48
21. Belmont, CA	15.00	16.41	0.40

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Cities	MW in 2020	Planned nominal MW in 2022	Kaitz index
22. New York, NY	15.00	15.00	0.66
23. Pasadena, CA	14.25	14.94	0.63
24. Los Angeles, CA	14.25	15.72	0.75
25. Santa Monica, CA	14.25	15.36	0.44
26. Malibu, CA	14.25	15.72	0.36
27. Oakland, CA	14.14	15.01	0.56
28. Washington, DC	14.00	14.50	0.48
29. San Leandro, CA	14.00	15.00	0.52
30. Daly, CA	13.75	14.60	0.57
31. Sonoma, CA	13.50	16.00	0.60
32. Fremont, CA	13.50	15.92	0.36
33. Alameda, CA	13.50	15.48	0.50
34. Flagstaff, AZ	13.00	15.50	0.81
35. Chicago, IL	13.00	13.60	0.65
36. Denver, CO	12.85	15.87	0.58
37. St. Paul, MN	12.50	15.00	0.66
38. Portland, OR	12.50	14.75	0.56
39. Minneapolis, MN	12.25	15.00	0.61
40. Santa Fe, NM	11.80	12.65	0.62
41. Las Cruces, NM	10.25	10.70	0.80
42. Albuquerque, NM	9.35	9.60	0.55

Notes: Kaitz index is the minimum wage divided by the median wage. The median wages of all workers is calculated from the 2018 wave of the American Community Survey and it is measured in 2020 dollar value.
** Minimum wage only applies to transportation and hospitality workers within SeaTac city. We report the city level Kaitz index, where we calculate the industry share weighted average of the minimum to median wage.*

2 Data

The city-level and state-level minimum wage information comes from various sources. For city-level minimum wages, we rely on Vaghul and Zipperer (2016), UC Berkeley Labor Center (2020), EPI (2020) and the specific local ordinances of each city. For state-level minimum wages, we rely on Vaghul and Zipperer (2016) and EPI (2020). Minimum wages refer to the ones in effect at the end of the year. A notable exception is New York City, which usually changes minimum wages on 31st of December, where we report the minimum wage as if it were instituted in the following year. For the planned minimum wages in 2022, we use either the nominal values when stated in the ordinance or obtain them following the city indexation rules. For indexation we use the average growth rate in regional CPI between 2014 and 2019

The main dataset used for the analysis is the American Community Survey (ACS) 1-Year Public Use Microdata Sample (PUMS) files of United States Population Records for 2012, 2013, 2017 and 2018. This data source contains individual-level information and we exploit its most detailed unit of geography which is the Public Use Microdata Area (PUMA) of residence. In order to get statistics at the city level, we weight by the population shares of each city in each PUMA which are obtained from Missouri Census Data Center (2014). We complement this with other ACS aggregate variables at the city level, namely employment and population, which are obtained from the ACS 1-Year Summary Files. For cities with less than 65,000 inhabitants, the aggregate information is obtained from the ACS 5-Year Summary Files.

The mean and median wage at the city level are constructed using the ACS variables WAGP (annual salary income), WKW (annual weeks worked), WKHP (annual usual hours worked per week). Given that WKHP is discrete, we take the mean value of each category except for the highest one where we assume 52 weeks worked for everyone reporting 50 to 52 weeks. We winsorize the wage variable (1 and 99 percentiles). Comparison of our ACS variables at the city level with their counterparts at the MSA level from the Occupation Employment Statistics (OES) yields a correlation of around 0.67. In order to compute bin-by-bin employment, we deflate wages using the US city average CPI from the Bureau of Labor Statistics.

In addition, we also consider variables regarding cost of living and electoral outcomes from other sources. For cost of living we use Regional Price Parities (RPP) data at the MSA level, which is obtained from the Bureau of Economic Analysis (BEA). Regarding political outcomes, we use the share of people voting for the Democratic party in the 2016 election, which we take from McGovern (2016). This information is at the county level, so we construct our city level statistics weighting by the share of each city in each county from Missouri Census Data Center (2014).

3 Calculation of wage effects

We follow the approach developed in Cengiz et al. (2019) to calculate the wage effects for workers likely affected by the policy. In particular, the percentage change in wages of affected workers is defined as:

$$\%\Delta w = \frac{\%\Delta\, wb - \%\Delta e}{1 - \%\Delta e} = \left(\frac{b_{-1}}{wb_{-1}}\right)\left(\frac{wb_{-1} + \Delta wb}{b_{-1} + \Delta e}\right)$$

Here Δwb is the change in wage bill under \$20/hour, Δe is change in employment under \$20/hour, wb_{-1} is the wage bill under the new minimum wage in 2012, while $b_{-1}$is employment below the new minimum wage in 2012. All of these are in per-capita terms.

This expression can equivalently be calculated using changes in the conditional average wage $\Delta\overline{\mathrm{w}}$ (i.e., the change in the average wage conditional on earning under \$20/hour) and changes in employment. Denoting employment below \$20 in 2012 as e_{-1} and the conditional average wage under \$20 in 2012 as $\overline{\mathrm{w}}_{-1}$, we can rewrite the above expression as:

$$\%\Delta w = \left(\frac{b_{-1}}{wb_{-1}}\right)\left(\frac{wb_{-1} + \Delta\overline{\mathrm{w}}(\mathrm{e}_{-1} + \Delta\mathrm{e}) + \Delta\mathrm{e}\cdot\overline{\mathrm{w}}_{-1}}{b_{-1} + \Delta e}\right)$$

This is the expression we estimate in the paper. We separately estimate regressions with the conditional wage and employment as outcomes; we calculate standard errors using the delta method (`suest` command in Stata). The above expression also highlights that it is insufficient to simply consider the percentage change in the conditional wage below \$20, i.e., $\Delta\overline{\mathrm{w}}/\overline{w}_{-1}$. This is because we are adding many potentially unaffected, higher wage workers earning below \$20, and we need to account for this dilution effect. For example, in our sample, the change in conditional wage under \$20 is around 2% while our estimates for the affected wage is around 4%. By using information about the location of the minimum wage relative to \$20, our approach accounts for this dilution.[15]

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[15] Jardim et al. (2017) define the wage effect as the change in the conditional wage under \$19. This is likely to understate the wage effect for affected workers for reasons described above.

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4 Existing Estimates in Table 3

In Table 3 we report existing estimates on city-level minimum wage changes. The following table summarizes the key sources of the estimates. In some cases, we had to calculate the own-wage elasticity as it was not directly reported. In those cases, we calculate the standard errors using the delta method and we assume that the non-diagonal elements of the variance-covariance matrix is zero.

Paper	City	Outcome	Wage	Note
Allegretto et al. (2018) - restaurants	Average of 6 cities	Wage	0.02 [0.01,0.03]	Table 4, col 3. CI clustering at city/county level
		Employment	-0.01 [-0.02,0.01]	Table 4, col 6. CI clustering at city/county level
		Elasticity	-0.23 [-0.78,0.32]	Computed using wage and employment estimates. CI obtained using the delta method
	Oakland	Wage	0.10 [0.06,0.14]	Table 5, col 3
		Employment	0.07 [0.03,0.11]	Table 5, col 3
		Elasticity	0.71 [0.20,1.22]	Computed using wage and employment estimates. CI obtained using the delta method
	San Francisco	Wage	0.06 [0.04,0.09]	Table 5, col 4
		Employment	0.01 [-0.05,0.07]	Table 5, col 4
		Elasticity	0.14 [-0.83,1.11]	Computed using wage and employment estimates. CI obtained using the delta method
	San Jose	Wage	0.11 [0.06,0.15]	Table 5, col 5
		Employment	0.00 [-0.06,0.06]	Table 5, col 5
		Elasticity	-0.02 [-0.5,0.53]	Computed using wage and employment estimates. CI obtained using the delta method

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Paper	City	Outcome	Wage	Note
Allegretto et al. (2018) - restaurants	Seattle	Wage	0.04 [0.02,0.07]	Table 5, col 6
		Employment	0.01 [-0.05,0.07]	Table 5, col 6
		Elasticity	0.20 [-1.16,1.57]	Computed using wage and employment estimates. CI obtained using the delta method
Dube, Naidu, Reich (2007) - restaurants	San Francisco	Wage	0.14 [0.06,0.22]	Table 2, col 1. Divide estimate by pretreatment mean in Table 1, col 1. CI computed from reported SE.
		Employment	0.04 [-0.12,0.2]	Table 7, col 1. CI computed from reported SE.
		Elasticity	0.29 [-0.34,0.91]	Computed using wage and employment estimates. CI obtained using the delta method
Jardim et al. (2017, 2018, 2020) - jobs below $19	Seattle, worker level	Wage	0.15 [0.14,0.17]	2018 WP, Table 5, col 7 (Divide DDD estimate by pretreatment mean in Table 5, col 1). CI computed from reported SE.
		Employment	0.01 [-0.01,0.02]	2018 WP, Table 6, col 7 (DDD estimate). CI computed from reported SE.
		Elasticity	0.03 [-0.04,0.11]	Computed using wage and employment estimates. CI obtained using the delta method
	Seattle, aggregate level	Wage	0.03 [0.03,0.03]	2017 WP (revised in May 2018), Table 5, col 1 (2016.3). Standard error is assumed to be zero (only p-value is reported, which is 0.000)
		Employment	-0.07 [-0.14,-0.01]	2017 WP (revised in May 2018), Table 6, col 3 (2016.3). Standard error is computed from the reported p-value assuming that the test statistic follows a Student's t distribution (se=beta/T, where T=f(p_value))
		Elasticity	-2.18 [-4.14,-0.22]	Computed using wage and employment estimates. CI obtained by assuming that the standard error around the wage estimates is zero

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Paper	City	Outcome	Wage	Note
Moe, Parrott, Lathrop (2019) - full service restaurants	New York	Wage	0.10 [0.03,0.16]	Figure 9. Standard error is obtained using Randomization Inference. For each control city with no minimum wages, we take the difference between the city's wage growth and and the average wage growth in the other 11 cities in the control. To obtain 90th percentile confidence intervals we multiply the standard deviation of this difference by 1.645.
		Employment	0.02 [-0.16,0.21]	Figure 8. Standard error is obtained using Randomization Inference. For each control city with no minimum wages, we take the difference between the city's employment growth and and the average employment growth in the other 11 cities in the control. To obtain 90th percentile confidence intervals we multiply the standard deviation of this difference by 1.645.
		Elasticity	0.25 [-2.89,3.38.]	Computed using wage and employment estimates. CI obtained using the delta method
Schmitt and Rosnick (2011) -fast food	San Francisco	Wage	0.10 [0.05,0.14]	Table 4, cols 1, 2 and 3 (three years). Computed by averaging the point estimates and standard errors over the three specifications.
		Employment	0.00 [-0.33,0.34]	Table 4, cols 1, 2 and 3 (three years). Computed by averaging the point estimates and standard errors over the three specifications.
		Elasticity	0.03 [-3.45,3.5]	Table 4, cols 1, 2 and 3 (three years). CI obtained using the delta method
	Santa Fe	Wage	0.07 [0.02,0.12]	Table 4, col 5 (three years)
		Employment	-0.08 [-0.29,0.13]	Table 4, col 5 (three years)
		Elasticity	-1.20 [-4.36,1.96]	Table 4, col 5 (three years). CI obtained using the delta method