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Channels of Adjustment in Labor Markets: The 2007-2009 Federal Minimum Wage Increase

Tetyana Zelenska

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The author of this dissertation is:

Tetyana Zelenska
556 Oakdale Rd
Atlanta, GA 30307

The director of this dissertation is:

Professor Bruce Kaufman
Department of Economics
Andrew Young School of Policy Studies
Georgia State University
P.O. Box 3992
Atlanta, GA 30302-3992

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CHANNELS OF ADJUSTMENT IN LABOR MARKETS: THE 2007-2009 FEDERAL MINIMUM WAGE INCREASE

BY

TETYANA VOLODYMYRIVNA ZELENSKA

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ACCEPTANCE

This dissertation was prepared under the direction of the candidate's Dissertation Committee. It has been approved and accepted by all members of that committee, and it has been accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Economics in the Andrew Young School of Policy Studies of Georgia State University.

Dissertation Chair:	Bruce Kaufman
Committee:	Barry T. Hirsch
	Madeline Zavodny
	Klara Sabirianova Peter

Electronic Version Approved:
Mary Beth Walker, Dean
Andrew Young School of Policy Studies
Georgia State University

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ABSTRACT

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APRIL 8, 2011

Committee Chair: Dr. Bruce Kaufman
Major Department: Economics

In the debate on the economic effects of labor market regulation much work has focused on minimum wages. A legal minimum wage remains one of the most controversial policy issues. The controversy arises for two main reasons: first, there is no consensus over the economic impacts of the minimum wage mandate, especially its effect on employment, and, second, there is a disagreement over the empirical methods used to identify the minimum wage effects. Although the standard competitive model predicts that wage floors should have a negative impact on employment, empirical work shows mixed results.

This dissertation explores a number of adjustment channels that can explain the paradox of the small and insignificant employment effects uncovered in the MW literature. Specifically, the economic impact of the most recent 2007-2009 Federal minimum wage increase (from $5.15 to $7.25 an hour) is analyzed using a sample of quick-service restaurants in Georgia and Alabama. In contrast to prior studies, store-level bi-weekly payroll records for individual employees are used, allowing greater precision in measuring the relative cost-impact of the MW on establishments. Despite significant variation in the cost-impact of the three-stage MW increase across establishments, regression analysis finds lack of a negative effect on employment and hours following each MW increase. Additional channels of adjustment are explored using

unique data from manager surveys. Evidence suggests that higher product prices, lower profit margins, wage compression, reduced turnover and higher performance standards largely account for insignificant employment effects.

These results are consistent with a number of alternative theoretical models of labor markets. An expanded version of the perfectly competitive model that incorporates additional margins of adjustment is also compatible with the reported findings.

I. Introduction

The minimum wage (MW) produces widespread disagreement regarding its effects. Some believe it is a counterproductive labor policy because it decreases employment as labor cost increases, while others claim that the effect of MW on employment is not clear-cut and that the MW helps to reduce poverty.

The MW debate has not abated since the establishment of the federal MW law in 1938[1]. It has become relevant again following the latest adjustment to the federal MW rates in more than a decade (Figure 1): the U.S. federal MW was raised in three $0.70 increments—to $5.85 in July, 2007, $6.55 in July, 2008, and to $7.25 in July 2009.

The controversy over the MW arises due to disagreement between theoretical predictions and empirical evidence of the MW effects. The textbook competitive model predicts unambiguously lower employment as the cost of labor input rises above the equilibrium level. The distortion caused by the "tax" on wages is predicted to cause inefficiency and other undesirable outcomes, such as lower profits and slower economic growth in the long run. The opposing theoretical paradigm—encompassing a broad class of behavioral, monopsony, Post-Keynesian and institutional labor market models—generally emphasize positive economic effects associated with a higher MW, including greater worker productivity and lower turnover. Despite extensive empirical study of the employment effects, little consensus has been reached. While panel-based studies using variations in the state and federal MW rates tend to find small *negative* employment elasticities, a number of "quasi-experimental" case-studies on a sample of

[1] The minimum wage is a provision of the Fair Labor Standards Act (FLSA), which was passed in 1938. Original minimum wage was set to $0.25 per hour and also established standards regarding overtime pay, maximum hours worked per week, and child labor. Subsequent increases are passed at the will of Congress as amendments to the

low-wage establishments (typically in fast-food or retail sectors) have uncovered small *positive* or *insignificant* employment effects.

Lack of theoretical and empirical consensus undermines the ability of policymakers to evaluate the implications of the MW policy for public welfare, making it an easy target for political controversy. The recent economic recession (2007-2010) has again generated considerable criticism of the MW mandate due to the surge in teen unemployment and a sluggish national economic recovery. Given a strong commitment among many politicians and interest groups to further increases in the MW—to $9.50 an hour and, possibly, indexing it to inflation—the debate over how MW laws affect labor market outcomes is likely to remain at the forefront of policy discussion. Unless we improve our understanding of the economic effects of the MW mandate, the welfare implications of this policy will remain obscure.

The goal of this dissertation is to assemble a comprehensive range of evidence on the channels of adjustment to the most recent three-step federal MW increase from $5.15 to $7.25 an hour. This research contributes to existing MW literature in several ways. Using unique data on individual workers' earnings from a sample of quick-service establishments in Georgia and Alabama, we are able to exploit the differential cost-impact of the three-stage MW mandate on employment and hours worked across establishments located in relatively low- and high-cost areas. Importantly, the measure of policy "treatment" is calculated from individual-level payroll data which allows capturing the relative cost-impact with greater precision than in prior studies that rely on store-level averages (Card & Krueger, 1994). Second, this study goes beyond the standard competitive model of labor markets by considering several alternative theoretical models which incorporate additional margins of adjustment to the higher labor costs and provide an alternative framework for analyzing the MW impact. Third, we examine a range of channels

of adjustment using several data sources. In addition to analyzing payroll records, we collect unique survey data from the managers to document internal adjustments which help businesses to offset and mitigate higher wage bill costs due to the MW increases. Some of these adjustment mechanisms have not been adequately explored in prior studies; yet they help to reconcile the controversial findings of insignificant or small positive employment effects.

Results indicate that the 2007-2009 federal MW increases did not have a discernable negative or positive effect on employment or work hours for restaurants in my sample. Employment and hours elasticities are not precisely estimated, both positive and negative, and are not statistically significant. Non-employment channels of adjustment to higher labor costs include higher output prices, lower profits, reduced use of overtime work, wage compression, adjustment in work schedules and greater worker productivity. These findings seem to support Flinn's (2006) assessment that "the 'textbook' competitive model of the labor market […] may have serious deficiencies in accounting for minimum wage effects on labor market outcomes." While inconsistent with the most narrowly-defined simple competitive model, the results presented in this dissertation are in agreement with an expanded version of the standard model which allows more margins of adjustment and more flexible production function, in the context of an imperfectly competitive product market. A more cautious implication is that the models of perfect competition and monopsony may lack predictive power in assessing the multidimensional effects of the MW increases and should be revised.

The rest of the dissertation is organized as follows. Section II provides a brief theoretical overview of labor market theories and the different predictions of the MW effects. Section III reviews empirical studies on the economic impacts of the MW increase. Section IV describes data sources and provides descriptive data of the sample. Section V outlines the estimation

strategy used to measure employment and hours effects. Principal results from the payroll data analysis and robustness check are presented in Sections VI and VII, respectively. Evidence on non-employment responses to the MW based on payroll data and descriptive evidence are discussed in Section VIII. Section IX presents analysis of internal adjustments from manager and employee surveys; Section X briefly discusses the implications of the primary results for the theoretical models. Discussion is concluded in Section XI.

II. Theoretical Models of Labor Markets

The standard competitive model, and to a lesser extent, monopsony model, have been widely used as an interpretive framework for the majority of the MW empirical studies. In this section I briefly review different theoretical models of labor markets and the predicted MW effects generated by these models (Table 1). The theoretical models reviewed include: perfectly competitive, monopsony, behavioral, Post-Keynesian and institutional. This analysis suggests that that framework for analyzing MW may need to be broadened to go beyond the simple competitive and monopsony models.

Competitive model.

*Key characteristics***.** In a perfectly competitive model of labor markets under well-known assumptions of perfect information, profit-maximizing behavior, and free mobility, the interaction of the labor demand and labor supply curves determines the market wage rate. An individual firm faces a perfectly elastic labor supply curve, implying that it can hire any number of workers it requires at that wage level (Mincer, 1976; David Neumark & Wascher, 2008; Stigler, 1946). Infinite elasticity of the labor supply curve also implies that lowering the wage by any amount results in employees immediately leaving their workplace to be rehired elsewhere.

Employers do not have power to set wages and face a uniform wage determined by the labor market. They set the level of employment at the point where the marginal cost of the last workers hired is equal to the extra revenue produced (i.e., marginal revenue product of labor). Figure 2A is a representation of these assumptions at the market level.

Predictions. Figure 2A shows the economic effects of a MW increase in a competitive market with a covered and uncovered sector[2]. Starting at the equilibrium wage W_1, a higher mandated wage of W_2 in the covered sector increases the marginal cost of hiring an additional worker. In response, firms move along their downward-sloping marginal revenue product of labor curve until they reach the point where the marginal revenue product of labor is equal to marginal cost, *ceteris paribus*. As a result, the work force (or work hours) is reduced to L_2, amounting to lay-offs of L_1-L_2. In the longer run, the negative employment effect may be reinforced if the labor demand curve becomes more elastic due to capital-labor substitution. The elasticity of the demand curve is determined by four factors: the price elasticity of demand for the final product; the share of labor in total cost; substitutability of capital inputs for labor; and the elasticity of the supply of capital and other factor inputs.

The prediction is less certain in regards to *unemployment* in the covered sector. As a result of the minimum wage provision, the quantity of workers supplied exceeds quantity demanded by L_3-L_2. If all these workers continue to seek employment in the covered sector, unemployment remains at L_3-L_2. However, some of these workers may become discouraged and drop out of labor force or seek employment in the uncovered sector. Thus, unemployment may increase but the prediction is less certain since some of the L_1-L_2 laid-off workers may seek employment opportunities in the uncovered sector, graphically represented by a rightward shift

[2] However, since the Federal MW covers 98 percent of workforce, one-sector discussion is typically more applicable.

in the labor supply curve in Figure 2B. An excess supply of labor creates downward pressure on the wage in the uncovered sector. If the wage is not flexible, the uncovered sector will experience unemployment; if the wage is flexible downward, then the wage will fall, leading to an increase in employment from the initial equilibrium L_4 to L_5.

Ultimately, the extent to which MW increases earnings of low-wage workers depends on the elasticity of the demand curve: the more employment is responsive to changes in the wage rate (greater elasticity), the greater is the percentage decline in jobs and hours.

Other predicted economic effects include the following: higher consumer prices (as the cost shock is passed onto consumers); decreased short-run profits; possibly lower general on-the-job training (since employer cannot pass the cost of training onto the worker in the form of lower wages); and decreased aggregate output (some businesses exit and remaining firms reduce output). For society as a whole, the burden of the MW "tax" is misallocation of productive resources and reduced output, represented by a movement inside the production possibility frontier. The benefit of a higher MW is shared by the low-skilled workers if they are able to maintain their jobs.

Monopsony

Key characteristics. The term "monopsony" is used to describe two types of the labor markets. Classic or structural monopsony, attributed to Robinson (1969), pertains to the case of a single buyer of labor in the market where the firm faces an upward-sloping labor supply curve. More recently, the "new" approach to monopsony posits that employers (both in concentrated and non-concentrated markets) face a labor supply of curve that is not perfectly elastic because of market

imperfections, including limited mobility, search costs, and imperfect information (Manning, 2003)[3].

In a monopsonistic labor market (Figure 3) the marginal cost of hiring a worker *MC(L)* is greater the new worker's wage *w(L).* Unlike the competitive firm, which offers the same market wage to attract more workers, the monopsonistic firm has to increase the wage of its current (inframarginal) workers as well. The profit is maximized where the marginal cost equals to the marginal revenue product, resulting in the equilibrium level of employment L_1 (and wage w_1)—lower than the employment level in the competitive market (*Lc*). The elasticity of the labor supply curve determines the extent to which the worker's marginal revenue product diverges from the wage rate (also referred to as a "monopsonistic exploitation"). Specifically, the proportional gap between the marginal revenue product and the wage is equal to the inverse of the labor supply elasticity (Hirsch & Schumacher, 2005). Intuitively, the less elastic is the labor supply curve, the greater the ability of a firm to "underpay" its workers.[4] A monopsonist does not have a labor demand schedule as traditionally defined: in contrast to the competitive market, *MC(L)* is upward-sloping which, jointly with the upward sloping supply curve, determines the equilibrium combinations of wage and employment.

Predictions. The effect of the MW depends on how high the minimum is set relative to the competitive wage level. In principle, there are two counteracting forces: on the one hand, the

[3] Hirsch and Schumacher (2005) test for "classic" and "new" monopsony in the market for registered nurses. Presence of the "classic" monopsony implies that relative wages of nurses relate negatively to hospital system concentration and market size. On the other hand, a high proportion of new hires from outside employment (unemployment or out of labor force) would imply little mobility across employers and support for the "new" monopsony.

[4] Hirsch and Schumacher (2005, p. 973) argue that the inverse should not necessarily hold: presence of inelastic labor supply curve is a necessary but not a sufficient condition for employers to possess and exercise power with respect to wages. The reason is that imperfect information and limited mobility may not harm workers but may actually be beneficial if they are associated with incentive contracts, specific training and worker rents.

MW raises the average cost of labor and, on the other hand, there is a reduction in incremental wage increase for inframarginal workers, up to the point where the minimum wage equals the competitive wage. Hence, if the MW is placed between the wage paid by the monopsonist (w_1) and the wage paid by in the perfectly competitive market (w_c), as shown in Figure 2, employment will increase to L_2 because the marginal cost of hiring a worker falls and is equal to the new MW (until L_2) (there is a discontinuity in the marginal cost curve, marked in bold in Figure 2). However, if the minimum is set above w_c, employment is reduced just as the competitive model predicts. Ultimately, the effect of the minimum wage on employment depends on the size of the increase.[5]

Other economic effects of the MW in the monopsonistic setting are less clear. The product price should fall if employment increases because output also increases. However, lower price effects have not found much empirical support[6]. In the long run, product prices may increase if some firms exit or if the MW is raised further and exceeds the competitive level. In addition, and despite small employment gains, if the average total cost exceeds the market price level, firms will eventually have to reduce employment and may go out of business. Additional outcomes may include the following: 1) largest gains for minority and low-skill workers since they experienced the largest exploitation prior to the MW increase; 2) labor turnover is likely to

[5] It is crucial to keep in mind that these conclusions are based on the partial equilibrium model of a single monopsonist, and the extent to which the conclusions remain true in a general equilibrium model is obscure. As Manning (2003) notes, the aggregate employment effect in the general equilibrium setting depends on the elasticity of the labor supply curve to the market as a whole, and not simply on the elasticity of the labor supply to a single firm. The employment effect, in contrast to the partial equilibrium outcome, may not be positive for a low level of the minimum wage in oligopsonistic labor market.

[6] The inconsistency between small positive employment effect of the New Jersey minimum wage *and* higher product prices is known as the "Card and Krueger paradox." Shepherd (2000), however, recognizes, that the minimum wage shifts firms' long-run average costs upward, thus encouraging some firms to exit the industry and increasing product prices in the remaining firms.

decrease; and 3) similar to the competitive model prediction, on-the-job training is likely to fall (since the wage floor inhibits employers' ability to pass the cost of training onto workers).

A closely related theoretical model assumes search costs for job-seekers and employers are the main source of monopsony power (Ahn, Arcidiacono, & Wessels, ; Burdett & Mortensen, 1998; Flinn, 2006; Flinn & Heckman, 1982; van den Berg & Ridder, 1998). In these models, MW induces individuals to enter the labor market and search for jobs. These models are generally consistent with monopsony-like implications for employment, although the results vary significantly with the assumptions. For instance, Flinn (2006) analyzes effects of changes in MW in a continuous-time model of search with Nash bargaining and finds that MW increase may have ambiguous effects on employment in such context, it can improve welfare on both the supply and the demand side of the labor market.

Behavioral models

Key characteristics. The fundamental assumption of behavioral models—which include efficiency-wage, shirking, labor turnover, adverse selection and gift-exchange versions—is that labor is not an inert commodity but is rather embodied in human beings who respond in predictable psychological/sociological ways to a higher rate of pay. These theories often assume imperfect and costly information, presence of moral hazard, heterogeneity of the work force, and less-than-perfectly-elastic labor supply curve (which implies that employers have some power to set wages). In contrast to the competitive model, where wages (and reservation wages for involuntary unemployed workers) are bid down until the market equilibrates, behavioral wage models posit that employers for various reasons do not find it in their best interest to cut wages, even if unemployed workers are willing to take jobs for less pay. The potential benefits of not

lowering the wage stem from productivity-increasing or cost-saving effects of a higher wage rate (Yellen, 1984).

Productivity-enhancing and motivational properties of the wage rate are the principal characteristics of the efficiency wage model (Solow, 1979; Stiglitz, 1974, 1976). According to this model, the wage rate has a direct effect on worker's effort level and thus enters the production function. Greater productivity for affected workers is a result of improved morale or better ability to satisfy their physical and nutritional needs. Enhanced productivity implies that more output can be produced with the same amount of labor and capital, hence employment may not change or may even increase following the MW increase. A related idea is embedded in the gift-exchange model, which assumes that higher MW affects the workers' perception of fairness. Since the employer-employee relationship is based on mutual reciprocity, the "gift" of higher income via MW compliance is reciprocated with higher productivity, improved workers morale, and less conflict among workers.

In addition to a positive effect on productivity, a higher MW may lead to some cost-savings which, at least to some degree, offset the increase in firm's total wage bill. There are three closely-related explanations for why this may be the case—shirking, labor turnover, and adverse selection. First, according to the shirking model, developed by Shapiro and Stiglitz (1984), as a result of a higher wage rate a worker does not "shirk" because the relative cost of losing the job is higher. Also, the cost of monitoring the workers' effort is reduced since the threat of being unemployed serves a disciplinary role. Similarly, according to the labor turnover model, workers who receive a raise as a result of the MW increase have greater job attachment, which reduces turnover costs and increase expected returns on employer-provided training (J. Salop & Salop, 1976; S. C. Salop, 1979; Stiglitz, 1974, 1985). Finally, in the adverse selection

model workers have heterogeneous ability which is positively correlated with their reservation wages (Stiglitz, 1976). As Yellen (1984, p. 203) points out, "[the] willingness of an individual to work for less than the going wage places an upper bound on his ability, raising the firm's estimate that [the worker] is a lemon." Similarly, Drazen (1986) suggests that once adverse selection is eliminated by increasing competitive market wage to a higher wage rate, an improvement in worker skills more than offsets the increase in labor costs.

Predictions. A positive impact of higher wages on productivity has several important implications for the analysis of MW effects. Figure 4 illustrates the impact of a MW under the competitive labor market assumptions but where wages and worker productivity are positively correlated. Prior to the minimum wage, the equilibrium level of employment is L_1 and the corresponding market wage is W_1. If the new minimum is set at W_2, then under the efficiency-wage model, workers increase their effort, making the marginal revenue product of each worker higher. A greater marginal revenue product translates into a rightward shift in the demand curve; however the extent of the shift ultimately depends on the responsiveness of individual worker effort to changes in wage rates. The new demand curve (*Demand 2*) implies that at the new wage level each worker contributes more to the output and employment expands to L_2.

Endogenous work effort models posit there may be a positive effect of the MW on employment as workers become more productive but other effects are ambiguous. Aaronson et al. (2008) show that a small price increases are consistent with assumptions of endogenous work effort. However, if more output is produced due to greater productivity of workers, prices may go down. In the long run, the positive productivity effects may wear off and workers' productivity may converge to the original level, leading to price increases. Non-wage benefits may be reduced according to the principal of compensating differentials, or they may be

increased as part of the "gift exchange." A firm may invest in general on-the-job training since labor turnover is reduced and the firm can now capture some of the returns.

Post-Keynesian (PK) model

Key characteristics. Effective demand is the central concept in the PK[7] theory of labor markets. According to this model, the economy is demand-driven, and investment and capital accumulation do not derive from the intertemporal consumption decisions of households (N. Shapiro, 1977). The level of output is inherently determined by the *demand* for a firm's products, and at the aggregate level, the supply of output is determined up to the point of full resource utilization (the production possibilities frontier) by the effective demand. In addition, the concept of the production function is modified into a utilization function,[8] which assumes no decreasing returns as long as capacity utilization is below 100 percent. Thus, if a firm operates just below its full capacity, it can vary its level of employment and intensity with which a given stock of capital is utilized (Lavoie, 2006). Labor generally is divided into two types: blue-collar (variable) workers and overhead (fixed) white-collar workers, unrelated to production.

The PK theory is concerned more with the aggregate labor market than with a single industry. Figure 5 depicts the demand for labor and the principle of the effective demand (goods market). For the economy as a whole, there is a positive relation between the real wage and the equilibrium level of employment. Intuitively, an increase in real wages leads to higher aggregate consumption spending, which in turn leads to increased demand for labor and lower unemployment. Thus, an increase in the real wage *w/p* implies movement along the curve, and

[7] The term "post-Keynesian" is a vague concept, unifying an ensemble of economists. The founding fathers of the PK economics are the Cambridge economists of the 1950s, such as Joan Robinson, Richard Kahn, and Nicholos Kaldor (Lavoie, 1992).

[8] The concept was first proposed by Joan Robinson in 1964 (Lavoie, 2006).

hence a higher level of employment[9]. The curve is asymptotic to the horizontal line $y_{v,}$ representing the constant marginal product of variable labor; thus, the real wage has an upper bound, i.e., the productivity of blue-collar workers. Employment is restricted by *Lfemp* which is the number of workers who can be hired at full capacity of output. The supply curve of labor (vertical) is the level of employment at full capacity, with the corresponding real wage rate of (w/p)f. If the real wage rate is set at (w/p)* and the corresponding level of employment is *L*, then there is unemployment, equal to *Lfemp-L*. According to the perfectly competitive model, the excess supply of labor should exert a downward pressure on wages to bring employment back to equilibrium. However, in this case, lower real wage creates lower effective demand and erodes employment.

Predictions. Economic effects of the MW increase in the PK framework are antithesis to neoclassical predictions. In the diagram, if the real minimum wage is increased from $(w/p)_1$ to $(w/p)_2$, the new level of employment is traced along the effective demand curve, from L_1 to L_2. As long as the full capacity is not exceeded, an increase in real wages leads to increased aggregate consumption and more workers are needed to satisfy greater product demand. The supply in the economy is demand-driven, determined by the effective demand. As a result of the MW increase, the economy is closer to full employment because it positively stimulates aggregate demand.

The effect on prices is ambiguous. Prices may increase if firms use "cost-plus" pricing; on the other hand, prices may decrease if larger output leads to lower average costs (economies of scale). Other predicted effects are also uncertain. Higher real wages, for example, may reduce

[9] This positive relation between the real wage and employment is sometimes termed the "Kaleckian paradox of costs." According to Lavoie (2006), the paradox relates to the crucial distinction between behavior of a single firm and many firms across different markets: "While it is true that each individual firm could increase its profits by lowering its unit wage costs—if it acted alone—overall profits will not in the end by any higher. Once all firms have lowered wages and, by keeping prices constant, increased their mark-ups, they will end up selling fewer goods."

turnover but a tighter labor market may lead to higher turnover. Likewise, a higher wage floor may reduce workers' ability to receive general on-the-job training, but greater job attachment may increase an employer's incentive to undertake the investment.

Institutional Model

Key characteristics. Institutional labor economics (ILE) defines institutions broadly as a set of rules, legal constructs and informal arrangements which govern the functioning of society and operation of the economy. According to ILE, labor markets (as all markets) are *imperfectly competitive* due to non-zero transaction costs, incomplete contracts, and heterogeneous workers (Kaufman) . Because of these factors, firms have slack and labor markets have indeterminacies which make competitive predictions uncertain or even reversed in sign. As Figure 6 illustrates, the labor demand curve may resemble a "band," where the wage-employment combinations are not unique, and wage rates are dispersed around the wage rate Wc, which would prevail in the perfectly competitive market. The area is bounded by some upper and lower limits of wage rates, W_u and W_l, respectively. The majority of firms pay a wage which is close to the market wage W_c, but some are at either end of the wage distribution (Kaufman, ; Lester, 1952). The size of the indeterminacy area will vary depending on the degree to which the market conditions come close to the perfectly competitive model.

Predictions. The model does not generate a clear-cut prediction about the labor market effects of the MW increase. Depending on the initial position of a firm in the wage distribution relative to the competitive wage, a higher minimum wage may lead to higher, almost unchanged, or lower employment. However, akin to the behavioral models described earlier, the IE postulates that the marginal product of labor may be a function of the wage rate; thus, higher minimum wage may lead to increased productivity. In addition, the minimum wage mandate may serve an important

social purpose of balancing the inequality of bargaining power by protecting workers rights and ending exploitation, increasing efficiency (through greater work effort, more effective management practices, etc.) and improving equity.

Other predicted effects depend on the extent to which markets deviate from the assumptions of the competitive model. If employment is increased as a result of the higher minimum wage and there is a positive effect on productivity, then the predicted effects on labor turnover, benefits and training are similar to those from the behavioral models. If the opposite is true, the predicted effects are more negative and closer to the competitive model predictions.

The standard competitive model of labor markets is central for framing the MW discussion, while alternative models reviewed in this section—except for the monopsony model—have remained largely in the background. The difficulty in using and testing for alternative models stems from their impracticality and inherent ambiguity with respect to clear-cut predictions of the MW effects. Hence, in this research the competitive model is not abandoned but instead its expanded version is considered. This integrated approach allows me to consider a broad range of internal business responses which lessen the marginal cost shocks due to higher labor costs, considerably enhancing the depth of my analysis.

III. Literature Review: Channels of Adjustment

The empirical literature is extensive. Table 2 shows various adjustment mechanisms through which markets, managers and employees may respond to the MW increase; relevant empirical research is also presented. Since a thorough review is beyond the scope of this study (see David Neumark & Wascher, 2007 for an in-depth survey of the MW literature), in this section a brief review of prior literature is presented, with a focus on: 1) employment effects of

the MW mandate, the most commonly studied labor market response to the MW laws; 2) other non-employment channels of adjustment.

MW and Employment

Does higher MW reduce employment? Much research effort has been devoted over the last century to answer this question. The pioneers of the MW research (Obenauer & Nienburg, 1915; Peterson, 1959) have used qualitative methods and detailed case studies of low-wage industries to evaluate the impact of the MW laws on employment. National time-series studies later examined the employment responses with respect to changes in federal MW laws, finding a negative but low teenage employment elasticities (between -0.3 and -0.1) (Brown, Gilroy, & Kohen, 1982).

Recent MW studies generally fall into two groups, based on their methodological approaches. The first group of studies uses panel data at the state or county level, exploiting the fact that many states have established their own state MW rates, setting them above the federal level. Thus the variation in the federal MW rates may have no (or a very small) impact on markets where state minima exceed the federal rate, while having a greater impact in those states where the federal rate is binding. Typically using the Current Population Survey (CPS) or other national household survey data to examine employment responses[10] to changes in state and federal MW rates, these studies—with rare exceptions—tend to find evidence of adverse labor demand effects for sub-groups of low-skilled workers, with employment elasticities ranging from

[10] The dependent variable is typically the log of employment rate for a particular demographic group; the MW variable is typically expressed as the real effective MW rate or as the relative minimum wage (ratio of the prevailing W rate to the average wage for a particular demographic group). A standard set of controls for the business cycle, as well as state and year fixed effects are also included in the estimation. In fact, the appropriateness of including year effects in such models has been a contentious issue, since the results are inconsistent. For instance, Burkhauser et al. (2000a, b) argue that inclusion of year effects substantially reduces identifying variation of the minimum wage, and should not be included. See Sabia (2009) for a more thorough discussion of this issue.

-0.2 to -0.3 on average (Burkhauser, Couch, & Wittenburg, 2000a, 2000b; David Neumark & Wascher, 1992, 2006; Sabia, 2009)[11].

The second class of MW studies examines the impact of the MW policy change on a sample of establishments, most often in the fast-food and retail industries where the impact of the MW laws is the strongest. Exploiting the variation in the MW impact across businesses in low-wage and high-wage markets, in a relatively short time frame, these studies use variants of difference-in-difference estimates. This "quasi-experimental" approach in the MW literature originated with a series of studies by Card (1992a, 1992b), Katz and Krueger (1992). Best known is the work by Card and Krueger (1994), who uncovered small positive or insignificant employment effects in a sample of fast-food restaurants following an increase of New Jersey MW rate, relative to a similar set of restaurants in Pennsylvania where MW hike was non-binding. Their findings were treated as an assault to the entire classical school of labor economics Ehrenberg (1992, p. 827):

> Taken at face value, [Card and Kruger's] findings suggest that simple competitive demand and supply models do not provide adequate description of low-wage labor market, the very labor markets in which one might expect these models to "work the best." Taken at face value, their findings also cast considerable doubt on empirical research methods used by generations of labor economists.

These unsettling implications of Card and Krueger's work triggered a surge in MW studies, attempting to explain away their findings but with only mixed success (Card & Krueger, 2000; David Neumark & Wascher, 2000). A number of studies have followed in Card and Krueger's

[11] However, applying meta-analysis, Card and Krueger (1995) and more recently Doucouliagos and Stanley (2009) dispute these findings on the ground of publication bias and specification searching.

methodological tradition and continue to find small positive but often *insignificant* employment effects. For example, Dube et al. (2007) adopt a similar econometric approach to investigate the economic effects of a citywide San Francisco MW, relative to the neighboring Alameda county, and do not detect any significant employment loss due to the MW mandate.

Recent minimum wage studies have attempted to address the statistical issues present in prior work. Among the main concerns in the case of state-level panel studies is the presence of unobserved heterogeneity in employment growth across states, in practice creating a downward bias in the estimates of the employment elasticities. Common criticisms of the establishment-level cross-section approach include spatial autocorrelation with inconsistent standard errors[12], lack of external validity due to a limited geographic focus, and insufficient lag time to capture the employment adjustments. For instance, Addison et al. (2008) examine county-level employment at the restaurant-and-bar sector from 1990-2006 and incorporate trends in this sector's employment to account for unobserved heterogeneity in employment growth. While they do not find support for lower employment in the restaurant-and-bar sector, there is compelling evidence that without controls for trends in employment traditional fixed-effects estimates are biased toward uncovering a negative employment effect. Dube et al. (2008) use the minimum wage policy discontinuities at the state borders to identify the effects of the minimum wage on earnings and employment in restaurant and other low-wage sectors within contiguous county pairs between 1990 and 2006. Their findings also point to the presence of spurious negative employment effects due to spacial heterogeneities in the employment trends. They find no

[12] In this case, individual firm level observations are treated as independent when in reality the correlation in non-zero. Bertrand et al. (2004) test for this bias by randomly generating placebo laws in state-level data on female wages from the Current Population Survey. They use standard difference-in-difference approach to estimate the "effect" on wages and find that their standard errors significantly overstate precision of the estimates.

employment effects of MW increases after controlling for both local and regional employment trends.

In a paper closely related to this study, Giuliano (2009) uses data from personnel records on individual employees from 700 retail stores located nation-wide, from January 1996 to July 1998, to exploit geographic variation in the state minimum wages and its impact on retail employment. Her micro-level data are similar to data used in this study, with an important distinction being the presence of hours worked in our data set. One disadvantage of the Giuliano study is that the national chain adjusted its sharing formula with its stores in response to the MW, possibly diluting differences across stores in their responses. Consistent with non-competitive labor market theories linking higher minimum wage to greater labor supply, she finds that employment did not fall as predicted by the competitive model but the employment effect varies across the types of workers (teenagers versus adults) and across geographic areas (high- versus low-income areas).

Minimum wage and non-employment channels of adjustment

The next topic of discussion will be empirical research on the non-employment effects of the MW policy (Table 2).

Market response

Output prices. The conventional perfectly competitive model of a binding MW predicts an increase in the output price in reaction to a minimum wage. According to the "pass-through" argument, an increase in the minimum wage leads to higher output prices, and the higher costs are shifted to consumers. In the long run, the demand for the product falls and profits are reduced. The "hungry teenagers" hypothesis posits the opposite: higher incomes of low-wage workers due to a MW increase stimulate the demand for low-wage products, increasing business

profitability. The overall effect on the fast-food industry from a theoretical standpoint is therefore ambiguous. However, ignoring the aggregate demand and supply effects, a simple theoretical prediction of a full pass-through (under the assumption of constant-returns to scale production function) is that the increase in price should be proportional to the share of minimum wage labor in the total factor cost.

Empirically, there is a general consensus that a higher MW leads to higher output prices. Lemos (2008) provides a thorough discussion of approximately 30 "price effects" studies). For instance, Card and Krueger (1994) find that a pre-tax price of a standard fast-food meal increases by approximately 4 percent in response to the MW increase— which is a slightly higher than needed to "pass through" the labor cost increase. Aaronson et al. (2008) using a different methodological approach also find evidence of unambiguous price increases in response to the MW policies; however, the reported price elasticities are small, ranging from 0.07-0.155. Dube et al. (2007) conclude that price effects are location-specific and operate at the geographical market level, with higher prices at locations more affected by the city-wide MW increase but no detected differences across more and less affected restaurants within the same location.

Profits/Business Growth. According to the competitive model, the MW floor is detrimental to business profitability and growth. However, there is hardly any empirical evidence on the effect of the MW increase on firm performance, mainly because of data unavailability, as well as technical difficulties of identifying an appropriate time horizon that captures long-run effects.

Two studies are notable exceptions. Card and Krueger (1995) use shareholder value of the firm to proxy for profitability effects resulting from the *anticipated* MW increase, finding mixed evidence. While no systematic relationship is uncovered for the 1989 federal MW

increase, subsequent news about possible MW increases coincided with one to two percent variations in shareholder wealth. In a more recent study, Draca et al. (forthcoming) examine differential impact of the 1999 national MW in the United Kingdom on profitability of low-wage (residential care) firms, as well as a large number of firms in other sectors. Using a difference-in-differences approach, they find that firm profitability was significantly reduced (23 percent fall in profit margins for the average care home and 8 to 11 percent reduction in profit margins for the average affected firms from other sectors); interestingly, the authors uncover no increase in firm exits.

Manager response

Hours worked. Firms are able to adjust not only the number of workers but also the hours each person works. In fact, given fixed costs of employment in the form of hiring and training expenditures, firms may prefer cutting hours to downsizing their workforce. This especially may be true in the fast-food industry where employers try to reduce costly labor turnover by instituting flexible work arrangements for their part-time workers. This allows fast-food establishments to adjust work hours fairly regularly in response to demand fluctuations. The higher is the share of fixed costs of employment in total costs, the greater is the elasticity of hours worked, and more employees work overtime.

Empirical evidence on the hours effect is inconclusive and, similar to the employment effect studies, results vary. As discussed in Sabia (2009), elasticities of hours worked derived from time-series studies using CPS data are sensitive to the inclusion of year effects. For instance, Couch and Wittenburg (2001) do not use year effects in their model and find a substantial decrease in teenage work hours (elasticities between 0.48 and 0.77). When year effects are included (Zavodny, 2000), no effect on hours worked (and small positive effect on

teenagers' work hours) is uncovered. Sabia (2009) attempts to resolve this issue by conducting a number of robustness checks. He finds consistent evidence that a 10 percent minimum wage hike reduces average weekly hours worked by teenagers between 3.7 to 5.1 percent. These results did not remain unchallenged. Using a quasi-experimental research design, Dube et al. (2007) find that total hours of work grew more in their treated sample as compared to their control sample, yet the difference is not statistically significant. Similarly, Orrenius and Zavodny (2008) do not find evidence for reduced hours worked among low-skilled immigrants—a group for whom one would expect more adverse effects. In fact, the effect appears to vary among workers with other demographic characteristics: the authors uncover an increase in the average hours worked for male teen workers (elasticity of 0.1) but a decrease for female teen workers (elasticity of -0.13). Fewer studies address overtime work explicitly: Fairris and Reich (2005) find a reduction in overtime hours in a subsample of establishments affected by the living wage policies in Los-Angeles, relative to non-living wage comparable establishments.

Turnover rates. Labor turnover is costly to firms because there are costs associated with filling in vacancies, training new workers and initially low productivity of a new hire. From a worker's perspective, higher wages should reduce voluntary quits among the affected workers, reducing hiring and training costs. Empirical evidence capturing greater job attachment as a result of the MW increase is quite limited. Dube et al. (2007), using difference-in-difference approach, offer suggestive evidence of increased tenure (by roughly three and a half month) as a result of a city-wide MW hike but no evidence of reduced job separation rates in their sample[13]. Using a mix of administrative and survey data, Reich et al. (2005) find that turnover fell

[13] It is likely that workers' tenure in their sample is measured with error. Specifically, to measure turnover the survey respondent was asked how long the firm's "typical worker" had been working at the restaurant—which is likely to be imprecise. In addition, for the fast-food industry where turnover rates are very high, an increase of 3 and a half month in turnover on average appears to be rather high.

drastically among airline service firms that experienced the highest wage cost increases as a result of the San Francisco airport living wage ordinance and its related program. Airport screening workers, whose wages grew by 55 percent, experienced the most prominent decrease in turnover rates (80 percent). Using the difference-in-differences approach, Fairris (2005) examines the impact of Los Angeles living wage ordinances on a number of human resource outcomes among the city service contractor firms affected by the ordinance and a set of establishments from the industrial sectors, which were not covered by the ordinance. He finds lower turnover rates (35 percent lower on average) in the living wage subsample, relative to nonliving wage establishments. However, the study suffers from a number of econometric issues, including the retrospective nature of the data, sample-selection, comparability between the treatment and control groups, and inadequate control for the difference in timing of the ordinances taking an effect.

Training. Theoretical models are not unanimous in their predictions with regard to the MW effect on worker training. Very few studies address this issue empirically, and their evidence is inconclusive. Card and Krueger (1995) find no evidence of MW hikes effect on training. Similarly, Reich et al. (2005) find that the airline service firms at San Francisco airport, experiencing a significant rise in labor costs as a result of the living wage ordinance, increased the amount of initial or on-the-job training provided but the result was not statistically significant. Fairris (2005) examines the effects of Los Angeles living wage ordinance on a range of labor market outcomes, including turnover. He finds reduced job training in the affected establishments, relative to the control group.

Salary compression. Higher labor costs due to the MW mandate may significantly limit a firm's ability to give proportional raises (in the form of bonuses or scheduled performance-based

raises) to workers earning above the minimum desired in order to preserve the internal wage-tenure hierarchy. The difference in earnings between the highest-paid/most experienced workers and the newly hired/low-wage workers is likely to be reduced. Empirically, very few studies address this issue. Card and Krueger (1994) find no evidence that the time before the wage increase and the amount of raises are negatively affected by the minimum wage increase. However, wage compression within a firm is supported by evidence from a study of the city-wide MW increase by Dube et al. (2007).

Skill/Compositional changes in workforce. Small changes in employment levels associated with the higher MW may conceal compositional changes in the workforce, such as substitution away from low-productivity workers (typically less-experienced, teenage workers) towards those with higher productivity (older, more experienced workers). Also known as labor-labor substitution, this may also occur if employers have preferences for a certain type of worker (by gender, race, etc.). A number of studies have examined compositional changes by looking at the aggregated employment rates for different demographic groups at the state level, and find heterogeneous employment effects. Neumark and Wascher (1996) use CPS data and find evidence consistent with substitution away from teenage workers as a result of the MW increase. Taking a similar approach, Burkhauser et al. (2000a, 2000b) find that the most vulnerable groups in the working-age population—including young adults without a high school degree (aged 20-24), young black adults and black teenagers (aged 16-24), and teenagers (aged 16-19)—have been the most adversely affected by the MW mandates, relative to other demographic subgroups. More recently, Ahn et al. (forthcoming) develop a search model with endogenous labor supply and demand and test it using CPS data for teenagers. They find that teenagers from more affluent (more educated) families "crowd out" teenage workers from the less privileged background (less

educated families). An interesting contrast to this group of studies is Orrenius and Zavodny's (2008) work on the employment effects among immigrants: using CPS, they find no adverse employment effect as a result of the MW increase for immigrant workers, who for various reasons (language barriers, cultural differences) may also be considered one of the vulnerable labor market groups.

Fewer studies examine compositional shifts using establishment-level data. Fairris and Bujanda (2006) explore the extent of worker substitution based on both observed and unobserved worker characteristics at a sample of city contract establishments affected by the Los Angeles Living Wage Ordinance. Using employee surveys, they find evidence for substitution toward worker characteristics associated with higher pre-ordinance wages. Guiliano (2009) explores compositional changes in workforce among a large number of retail stores located nationwide. She finds a differential effect on teenage employment between low and high-wage markets. In higher-wage markets where, relative to an adult worker, increase in wages for teenagers was higher, employment of teens increased; the opposite is true in the low-wage locations. The author contends that the small positive employment effect for teenagers may be explained by more affluent teens entering the labor market.

Employee benefits. According to the theory of compensating differentials, higher hourly earnings should lower non-wage compensation to existing and new employees. However, considering that benefits in quick-service restaurants are typically limited to a free or reduced-price meal for hourly crew members, and occasionally health insurance for salaried managers, reduction in benefits is not likely to be an important strategy for offsetting the higher labor costs.

Empirical evidence on changes in benefit structure is very scarce. Two studies have a measure of worker benefits but the results are ambiguous. Card and Krueger (1994) find that

although the proportion of restaurants offering meal price discounts fell in both treatment and control establishments, more restaurants in both groups were offering free meals after the minimum wage increase. However, the estimated effect of the MW increase on the likelihood of receiving a free or reduced-price meal is insignificant. Dube et al. (2007) look at health insurance coverage at the establishments in their sample affected by the MW law but fail to find any reductions in coverage.

Worker response

Increased productivity/effort/morale. As discussed earlier, several behavioral models of labor markets treat worker productivity as endogenous and assume a positive relationship between the wage and non-wage benefits and worker morale and effort. Reich et al. (2005) use data from employer surveys to assemble descriptive evidence of the effect of the living wage policies at the San Francisco Airport on employee performance. Their results suggest that higher wages and improved benefits generated significant improvements in workers' performance, including overall performance, improved morale, lower disciplinary issues, and better customer service. The authors supplement these findings with data from worker surveys and report greater skill requirements, more hard work and increased pace of work for employees receiving the wage increase. They conclude that the increased work effort is likely a reflection of combination of voluntary and involuntary effects.

Lack of consensus in empirical findings points to the "elusive" nature of the minimum wage effects on employment. In this respect, John Kennan (1995) noted that "we just don't know how many jobs would be lost if the minimum wage were increased to $5.15, and … we are unlikely to find out by using more sophisticated methods of inference on the existing body of data. What is needed is more sophisticated data." The variety of empirical findings on MW

employment effects and the limited research on non-employment responses leave the door open for additional research that brings to the table data that has detail on employment, hours, and pay, while at the same time providing complementary evidence on non-employment responses to minimum wages.

IV. Data and Sample Description

This study was able to obtain a new data set with more micro-level information than available for other studies, allowing for improvement in some of the problem areas noted above. Specifically, the study utilizes two complementary data sets on a sample of 81 Quick-Service restaurants located (QSRs) in Georgia and Alabama. Since both states had to raise their state minimum wage rates to the new federal levels and the QSR sector is the most intensive user of low-wage work force, they are good candidates for investigating the effects of the 2007-2009 federal minimum wage increases. The primary data set used to investigate employment effects comes from the confidential bi-weekly electronic payroll records of individual employees collected from January 2007 through December 2009. Other outcomes and firm responses to the minimum wage are explored qualitatively using a survey of store managers, which in turn is supplemented by data from confidential employee surveys and information from semi-structured interviews of sample business owners. Below we describe the data sets in more detail and provide descriptive data.

Payroll records

The primary data set for this study is constructed from confidential individual-level electronic payroll records of 81 QSR restaurants located in Georgia and Alabama, from January 1, 2007 through December 31, 2009. Since for both states the federal MW mandate is binding,

they are good candidates for investigating the effect of the 2007-2009 federal MW increases. The focus is on the limited-service food sector because, along with retail sector, it is the most intensive user of low-wage workforce. The restaurants in the Georgia-Alabama sample are owned by three franchisees of one national QSR chain who have generously agreed to release the payroll data for this study under the condition of strict confidentiality[14]. Although my sample is non-random, we believe that it is representative of the fast-food sector in general since the products offered at fast-food restaurants are highly uniform and employees' skill sets are very similar[15].

The restaurants display substantial geographic variation within the two states: 20 restaurants are located in 12 Eastern Alabama counties (close to the Georgia border) and the rest are located in 23 Georgia counties (in Central and Southern Georgia)[16] (Map 1). Importantly, since wages in rural areas tend to be considerably lower, the spatial variation provides very useful source of differential impact of the minimum wage increases across stores and time periods in our sample.

Electronic payroll data report the following information for each individual worker in a given pay-period (there are typically two pay periods per month[17]): store unit I.D., individual

[14] In further discussion of our sample, we have to maintain our confidentiality agreement and to ensure that neither the name of the restaurant chain nor the individual store units and their owners can be identified.

[15] Unfortunately, persistent attempts to extend the sample beyond 81 units were unsuccessful. The corporate headquarters of the QSR chain after much deliberation refused to participate in the study. However, adding franchisor stores would create problems of comparability since the decision-making process and operation model in these restaurants are likely to be quite different (much more centralized) compared to a franchisee-owned restaurant.

[16] Four counties in Georgia have a higher concentration of stores from our sample than the average (approximately 8.5 stores per county, compared to1.5 restaurants per county on average for the rest of the sample).

[17] Payroll data for 65 stores were reported with an exact date of the payroll (day, month, year). For the rest of the sample, payroll was split by the first and the second half of each month. Thus all payroll data were aggregated bi-monthly, i.e. for the first (within the first 16 days of each month) and the second half of each month.

worker I.D., job title (kitchen staff, assistant manager, etc.), regular hours worked, regular pay, an indicator equal to 1 if an employee worked overtime (and if so, the number of overtime hours and overtime pay) and total pay (regular pay plus overtime pay). Hourly wage rate was calculated by dividing regular pay by regular hours (some restaurant units reported the hourly wage rate separately). Since managers are salaried workers, their earnings are not part of an hourly-worker payroll and therefore managers are excluded from the analysis[18].

We have complete payroll records for all establishments during 36-months (72 pay-periods), commencing in January, 2007. Six stores enter our sample later (one store opened in May 2007 and one in January 2008; four more stores were acquired by the owner in May 2007). None of the stores went out of business during the study period and one unit was closed for two months for remodeling (in September and October of 2009). In addition to the payroll data, we have information on monthly percentage change in sales.[19]

Descriptive statistics for the payroll records data are presented in Table 3 in the Appendix. There are approximately 64,000 individual-level observations for each year in our sample (24 bi-weekly pay periods each year). The average hourly wage for the first 12 months is $6.27, increasing to $6.67 and $7.15 per hour for the last 12 months of the study period. It should be noted that all units are in compliance with the three Federal MW increases[20]. Interestingly, while the regular hours worked remain stable across the study period (at approximately 49 hours

[18] Inability to observe managers' earnings is one of the drawbacks of our data. It is possible that compression of managers' salaries (or postponed bonuses and raises) is one of the adjustment channels used to offset higher labor costs.

[19] Only one franchisee owner provided the actual sales levels, while the other two owners kindly provided monthly percentage changes in sales to ensure confidentiality. Monthly percent change in sales is transformed into log points.

[20] None of the stores from our sample utilize Youth or Training Minimum Wage, which sets a lower minimum wage for new employees who are under 21 years old for the first 60 to 90 days. The owners cited the long filing process and workers unwillingness to work for less than the minimum wage as two main reasons for not utilizing Youth or Training Minimum Wage.

each pay-period or approximately 24.5 hours per week), overtime work declines: the share of employees working overtime decreases from 13 to 12 to 9 percent in 2007-2009, respectively, and the amount of overtime hours falls as well, from an average 0.74 hours to 0.45 hours in 2009.

Although limited in its geographic focus, the dataset used in this study possesses several distinct advantages. First, the key advantage is that our data is based on the individual-worker level instead of establishment-level averages. Data based on averages limit the ability to explore important aspects of the minimum wage impact, such as changes in the distribution of wages and wage compression. Importantly, the micro-level nature of data allows constructing a more precise measure of the *relative* cost impact of the higher minimum wage over the entire three-year period—a much broader window than in related studies. The second asset is the presence of regular and overtime hours worked which are rarely available in other datasets. Finally, payroll data is highly accurate because it is collected for tax-reporting reasons, eliminating almost entirely our concern for measurement error due to recall. Unlike studies using self-reported measures of earnings and hours worked, or survey data which were collected over the phone (Card & Krueger, 1994; Dube et al., 2007), collection of our payroll data is retrospective and should not be influenced by our research question.

Payroll data are supplemented with the county-level data from the *Quarterly Census of Employment and Wages* (QCEW),[21] produced by the Bureau of Labor Statistics (BLS), to control for any labor market fluctuations at the local level. The QCEW produces a comprehensive tabulation of employment and wage information based on ES-202 filings that every establishment is required to submit quarterly for the purpose of calculating payroll taxes for

[21] For more information on QCEW, please see http://www.bls.gov/cew/home.htm.

unemployment insurance—which accounts for 99.7 percent of all wage and salary civilian employment. Publicly available files include county-level data on the quarterly number of establishments, monthly employment, and quarterly wages by disaggregated North American Industrial Coding System (NAICS) industry and ownership sector. Specifically, we extract data on the total employment (as well as number of establishments and wages) for all industries and then separately for *Accommodation and Food Services* sector (NAICS sector number 72) and *Retail* sector (NAICS sector number 44-45) for the years 2007-2009[22]. In addition, population estimates from the U.S. Census Bureau's are used to compute annual population density at the county level.

Manager and employee survey data

In order to examine a wider range of firm responses to the MW increase, we use data collected from the written surveys of restaurant managers and employees (samples of both surveys are available from the author). Employee survey data provide a portrait of the workers in the sample in terms of the standard demographic characteristics such as age, gender, education, marital status, income, etc.

The questionnaires to managers and the hourly employees were administered in mid July-early August, 2009. Each unit in our sample received a pre-paid package with 30-50 employee questionnaires and one questionnaire for the store manager. Survey questions were provided both in English and Spanish languages. On the instruction sheet, a manager was asked to distribute the surveys and to encourage their employees to fill them out; however, it was emphasized that the completion of the survey is completely voluntary. Each employee questionnaire was distributed

[22] We gather these data at the 2, 3 and 4-digit disaggregated levels, which includes *Food Service and Drinking Places* sector (NAICS 722) and *Limited-service Eating Places* sector (NAICS 7222).

in a sealable envelope and contained a detailed instruction sheet. The respondents were asked not to disclose their full names (or their individual worker I.D. numbers) so that their identity was completely anonymous. They were also assured that the managers would not read or be able see their surveys. In approximately two weeks (times varied), the managers collected the surveys in the sealed envelopes and mailed the package back to the researchers. Upon receiving a package from a manager, a $50 gift certificate was mailed as"thank you" for manager's cooperation. Receiving a gift certificate was not conditional on the number of surveys completed or their quality. The response rate was 81.4 percent for managers and 54 percent for the individual employees.

The manager survey was structured as follows. In the first section, managers were asked a series of open-ended questions about cost-saving strategies in different areas of business operation, including human resource (HR) practices, operational efficiency, non-labor costs and customer service. The goal was to assemble evidence on how MW mandate can affect business along several dimensions from a perspective of a manager. In the second section, we examine each cost-saving strategy in greater detail. The list was partially based on alternative theoretical models but mainly on our face-to-face discussions with managers and franchisee owners. The goal was to document which internal adjustments managers plan to use or have already used to offset higher costs due to the MW increase.

Employee descriptive characteristics

A portrait of employee demographic characteristics is presented in Table 4A. The majority of hourly employees are females, and 64 percent are African-Americans. Only 8 percent of workers are of Hispanic ethnicity. The average age of worker respondents is 28 and only 23 percent of respondents are in their teens. Smaller than expected share of teenager workers in the

fast-food workforce could reflect that teenagers have shifted away from fast-food jobs toward retail jobs; it could also reflect a short-term change due to the severe recession that causes more adult workers to take low-wage fast-food jobs. The level of educational attainment in our sample is relatively low, with almost half of all workers having a high school diploma or GED. It does not appear that there are many immigrant workers in our sample: only 5 percent report being born in Mexico. However, it is likely that this figure is understated if workers are reluctant to reveal their current immigration status. Not surprisingly, workers have very low family incomes: 64 percent of respondents have total annual family income of less than or equal to $20,000, and 38 percent live on less than 10,000 a year. Additional worker attributes can be seen in the table.

Several questions explore the reasons for workers' preferences for staying at this job (Table 4B). A large majority of workers agree that the convenience of the store's location and costs of finding another job, including time and money, are primary reasons for staying at the current job. This finding implies that low-wage workers face significant labor market mobility constraints. Evidence also shows that wages, although important, are not the most important factor: social interactions with peer workers, a sense of being treated with fairness and respect, good work team and opportunity to move up in pay and position, play a major role in worker's job attachment. Workers generally seem to be pleased with their job: more than half (57 percent) of respondents consider their present job "satisfying" and "very satisfying," and only 10 percent are not satisfied at all.

Approximately 12 percent of our sampled restaurants are located in the Atlanta Metro Area, where relative costs are much higher. As one would expect, these stores are significantly smaller (20 workers on average, compared to 35 workers on average in other locations), and hourly earnings are substantially higher than in the rest of the sample. For instance, in June 2009

average hourly wage for employees from the Metro Atlanta sub-sample is $8.03 while it is $6.94 an hour for other hourly employees. In terms of demographic characteristics of workers, there are some noteworthy differences: employees from the Metro Atlanta sub-sample are slightly older (16 percent are teenagers, compared to 23 percent in the rest of the sample), 32 percent are married (compared to 16 percent in the rest of the sample), and they are more likely to have dependents. However, the major difference is in the share of Hispanic workers—45 percent of workers from the Metro Atlanta sub-sample are Hispanic, compared to only 6 percent in the rest of the sample. A large share of these workers is first-generation immigrants: 31 percent of workers were born in Mexico, compared to only 3 percent in the rest of the sample. High prevalence of Hispanic workers in the Metro Area establishments is not surprising: immigrants tend to locate in larger urban areas with better employment opportunities and near already established immigrant communities with developed social networks. Although there is no significant difference in educational attainment levels between the two groups, workers in Atlanta sub-sample have on average 3 more months of tenure at the store. Interestingly, the two sub-samples also differ in their attitude toward their job: 60 percent of workers from the Atlanta Metro area consider their job to be "long-term" (11 percent) or "permanent" (49 percent), while 42 percent of workers from the rest of the sample do (11 percent consider the job "long-term" and 31 percent think of it as a "permanent" position). In short, a sub-sample of establishments located in higher-cost urban area of Metro Atlanta employ a significantly larger share of immigrant labor (of Hispanic origin) with a stronger work attachment—which may be due to the limited labor market opportunities for this segment of labor force (due to insufficient English proficiency or other social barriers).

V. Estimation Strategy

In this section we describe the specification of the MW variable, used in this study to measure compliance costs, and the estimation strategy for indentifying the employment and hours response to the three-stage MW increase.

Measuring costs of MW compliance: the GAP variable

The identification strategy uses the MW policy change and its effect on the establishment-level wage bill increase as the source of exogenous variation in wages. In order to identify the effect of MW increases on establishment-level employment and hours worked, we construct a measure of the relative cost-impact of the exogenous MW shock called *GAP*. Although other studies have used similar measures (Card & Krueger, 1994; Dube et al., 2007; Giuliano, 2009; Katz & Krueger, 1992), the *GAP* variable is differently specified in several important respects. The major difference is that we are able to exploit the micro-level nature of the data to construct a more precise measure of GAP based on the individual-level wages.

Specifically, the GAP variable GAP_{jt} is constructed using data from individual worker *i* at the restaurant *j* and at time *t* (pay-period). It measures the log change in unit *j's* wage bill resulting from a MW increase, assuming individual workers' hours *h* stay fixed between period t and period t-1 (before and after the MW increase). Specifically, the GAP for restaurant *j* at time *t* is defined in the following way:

$$GAP_{j,t} = 1 + [(\Sigma h_{i,j,t-1} \cdot MW_{i,j,t} - \Sigma h_{i,j,t-1} \cdot W_{i,j,t-1}) / \Sigma h_{i,j,t-1} \cdot W_{j,t-1}],$$

summed over workers i for whom $W_{i,j,t-1} < MW_t$

and set to 0 for workers for whom $W_{i,j,t-1} \geq MW_t$.

The numerator in the brackets is the change in the wage bill between time periods *t-1* and *t*, keeping hours constant; the denominator is the original wage bill. Thus, by summing additional earnings for each employee (change in the wage rate times hours) required for compliance with the higher MW, *GAP* measures the percentage increase in the total wage bill due to the MW hike. Adding 1 to the bracketed term converts this from a proportion to a wage ratio (say 1.15 or 15%). Specifically, we use the natural log of *GAP* (e.g., ln(1.15) = .140) in order to estimate a double log model and employment elasticities with respect to GAP. The *lnGAP* (say .140) is a "percentage" or "proportion" based on an intermediate base between the initial wages and subsequent minimum wage. If restaurant *j* in period t-1 was paying all employees above the new MW effective in period t, then *GAP* = 1 (and *lnGAP* = 0). After the MW increase, GAP also reduces to 1. Table 5 presents summary statistics of the GAP variable, expressed as a percentage (by subtracting 1 and multiplying by 100), defined at the establishment-level as an average during March-May of each year (i.e., prior to a MW-induced wage increase). The relative cost-impact of the MW grows over time and is the strongest for last MW hike as a greater proportion of workers are affected. The average total wage bill in the sample increased: by 2.6 percent as a result of the first MW increase; by 4.6 percent as a result of the second MW increase; and by 6.8 percent in 2009.

The "wage gap" measure used in this study differs from several similar measures used in other studies. Card and Krueger (1994) define their GAP as a proportional increase in the store's *starting* wage necessary to bring it to the new level. According to this definition, *GAP* reduces to the wage ratio (MW_t/W_{t-1}), one plus the proportional difference between the new MW and the prior starting wage. This variable provides imperfect information on the actual cost-impact of the minimum wage: one does not know how many workers are actually impacted by the

minimum wage, nor does one know the total cost of the increase since hours worked are not included and the actual amount of the required wage increase is not observed. In fact, Card and Krueger's "wage gap" is a proxy for a relatively high- or low-cost store location. Recognizing the problems with Card and Krueger's GAP variable, Dube et al. (2007) define their measure as a share of workers affected by the city-wide minimum wage increase (their "wage gap" variable is called "treatment intensity"). Although they are able to account for the *quantity* dimension of the minimum wage impact (i.e., the number of workers whose wages are raised), not accounting for the *price* dimension (i.e., by how much wages have to be raised) generates an imprecise measure of the cost shock due to the minimum wage mandate. Similarly, using simple averages (of wages and hours) would provide a noisy measure since largely unaffected workers with wages above the new minimum wage would, in effect, cancel out affected workers. Since the GAP measure is based on individual-level data, this study is able to capture both *cost* (by how much each wage has to increase) and *quantity* (for how many workers the wages increase). In addition, we can examine the sensitivity of estimated minimum wage effects using less precisely-defined GAPs, as well as several alternative "expanded" GAP measures (by varying the months before and after the policy change at which GAP is calculated).

Estimation strategy

For the empirical analysis of the MW impact on employment and hours worked, this study uses store-level bi-weekly averages, compiled from individual payroll data. Variable definitions, as well as data sources, are presented in Table 6.

The empirical strategy relies on the standard reduced-form employment equations:

$$\ln(E_{jct}) = \alpha_0 + \beta \ln(GAP_{jct}) * MW_t + \alpha_1 \ln(GAP_{jct}) + \alpha_2 MW_t + \lambda Sales_{jct-1} + \gamma Z_{ct} + \varepsilon_{jct} \quad (1a)$$

$$\ln(H_{jct}) = \alpha_0 + \beta \ln(GAP_{jct}) * MW_t + \alpha_1 \ln(GAP_{jct}) + \alpha_2 MW_t + \lambda Sales_{jct-1} + \gamma Z_{ct} + \varepsilon_{jct} \quad (1b)$$

where the dependent variable is either $ln(E_{jct})$, the log of the average employment in store j, county c during period t (bi-weekly) or the log of aggregate hours H_{jct}, the sum of regular and overtime hours. MW_t is a time treatment dummy equal to 1 for six months *after* each MW increase (i.e., August through January each year); it captures aggregate factors that could cause changes in hours and employment even in the absence of a policy change. The coefficient of interest is β, the interaction term of *GAP and MW*; it measures the impact of the proportional cost increase of the MW mandate on establishment employment (or aggregate hours) averaged over the months following the increase. The parameter β provides a measure of the employment (hours) elasticity with respect to the exogenous increase in mandated wages. The higher is the *GAP*, the larger is the cost-impact of MW on labor costs and the greater the predicted employment decline (β <0), as the competitive theory predicts.

The log of GAP_{jct} controls for any differences in anticipated MW effects *prior* to the annual July increases between high- and low-wage restaurants. However, recent empirical evidence by (Schmutte & Gittings, 2011) suggests that MW increase may have long-run effects on employment; hence, including the *initial* measure of the compliance costs in the equation for each year may be more appropriate (the average *GAP* over March-May in 2007 prior to the first increase)[23]. $Sales_{jct-1}$ is monthly percent change in sales, converted to log points and lagged two months to account for potential bias from sales and employment being determined simultaneously. The sales variable is an imperfect measure of the product output since the number of actual purchases or transactions is not observed, and sales differences reflect variance

[23] Alternatively, under the assumption that the "shock" of the first MW hike has little impact on stores' employment trajectories for the next two years, one should instead include GAP_{jct} separately for 2008 and 2009 MW hikes. In my estimations I experiment with both specifications—with and without accounting for possible "lingering" effects of the MW. Interestingly, different assumptions about the lag of the MW impact do not have a significant effect on the principal findings.

in the product mix or price differences across locations. Z_{ct} is a vector of time-variant county-level characteristics reflecting supply and demand factors in local labor markets; these include county-level population density and total private sector employment minus employment at *Accommodations and Food Services* and *Retail* sectors[24] which captures employment unrelated to changes in the two sectors most affected by the MW increases. In addition, state and owner fixed effects are included to control for time-invariant differences across states and the three franchisee owners. Finally, ε_{jct} is modeled as a composite error term; specifically, $\varepsilon_{jct}=\mu_c+\upsilon_{jct}$ where μ_c is a county fixed effect[25]; bi-weekly fixed effect, λ_t, is assumed to be absorbed into the idiosyncratic time-varying error term υ_{jct}.

A few additional econometric issues warrant mention. To allow for autocorrelation at the establishment level, we use panel-robust standard errors clustered on individual establishments. If autocorrelation is ignored, standard errors will be inconsistent and biased (Bertrand et al., 2004; Cameron & Trivedi, 2005)

Possibility of heterogeneous trends across counties (or states) over time is another potential source of bias. Previous studies based on county-level panel data have shown that without adequate controls for pre-treatment trends in employment growth—i.e., not controlling for a negative employment growth in counties which were relatively more affected by the MW increase—the estimated employment effects are biased downward (Dube et al., forthcoming).

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[24] Other county-level controls which have been considered in previous studies are total county employment and earnings, unemployment rate and school enrollment rates (Addison et al., 2008).

[25] Since the error term can be modeled to allow for county effect to be random, I also check whether different specifications result in significantly different standard errors. For instance, allowing time dummies to enter separately makes robust standard errors practically unchanged. Second, estimating the model as a fixed-effects model (which assumes that time-variant controls are correlated with the unit-of-observation fixed effects λ_j, creating a serial correlation in the error term and inconsistent standard errors due to heterogeneity bias) presents serious limitations in our context since it prohibits including establishment-level controls that change across establishments but do not change with time (state, county and franchisee owner fixed effects). Third, under the random effects model λ_j is assumed to be orthogonal to the regressors which is a strong assumption, given that any unobserved establishment characteristics are likely to be correlated with observed controls, such as sales.

There are two possible ways to address this problem. First, we can examine longer time trends in county-level employment to identify whether there are any obvious negative or positive trends in the years preceding the policy change. Second, in a regression analysis controlling for time-varying county-level supply and demand shifters (due to the business cycle) mitigates this concern at least to some degree.

Figure 7 presents county-level annual employment growth rates in the private sector from 1990 to 2008. There is significant variation in employment growth in this period, with a strong positive growth in the early 1990s, followed by a steady decline until late 2001, a period of recovery and another decline starting around 2005—which also reflects nationwide trends. However, some heterogeneity in employment growth may be present depending on low/high-income location. Panel B shows annual employment growth rates for three groups of counties, based on the size of the initial GAP in 2007. Although the general trends are consistent, there are a few notable differences across these three groups. Relative to the "Least" affected group, the other two groups experienced an earlier and a more negative employment growth rate in 2002. However, in 2007 the first two groups of counties switched from a small positive growth rate of about 2 percent to a negative 3 percent in the following year, while the "Most" affected group had a reverse trend: from a negative 1.5 percent to about 0 in 2008. Thus it is possible that during the time of the first two MW hikes, "low-wage" counties are recovering faster from a period of negative and declining employment growth, relative to other counties. This exercise demonstrates that while county fixed effect control for the level differences across counties, it is also important to control for time-varying factors, such as changes in the overall employment, at the county-level.

VI. Principal Findings on Employment and Hours from Payroll Records

This section reports the main findings of the impact of 2007-2009 federal MW increases on employment and hours worked from restaurant payroll records. First, we present graphical descriptive evidence and then turn to the estimation results.

Graphical grouped analysis

Since cumulative averages across all establishments in my sample would conceal substantial variation due to differences in pre-MW levels and the size of *GAP* (compliance costs) across relatively high- and low-wage areas in Georgia and Alabama, establishments are grouped based on broadly similar anticipated MW impacts. Using the size of *GAP* averaged for March - May, 2007 (prior to the July MW increase), the sample is divided into three groups—least, middle and most affected. The "least" affected group includes all zero *GAP* stores (no compliance costs from the first MW increase) and represents the lowest 25^{th} percentiles of *GAP*. The "middle" affected group has *GAP* values between the 25^{th} and bottom and the top 75^{th} percentiles of *GAP*, while establishments in the "most" affected group have *GAP* compliance costs in the top 75^{th} and up percentiles. Grouped analysis allows for a rough comparison of employment and hours across establishments with presumably different minimum wage compliance costs.

Figure 8 plots bi-weekly establishment-level average changes in actual hourly earnings, employment, average regular hours and overtime hours for the three groups of stores over the three-year period. In Panel A, one can see three distinct jumps in the average hourly earnings, coinciding with the three MW hikes. The least affected group of stores is largely unaffected since the average wage there was slightly above $7 during the whole study period; however, there is a pronounced increase in the average hourly wages following the third MW increase. Importantly,

there is no evidence of pre-adjustments in hourly wages prior to the MW increases[26]. The third MW increase in July, 2009 has the strongest effect across all three groups. Small increases around January-February in 2007 and 2008 are attributed to the performance-based raises for a significant portion of the workforce in our sample. According to the restaurant owners, performance-based increases were substantially reduced following the first two MW increases in July 2007 and 2008, and largely eliminated in the third year. This is consistent with evidence suggesting that a mandatory MW increase is partially offset by reduced wage growth from employer increases (Card & Krueger, 1995).

In short, we observe that the three MW increases have a substantial exogenous "treatment" effect on the average hourly earnings during the study period but with substantial differences in the intensity across the sampled restaurants. The regression estimates of the MW impact on employment and hours will rely on outcome differences between restaurants with different sized compliance costs (varying *GAP*). Thus, in the Figure 8, one should focus on differences in outcomes between the least, middle, and most affected restaurant groups.

Panel B presents average employment for the three groups of stores. Despite substantial jumps in the average hourly earnings observed in Panel A, employment is stable across the three groups during the study period. Although there is a negligibly small decline after July 2008 and a slight increase in the average employment after July 2009, overall employment (35 workers on average) did not change significantly not only within a particular group of restaurants but also across groups with different compliance costs. The least affected stores are on average smaller in size which is a sub-sample characteristic of establishments located in the higher-wage Atlanta Metropolitan Area. Some seasonal fluctuations in the average employment are also evident.

[26] Absence of pre-adjustments in hourly earnings is consistent with evidence from the managers and franchisee owners.

There are systematic increases in employment (and turnover) twice a year (in June-July and December-January) which are attributable to vacation leaves and voluntary turnover of teenage workers (who are more likely to be employed during summer and winter school breaks).

Panel C shows average regular hours per worker across the three groups of stores. Although regular hours fluctuate substantially on a pay-period basis, there is no apparent trend in the average hours over the entire study period. The "least" affected stores have the highest average hours worked, 55 hours bi-weekly per worker as compared to the middle and most affected stores with the average of about 46 hours worked. Finally, panel D shows the average overtime hours per worker. Although the average number of overtime hours is very small (one hour on average), there is a significant difference in the overtime hours among the three groups. In the two more affected groups, overtime work is practically non-existent, while it plays a more important role for the least affected group. However, the trend in overtime work is rather uniform across stores that experience differential impact of the minimum wage mandates.

Graphical analysis demonstrates that despite significant increases in the average hourly wages brought by the federal MW increases from 2007 to 2009, there is no apparent difference in employment and hours worked, not only within each of the three groups of stores but also across groups that have experienced different cost-impact due to the MW compliance. Lack of significant differences in outcomes between the most and least affected restaurants is the first suggestive evidence that the MW increase did not produce a large change in employment or hours worked. Smaller effects, however, might be masked by other changes co-varying with the size of MW employment effects. Next we explore effects of the MW increases on employment and hours worked in a regression framework in order to account for important covariates of employment and hours.

Findings from regression analysis

As a first step, we estimate simple equations based on changes over the six-month period before and after each MW increase, ignoring other sources of employment growth besides the three MW increases. The dependent variable is logged employment, and on the right-hand-side we include a "treatment" dummy equal to 1 six months after each MW increase (August through January of the following year). The coefficient on the dummy variable provides a measure of the log difference in employment six month before and after each policy change. First we estimate the relationship without including any covariates (first 3 columns of Table 7). The results are similar to the visual evidence from the graphical analysis: there is a small decline in employment six months after the second MW increase in July, 2008, but there is no statistically significant relationship for the first and third MW hikes.

Next restaurant, county and owner fixed effects are included to establish sensitivity of the first estimates to these variables (columns 4-12 in Table 7). Interestingly, the coefficient on the dummy variable is robust to the inclusion of the store fixed effects (columns 3-6), as well as county and owner fixed effects (columns 7-12). Adding store-fixed effects sharply increases R^2, from zero to about .9. Notably, the magnitudes of the estimated employment effects are small, suggesting a small decline (of 1 to 3 percent on average) following July 2007 and 2008 MW increase and a small increase (of about 1 percent) following July 2009 MW increase although the effect is not estimated precisely. These results demonstrate that, although time-invariant controls for unobserved county, owner and store-level factors are important determinants of the levels of employment in our sample, they do not appear to sweep out unadjusted employment change correlations with the three MW increases.

Next the full model is estimated where we use the measure of compliance costs, *GAP*, along with a host of time-varying covariates that account for the supply and demand factors, to estimate the effect of the MW increase on employment (and total hours). As before, the impact is estimated separately in 12-month intervals (six months before and after each policy change). Estimates of β, the coefficient on the interaction term, $ln(GAP_{jct}) * MW_t$ in equation 1, provides the estimate of the employment (and hours) effect of the MW mandate. Specifically, the interaction term shows how the change in payroll costs of complying with the MW mandate affects employment six months after the MW hike, while keeping hours worked unchanged. The coefficient β may also be interpreted as employment (and hours) elasticity, since a double-log model is estimated.

I address the issue of endogeneity of sales variable by using lagged instead of contemporaneous sales. However, it is not clear a priori what the "correct" lag should be; therefore we explore several specifications with and without lagged sales variable and observe how this affects my results. The estimates are presented in Tables 8A-C. In this set of results we also assume that the MW increase does not have a substantial long-run effect that would extend beyond a 6-month period. The first notable difference from previous estimates is a sharp increase in the absolute value of the coefficient β. It is not precisely estimated for the first two estimation periods, corresponding to 6 months before and after 2007 and 2008 MW increases; however, $\beta>0$ and is significant for the final MW increase in 2009 (in both employment and hours estimations). As expected, lagged sales variable has a consistently positive coefficient, but the relationship is not always significant. Since sales represent price times quantity, one should expect the estimated coefficient on sales to be less than one, as it is. In general, the results do not appear

sensitive to whether sales are lagged or not. However, in my preferred specifications sales should be lagged, but the choice of an appropriate length of a lag is ambiguous.

The principal findings are presented in Tables 9A-C. These estimates are based on my preferred specification, where the sales variable is lagged 2 months (and 1 month in the hours equation under the assumption that adjustments in hours worked can be implemented relatively easier and faster than adjustments in employment); in addition, the *initial* GAP (prior to the first MW increase) is included to control for the lingering effects of the policy change that may extend beyond the 6-month period after the policy goes into effect in the end of July of each year.

Despite this study using a more accurate measure of the relative strength of the cost shock due to minimum wage increases, the results are consistent with studies which find small labor demand elasticities, both positive and negative. For the first and the third MW hikes I positive employment and hours elasticities are uncovered (employment elasticities of +.13-.19 and +.45 and hours elasticities of +.27 and +.3, for 2007 and 2009 respectively), but they are not statistically significant. Interestingly, it appears that the assumption regarding how long the effects of the MW increase last seem to matter the most for the estimates of the impact of the final round of MW increases in 2009. If the initial cost shock from the 2007 MW hike is ignored (columns 4, 7, 10 and 13 in Table 8C) and is assumed to not have a discernable effect on stores employment two years later, then the estimated elasticity of demand is positive, significant, and quite sizable (+.6 and +.35 for employment and hours, respectively). If, however, the effect of the first MW increase is long-lasting (as suggested by recent evidence), the effect on employment (and hours) is still positive but no longer statistically significant (Table 9C). Hence this assumption appears quite important.

For the 2008 increase, we obtain negative but also statistically insignificant elasticity estimates of about -.2 (and +.16 for hours elasticity). We conclude that there is no statistically significant evidence that stores experiencing relatively greater wage bill increases reduce their employment in response to the minimum wage.

In results not shown, we compare the estimates using our relatively precise *GAP* measure of dollar compliance costs with estimates from an identical specification, except that *GAP* is replaced with a less precise treatment variable measuring the share of affected workers, similar to that used in Dube et al. (2007). Both the sign and the size of the estimated effects are similar to those previously shown. While this study's *GAP* variable is the more precise measure of dollar compliance cost, the improvement is not sufficient to significantly change the estimated results.

As for other control variables, monthly percent change in sales (expressed in logs) has a consistent positive and statistically significant impact on the dependent variable (the coefficient is insignificant in Table 9A). Using the two month lag in sales variable alleviates some concerns over endogeneity bias due to contemporaneously determined sales and employment. However, the magnitude of the estimated effect is not very sizeable (elasticities of about +.12 and +.07 for 2008 and 2009, respectively). Other controls, including population density and private sector employment at the country level, are statistically insignificant in most specifications.

The three-step increase in the minimum wage provides a unique opportunity for testing the applicability of the monopsony model. If monopsony were important for understanding the observed outcomes, we would expect to find a small *positive* employment adjustment after the first minimum wage increase as the wage moves from a sub-competitive level toward a competitive level. As the minimum rate is further increased and exceeds the competitive level,

we should observe employment reductions, in line with the competitive model as firms move up their labor demand schedule. However, the opposite pattern is observed.

Overall, these results are consistent with a number of previous studies that find small employment elasticities, both *positive* and *negative*, but that are not statistically significant. Lack of statistical significance, however, does not imply lack of economic significance. In fact, the estimated employment elasticities are somewhat larger than in prior comparable studies, possibly due to a substantial heterogeneity in the way businesses respond to the higher MW.

In addition, there is no evidence showing that the three-step MW increases had a discernable effect on the total hours worked. Possible explanations for these results have surfaced during semi-structured interviews with the store managers. According to store managers, lowering work hours may not be a viable strategy to recover payroll costs because quality of service can be negatively impacted which in turn may reduce customer flow and lower total output. In fact, one manager noted: "Hours have always been allocated based on what it takes to serve the customer flow of the restaurant, *not cost*. The number of people employed is based on the number of hours that must be allocated to serving the customers. We have to employ enough people to fulfill the hours that we need in order to meet our service standards" (italics added). Thus once an optimum combination of employment-hours to serve a certain number of customers is reached, independent of the wage rate, managers may not be willing to lay off workers or reduced their work hours. Hence, cost recovery has to occur in other areas of business operations.

VII. Robustness Checks

In this section we report results of several robustness checks. After accounting for a range of potential problems, the estimates presented in previous section remain largely unaffected.

Ripple effect

Using the *GAP* variable to measure the relative cost-impact of MW increase on total labor costs is likely to understate the wage effect (and overstate the estimated employment elasticities) if workers for whom MW is non-binding also receive wage increases. Higher MW may create a spillover effect across the entire wage distribution if managers want to preserve the internal wage-tenure hierarchy and give raises to their more experienced or more productive workers. Empirical identification of the spillover effect due to MW increases is challenging due to the presence of regular performance-based increases, which also coincide with July increases due to the MW mandate[27]. Since it is impossible to observe what the performance-based increases would have been in the absence of the MW increase, the two effects cannot be effectively separated. [28] One way to address this issue is to identify workers for whom MW is non-binding *prior* to the MW increase and then examine how their wages change in the course of the year. Adding the "ripple" effect and the *GAP* variable creates an upper bound for estimating the cost-impact of MW increase on labor costs since it assumes that their wage increases would have been zero absent the MW.

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[27] Prior to the three MW increases, performance-based wage re-evaluations were performed for all hourly crew members in our sample twice a year, typically in January-February and in June-July. After the first MW hike, however, most of the establishments converted to one annual increase for crew members with hourly wages below the required minimum to coincide with the July MW mandated increase. For higher-paid workers, increases were given according to the pre-MW schedule (in the beginning of the year and then in July-August).

[28] In principle, we could make an assumption about what performance-based increases would have been if MW were not increased (3 to 4 percent, for instance). We could then subtract that measure from the "ripple" effect to separate increases due to MW only.

The "ripple" effect is defined similarly to the GAP variable: it measures the percent increase in the total wage bill due to pay raises received by high-wage workers throughout the first half of the year, assuming that their hours worked remain the same. Table 10 presents summary statistics for the ripple effect. The cost of complying with the MW regulations, captured by the *GAP* variable, is higher than the cost of providing higher-paid workers with the annual raises. In addition, in line with expectations, the two wage effects move in the opposite direction: as the cost of MW compliance increases each year, pay increases for employees above the new minimum fall since the managers' ability to offer extra pay to their higher-wage workers diminishes.[29]

The results of estimating reduced-form employment and hours models using the upper bound of the *GAP* variable are presented in Tables 11A-C. The upper bound is equal to the sum of GAP and the percent increase in the wage bill due to wage increases that are not required to comply with the MW mandate. There is no significant change in employment elasticities or the estimated coefficients of other control variables as compared to earlier results. As expected, the estimated employment elasticities are slightly lower than our earlier results. Although our primary results overstate the employment effect, any bias is very small and does not affect the primary conclusions.

Another alternative for capturing the spillover effect of the MW increase across the wage distribution is to use the actual growth in the wage bill; this "expanded" definition of the *GAP* variable measures the share of wage bill increase at a fixed point before and after the MW hikes

[29] Considering that the spillover effect is smaller, the bias is from understating the cost-impact is expected to be relatively small. In addition, one would be more concerned if the bias would work in the opposite direction—biasing employment elasticities downwards, instead of upward.

(between June and August), while keeping hours worked constant[30]. Estimating the main equations using the "expanded" definition of *GAP* did not result in noticeable changes to employment and hours elasticities (results are not shown).

Extended hours mandate

In March of 2008, the corporate office of the restaurant chain issued a requirement for all franchised restaurants to stay open for additional hour Sunday through Wednesday and for an additional two to three hours Thursday through Saturday.[31] Businesses struggled to generate sufficient revenue to cover the costs of complying with this mandate,[32] and the franchise owners launched an aggressive campaign to revoke the requirement. As a result, in August of the same year the hours requirement was lifted for Thursday nights, and stores were eligible for an exemption from the rest of the mandate depending on the hours of direct competitors in the area.[33] A total of 29 stores in my sample filed for and received an exemption[34] but even these stores had to extend their hours of operation for at least one hour, from 11pm to midnight.

Longer store hours might directly increase total employment or hours, or have some offsetting effects via adverse effect on store's profits. Alternatively, stores that received an

[30] Other fixed points in time could also be used. However, since "expanded" GAP is still based on *individual* worker records (each workers contribution to the higher wage bill, aggregated at the store level), a balanced "panel" of workers had to be used to perform calculations (i.e., each worker had to appear on a payroll both before and after the MW hike); extending our months of reference (say, to March and October-November) is possible, but given a high turnover rate, would require that hours worked, as well as wages, would have to be *averaged* at the store level, lowering the precision of the estimate.

[31] About 10 restaurants in our sample were already operating at or near the required hours. Unfortunately, we could identify them exactly.

[32] The minimum staffing requirements for the "late hours" is two hourly crew workers and one manager, implying a total increase of approximately 18 hours per pay period.

[33] Specifically, a store could request an exemption if its competitor within a one mile radius was not open for late hours.

[34]Three stores in our sample received an exemption much later (2 received it in summer 2009 and one in September-October, 2009). Exact dates are not available.

exemption were better positioned to address the cost-impact due to the MW increase, relative to stores that were not exempt. Both responses can potentially contaminate our estimates. Considering these various scenarios, the impact of this mandate on the estimates of MW impact is difficult to disentangle.[35] One way to test for the effect of the mandate is to compare employment and hours changes between stores that did and did not receive an exemption.

Figure 9 shows total hours worked for stores exempt and non-exempt from the corporate mandate. From the end of February through early March 2008 there is a "spike" in total hours for exempt stores. However, hours worked (both total and average) fall close to pre-mandate levels by the end of May—which can be due to adjusting daytime work hours. Beginning in June, there is a sharp reduction in total hours for stores that were granted an exemption, reaching minimum in August, as one would expect. Stores that were not exempt also experience decline in total hours which reflects a high degree of seasonal volatility in hours worked. After August, however, the difference in hours worked between the two groups diminishes and is not significant.

The effect of mandated hours increase on employment (and hours worked) can also be analyzed in a regression framework using three-way interactions. Specifically, we test whether employment in stores that were *not* exempt from the longer operating hours mandate *after* the MW increase (beginning in August 2008) were affected differently than stores that were exempt, holding other controls constant. Therefore, we are interested in the estimated coefficient on the interaction variable, $NOEXT*lnGAP*MW_2$, where *NOEXT* is a binary variable equal to 1 if a restaurant is in the non-exempt group. Results are presented in Table 12 (two-way interactions are also included but not shown). Although the sign of the estimated coefficient is negative as expected, it is not statistically significant. Alternatively, one can exclude the stores that were

[35] When asked, franchise owners disagreed as to whether the mandate was a significant problem.

exempt to smooth the variation in hours worked; estimated effects using sub-sample of stores do not change earlier findings (results are not shown).

In short, it appears that potential bias from the longer hours mandate is very small and it does not affect the previous conclusions.

Further considerations

Another potential bias may arise due to the restricted franchise ownership of the sampled stores. Since there are only three franchise owners, it is important to ensure that the results are not driven by idiosyncrasies of one franchise owner. To address this problem, we re-estimate the preferred model using stores owned by one franchise owner (representing roughly 75 percent of establishments in my sample); the results, presented in Tables 13A-C, support the robustness of earlier findings. Although the estimated employment elasticity is never significant, the magnitude of the effect is non-zero, underscoring the high degree of variation in compliance costs across the sample located in high and low-wage areas. Excluding metro-Atlanta stores (as shown in Tables 14A-C) does not affect the primary results; the estimated employment elasticities follow a similar pattern as in previous estimates: β is negative for the first and second MW hikes; the coefficient is positive for 2009 MW increase, but none of the estimates are statistically significant. This exercise suggests that lowering the degree of variation in compliance costs—homogenizing the effect by restricting the sample to one franchise owned store or rural and semi-urban areas— lowers the precision of the estimates and does not lead to different findings.

Finally, we examine the cumulative effect of all three stages of the MW mandate over an entire three-year period by looking at changes in employment (logged) from January, 2007 to December, 2009. Hence, for each establishment there are only 2 observations: 6 months before

2007 MW increase and 6 months after the last stage of the MW increase in 2009. To measure the "cumulative", balanced panel of stores is used, along with store and owner fixed effects. Results are presented in Table 15. The coefficient on the GAP variable—which represents the total cost impact from all of the three MW increases—is positive but not significant for the employment equation (column 1) and it is marginally significant at the 10 percent level in the estimate for aggregate hours.

In summary, despite examining a sample of establishments that were substantially and differentially impacted by the minimum wage mandates, statistically significant employment and hours reductions in response to the MW increases could not be found. There is weak evidence of a *positive* employment effect following the 2009 MW increase, but this result does not hold if the dynamic, long-term effects of MW on employment are incorporated into the analysis.

Importantly, the size of the estimated employment (and hours) elasticities is nontrivial and somewhat large relative to the estimates from similar studies. Given that these estimates are based on arguably highly accurate observations, it is highly unlikely that this is the outcome of 'noisy' data. Instead, somewhat higher-than-expected elasticities may reflect a high degree of heterogeneity in individual restaurant responses to the MW increases. Next section explores in greater detail a number of non-employment mechanisms which help to offset the higher labor costs due to the MW mandate.

VIII. Non-Employment Channels of Adjustment from Payroll Records

> *"[To] control cost we cannot simply reduce labor hours because customers still have to be served within the standard amount of time. We have to raise prices or recover our cost in other areas of the operation."*- Restaurant manager

The finding of insignificant positive, as well as negative, employment effects as a result of the MW increases is not atypical in the recent MW literature. It leads to a puzzle: if employment and hours remain relatively stable, firms must find other ways to absorb and offset higher labor costs.

This section addresses this question by exploring a range of adjustment mechanisms. Drawing evidence from several sources, we explore a comprehensive list of adjustment channels. Some of these adjustments—such as price increases—have received considerable attention from researchers, while others—such as lower turnover rates—have not been well-documented in the minimum wage literature. Next we turn to manager survey data for additional evidence on the adjustment channels.

Output prices

The standard perfectly competitive model predicts an increase in the output price in response to a binding MW. Businesses shift the burden of higher costs onto consumers, which eventually lowers demand for the product and reduces profits. An alternative view, the so-called "hungry teenagers" hypothesis, holds that higher earnings of low-wage workers may stimulate the demand for fast-food. The overall effect on the fast-food industry from a theoretical standpoint is therefore ambiguous. Empirical work generally supports the price pass-through hypothesis (see Lemos, 2008 , for a thorough discussion of the price-effect studies).

If there is a full pass-through, price increase should be proportional to the share of MW labor (affected workforce) in total factor costs, assuming a constant returns to scale production function. Given that the wages increased by about 41 percent (from $5.15 to $7.25/hour), and assuming that labor share of total costs is one third, and approximately half of all workers have

been affected, holding other factors constant, the expected (cumulative) price increase over the three years is 6.7 percent.

Price increases enacted for one of the most popular menu item, homogeneous among the stores, by the three owners are summarized in Table 16[36]. The total price increase is close to the expected estimate. The differences, both in terms of the average percent increase and the timing of price increases, are due to: 1) significant cost variation across establishments located in high/low income areas; 2) different strategies used by the owners for determining the price increase; 3) local competition and other unobserved factors.

Strategies used to determine price increases (learned from personal interviews) are not uniform among the three franchise owners in my sample. The price setting mechanism is a combination of two crucial factors: 1) food costs; and 2) competitor's pricing. One owner reportedly uses a formula in which food input cost is a fixed share of the price. Another owner calculates a share of the price increase necessary to fully offset higher costs of labor due to the MW hikes: "It is hard to measure if we were able to generate enough sales increase to cover the increase labor cost but we tried to estimate how much the minimum wage would cost us. If we thought it was $3,000 for a store for a month, we tried to figure out through price increases how to generate another $3,000." In a large share of sampled establishments, prices for similar menu items are adopted from the closest competitor or a market leader; as one owner stated, "the most important determinant is competitor prices. The only rule we have is to not have higher prices than our primary competitor." Interestingly, some prices—such as soda drinks—actually fell to maintain competition. Finally, the least structured way of determining the price increase does not involve the actual computation of the costs but a rough assessment of "consumer sensitivity." In

[36] Prices were increased for a variety of menu items. Only one item is presented for an easier comparison and interpretation.

setting prices, one owner appears to have a reasonably good sense of the demand curve although he does not directly estimate it. In addition, when determining the price increase all three owners takes into account general economic trends, estimates of consumer confidence, etc.

As Table 16 demonstrates, the ability to increase prices diminished over the three years largely because of the severe economic downturn. In fact, two owners did not make any significant price changes in 2009, citing a growing concern about sales declines. Another important limiting factor is the fixed price for the "dollar-menu" items, which is set by the corporate headquarters and cannot be changed by the franchisee: "dollar-menu" indirectly limits price increase for other items on the menu since customers are more likely to substitute away from the more expensive items to the items from the dollar menu.

Unfortunately, data on profits and sales levels were not available. In fact, empirical evidence on the impact of the minimum wage on firm performance is scant[37]. However, anecdotal evidence reveals that price increases in my sample were not high enough to maintain existing returns. All of the owners and managers we spoke to unanimously expressed their concern over declining profit margins. Figure 10 shows the share of labor costs in total sales for the largest subset of establishments in our sample; despite higher output prices, the labor cost is much higher than prior to the minimum wage increases. However, it is rather difficult to isolate the minimum wage impact from the recessionary pressures prevalent during 2007-2009, although fast-food restaurants were affected far less than were most sectors.

Additional evidence for the anticipated impact on sales, profits, and overall business survival following the last MW hike comes from the managers surveys. Survey data reveals that only 17 percent of managers in our sample consider MW increase to be a significant worry for

[37] A notable exception is a study by Draca et al. (forthcoming), examining firm profitability of low-wage (residential care) firms after the introduction of national minimum wage in the U.K.

theirs stores survival and profitability, while 41 percent think MW will not have much effect on these outcomes. Most of the mangers also agree that sales will not fall significantly as a result of higher product prices, raised to offset the MW increase: only 11 percent of managers believe that sales will fall significantly

Wage compression and wage distribution

A higher minimum wage paid to the lowest-wage workers may limit wage growth of higher-wage, more experienced workers. On the other hand, managers may boost their wages in order to preserve internal tenure/wage hierarchy in order to retain their more experienced workers and maintain their morale. Evidence presented here suggests that the former predominates. In Table 17 the average wage increase is compared between the group of workers for whom MW is binding and those for whom it is non-binding. The data reveal that workers at the higher end of wage distribution received smaller absolute pay increases, and their relative position in the wage distribution is worse than prior to the MW hikes. Figure 11 shows changes in the wage distributions between low and high-wage workers, before (March-May) and after (August-December) each of the three MW hikes. The wage distributions shift significantly to the right for the low-wage workers, with the high frequency for workers getting the minimum rate. For higher-wage workers, however, the distribution barely shifts, and the change practically disappears after the July, 2009 increase. These results are consistent with wage compression uncovered in other studies (Dube et al., 2007) suggesting that gains due to ME increases are distributed from high- to low-wage workers.[38]

[38] Evidence on wage compression from the payroll records is also supported by managers' responses to a series of open-ended questions. Specifically, managers were asked what, in their opinion, was the most negative aspect of the MW increase. Interestingly, an overwhelming majority of managers cited wage compression and its adverse effects on the higher-wage workers' morale as one of the most negative results of the MW increase. Managers repeatedly expressed their concern over being unable to offer sufficient increases to their "veteran" workers in order to preserve their relative earnings: "Employees that are walking in off the street make just a quarter less than veteran

Turnover rates

Higher earnings due to the MW mandate may lower voluntary quits of affected workers, partially by having a positive impact on their morale, and therefore reduce vacancies[39]. The firms may also benefit from savings generated through lower hiring and training costs. Empirically, the link between higher MW mandate and lower labor force turnover has not been well documented (Fairris & Reich, 2005; Reich et al., 2005 for the living wage ordinances).

One can apply duration analysis to examine turnover rates, or the average spell of workers at the stores, over the three-year period[40]. The actual length of employment is difficult to estimate due to censoring and truncation. Left censoring occurs because we do not observe each worker's entry (we only observe entry of workers that were hired after January, 2007). Right censoring occurs because our observation terminates in December, 2009 while employment still continues. In addition, interval censoring arises because we only observe individuals that appear on the payroll every two weeks and do not observe those that were hired and left the job between the sampling periods, understating the number of very short spells. Left censoring may in part be addressed by considering only the "new hires"—workers that enter the sample for the first time *after* mid-January, 2007[41]. Using this definition, a high turnover rate is observed, as is common

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employees"; "Newer team members are making almost as much as people who have been here for years, [causing] some hostility." As one would expect, strong wage compression may disrupt cohesion of the workforce as higher-wage/more experienced workers feel that they are being treated unfairly.

[39] Manager survey responses confirm the positive effect of higher earnings on workers' morale. When asked to comment about the most positive aspect of the higher MW (open-ended question), lower turnover/attrition rates was by far the most common response.

[40] The "failure event" in this case is falling out of the sample; if a worker is not observed in the same store location for two or more months and then returns to work, the payroll records count the person as two distinct workers.

[41] Even then, someone observed in mid-January may actually be a new hire but would not be included in the "new hire" group.

in fast-food sector: the median "survival" in the sample is approximately three and a half months (7 pay periods).[42]

Turnover rates may or may not vary between high- and low-wage stores. On the one hand, restaurants with greater cost-impact due to the MW hike could benefit from relatively lower turnover rates; on the other hand, the composition of workers in higher-wage stores (more experienced workers) may also be correlated with low turnover. Figure 12 plots the Kaplan-Meier survival curves for the two groups of stores (using the *GAP* variable to define stores relatively unaffected by the MW increase). There is no evidence that the two groups of stores have any significant difference in their survival spells.

Next, we estimate multivariate survival time model to examine the relationship between the length of individual worker spells, prior to exit from the sample, and several important covariates. Specifically, the standard hazard function for worker *i* can be written as:

, where or

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where $h_0(t)$ is the baseline hazard; X_i is a vector of individual characteristics, including the average wage, regular and overtime hours, and store-level characteristics, including the cost of compliance to the MW mandate (prior to the 2007 MW increase) and average employment; and is a vector of regression coefficients that includes an intercept term. The term scales the baseline hazard multiplicatively by the same amount for each value of *t*. Unfortunately, it is not possible to match individual worker characteristics from the employee survey to payroll data, limiting the ability to examine how personal demographic characteristics may affect the length of

[42] This measure ignores the shortest spells, i.e if a worker appears on the payroll only once. If the same worker re-appears in the sample at the same restaurant for only one pay period, this spell is also ignored; the intervals between spells for the same worker are treated as separate spells (different unique identification number).

individual spell. We compare the results from the parametric regression survival-time model (Weibull) and the semi-parametric Cox model. The results are similar (Table 17). The estimates suggest that the hazard rate is increasing over time at a decreasing rate ($1<p<2$). As expected, there is a negative association between the average wage and the hazard rate: high-wage workers have lower conditional hazard rates (and hence longer survival times), *ceteris paribus*. It also appears that the hazard rate is increasing at the stores with larger size of the workforce; this could relate to lower relative costs of quits due to worker-worker substitution. Finally, at stores that experience greater cost-shock induced by the MW increase, the survival times are longer, but the magnitude of the effect is small: in the Weibull model, the elasticity of the hazard rate with respect to GAP is -0.012; implying that a 10 percent increase in GAP lowers the hazard rate by 0.12 percent.

Alternatively, turnover can be measured as a share of total workforce observed in pay period *t-1* but not observed in period *t*. According to this definition, if all workers are present in two consecutive pay-periods in a given restaurant (not counting new hires), the turnover is equal to zero[43]. Figure 13 plots the averaged shares of workers missing from the consecutive payrolls for the entire study period. The average turnover defined in this way is quite high—approximately 8 percent over 3 years. Interestingly, over the entire study period there is a downward trend in turnover rates, more pronounced after the second MW increase in July, 2008. The turnover rates are not stable throughout the year: a spike in turnover occurs around July in 2007 and 2008, followed by a sharp decline; there is another relatively smaller "spike" around December-January, paralleling the observation of employment fluctuations depicted in Figure 8

[43] However, the turnover is likely to be overstated because short leaves due to sickness or longer leaves due to vacation are not accounted for.

(changes in employment at these times of the year are related to high school students working more during their summer and winter school breaks).

In sum, analysis of the payroll data suggests that, despite high turnover rates across restaurants in my sample, average turnover decreased between January 2007 and December 2009. The causal relationship between higher MW rates and lower turnover is difficult to establish. Results from estimating parametric survival time model and the Cox model imply that the size of the compliance cost with the MW increase is associated with reduced hazard rate (longer employment spells) for individual workers, *ceteris paribus,* but the effect is relatively small. A conservative assessment of the available evidence suggests that the decline in worker turnover between 2007 and 2009 observed in the sample may reflect a combined effect of several factors, including severe economic recession that began in late 2007, the sharp decline in quits economy-wide, poor alternative opportunities in the job market, and increased job attachment due higher earnings.

IX. Non-Employment Channels of Adjustment: Manager Response

The most important decision [for me] is to have the right manager. - Franchise owner

In this section, we examine additional qualitative evidence on channels of adjustment to higher MW by examining survey data from the manager surveys. Managers have much discretion in their decision of how to recover some of the revenue lost due to a MW hike. Although the sample is too small to perform formal analysis, descriptive evidence from manager surveys offers valuable insights into the realm of business operations which is largely absent from the MW debate. Interestingly, managers believe they can offset on average (with relatively high variability) 20 percent of the weekly cost increase due to the MW hike—which equals to

approximately $224 in weekly savings—by applying cost-saving measures unrelated reduction in labor force. This suggests that savings from other adjustment channels are non-negligible.

To frame this discussion, we use the expanded definition of efficiency first elaborated by Harvey Leibenstein in 1966. His major insight into the existing economic theory was that economic agents—because decision-making is costly and burdensome—may not act as to achieve maximum efficiency in their productive decisions and behavior. The term X-efficiency (or X-inefficiency) describes the difference between efficient behavior assumed in the economic theory—i.e., constrained optimization to solve for the highest value of the objective function—and the actual observed behavior. As a result, the firm operates inside its production possibilities frontier: "Firms and economies do not operate on an outer-bound production possibility surface consistent with their resources. [...] This means that for variety of reasons people and organizations normally work neither as hard nor as effectively as they could" (Leibenstein, 1966, p. 413). There are many possible sources of X-inefficiency, including principal-agent relations, degree of competitive pressures in a firm's product market and the regulatory regime in which a firm operates (Button & Weyman-Jones, 1992). Although X-inefficiency theory has been interpreted by some researchers as the antithesis to the conventional competitive model, these concepts may be reconciled with the standard neoclassical theory if it is expanded to incorporate such concepts as motivational differences, endogenous effort, or changing preferences for leisure (Rozen, 1985).

In the context of the fast-food industry, X-inefficiency implies that management may not always maximize profits by maximizing the difference between revenues and costs. In the presence of positive costs to achieve efficiency due to asymmetric information, moral hazard,

and motivational slack, among other things, managers are more likely to improve efficiency as the relative costs of slack rise with higher mandated wages.

Manager characteristics and hours worked

Table 19 presents descriptive characteristics of restaurant managers. Interestingly, managers perceive a majority of their workforce as over-qualified for the job. There is a great variation in managers' experience levels: respondents have on average over 10 years of professional experience but with much variation—an important element indicating that managers are heterogeneous in terms of their skills.

Managers are incentivized[44] to maintain their labor costs at a fixed share of the sales value[45]; hence managers may be inclined to reduce their own hours worked to maintain labor costs. Figure 14A plots monthly averages for regular and overtime hours worked (Figure 14A) using a sub-sample of restaurants which report managers' hours in the payroll for hourly workers.[46] Regular hours and overtime hours worked for managers are stable during the entire study period. Managers work on average slightly above 160 hours a month (approximately 40 hours a week working full time) and also report on average 20 hours in overtime (approximately five extra hours a week). Figure 14B plots the average hours worked for the two groups of stores, based on the *GAP* measure. There is no significant difference between managers' hours in stores that experienced a different cost-impact due to the MW increases. It appears that, at least in a sub-sample of establishments, managers did not reduce their own work hours to offset the increasing labor costs due to the MW compliance.

[44] This is an operational mandate made by the owner to manager.

[45] Although most of the managers are salaried employees, some assistant managers are paid on an hourly basis.

[46] Only 16 restaurants report managers' hours as part of their electronic payroll records.

Cost-saving adjustments in response to the MW

Using behavior models of labor markets as a starting point, and including suggestions from the store managers and franchisee owners, 23 potential cost-saving measures were identified in the following areas: human resource practices, operational efficiency and productivity, non-labor costs and customer service. The goal was to identify which cost-saving strategies are perceived by managers as the most effective at reducing costs induced by the final 2009 MW increase. Managers were asked whether they use a particular strategy and if so, they rated it on the scale from 1 to 5, with 5 being the most cost-effective. Descriptive results are presented in Table 20 and the distribution of rated answers is presented in Figures 15A-C. Provided below is a summary of what the data reveal.

Human Resource (HR) practices

Cost-savings may be obtained by adopting a number of changes in a store's HR practices. Several such measures were identified, including reduced training (as suggested by the competitive model), change in workers' demographic characteristics, part-time/full-time worker substitution, etc. Figure 15A shows that most of the managers (90 percent) plan to increase performance standards; this measure also ranks high in terms of anticipated cost-savings. "Higher performance standards" is a more general term which can include greater discipline from workers, less slack and more satisfactory performance of job duties. Sixty-nine percent of managers indicate that a change or adjustment to the work schedule is necessary to offset higher costs of labor. Adjusting schedules requires a solid understanding of how store's sales fluctuate throughout the day in order to allocate appropriate number of workers during peak and off-peak hours. In terms of part-time/full-time substitution, the effect is unclear: most of the managers do not consider changing the number of either their part- or full-time crew members to be important

cost-saving strategy. Only 15 percent of managers expressed interest in hiring more teenage workers: this ambivalence is related to the fact that teenagers, who are typically high school students, have less flexibility in their schedules.

Interestingly, only 10 percent of surveyed managers plan to reduce training to their workers. This is contrary to the prediction of the competitive model which posits that MW reduces on-the-job training because workers cannot accept lower pay to cover the cost of their training. In line with our earlier findings from the payroll data, we find that a significant portion of the cost burden due to the MW is shifted to the most experienced/higher-paid workers: 40 percent of managers noted they would delay or limit pay raises or bonuses to these workers.

Survey findings are also consistent with our previous evidence of no substantial employment and hours reduction. While 60 percent of managers consider lowering weekly hours to some employees, only 20 percent plan to lower their workforce to offset the higher cost—and only 8 managers (of 66 answering the question) consider this strategy to be "somewhat" or "very important" for cost-savings.[47]

Operational efficiency and productivity

Store managers can affect operational efficiency in their stores in various ways. For instance, they may cross-train workers so that one worker can perform several tasks or rearrange duties for greater efficiency. They may also demand more effort from each worker or try to motivate the crew to work harder by increasing morale and team spirit. In interviews, managers consistently stressed the importance of communicating to workers about challenges that they, as managers, face when the MW goes up. This accomplishes two objectives: first, it makes workers

[47] In fact, one manager noted: "[Laying off workers] hurts our ability to serve customers which hurts our sales." Another manager pointed out that the fixed costs of hiring a new employee is quite high and only serious disciplinary problems are typically considered for lay-offs: "[We] do not fire. They fire themselves."

feel they are being treated fairly and with respect because their opinion and input matter, and second, increasing workers' effort and loyalty through awareness and team work ensures a smoother transition through the first few months after the MW increase.

The significance of productivity-enhancing measures in terms of cost-savings is in Figure 15B: 92 percent of managers have agreed that they work to increase morale and team spirit of their workers, while 60 percent of those who responded also consider it to be important for controlling their labor costs.

Non-labor costs and customer service

In addition to labor-related savings, managers can also save on non-labor inputs, namely utility and food costs. According to Figure 15C, this response was quite common. Almost all managers stated they plan to reduce or save electricity and water usage or have already done so, and 97 percent of managers planned to reduce food waste in preparation and storage. Both measures also are rated highly in terms of cost-reducing potential. This finding is at odds with textbook competitive theory. If it pays to adopt improved business practices, the question is why managers have not already done so. In personal interviews, managers generally agreed that there are costs to attaining higher efficiency—such as to insure that the stove is always turned off during slow business hours or that no extra bag of frozen hamburgers is ordered from a food supplier. The first improvement requires closer monitoring and stricter discipline from workers; the second measure requires expert knowledge of the exact amount of inputs to be used in a particular week. Often a manager may not even be aware of existing inefficiencies and wasteful resources that exist at his/her store until a cost increase impels attention to this matter.

Finally, managers can stimulate customer demand by improving customer service in new and innovative ways. This may include special group discounts, raffles, new menu items, or

improved service quality (more "smiling faces", as one manager told us). Managers may also try to reach out to various youth, sports or church groups in their community, although this measure seems to be less popular because it is more difficult and costly to design and implement.

Channels of adjustment: employee perspective

Employees in our sample have expressed an overwhelming support for raising the minimum wage rate: 91 percent "vote" in favor. One explanation is that workers may not be aware of the potential negative effect of higher wages on their jobs. Therefore, the study explores workers' perspectives on the mechanisms used to offset higher labor costs. Descriptive statistics are presented in Table 21. Workers appear to have a reasonably good understanding of the adjustments necessary to offset higher labor costs, and there is no significant difference between manager and worker responses. Forty-four percent of workers believe that at least one employee will have to lose his or her job as a result of higher labor costs. This is somewhat higher than one would expect given our earlier findings from payroll data and manager surveys. Thirty-six percent of the workers expect lower training as a result of the MW hike. Most of the workers agree that prices will increase and hours will be cut in order to offset the increased labor costs. In terms of workers' own effort and productivity, 74 percent believe that they will "have to work harder and faster." Although this evidence is only suggestive, it appears that higher MW does induce greater effort and productivity from workers.

In sum, this study presents new evidence on adjustments that store managers state they will use to mitigate higher labor costs due to increased minimum wage when employment and hour adjustments have been exhausted or are limited. Using survey data, we find that cost-controlling adjustments can be applied to many areas of business operation. Specifically, store managers identified the following channels of adjustments as being the most significant in terms

of their cost-saving properties: increasing performance standards for their workers and adjusting their work schedules; discouraging overtime work; cross-training workers for multitasking and increasing morale and team spirit for higher productivity; reducing food and utilities waste; and stimulating local demand through better customer service. Taken together, the cumulative effect of adopting these measures can generate significant cost-savings and help to offset costs after accounting for price increases, lower profit margins and other commonly identified responses.

X. Implications for the Theoretical Models of Labor Markets

This study offers several implications for the theoretical models of labor markets discussed in Section II. First, the primary findings of the adjustment channels appear to be consistent with several alternative models of labor markets.

Evidence from the manager (and employee) surveys suggests that worker productivity and wage increases due to the minimum hikes are positively correlated, supporting the predictions of the behavior models of labor markets. For instance, managers have reported that higher performance standards, greater worker effort and increased morale were important strategies for offsetting higher labor costs.

Lower worker attrition between 2007 and 2009 uncovered from the payroll records support the predictions of the labor turnover model. Results from the regression analysis also appear consistent with the institutional model, which assumes an indeterminacy area around the firm's labor demand curve. As Lester (1952, p. 264) put it, "[there] is *not one invariant* employment reaction to wage change brought about by legal minimums, but varieties of employment and *non-employment adjustment*, especially within a moderate range of wage change" (italics added). The findings of both positive and negative, but insignificant,

employment elasticities, highlighted in this study, seem to suggest that the elasticity of labor demand may be contingent on the combined effect of the different channels of adjustment used by managers.

Second, the empirical results in this study challenge the monopsony model which, until recently, has been commonly used to explain the small positive employment effects found in some minimum wage studies. Applying the monopsony framework to examine three consecutive minimum wage increases, one might expect to find a positive effect on employment following the first or the second minimum wage increase, possibly followed by a reversal in the sign of the estimated elasticity as the wages approach the competitive level; however, this there an opposite pattern uncovered in this study, albeit employment elasticities are not estimated precisely. Similarly, the regression results do not support the predictions of the standard competitive model.

In sum, the results are consistent with a number of theoretical models of labor markets, but the distinction among various theories is not clear-cut. Hence, evidence presented in this study advocates for a more flexible interpretation of the standard competitive model—one which allows for a more flexible production function and incorporates additional margins of adjustment to the minimum wage increases and other market regulations.

XI. Conclusion

In the debate on the economic effects of labor market regulation much work has focused on minimum wages. Despite there being a large literature on the impact of the minimum wage laws on labor market outcomes, especially on employment, there is a surprising lack of consensus, not only about the size of the employment effect but also about the identification

methods. This dissertation examines the economic effects of the recent three-stage increase in the Federal minimum wage from $5.15 to $7.25 in 2007 through 2009. Using confidential electronic payroll records of individual workers from a sample of quick-service restaurants in Georgia and Alabama, we construct an improved measure of the cost impact of compliance with the minimum wage increases. Contrary to the standard competitive model, we do not find a significant reduction in employment or hours worked following the three minimum wage increases. The estimated employment and hours elasticities are both positive and negative but insignificant; the relative size of the estimated coefficients is non-trivial, possibly due to substantial heterogeneity in responses to the MW increases among the sampled establishments.

Drawing on a broadened theoretical framework, this study explores a range of adjustment channels that help reconcile the paradox of small and insignificant employment (and hours) effects uncovered in prior studies. Higher product prices and lower profit margins appear to be the two most important adjustment mechanisms that enable firms to sustain the increased labor costs induced by minimum wages. In addition, wage compression and lower turnover rates help businesses mitigate higher labor costs.

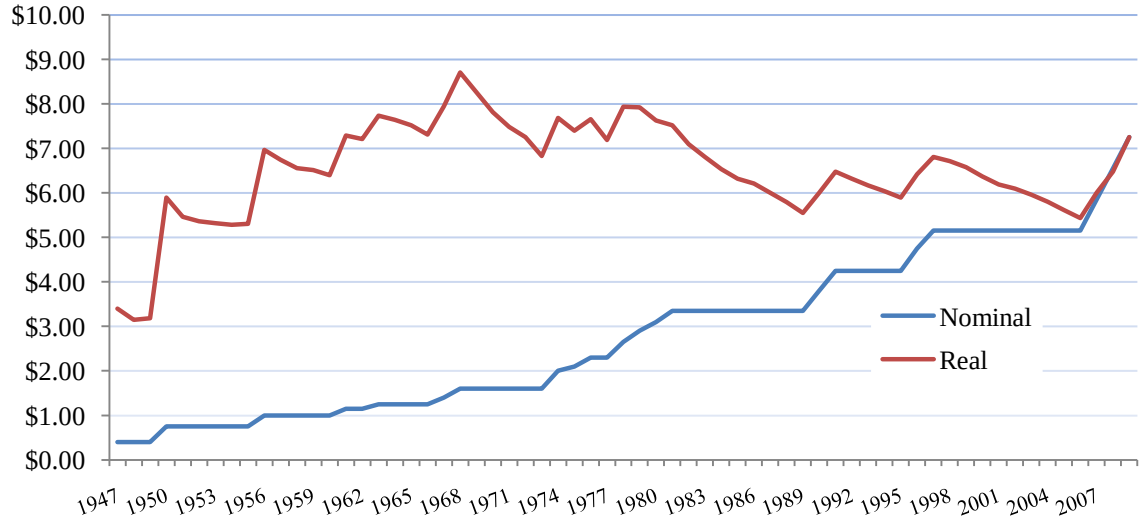
Additional evidence on adjustment channels, some of which have received little-to-no attention in existing literature, comes from the unique manager surveys. The descriptive analysis of manager survey data offers an insight into the "black box" of small business operation. The results suggest that an indirect effect of the minimum wage is to increase efficiency in several areas of business operation; in addition, there is evidence that minimum wages have a positive impact on worker productivity through higher performance standards and improved morale.

This dissertation represents an important contribution to looking at the impact of labor market regulation on labor market outcomes and contributes to a more complete understanding of the effects of minimum wage laws on businesses and individuals.

Appendices

List of Figures

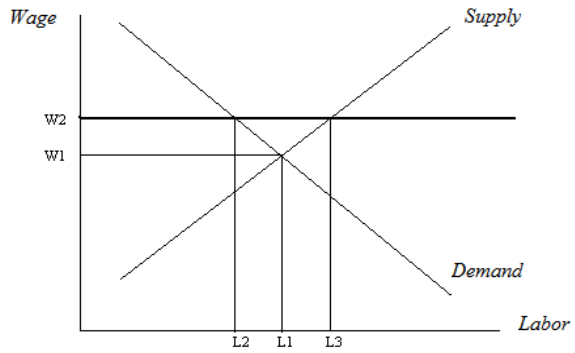
Figure 1. U.S. Federal Minimum Wage Rates: Nominal and Inflation-adjusted



Source: EPI analysis of Department of Labor and Bureau of Labor Statistics data. Inflation-adjusted measures are expressed in May 2009 dollars, using CPI-U-RS

Figure 2. The Impact of a Minimum Wage in a Perfectly Competitive Labor Market: Covered and Uncovered Sectors

A. Covered Sector



B. Uncovered Sector

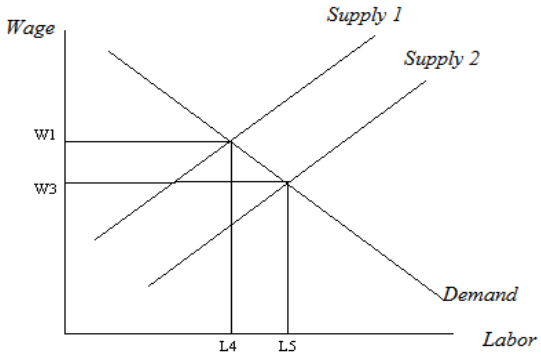


Figure 3. Wage Determination in a Monopsony Market and Effect of the Minimum Wage

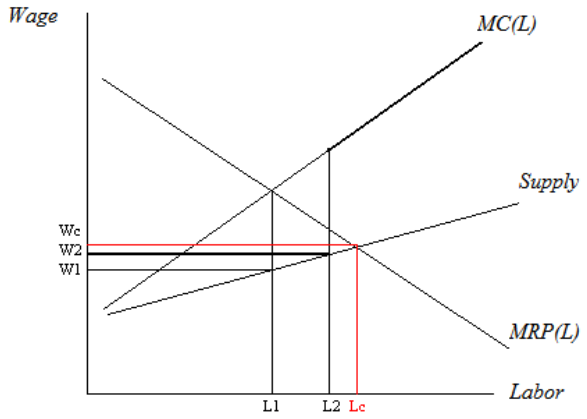


Figure 4. Efficiency Wage Model and the Impact of the Minimum Wage

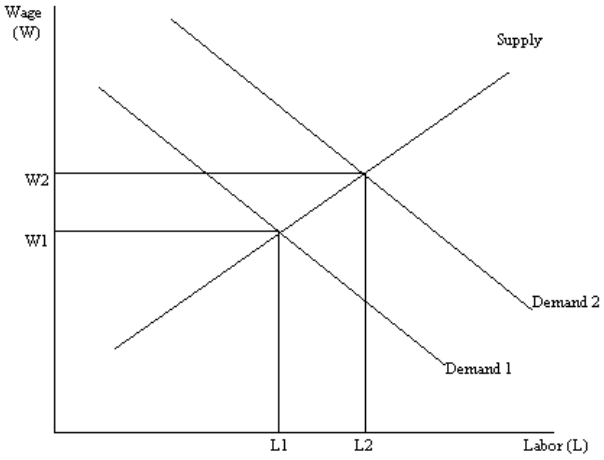


Figure 5. Post-Keynesian Labor Market and Effect of the Minimum Wage

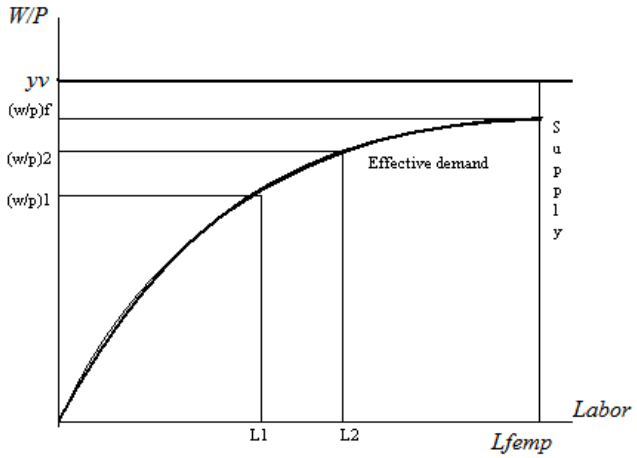
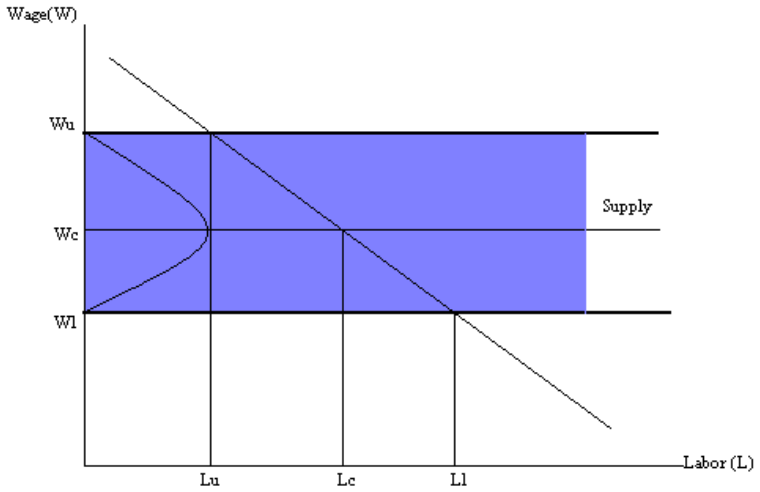


Figure 6. Institutional Labor Market and Minimum Wage Increase



Map 1. Georgia and Alabama Sample of Quick-Service Restaurants

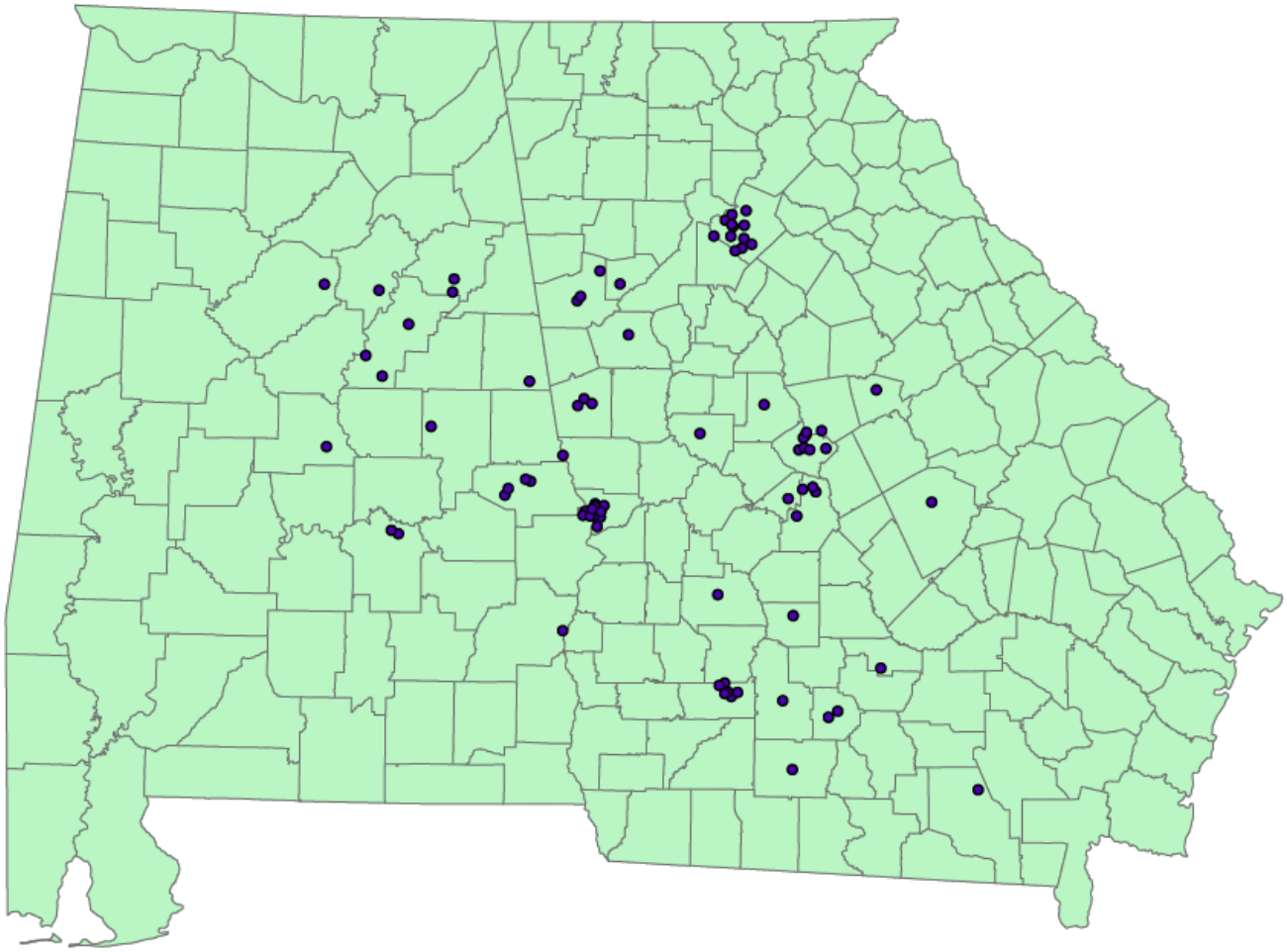
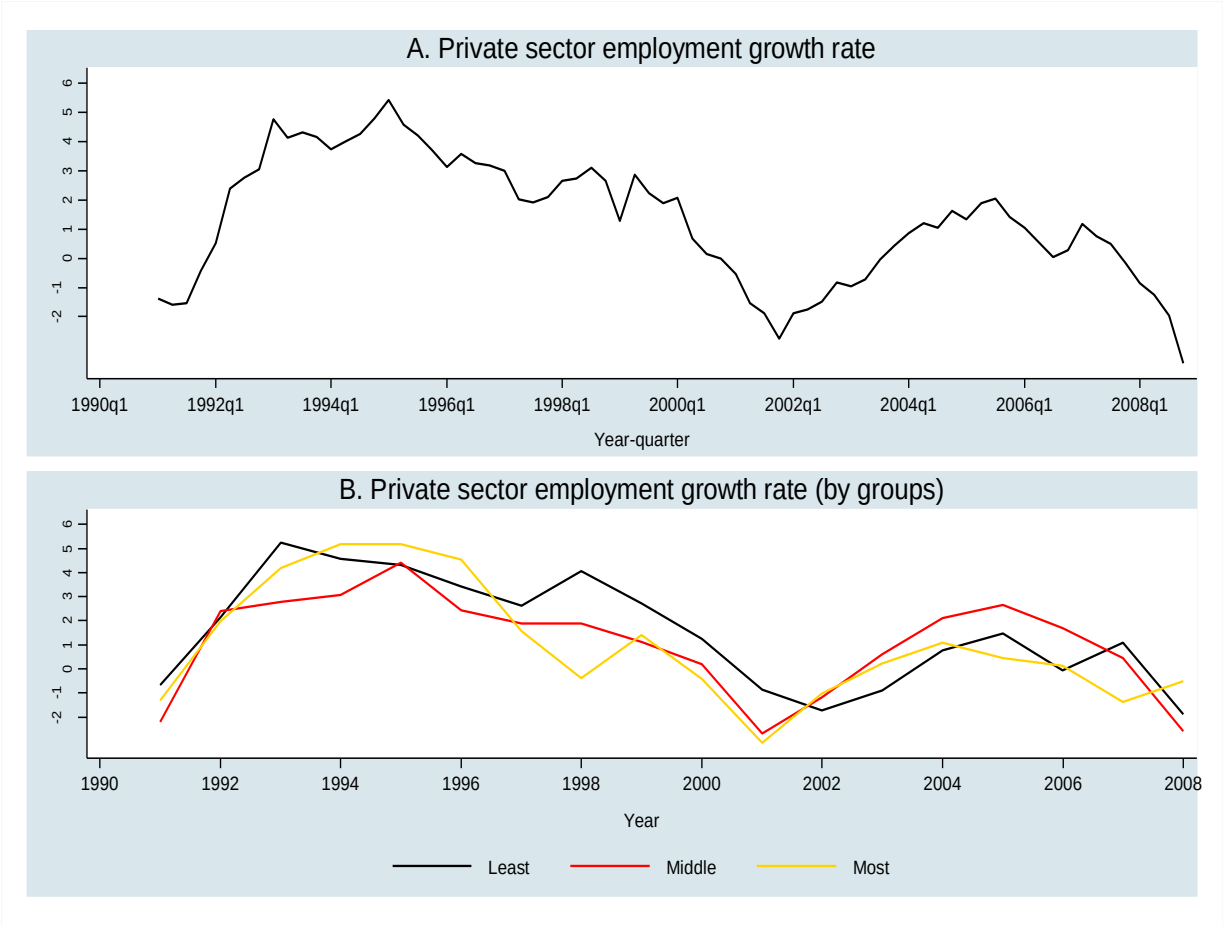


Figure 7. Annual county-level employment growth rate in the private sector, total versus grouped



Notes: County-level data come from QCEW. Panel A shows annual employment growth rate in the private sector (calculations are based on a quarterly basis, i.e. 1990Q1 is compared to 1991Q1, etc.). Panel B shows annual employment growth rate in the private sector for the 3 groups of counties: "Least" include counties in which stores from the sample were unaffected by the 1st MW increase (lnGAP=0 for March-May in 2007); "Most" includes counties in which stores from our sample are in the top 25th percentile of being affected by the 1st MW increase; "Middle" includes counties where the rest of the sampled stores are located.

Figure 8. Average hourly wage, employment and hours worked, January, 2007-December, 2009

Notes: Figure 1 shows establishment-level averages for: hourly earnings, employment, regular hours and overtime hours for 3 groups of stores by pay-period (bi-monthly). The first group of stores, "Least" affected, includes stores for which lnGAP is equal to 0 for March-May 2007; "Middle" group includes stores between the bottom and top 25th percentiles of lnGAP distribution; "Most" affected group includes stores in the top 25th percentile of lnGAP distribution. 15th day of each month corresponds to the payroll data for the first half of each month; 30th day of each month corresponds to the payroll data for the second half of each month. Vertical lines mark the MW increases. Horizontal lines in Panel A show the MW levels.

Figure 9. Average total hours worked, by pay-period, January 2007-December, 2009: Exempt versus non-exempt stores

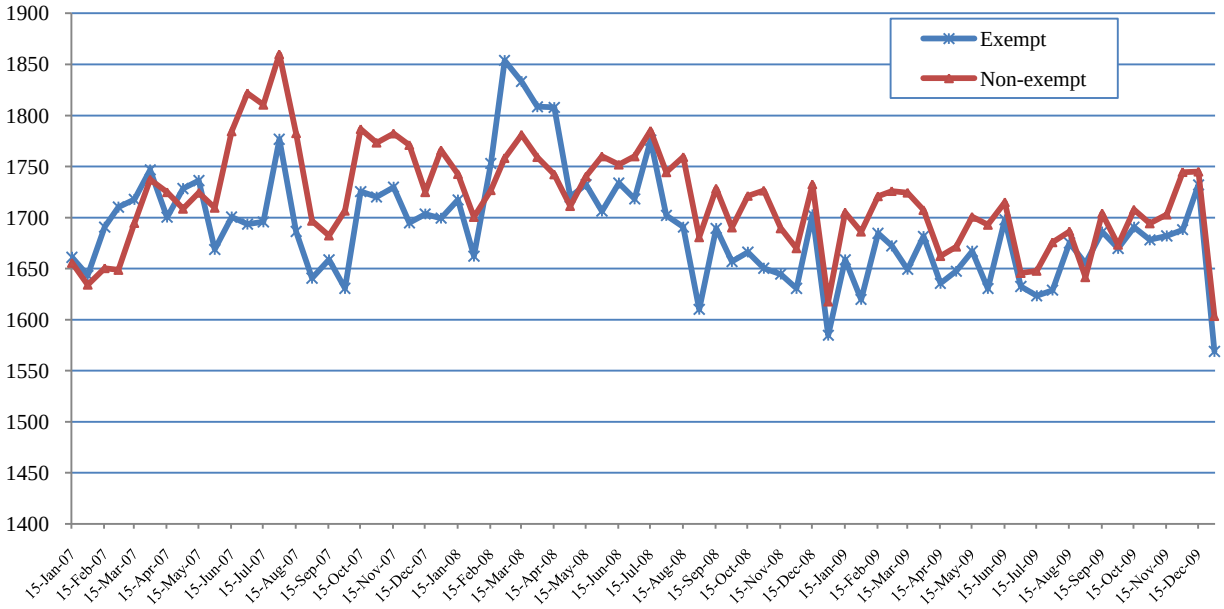


Figure 10. Share of Labor Costs in Total Sales

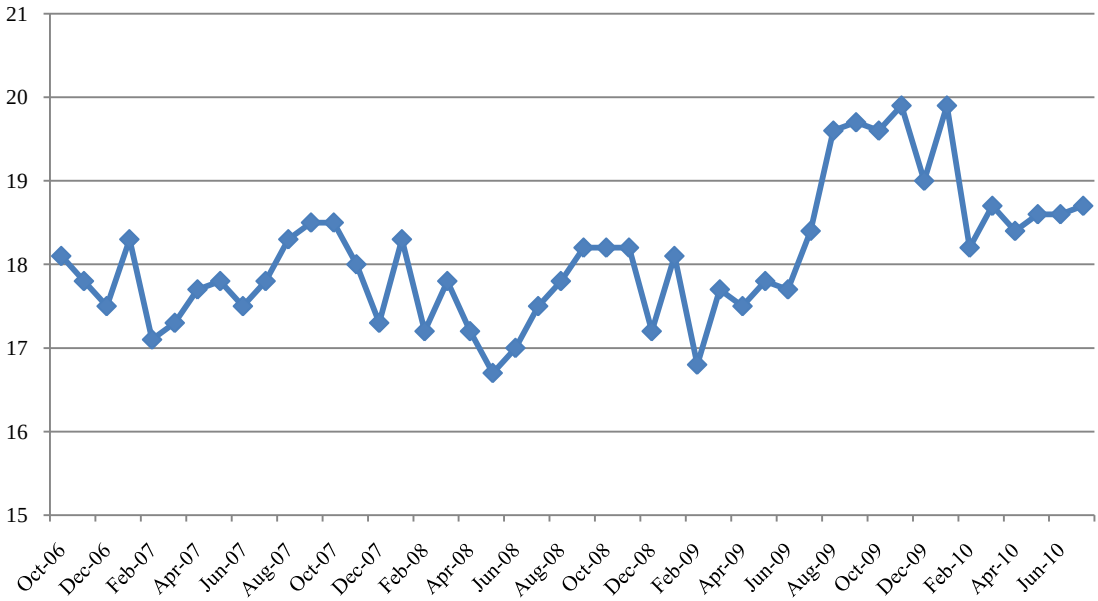


Figure 11. Distribution of hourly wages: High and Low-Wage workers, before (March-May) and after (August-December) 2007-2009 MW increase

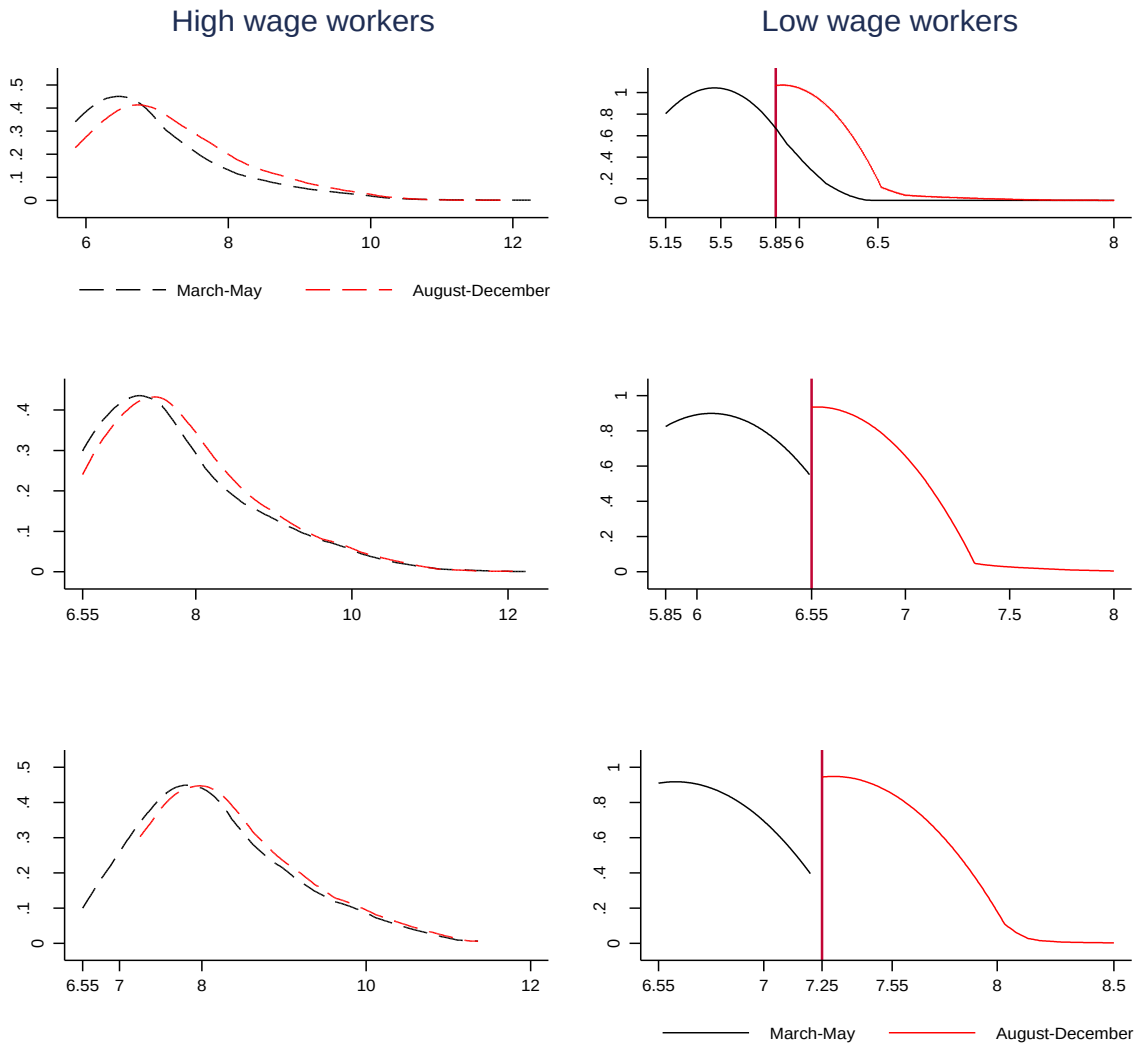
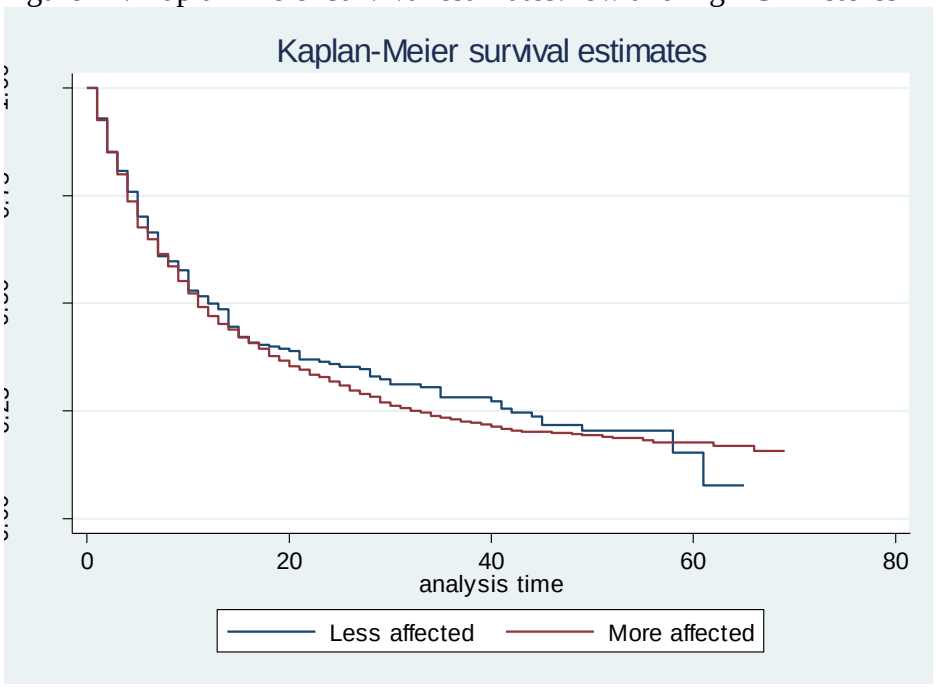


Figure 12. Kaplan-Meier survival estimates: low and high-GAP stores



Notes: "Least affected" categories includes stores for which GAP=0 in March-May, 2007; the rest stores are included in "More affected" category.

Figure 13. Average turnover of workforce: January, 2007-December, 2009

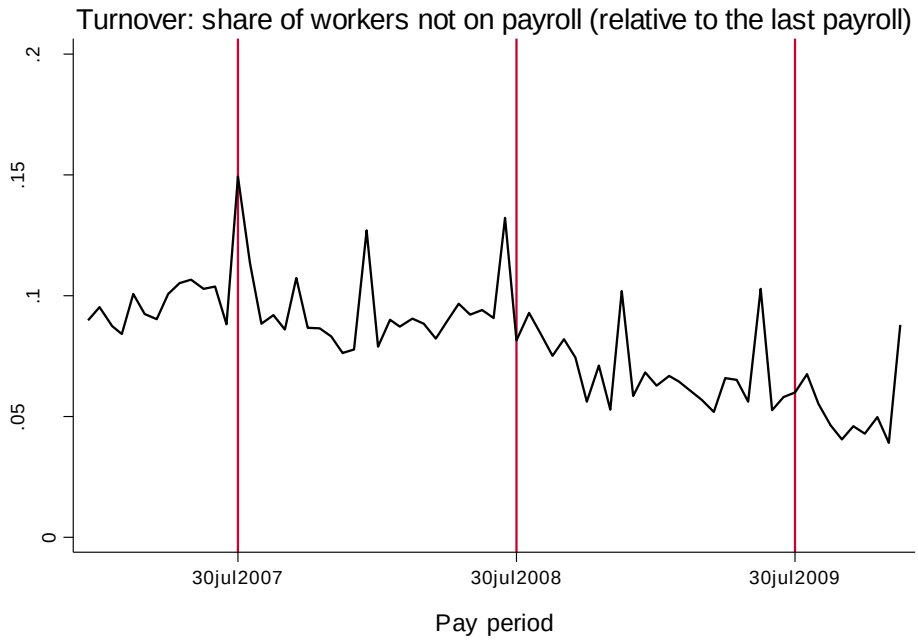


Figure 14A. Managers' regular and overtime hours (monthly averages)

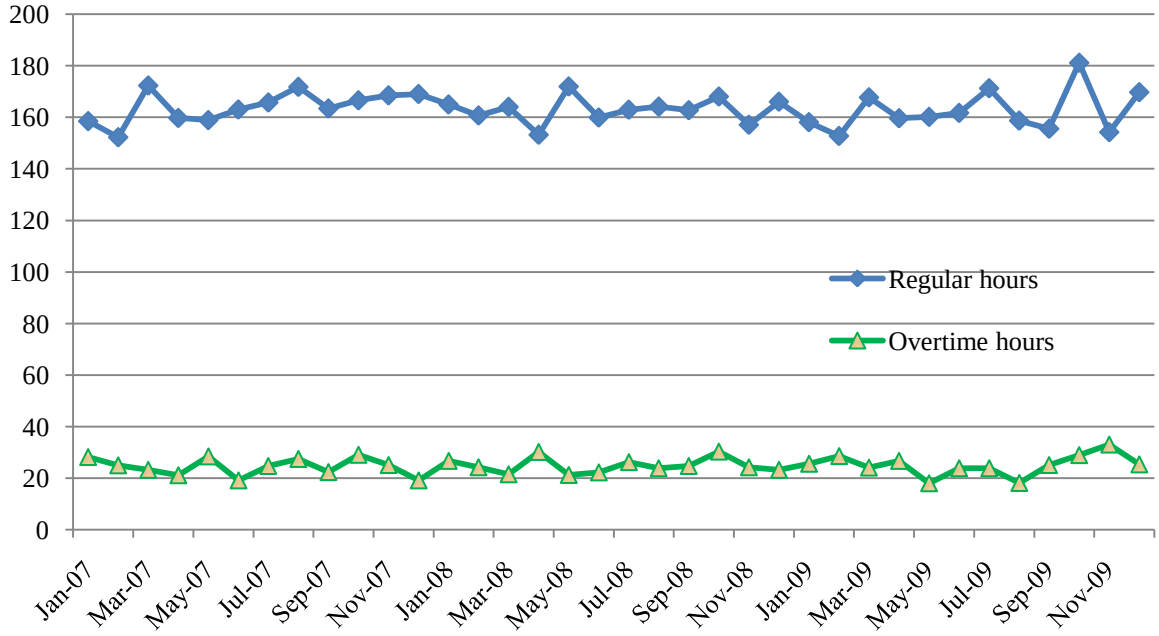
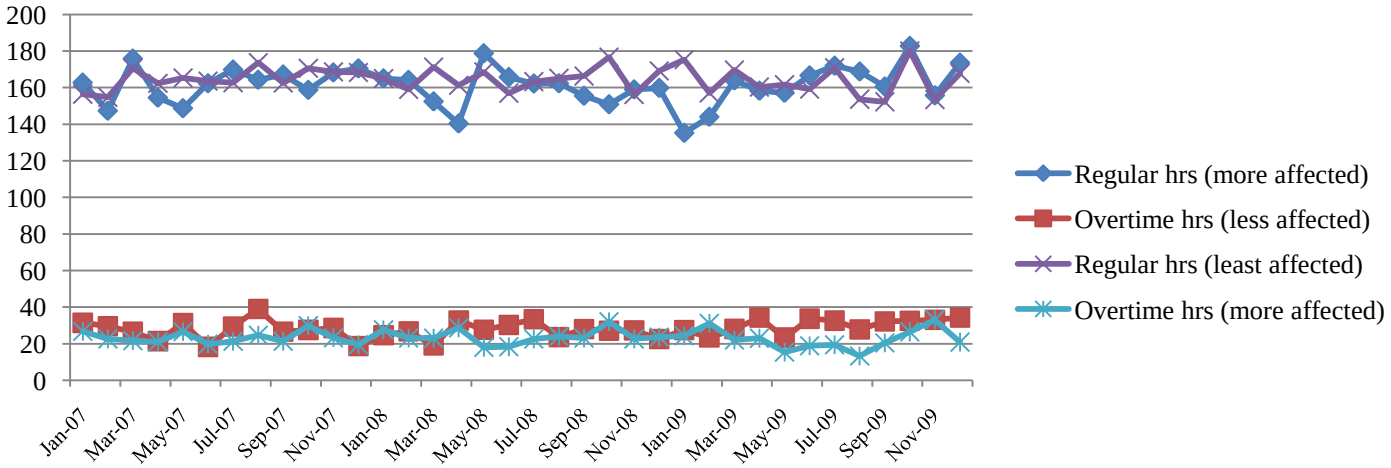


Figure 14B. Managers' regular and overtime hours (monthly averages): high and low-impact group of stores



Notes. The figure shows average monthly regular and overtime hours worked of restaurants managers for two groups of stores: "less affected" are stores for which GAP in March-May 2007 was in the lower 75th percentile distribution; "more affected" are stores for which it was in the top 25th percentile of GAP distribution.

Figure 15A. Reaction to Higher Labor Cost due to MW increase: Human Resource Practices and Cost-Savings

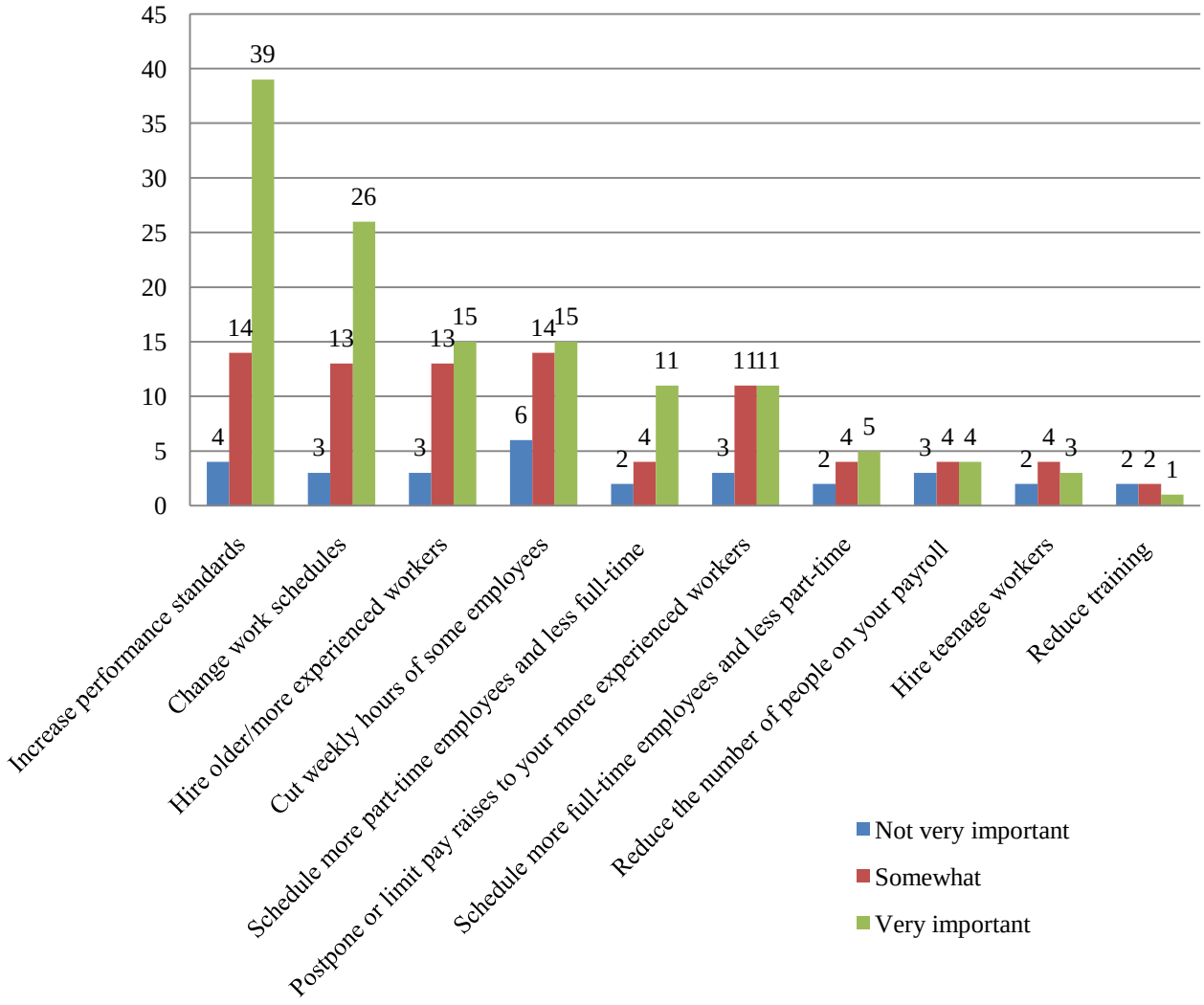


Figure 15B. Reaction to Higher Labor Cost due to MW increase: Operational Efficiency and Productivity

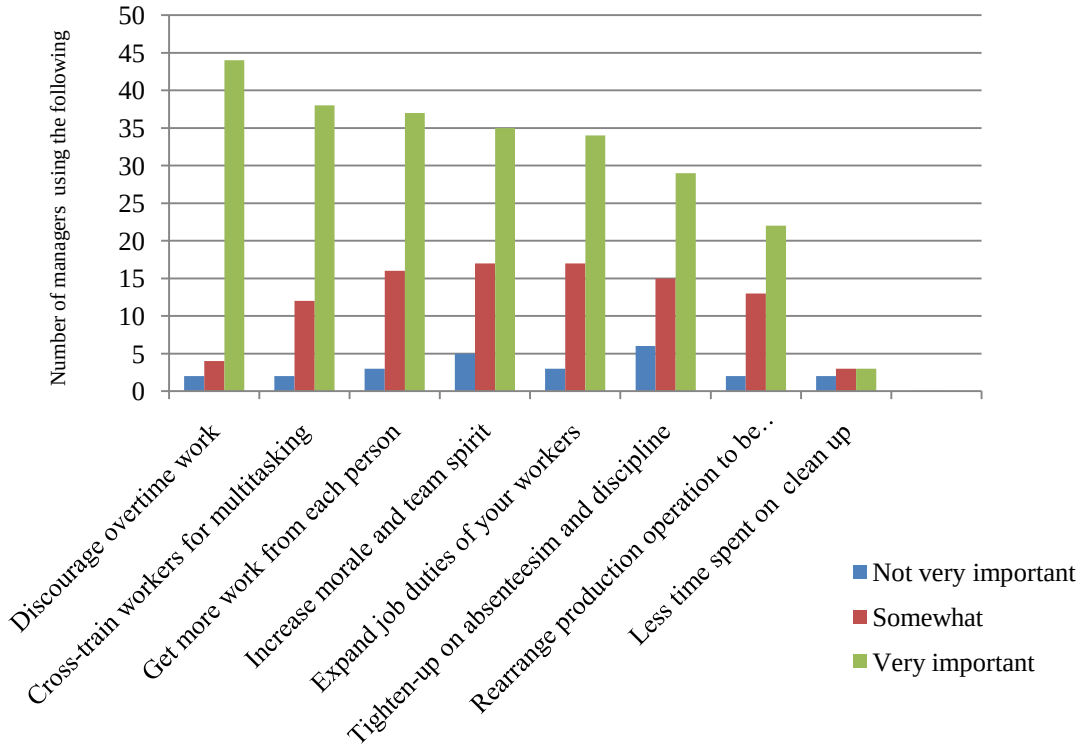
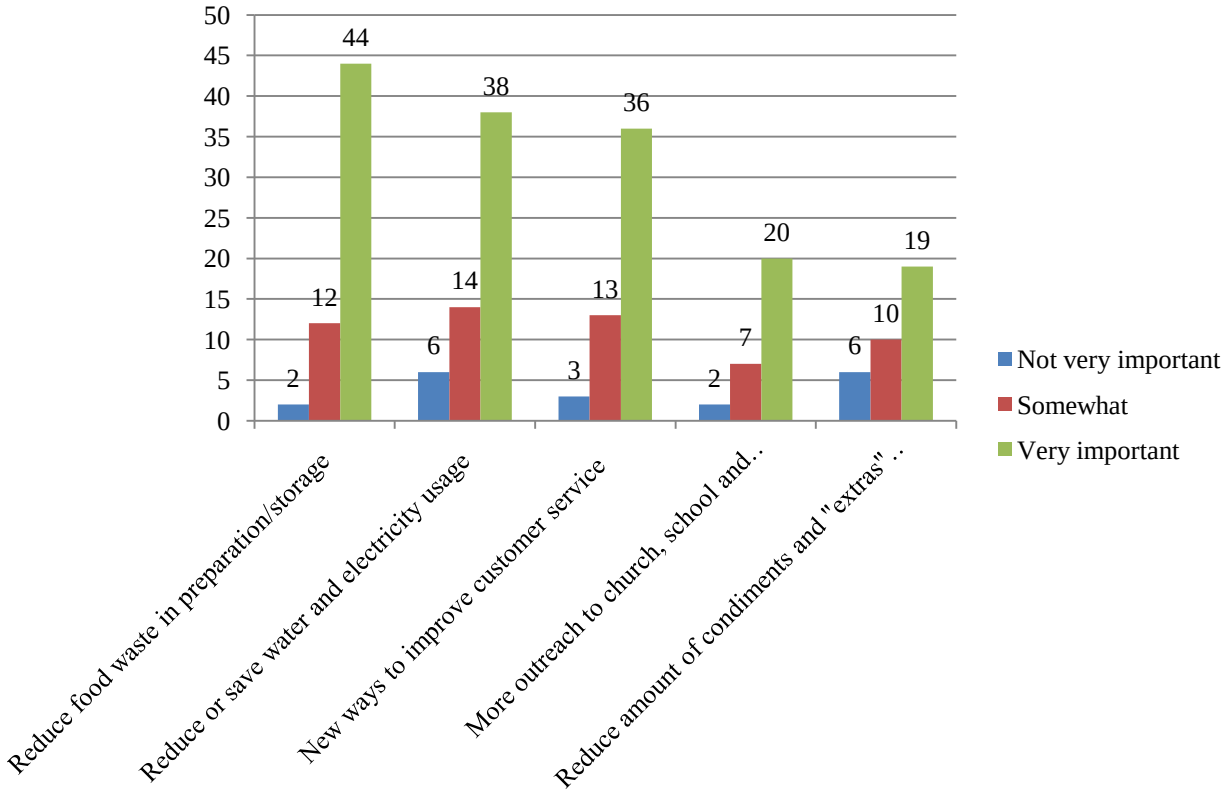


Figure 15C. Reaction to Higher Labor Cost due to MW increase: Non-Labor Expenses/Customer Services and Cost-Savings



Notes: Figures 14A-C show distribution of answers to Question 7 in the MGR survey. Specifically, each manager was asked to following question: "Other research studies of the minimum wage have identified the following list of items as BUSINESS ADJUSTMENTS you might possible make in order to OFFSET the payroll cost increase associated with the higher minimum wage. Which of the following are you planning to do in the next 1-3 months OR have done already in the last month (please check YES or NO)? If your answer is YES, please rate the impact of your action for cost-saving on the scale 1 to 5 (1=least important; 5=very important). Please circle one number from 1 to 5" Due to insufficient number of responses in some categories, the rating was redefined in the following way: "Not very important" if a respondent rated his answer 1 or 2; "Somewhat" if a respondent rated his answer 3; and "Very important" if a respondent rated his answer 4 or 5.

List of Tables

Table 1. Models of Labor Markets and the MW Effects

	Perfect competition	Structural Monopsony	Behavioral	PK/ILE
		Labor Market Assumptions		
Demand curve	Downward sloping; w=MRP	No demand curve as customarily defined	Separate demand for each wage rate; MRP(W)	Ill-defined; resembles a "band" with discontinuities, positive/negative slopes
Firm Supply curve	Horizontal	Upward sloping; MCL>S	Upward sloping	Upward sloping; separate supply for each wage rate
Equilibrium	Yes; no involuntary unemployment	Exploitation exists (w<MRP)	Multiple equilibria; involuntary unemployment	Inefficient; social cost of labor>private cost
		Predicted Economic Effects of the Minimum Wage Increase		
Employment	Lower; (depends on the elasticity of demand curve); ambiguous if consider uncovered sector	Higher/lower/unchanged	Higher/lower/unchanged	Higher/lower/unchanged
Output prices	Higher	Possibly lower (in the short run)	Ambiguous	Ambiguous
Worker productivity effort	N/A	N/A	Higher	Higher
Labor turnover	N/A	N/A	Lower	Ambiguous
On-the-job training (general)	N/A	N/A	Possibly higher	Possibly higher
Non-wage benefits	N/A	N/A	Ambiguous	Ambiguous
Aggregate demand/output	Lower	Possibly higher	Ambiguous	Higher
Overall	Misallocation of resources; a "tax" on consumers, firms, job losers	Lowers exploitation; improves efficiency	Positive "human" responses may offset negative efficiency effect	In addition to monopsony/behavioral effects, also positive agg. demand and social cost effects

Table 2. Channels of Adjustment: Summary of Existing Empirical Evidence

Response	Adjustment Channel	Predicted effect	Empirical studies
Market	Output prices [O, M]	↑	Lemos (2008) reviews approximately 30 studies; Aaronson *et al*. (2007)
	Business growth/profits/sales [O, M]	↓↑	Card and Krueger (1995); Draca *et al.* (2006)
Manager (or owner)	**Employment [P, M, O]**	↓↑**,** no change	many; Neumark and Wascher (2007) provide a thorough review of more than a 100 studies; Card and Krueger (1992, 1994, 2000); Neumark and Wascher (1992, 2006); Burhauser *et al*. (2000); (Addison *et al* (2008); Dube *et al* (2008); Sabia (2009); Guilianno (2009)
	Hours worked (overtime) [P, M]	↓, no change	Couch and Wittenburg (2000); Zavodny (2000); Dube *et al.* (2007); Sabia (2009); Orrenius and Zavodny (2008); overtime work: Fairris (2005)
	Turnover/Vacancies [P, M]	↓	Dube *et al.* (2007); Reich *et al.* (2005); Fairris (2005)
	Training [M]	↓↑	Card and Krueger (1995); Reich *et al.* (2005); Fairris (2005)
	Salary compression [P, M]	-	Card and Krueger (1994); Dube *et al.* (2007)
	Skill/Compositional changes [M]	-	Neumark and Wascher (1996); Burkhauser *et al*. (2000); Ahn *et al.* (2008); Reich *et al.* (2005); Zavodny (2008); Fairris and Bujanda (2008); Guiliano (2009)
	Employee benefits [O]	↓	Card and Krueger (1994); Dube *et al.* (2007)
Worker	Effort/improved morale/productivity [M, E]	↑	Reich *et al.* (2005); Fairris (2005)
	Job attachment/lower turnover [M, P, E]	↑	See Manager response above

Notes. Superscripted letters stand for the type of data used to analyze a particular adjustment channel: O stands for evidence from personal interviews with establishment owners; M stands for Manager Survey data; P stands for electronic payroll data; E stands for Employee Survey.

Table 3. Summary statistics: Individual-level Payroll Records

Year	Payroll record	N	Mean	St. dev.	Min	Max
2007	Hourly wage rate	63164	6.28	0.95	5.15	15.79
	Regular hours	63716	49.18	22.58	0.02	140.81
	Overtime work (dummy)	63718	0.12	0.33	0	1
	Overtime hours	63716	0.74	3.38	0	76.64
2008	Hourly wage rate	64764	6.68	0.84	5.85	12.29
	Regular hours	65291	49.27	22.3	0.02	124.57
	Overtime work (dummy)	65290	0.1	0.3	0	1
	Overtime hours	65290	0.63	3.15	0	55.9
2009	Hourly wage rate	63484	7.15	0.69	6.55	11.36
	Regular hours	63972	49.18	21.67	0.02	120
	Overtime work (dummy)	63975	0.07	0.25	0	1
	Overtime hours	63972	0.45	2.76	0	58.94

Table 4A. Employee Characteristics from Employee Surveys

Variable	Obs.	Mean	St. dev.
Gender (female=1)	1649	0.657	0.475
Race			
White	1595	0.207	0.405
Hispanic	1595	0.082	0.275
Black	1595	0.644	0.479
Asian	1595	0.053	0.225
Other	1595	0.014	0.117
Marital status			
Single	1451	0.686	0.464
Married	1451	0.175	0.38
Divorced/widowed	1451	0.054	0.226
Living with partner	1451	0.085	0.28
N of children under 18	1625	0.958	1.3
Age	1628	28.194	10.719
School in Fall (=1)	1623	0.34	0.474
Level of schooling			
Some high school	1611	0.273	0.446
Finished high school/GED	1611	0.475	0.5
Some college	1611	0.22	0.414
College graduate	1611	0.032	0.175
Health insurance (=1)	1618	0.406	0.491

Country of origin			
U.S.	1551	0.917	0.276
Mexico	1551	0.05	0.219
Other	1551	0.033	0.178
Wage in June	1555	6.987	1.416
Average hours per week	1568	29.51	8.309
Tenure at store (in months)	1571	26.812	39.992
No other jobs	1592	0.832	0.374
Total annual family income			
Less than 10,000	1541	0.382	0.486
10-20,000	1541	0.263	0.44
20-50,000	1541	0.276	0.283
>50,000	1541	0.079	0.115
Vote "yes" for MW (=1)	1607	0.912	0.283

Table 4B. Worker reasons for staying at the present job

Reasons for staying at this job:	N	Mean	St. dev.
The pay here is equal or better than at other jobs I can get	1544	56.1	49.6
I like my job and the kind of work I do	1578	80.5	39.6
Other jobs in this area are hard to get	1565	71.8	45
I like the other people I work with	1567	88.8	31.5
I get the work schedule here that suits my needs	1571	78.7	41
I would have to start at a lower rate elsewhere	1551	41.4	49.3
My managers are good to work for	1561	85.5	35.3
There is good team spirit here	1571	73.3	44.3
It takes time and money to find another job I would want	1574	80	40
I like the way I get treated here	1562	77.3	41.9
Benefits, like insurance, vocation, etc are good here	1569	74.4	43.6
There is opportunity to move up in pay and position	1562	73	44.4
The store location is convenient for me to get to	1570	88.3	32.1
I can't afford to quit and miss a paycheck	1570	75.9	42.8
I am better off staying here than going to a different job	1565	68.9	46.3

Table 5. Summary statistics of the GAP variable: compliance costs as percentage of payroll costs

Year	MW effect	Mean	St. dev.	Min	Max	N of obs.
2007	GAP1	2.598	2.083	0	8.150	2013
2008	GAP2	4.640	2.628	0	9.157	2104
2009	GAP3	6.805	2.638	0.115	10.639	1940

Notes: Summary statistics for the GAP variable, which is the percentage increase in the store's wage bill, resulting from increasing hourly wage of workers to the new MW (for those workers whose wage in March-May is *below* the mandated minimum), while keeping hours constant; averaged for each store in March-May of each year

Table 6. Variable Definitions and Sources

Variable Name	Definition	Source	Formula	Unit
Employment	Total number of workers (with positive hours)	author calculation; electronic payroll records		log
Agg. hours	Total number of hours worked (regular and overtime)	author calculation; electronic payroll records		log
GAP	Percentage increase in the store's wage bill, which results from increasing hourly wage of workers to the new MW (for those workers whose wage in March-May is *below* the mandated minimum), keeping hours constant; averaged for each store in March-May of each year	author calculation; electronic payroll records	$GAP_{j,t} = 1 + [(\Sigma h_{i,j,t} \cdot MW_{i,j,t} - \Sigma h_{i,j,t} \cdot W_{i,j,t-1}) / \Sigma h_{i,j,t} \cdot W_{j,t-1}]$, summed over workers i for whom $W_{i,j,t-1} < MWt$ and set to 0 for workers for whom $W_{i,j,t-1} \geq MWt$	log points
RIPPLE	Percentage increase in the store's wage bill, which results from increasing hourly wage of workers above the required minimum level (for those workers whose wage in March-May is *above* mandated minimum), keeping hours constant; averaged for each store in March-May of each year	author calculation; electronic payroll records	$RIPPLE_{j,t} = 1 + [(\Sigma h_{i,j,t} \cdot \Sigma \Delta W_{i,j,t} - \Sigma h_{i,j,t} \cdot W_{i,j,t-1}) / \Sigma h_{i,j,t} \cdot W_{j,t-1}]$, summed over workers i for whom $W_{i,j,t-1} \geq MWt$ (in January-May) and set to 0 for workers for whom $W_{i,j,t-1} < MWt$ (in January-May)	
MWt	Binary variable equal to 1 in August, 2007-January, 2008; August, 2008-Janry, 2009; and August, 2009-December, 2009, respectivly	author calculation; electronic payroll records		
GA	Binary variable equal to 1 if establishment is located in Georgia			
Sales	Percentage change in monthly sales, converted to log points	Restaurant owners confidential files	Sales j,t =[Sales j,t-Sales j,t-1]/Sales j,t-1	log points
Pop. Density	County-level pulation density; number of people per square mile	U.S. Census Bureau Population Estimates; available from http://www.census.gov/popest/counties/counties.html		
Empl. Other	County-level number of employees in private establishments, minus employment at *Accommodations and Food Services and Retail sectors*(NAICS 722) and at Retail sector (NAICS 44-45)	Bureau of Labor Statistics, Quarterly Census of Employment and Wages (QCEW); available from http://www.bls.gov/cew/home.htm.		log
County f.e.	County fixed effects; binary varialbe equal to 1 if a restaurant is located in a given county	author calculation based on GSP mapping of store's locations		

Owner f.e.	Owner fixed effects; binary variable equal to 1 if a restaurant belongs to one of the three franchisers	author calculation; electronic payroll records

Table 7. Employment level changes during MW increase periods, with and without store, county, and owner and fixed effects

	Jan'07-Jan'08	Jan'08-Jan'09	Jan'09-Dec'09	Jan'07-Jan'08	Jan'08-Jan'09	Jan'09-Dec'09	Jan'07-Jan'08	Jan'08-Jan'09	Jan'09-Dec'09	Jan'07-Jan'08	Jan'08-Jan'09	Jan'09-Dec'09
MW_1	-0.018			-0.007			-0.006			-0.006		
	(0.012)			(0.009)			(0.009)			(0.009)		
MW_2		-0.033***			-0.033***			-0.033***			-0.033***	
		(0.008)			(0.008)			(0.008)			(0.008)	
MW_3			0.006			0.006			0.006			0.006
			(0.007)			(0.007)			(0.007)			(0.007)
Store F.E.	NO	NO	NO	YES	YES	YES	NO	NO	NO	NO	NO	NO
County F.E.	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES
Owner F.E.	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	YES	YES
N	2029	2104	1940	2029	2104	1940	2029	2104	1940	2029	2104	1940
R^2	0.00	0.00	0.00	0.88	0.91	0.94	0.74	0.79	0.82	0.74	0.79	0.82

Notes: Robust standard errors are clustered on establishments. The dependent variable in all regressions is store-level log of bi-weekly employment. 1st MW is a dummy variable equal to 1 for the 6 months after July 2007 MW increase (August, 2007-January, 2008). 2nd MW is a dummy variable equal to 1 for the 6 months after July 2008 MW increase (August, 2008-January, 2009). 3rd MW is a dummy variable equal to 1 for the 5 months after July 2009 increase (August, 2009-December, 2009).

Table 8A. Pooled OLS, reduced-form model for employment and aggregate hours, 1st MW increase: Contemporaneous and lagged sales, January, 2007-January, 2008

	lnEmp	lnEmp	lnEmp	lnEmp	lnEmp	lnEmp	lnEmp	lnEmp	lnEmp	lnEmp	lnHours	lnHours	lnHours
$lnGAP_1*MW_1$	0.392	0.374	0.251	0.194	0.360	0.243	0.193	0.310	0.178	0.139	0.361	0.265	0.366
	(0.465)	(0.469)	(0.490)	(0.503)	(0.469)	(0.489)	(0.502)	(0.459)	(0.477)	(0.490)	(0.305)	(0.334)	(0.376)
$lnGAP_1$	1.965	1.976	2.026	1.888	1.983	2.030	1.889	2.006	2.062	1.918	0.228	0.225	0.143
	(1.920)	(1.917)	(1.945)	(1.993)	(1.919)	(1.947)	(1.995)	(1.916)	(1.943)	(1.992)	(1.471)	(1.489)	(1.508)
MW_1	-0.014	-0.013	-0.016	-0.018	-0.013	-0.015	-0.018	-0.010	-0.012	-0.016	-0.004	-0.012	-0.020
	(0.016)	(0.016)	(0.018)	(0.019)	(0.016)	(0.017)	(0.019)	(0.016)	(0.017)	(0.018)	(0.011)	(0.012)	(0.013)
Sales (log)		0.090***	0.060	0.023	0.089***	0.060	0.024	0.083***	0.068	0.018	0.193***	0.187***	0.037
		(0.031)	(0.046)	(0.034)	(0.031)	(0.046)	(0.034)	(0.030)	(0.048)	(0.034)	(0.035)	(0.052)	(0.027)
Pop. density								-0.001	-0.001*	-0.001			
								(0.001)	(0.001)	(0.001)			
Emp. Priv(log)					0.073	0.072	0.080						
					(0.161)	(0.153)	(0.153)						
County F. E.	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Owner F. E.	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Sales lag?	N/A	No lag	1 mth	2 mths	No lag	1 mth	2 mths	No lag	1 mth	2 mths	No lag	1 mth	2 mths
N	2013	2001	1843	1685	2001	1843	1685	2001	1843	1685	2001	1843	1685
R^2	0.74	0.74	0.75	0.75	0.74	0.75	0.75	0.74	0.75	0.75	0.63	0.64	0.75

Notes. Robust standard errors clustered on establishments are in parentheses. MW_1 is a dummy variable equal to 1 in August, 2007-January, 2008. The dependent variable in columns 1-5 is the log of the average bi-weekly employment; the dependent variable in the last column is the log of the aggregate hours, which is equal to the total hours=regular +overtime (logged); Sales is the log of monthly percent change in sales, with no lag, and also lagged one and two months .

Table 8B. Pooled OLS, reduced-form model for employment and aggregate hours, 1st MW increase: Contemporaneous and lagged sales, January, 2008-January, 2009

	lnEmp	lnEmp	lnEmp	lnEmp	lnEmp	lnEmp	lnEmp	lnEmp	lnEmp	lnEmp	lnHours	lnHours	lnHours
$lnGAP_2*MW_2$	-0.246	-0.262	-0.267	-0.277	-0.211	-0.216	-0.227	-0.354	-0.376	-0.359	0.160	0.155	0.153
	(0.353)	(0.353)	(0.352)	(0.350)	(0.352)	(0.351)	(0.349)	(0.345)	(0.343)	(0.344)	(0.166)	(0.165)	(0.164)
$lnGAP_2$	0.552	0.540	0.527	0.524	0.517	0.504	0.501	0.582	0.577	0.562	-0.445	-0.463	-0.467
	(2.046)	(2.045)	(2.045)	(2.044)	(2.047)	(2.046)	(2.045)	(2.048)	(2.047)	(2.046)	(1.325)	(1.322)	(1.323)
MW_2	-0.022	-0.020	-0.019	-0.015	-0.018	-0.017	-0.013	-0.013	-0.011	-0.009	-0.044***	-0.044***	-0.041***
	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.018)	(0.019)	(0.008)	(0.008)	(0.008)
Sales (log)		0.042	0.028	0.122***	0.047	0.026	0.116***	0.034	0.053	0.109***	0.098***	0.125***	0.077***
		(0.035)	(0.032)	(0.037)	(0.035)	(0.032)	(0.037)	(0.036)	(0.034)	(0.036)	(0.029)	(0.025)	(0.028)
Pop. density								-0.002**	-0.002***	-0.001**			
								(0.001)	(0.001)	(0.001)			
Emp. riv(log)					0.085	0.094	0.075						
					(0.075)	(0.077)	(0.074)						
County F. E.	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Owner F. E.	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Sales lag?	N/A	No lag	1 mth	2 mths	No lag	1 mth	2 mths	No lag	1 mth	2 mths	No lag	1 mth	2 mths
Observations	2,104	2,102	2,100	2,098	2,102	2,100	2,098	2,102	2,100	2,098	2102	2100	2098
R-squared	0.786	0.788	0.788	0.789	0.789	0.790	0.790	0.788	0.789	0.789	0.75	0.75	0.75

Table 8C. Pooled OLS, reduced-form model for employment and aggregate hours, 1st MW increase: Contemporaneous and lagged sales, January, 2009-December, 2009

	lnEmp	lnEmp	lnEmp	lnEmp	lnEmp	lnEmp	lnEmp	lnEmp	lnEmp	lnEmp	lnHours	lnHours	lnHours
$lnGAP_3*MW_3$	0.626**	0.623**	0.627**	0.615**	0.624**	0.627**	0.617**	0.623**	0.627**	0.615**	0.360**	0.349**	0.366**
	(0.291)	(0.292)	(0.291)	(0.291)	(0.288)	(0.286)	(0.287)	(0.292)	(0.291)	(0.291)	(0.175)	(0.174)	(0.175)
$lnGAP_3$	-1.063	-1.064	-1.063	-1.062	-1.064	-1.064	-1.062	-1.064	-1.063	-1.062	-0.488	-0.484	-0.485
	(1.547)	(1.548)	(1.547)	(1.546)	(1.548)	(1.548)	(1.546)	(1.548)	(1.547)	(1.546)	(1.050)	(1.050)	(1.049)
MW_3	-0.035*	-0.035*	-0.035*	-0.034*	-0.038*	-0.038*	-0.037*	-0.035*	-0.035*	-0.034*	-0.021*	-0.018	-0.021
	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.012)	(0.012)	(0.012)
Sales (log)		0.033	-0.010	0.073**	0.031	-0.007	0.072**	0.033	-0.010	0.073**	0.135***	0.171***	0.035
		(0.041)	(0.033)	(0.035)	(0.041)	(0.034)	(0.035)	(0.041)	(0.033)	(0.035)	(0.046)	(0.025)	(0.034)
Pop. density								-0.000*	-0.000*	-0.000*			
								(0.000)	(0.000)	(0.000)			
Emp. Priv(log)					-0.128	-0.129	-0.125						
					(0.169)	(0.170)	(0.165)						
County F. E.	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Owner F. E.	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Sales lag?	N/A	No lag	1 mth	2 mths	No lag	1 mth	2 mths	No lag	1 mth	2 mths	No lag	1 mth	2 mths
Observations	1940	1940	1940	1940	1940	1940	1940	1940	1940	1940	1,940	1,940	1,940
R-squared	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.76	0.76	0.75

Table 9A. Pooled OLS, reduced-form model for employment and aggregate hours, 1st MW increase: Preferred specification, January, 2007-January, 2008

	lnEmp	lnEmp	lnEmp	lnHours
$lnGAP_1*MW_1$	0.194	0.193	0.139	0.265
	(0.503)	(0.502)	(0.490)	(0.334)
$lnGAP_1$	1.888	1.889	1.918	0.225
	(1.993)	(1.995)	(1.992)	(1.489)
MW_1	-0.018	-0.018	-0.016	-0.012
	(0.019)	(0.019)	(0.018)	(0.012)
l. sales (log)	0.023	0.024	0.018	0.187***
	(0.034)	(0.034)	(0.034)	(0.052)
Pop.density			-0.001	
			(0.001)	
Emp. Priv		0.080		
(log)		(0.153)		
County f.e.	YES	YES	YES	YES
Owner f.e.	YES	YES	YES	YES
Observations	1,685	1,685	1,685	1,843
R-squared	0.75	0.75	0.75	0.64

Notes. Robust standard errors clustered on establishments are in parentheses. MW_2 is a dummy variable equal to 1 in August, 2007-January, 2008. The dependent variable in columns 1-5 is the log of the average bi-weekly employment; the dependent variable in the last column is the log of the aggregate hours, which is equal to the total hours=regular +overtime (logged); l.sales is the log of monthly sales, lagged 2 months (last column, lagged 1 month).

Table 9B. Pooled OLS, reduced-form model for employment and aggregate hours, 2nd MW increase: Preferred specification, January, 2008-January, 2009

	lnEmp	lnEmp	lnEmp	lnHours
$lnGAP_2*MW_2$	-0.202	-0.155	-0.280	0.159
	(0.405)	(0.405)	(0.400)	(0.210)
$lnGAP_1$	0.123	0.110	0.143	-1.176
	(1.978)	(1.981)	(1.976)	(1.203)
MW_2	-0.017	-0.015	-0.011	-0.042***
	(0.022)	(0.021)	(0.021)	(0.010)
l. sales (log)	0.124***	0.118***	0.111***	0.125***
	(0.038)	(0.038)	(0.038)	(0.026)
Emp.Priv.		0.076		
(log)		(0.073)		
Pop. Dens.			-0.001**	
			(0.001)	
County f.e.	YES	YES	YES	YES
Owner f.e.	YES	YES	YES	YES
Observations	2,054	2,054	2,054	2,054
R-squared	0.79	0.79	0.79	0.75

Notes. Robust standard errors clustered on establishments are in parentheses. MW_2 is a dummy variable equal to 1 in August, 2008-January, 2009. The dependent variable in columns 1-5 is the log of the average bi-weekly

employment; the dependent variable in the last column is the log of the aggregate hours, which is equal to the total hours=regular +overtime (logged); l.sales is the log of monthly sales, lagged 2 months (last column, lagged 1 month).

Table 9C. Pooled OLS, reduced-form model for employment and aggregate hours, 2nd MW increase: Preferred specification, January, 2009-December, 2009

	lnEmp	lnEmp	lnEmp	lnHours
$lnGAP_3*MW_3$	0.454	0.456	0.454	0.312
	(0.397)	(0.396)	(0.397)	(0.277)
$lnGAP_1$	-0.610	-0.610	-0.610	-1.051
	(1.570)	(1.571)	(1.570)	(1.192)
MW_3	-0.024	-0.027	-0.024	-0.016
	(0.027)	(0.027)	(0.027)	(0.019)
l. sales (log)	0.076**	0.074**	0.076**	0.175***
	(0.036)	(0.035)	(0.036)	(0.025)
Emp.Priv.		-0.116		
(log)		(0.160)		
Pop. Dens.			-0.000	
			(0.000)	
County f.e.	YES	YES	YES	YES
Owner f.e.	YES	YES	YES	YES
Observations	1,892	1,892	1,892	1,892
R-squared	0.82	0.82	0.82	0.76

Notes. Robust standard errors clustered on establishments are in parentheses. MW_2 is a dummy variable equal to 1 in August, 2009-December, 2009. The dependent variable in columns 1-5 is the log of the average bi-weekly employment; the dependent variable in the last column is the log of the aggregate hours, which is equal to the total hours=regular +overtime (logged); l.sales is the log of monthly sales, lagged 2 months (last column, lagged 1 month).

Table 10. Summary statistics: Ripple effect

Year	Ripple	Mean	St. dev.	Min	Max	N of obs.
2007	Ripple1	1.990	1.100	0	5.711	2013
2008	Ripple 2	1.444	1.383	0	10.700	2104
2009	Ripple 3	0.448	0.680	0	3.851	1940

Notes: Table 12 shows summary statistics the Ripple effect, calculated as an average percent of wage bill increase due to pay increases for worker for whom MW increase was non-binding (in March-May of each year). Number of observations are establishment-level, pay-period, for Jan.2007-Jan2008; Jan 2008-Jan2009, and Jan 2009-Dec.2009.

Table 11A. Pooled OLS, reduced-form model for employment and aggregate hours, 1st MW increase: Exploring the ripple effect, January, 2007-January, 2008

	lnEmp	lnEmp	lnEmp	lnHours
$lnUGAP_1*MW_1$	-0.069	-0.080	-0.141	0.627
	(0.694)	(0.693)	(0.689)	(0.521)
$lnUGAP_1$	-0.091	-0.084	-0.061	-0.183
	(2.154)	(2.155)	(2.148)	(1.414)
MW_1	-0.010	-0.010	-0.006	-0.033
	(0.036)	(0.036)	(0.036)	(0.026)
l. sales (log)	0.023	0.023	0.017	0.188***
	(0.034)	(0.034)	(0.034)	(0.052)
Emp.Priv. (log)		0.074		
		(0.151)		
Pop.dens.			-0.001	
			(0.001)	
County f.e.	YES	YES	YES	YES
Owner f.e.	YES	YES	YES	YES
N	1,685	1,685	1,685	1,843
R^2	0.75	0.75	0.75	0.64

Notes. Robust standard errors clustered on establishments are in parentheses. MW_1 is a dummy variable equal to 1 in August, 2007-January, 2008. The dependent variable in columns 1-3 is the log of the average bi-weekly employment; the dependent variable in the last column is the log of the aggregate hours, which is equal to the total hours=regular +overtime (logged); UGAP is the upper bound for GAP, which is equal to the sum of GAP variable and the ripple effect (percent increase in the wage bill due to wage increases that are not due to the MW hikes); l.sales is the log of monthly sales, lagged 2 months (last column, lagged 1 month).

Table 11B. Pooled OLS, reduced-form model for employment and aggregate hours, 1st MW increase: Exploring the ripple effect, January, 2008-January, 2009

	lnEmp	lnEmp	lnEmp	lnHours
$lnUGAP_2*MW_2$	0.141	0.158	0.073	0.162
	(0.505)	(0.505)	(0.502)	(0.306)
$lnUGAP_1$	-1.893	-1.896	-1.886	-0.680
	(1.792)	(1.793)	(1.792)	(1.358)
MW_2	-0.034	-0.032	-0.029	-0.044**
	(0.033)	(0.033)	(0.032)	(0.019)
l. sales (log)	0.122***	0.116***	0.110***	0.124***
	(0.038)	(0.038)	(0.037)	(0.026)
Emp.Priv. (log)		0.078		
		(0.073)		
Pop.dens.			-0.001**	
			(0.001)	
County f.e.	YES	YES	YES	YES
Owner f.e.	YES	YES	YES	YES
Observations	2,054	2,054	2,054	2,054
R-squared	0.790	0.792	0.791	0.747

Notes. Robust standard errors clustered on establishments are in parentheses. MW_1 is a dummy variable equal to 1 in August, 2008-January, 2009. The dependent variable in columns 1-3 is the log of the average bi-weekly employment; the dependent variable in the last column is the log of the aggregate hours, which is equal to the total hours=regular +overtime (logged); UGAP is the upper bound for GAP, which is equal to the sum of GAP

variable and the ripple effect (percent increase in the wage bill due to wage increases that are not due to the MW hikes); l.sales is the log of monthly sales, lagged 2 months (last column, lagged 1 month).

Table 11C. Pooled OLS, reduced-form model for employment and aggregate hours, 1st MW increase: Exploring the ripple effect, January, 2009-December, 2009

	lnEmp	lnEmp	lnEmp	lnHours
$lnUGAP_3*MW_3$	0.188	0.194	0.188	0.196
	(0.497)	(0.498)	(0.497)	(0.378)
$lnUGAP_1$	-3.597*	-3.596*	-3.597*	-1.237
	(2.033)	(2.034)	(2.033)	(1.322)
MW_3	-0.008	-0.011	-0.008	-0.009
	(0.035)	(0.036)	(0.035)	(0.027)
l. sales (log)	0.074**	0.073**	0.074**	0.174***
	(0.035)	(0.035)	(0.035)	(0.026)
Emp.Priv.		-0.119		
(log)		(0.159)		
Pop.dens.			-0.000**	
			(0.000)	
County f.e.	YES	YES	YES	YES
Owner f.e.	YES	YES	YES	YES
Observations	1,892	1,892	1,892	1,892
R-squared	0.83	0.83	0.83	0.76

Notes. Robust standard errors clustered on establishments are in parentheses. MW_1 is a dummy variable equal to 1 in August, 2009-December, 2009. The dependent variable in columns 1-3 is the log of the average bi-weekly employment; the dependent variable in the last column is the log of the aggregate hours, which is equal to the total hours=regular +overtime (logged); UGAP is the upper bound for GAP, which is equal to the sum of GAP variable and the ripple effect (percent increase in the wage bill due to wage increases that are not due to the MW hikes); l.sales is the log of monthly sales, lagged 2 months (last column, lagged 1 month).

Table 12. Pooled OLS, reduced-form model for employment and aggregate hours: Effect of Longer Hours Mandate, January, 2008-January, 2009

	lnEmp	lnEmp	lnEmp	lnHours
$NOEXP*lnGAP_2*$	-0.627	-0.518	-0.600	-0.859
MW_2	(1.022)	(1.003)	(1.020)	(0.689)
$lnGAP_2*MW_2$	0.189	0.200	0.104	0.679*
	(0.639)	(0.641)	(0.641)	(0.375)
$lnGAP_1$	0.530	0.504	0.543	-0.621
	(1.867)	(1.865)	(1.865)	(1.100)
MW_2	-0.051	-0.049	-0.045	-0.080***
	(0.038)	(0.037)	(0.038)	(0.020)
l. sales (log)	0.121***	0.114***	0.109***	0.124***
	(0.037)	(0.037)	(0.037)	(0.025)
Emp. Priv.		0.085		
(log)		(0.073)		
Pop. Dens.			-0.001**	
			(0.001)	

County f.e.	YES	YES	YES	YES
Owner f.e.	YES	YES	YES	YES
Observations	2054	2054	2054	2054
R-squared	0.79	0.79	0.79	0.7

Notes. Robust standard errors clustered on establishments are in parentheses. NOEXP is a dummy variable equal to 1 if a store did not receive an exemption from the longer operating hours mandate; MW_2 is a dummy variable equal to 1 in August, 2008-January, 2009. The dependent variable in columns 1-3 is the log of the average bi-weekly employment; the dependent variable in the last column is the log of the aggregate hours, which is equal to the total hours=regular +overtime (logged). Included in the regression but not shown are: dummy variable for not being in the exempt group of stores, as well as two-way interaction variables (dummy for being exempt, interacted with MW_2 and $lnGAP_2$ interacted with dummy for being exempt); l.sales is the log of monthly sales, lagged 2 months (last column, lagged 1 month).

Table 13A. Pooled OLS, reduced-form model for employment and aggregate hours, 1st MW increase: One franchise owner, January, 2007-January, 2008

	lnEmp	lnEmp	lnEmp	lnHours
$lnGAP_1*MW_1$	-0.351	-0.343	-0.316	-0.375
	(0.531)	(0.532)	(0.535)	(0.293)
$lnGAP_1$	2.149	2.144	2.130	0.510
	(1.969)	(1.968)	(1.967)	(1.494)
MW_1	0.002	0.001	0.000	0.013
	(0.018)	(0.018)	(0.018)	(0.010)
l. sales (log)	0.026	0.025	0.028	0.200***
	(0.037)	(0.037)	(0.037)	(0.057)
Pop.density		-0.087		
		(0.176)		
Emp. Priv			0.004	
(log)			(0.002)	
County f.e.	YES	YES	YES	YES
Owner f.e.	YES	YES	YES	YES
Observations	1337	1337	1337	1459
R-squared	0.391	0.391	0.391	0.345

Notes. Robust standard errors clustered on establishments are in parentheses. Equations are estimated for sub-sample of restaurants owned by a single franchise owner. MW_1 is a dummy variable equal to 1 in August, 2007-January, 2008. The dependent variable in columns 1-5 is the log of the average bi-weekly employment; the dependent variable in the last column is the log of the aggregate hours, which is equal to the total hours=regular +overtime (logged); l.sales is the log of monthly sales, lagged 2 months (last column, lagged 1 month).

Table 13B. Pooled OLS, reduced-form model for employment and aggregate hours, 2nd MW increase: One franchise owner, January, 2008-January, 2009

	lnEmp	lnEmp	lnEmp	lnHours
$lnGAP_2*MW_2$	-0.717	-0.707	-0.718	-0.004
	(0.577)	(0.576)	(0.574)	(0.370)
$lnGAP_1$	0.255	0.252	0.255	-1.136
	(1.963)	(1.965)	(1.963)	(1.200)
MW_2	0.015	0.017	0.017	-0.026
	(0.032)	(0.031)	(0.032)	(0.020)

l. sales (log)	0.122***	0.118***	0.105**	0.128***
	(0.044)	(0.044)	(0.044)	(0.026)
Emp.Priv. (log)		0.090		
		(0.079)		
Pop. Dens.			-0.004***	
			(0.001)	
County f.e.	YES	YES	YES	YES
Owner f.e.	YES	YES	YES	YES
Observations	1586	1586	1586	1586
R-squared	0.434	0.435	0.436	0.505

Notes. Robust standard errors clustered on establishments are in parentheses. Equations are estimated for sub-sample of restaurants owned by a single franchise owner.MW_2 is a dummy variable equal to 1 in August, 2008-January, 2009. The dependent variable in columns 1-5 is the log of the average bi-weekly employment; the dependent variable in the last column is the log of the aggregate hours, which is equal to the total hours=regular +overtime (logged); l.sales is the log of monthly sales, lagged 2 months (last column, lagged 1 month).

Table 13C. Pooled OLS, reduced-form model for employment and aggregate hours, 2nd MW increase: One franchise owner, January, 2009-December, 2009

	lnEmp	lnEmp	lnEmp	lnHours
$lnGAP_3$*MW_3	-0.285	-0.298	-0.285	0.192
	(0.857)	(0.860)	(0.857)	(0.580)
$lnGAP_1$	-0.540	-0.538	-0.540	-1.043
	(1.562)	(1.562)	(1.562)	(1.194)
MW_3	0.040	0.039	0.040	0.001
	(0.065)	(0.065)	(0.065)	(0.043)
l. sales (log)	0.049	0.049	0.049	0.175***
	(0.038)	(0.038)	(0.038)	(0.031)
Emp.Priv. (log)		-0.073		
		(0.153)		
Pop. Dens.			-0.000	
			(0.000)	
County f.e.	YES	YES	YES	YES
Owner f.e.	YES	YES	YES	YES
Observations	1464	1464	1464	1464
R-squared	0.421	0.422	0.421	0.474

Notes. Robust standard errors clustered on establishments are in parentheses. Equations are estimated for sub-sample of restaurants owned by a single franchise owner.MW_3 is a dummy variable equal to 1 in August, 2009-December, 2009. The dependent variable in columns 1-5 is the log of the average bi-weekly employment; the dependent variable in the last column is the log of the aggregate hours, which is equal to the total hours=regular +overtime (logged); l.sales is the log of monthly sales, lagged 2 months (last column, lagged 1 month).

Table 14A. Pooled OLS, reduced-form model for employment and aggregate hours, 1st MW increase: Exclude Atlanta Metro Area, January, 2007-January, 2008

	lnEmp	lnEmp	lnEmp	lnHours
$lnGAP_1$*MW_1	-0.183	-0.186	-0.157	-0.309
	(0.454)	(0.455)	(0.457)	(0.266)
$lnGAP_1$	2.093	2.095	2.079	0.511

	(1.982)	(1.984)	(1.981)	(1.486)
MW_1	-0.003	-0.002	-0.005	0.012
	(0.017)	(0.017)	(0.017)	(0.010)
l. sales (log)	0.026	0.027	0.028	0.195***
	(0.036)	(0.036)	(0.035)	(0.055)
Pop.density		0.075		
		(0.154)		
Emp. Priv			0.003	
(log)			(0.002)	
County f.e.	YES	YES	YES	YES
Owner f.e.	YES	YES	YES	YES
Observations	1457	1457	1457	1591
R-squared	0.420	0.421	0.420	0.488

Notes. Robust standard errors clustered on establishments are in parentheses. Sample excludes stores located in Atlanta Metro Area. MW_1 is a dummy variable equal to 1 in August, 2007-January, 2008. The dependent variable in columns 1-3 is the log of the average bi-weekly employment; the dependent variable in the last column is the log of the aggregate hours, which is equal to the total hours=regular +overtime (logged); l.sales is the log of monthly sales, lagged 2 months (last column, lagged 1 month).

Table 14B. Pooled OLS, reduced-form model for employment and aggregate hours, 2nd MW increase: Exclude Atlanta Metro Area, January, 2008-January, 2009

	lnEmp	lnEmp	lnEmp	lnHours
$lnGAP_2*MW_2$	-0.809	-0.760	-0.812	-0.169
	(0.536)	(0.536)	(0.534)	(0.359)
$lnGAP_1$	0.280	0.267	0.280	-1.090
	(1.960)	(1.963)	(1.960)	(1.196)
MW_2	0.019	0.019	0.022	-0.022
	(0.030)	(0.030)	(0.030)	(0.020)
l. sales (log)	0.120***	0.113***	0.105**	0.137***
	(0.041)	(0.041)	(0.041)	(0.026)
Emp.Priv.		0.033		
(log)		(0.069)		
Pop. Dens.			-0.004***	
			(0.001)	
County f.e.	YES	YES	YES	YES
Owner f.e.	YES	YES	YES	YES
Observations	1742	1742	1742	1742
R-squared	0.469	0.473	0.470	0.604

Notes. Robust standard errors clustered on establishments are in parentheses. Sample excludes stores located in Atlanta Metro Area. MW_2 is a dummy variable equal to 1 in August, 2008-January, 2009. The dependent variable in columns 1-3 is the log of the average bi-weekly employment; the dependent variable in the last column is the log of the aggregate hours, which is equal to the total hours=regular +overtime (logged); l.sales is the log of monthly sales, lagged 2 months (last column, lagged 1 month).

Table 14C. Pooled OLS, reduced-form model for employment and aggregate hours, 2nd MW increase: Exclude Atlanta Metro Area, January, 2009-December, 2009

	lnEmp	lnEmp	lnEmp	lnHours
$lnGAP_3*MW_3$	0.293	0.280	0.293	0.553
	(0.834)	(0.830)	(0.834)	(0.583)
$lnGAP_1$	-0.590	-0.589	-0.590	-1.080
	(1.570)	(1.570)	(1.570)	(1.199)
MW_3	-0.012	-0.013	-0.012	-0.033
	(0.063)	(0.063)	(0.063)	(0.044)
l. sales (log)	0.055	0.053	0.055	0.192***
	(0.036)	(0.036)	(0.036)	(0.027)
Emp.Priv. (log)		-0.112		
		(0.161)		
Pop. Dens.			-0.000	
			(0.000)	
County f.e.	YES	YES	YES	YES
Owner f.e.	YES	YES	YES	YES
Observations	1,892	1,892	1,892	1,892
R-squared	0.82	0.82	0.82	0.76

Notes. Robust standard errors clustered on establishments are in parentheses. Sample excludes stores located in Atlanta Metro Area. MW_3 is a dummy variable equal to 1 in August, 2009-December, 2009. The dependent variable in columns 1-3is the log of the average bi-weekly employment; the dependent variable in the last column is the log of the aggregate hours, which is equal to the total hours=regular +overtime (logged); l.sales is the log of monthly sales, lagged 2 months (last column, lagged 1 month).

Table 15. Cumulative effect of 3 Federal MW increases: January, 2007 – December, 2009

	ln(Emp)	ln(Hours)
GAP	0.756	0.706*
	(0.522)	(0.370)
MW	-0.067	-0.100*
	(0.078)	(0.056)
Store F.E.	yes	yes
Owner F.E.	yes	yes
N	148	148
R^2	0.89	0.89

Notes. Robust standard errors clustered on establishments are in parentheses. GAP is defined as: $\Sigma GAP=GAP_1+GAP_2+GAP_3$ for each establishment in t=2 (December 2009) and 0 otherwise (January 2007); the dependent variable in columns 1 (2) is the log of the average monthly employment (log of the aggregate hours) in Jan. 2007 and Dec. 2009; MW is a dummy variable equal to 1 for t=2 (December 2009).

Table 16. Summary of the Main Menu Item Price Increases: January 2007 – December 2009

year	month	Owner "type"	average initial price ($)	average % increase	average $ increase	% increase in wage bill
2007	August	I	4.35	2.30%	0.10	1.73%
	July	II	4.50	2.20%	0.10	10.88%
	November	III	3.80	5.26%	0.20	4.98%
2008	May	I	4.44	4.50%	0.20	
	June	I	4.65	4.30%	0.20	2%
	August	I	4.76	2.10%	0.10	
	July	II	4.60	2.17%	0.10	9.18%
	June	III	4.00	2.50%	0.10	7.74%
2009	No increase	I	--	--	--	4.15%
	No increase	II	--	--	--	7.68%
	April	III	4.10	2.44%	0.10	8.50%
	November	III	4.20	4.52%	0.19	

Notes: The main menu meal includes a combo (sandwich, small fries and a drink). Percent increase in payroll costs for each owner is based on the average hours (and overtime hours), fixed in the first half January, 2007, and the average wages in the first half of January, 2008; January, 2009; and December, 2009.

Table 18. Average Wage Increases: Descriptive statistics for "Affected" and "Unaffected" workers

MW	"Affected" workers	"Unaffected" workers
1st MW	0.218 (.152)	0.168 (.2098)
2nd MW	0.362 (.2584)	0.231 (.3173)
3rd MW	0.650 (.1866)	0.231 (.2738)

Notes: Sub-sample "affected" workers includes those workers whose hourly wages in January-May of each year were less than the upcoming July minimum wage; sub-sample "unaffected" workers are those for whom MW is non-binding in a given year (prior to the MW increase). Standard deviations are in parentheses.

Table 17. Maximum likelihood estimates of the survival-time models: Weibull and semi-parametric Cox model (Hazard ratios)

	Weibull	Cox
Hourly wage	-0.691***	-0.703***
	(0.019)	(0.002)
Reg. hours	-0.986***	-0.987***
	(0.0001)	(0.0001)
lnGAP	-0.013***	-0.015***
	(0.003)	(0.003)
lnEmpl.	1.289***	1.277***
	(0.093)	(0.087)

Store F.E.	Yes	Yes
Owner F.E.	Yes	Yes
N	183,116	183,116
p	1.27	…
1/p	0.79	…
Clusters	81	81

Notes: Hazard rations are presented from estimating parametric survival-time model (under the assumption of Weibull distribution) and the semi-parametric Cox model. The duration of spells is defined as the number of consecutive pay periods a worker is observed in the sample, at the same store; the shortest spells (appearing in the sample only once) are ignored. Robust standard errors clustered on establishments are in parentheses. Also included but not shown are monthly sales variable (in log form), as well as store and owner fixed effects.

Table 19. Descriptive statistics, Manager Survey

Variable	Mean	St.dev.	Min	Max	N
MW increase and cost-saving measures:					
Total weekly payroll increase due to the MW	1118.19	1120.16	200	8000	57
Percent of the increase offset (through non-employment cost-savings measures)	22.86	21.83	2	100	60
Store and workforce characteristics:					
Number of applicants a month	51.26	48.41	3	300	65
Days to fill in new position	4.41	3.84	1	18	64
Percent of EEs underqualified	23.65	18.48	1	75	54
Percent of EEs overqualified	38.62	23.31	0	90	60
MGR experience:					
Tenure at this store (in months)	43.84	40.58	1	158	61
Tenure as a manager (in years)	10.57	9.11	0	49	62
MGR attitude to MW increase:					
How big of a worry is the MW increase? (distribution of answers)	4.5	2.73	1	10	64
No or little worry (1-3)	40.63	26			
Some worry (4-7)	42.19	27			
Big or very big worry (8-10)	17.19	11			
How big the effect of MW on sales? (distribution of answers)	4.37	2.44	1	10	65
Stay the same or change very little	43.08	28			
Decrease somewhat	46.15	30			
Decrease significantly	10.77	7			

Table 20. Business adjustments used to offset payroll costs

Area	Cost-saving adjustments:	Share of MGRs making adjustment	N
Human Resource Practices	Reduce training	10.61	66
	Change work schedules	69.23	65
	Hire older/more experienced workers	50	66
	Hire teenage workers	15.15	66
	Schedule more full-time employees and less part-time	21.21	66
	Schedule more part-time employees and less full-time	27.69	65
	Postpone or limit pay raises to your more experienced workers	42.42	66
	Increase performance standards	90.91	66
	Reduce the number of people on your payroll	19.7	66
	Cut weekly hours of some employees	62.12	66
Operational Efficiency and Productivity	Cross-train workers for multitasking	83.33	66
	Expand job duties of your workers	86.15	65
	Discourage overtime work	81.54	65
	Tighten-up on absenteeism and discipline	80.3	66
	Get more work from each person	89.39	66
	Increase morale and team spirit	92.42	66
	Rearrange production operation to be more efficient	62.12	66
Non-labor costs/Customer service	Less time spent on clean up	12.12	66
	Reduce food waste in preparation/storage	96.97	66
	Reduce or save water and electricity usage	93.94	66
	Reduce amount of condiments and "extras" given to customers	54.55	66
	New ways to improve customer service	84.85	66
	More outreach to church, school and community groups	49.23	66

Notes: Table 20 shows summary statistics for Question 7 in the MGR survey. Specifically, each manager was asked to following question: "Other research studies of the minimum wage have identified the following list of items as BUSINESS ADJUSTMENTS you might possible make in order to OFFSET the payroll cost increase associated with the higher minimum wage. Which of the following are you planning to do in the next 1-3 months OR have done already in the last month (please check YES or NO)?"

Table 21. Channels of adjustment: employee perspective, summary statistics

Channels of adjustment	N	Mean	St. dev.
Menu prices go up	1608	0.87	0.34
Some people weekly work hours get cut back	1610	0.82	0.38
Employees have to work harder and faster	1598	0.74	0.44
At least one person's job get eliminated	1596	0.43	0.5
The amount of training offered gets cut back	1582	0.36	0.48
Benefits, like insurance and meal discounts, get cut back	1595	0.33	0.47
The managers have to work harder and find ways to be more efficient	1593	0.73	0.44
People's job duties increase to include more tasks	1599	0.71	0.45
Managers tighten up on rules like missing work and taking breaks	1602	0.77	0.42
Customer services goes down	1604	0.3	0.47
Managers try to increase team spirit and workers' happiness	1603	0.71	0.45

Notes: The table presents summary statistics of workers' responses to the following question "The U.S. minimum wage (the lowest wage a company can legally pay) is currently $6.25 per hour. In July, 2009, it is going up to $7.25. Listed below are some adjustments your restaurant owner and manger might make because of this increase in labor cost. Tell us what you expect to happen (No=will not happen; YES=will happen)"

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VITA

Tetyana is originally from Ukraine. She came to the U.S. when she was 15 years old as a finalist of the *Future Leaders Exchange Program*, a U.S. Department-sponsored scholarship for students from the former Soviet Union countries.

She received her B.A. in Economics from Armstrong Atlantic State University. As a research assistant at the Center for Regional Analysis, she assisted with producing a report for the Housing Authority of Savannah which evaluated economic impact of the low-income housing redevelopment project, HOPE IV. In 2006, she began a doctoral program in Economics at the Andrew Young School of Policy Studies.

Her research centers on economic development and labor market regulation in the U.S. and emerging markets. Her additional research fields include international economics and public finance, with a focus on decentralization. She is also interested in applying impact evaluation methods, such as randomized control trials, to measure the impact of microfinance on poverty and other socioeconomic outcomes.

As a researcher or consultant with a progressive research-based NGO, think-tank or a consulting firm, Tetyana hopes to contribute her analytical skills for creating positive social change through policy-driven research.