Minimum Wages and Compliance: The Case of Trinidad and Tobago*

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I. Introduction

The impact of minimum wages on the labor market has consistently attracted a large amount of attention in the economics literature. Most empirical studies have focused on the effect on employment and the distribution of income and wages, although there has been no clear consensus on these issues.[1] While there are a large number of empirical case studies of industrialized countries, corresponding research on developing countries still remains scarce despite its likely greater importance in potential poverty reduction.[2] One exception is work by L. Bell, who, using data on firms in Mexican and Colombian manufacturing, found that there were no employment effects of minimum wages in Mexico, while there were negative employment effects in Colombia.[3] In addition, in a case study of changes in the minimum wage in Indonesia, M. Rama found that these caused the average wage to increase and employment to decrease.[4]

An important aspect of minimum wages in the developing world is the degree of compliance, given that regulatory structures tend to be substantially less developed than those in the industrialized world. While there is likely to be some noncompliance in industrialized labor markets, it tends to be small, and it has therefore received little attention.[5] In contrast, compliance appears to constitute an acute problem in developing nations. For example, Bell finds that, in 1988 in Mexico, 66% of females in various sectors were being paid below the minimum wage, whereas in Morocco more than 50% of firms paid their unskilled workers less than the minimum wage.[6] Additional evidence indicates that most of the reason for the high degree of noncompliance in developing countries is the large size of their informal sectors—for example,

C. Morrisson discovered from a survey of Nigerian informal sector firms that 98% did not comply with minimum wage legislation, while the equivalent figure for a sample of informal sector firms in Swaziland was 83%.[7]

Apart from the aforementioned statistics, however, detailed empirical analysis of the problem of compliance to minimum wages in developing countries has remained largely unexplored.[8] One exception is the study by P. Jones, who finds that minimum wage legislation in Ghana caused a reduction in employment in the formal sector but an increase in the informal sector, in which compliance is assumed to be low.[9] In contrast, a number of theoretical models dealing with the lack of compliance in developing countries have been proposed.[10] For example, L. Squire and S. Suthiwart-Narueput show that the likelihood of noncompliance will be greatest when the minimum wage is binding and the relevant supply and demand elasticities are high.[11]

The introduction of a statutory national minimum wage in the Republic of Trinidad and Tobago on April 6, 1998, as well as access to a large micro rotating panel data set for the years 1996–98, allows us to further address the issue of compliance to minimum wages in the developing world. The national minimum wage in Trinidad and Tobago, a law requiring a uniform specified minimum hourly payment to all workers regardless of age or type of work, was introduced in response to a report by the World Bank and was largely unanticipated. It can be argued to be at least weakly exogenous, providing us with a seminatural experiment. Moreover, as we will show, potential costs of full compliance would have been substantial. Not only does this institutional setting in conjunction with our data set allow us to examine the nature of compliance to the national minimum wage in general but the longitudinal nature of our data also enables us to trace the effect on the wages and employment at the individual level. Further, given that, as J. Tybot argues, smaller firms are more likely to avoid regulatory structures, we explicitly focus on the differential effects across firm size.[12]

This article proceeds as follows. Section II provides a brief outline of the Trinidad and Tobago labor market and the introduction of the national minimum wage. Section III describes our main data source, the Trinidad and Tobago Continuous Sample Survey of Population (CSSP). In Section IV, we use these data to calculate the potential costs associated with the national minimum wage. Section V examines the actual incidence of compliance in terms of employment and the wage distribution. In Sections VI and VII, we exploit the panel nature of our data set to examine whether the national minimum wage caused, respectively, compliance or job losses at the individual level. Section VIII concludes.

II. The Trinidad and Tobago Labor Market
At the onset of the 1980s, the socioeconomic conditions in Trinidad and Tobago were relatively good; the country enjoyed one of the highest standards of living in the developing world due to its large number of natural resources, especially oil.[13] The decline in oil prices and the problems of debt crisis and worldwide

recession, common to almost all developing countries over the 1980s, provoked a considerable reversal in these relatively good economic conditions. For instance, the unemployment rate more than doubled from 9.1% in 1982 to 22.0% by 1989. There is some evidence that this period was also accompanied by considerable employment shifts from the formal to the informal sector, particularly since there is no formal system of unemployment compensation in Trinidad and Tobago.[14] In terms of the skill composition of employment, this meant for many a move from the relatively skill-intensive formal industrial sectors to jobs of lower levels of technological sophistication and productivity in the informal sector. The economic recession was also reflected in a considerable fall in the real wage rate in practically all sectors; for example, from 1983 to 1995 the real wage rate fell by more than 9%, a trend apparent in almost every other sector of the economy. In recent years, however, the Trinidad and Tobago economy has managed, relative to other Caribbean countries, to recover noticeably.

Against this economic backdrop, one must also consider the Trinidad and Tobago labor market institutions. As noted by A. Rambarran, the Trinidad and Tobago (formal) labor market has "traditionally been characterized by politically strong, oligopolistic firms producing for the domestic market and an equally powerful and aggressive trade union movement concentrated in the energy-related, capital-intensive manufacturing and public sectors."[15] The most important pieces of labor legislation are the Industrial Relations Act, the Retrenchment and Severance Payments Act, and, more recently, the Minimum Wage Act. The Industrial Relations Act serves as a corporatist instrument in that it sets forth legislation concerning strikes and the registration and certification procedures for trade unions. One should note that, while a deal negotiated between the majority union and the employer in question covers all workers in the area of activity, the essential bargaining process and the scope of coverage remain essentially decentralized. Moreover, these agreements probably cover no more than 20% of those employed.

The Retrenchment and Severance Payments Act guarantees severance payments as a function of the length of uninterrupted service in the case of dismissal due to redundancy, generally 2–3 weeks for each year of service. It has been argued, however, that, although this legislation has in theory considerably constrained the flexibility of employers, many employers have reacted by substituting full-time labor with part-time and temporary workers who are not covered by the legislation.[16]

While the legislative framework enabling the introduction of minimum wages in Trinidad and Tobago was first passed in 1976, it has remained fairly idle until recently. Minimum wages prior to the national minimum wage introduced in 1998 had covered only a small number of specific sectors encompassing only a small proportion of total employment. Specifically, minimum wages were implemented for a select number of occupations in the security industry and the catering industry, for gas station workers, for shop assistants, and for domestic assistants. As can be seen in table 1, most of the

TABLE 1

Minimum Wages for Industries prior to the National Minimum Wage Act

Occupation	Wages (TT$)	Occupation	Wages (TT$)
Security industry:		Catering industry (continued):	
Canine security officer	6.00*	Cleaner	185.00
Unprecepted security guard	5.50*	Clerical worker	215.00
Dog handler	5.30*	Clerk/typist	215.00
Secretary	5.63*	Cook	235.00
Clerk/typist	5.38*	Counter attendant	185.00
Receptionist	5.00*	Driver	225.00
Clerical worker	5.00*	Other:	
Telephone operator	4.88*	Electrician	275.00
Retail industry:		Elevator operator	185.00
Supervisor	280.00	Gardener	185.00
Window dresser	225.00	Grill worker	195.00
Driver/loader	225.00	Handyman	185.00
Messenger/driver	225.00	Head cook	285.00
Clerical worker	200.00	Head waiter	285.00
Telephone operator	195.00	Housekeeper	285.00
Cashier	210.00	Kitchen assistant/assistant cook	195.00
Sales clerk	200.00	Launderer/washer	185.00
Loader/porter	190.00	Maintenance worker/skilled tradesman	260.00
Stock replenisher	190.00	Messenger	185.00
Wrapper	185.00	Porter/bell-boy	185.00
Messenger	185.00	Potwasher/dishwasher	185.00
Cleaner	185.00	Reservations clerk/receptionist	225.00
Receptionist	200.00	Secretary	225.00
Domestic service industry:		Storekeeper	250.00
Full-time household assistant	150.00	Supervisor	280.00
Part-time household assistant	3.75*	Swimming pool attendant	185.00
Catering industry:		Telephone operator	215.00
Bartender	220.00	Waiter/waitress/hostess	190.00
Cashier	210.00	Watchman/caretaker	185.00
Chambermaid	185.00		

Note.—Wages are reported for full-time employment. Amounts are weekly wages except as otherwise noted. Asterisk (*) indicates an hourly rate.

rates were considerably lower than TT$7.00, the level at which the national minimum wage was later set.[17] Moreover, in practice, these rates appear not to have been strictly enforced, if they were enforced at all.[18]

It was only in response to a World Bank Report strongly recommending the introduction of a national minimum wage to reduce poverty that the Ministry of Labor and Cooperatives set up a Minimum Wages Board to investigate the issue.[19] This board subsequently completed an investigative report on the matter in July 1997, specifically recommending the introduction of a national minimum wage at a rate of TT$7.00 per hour, covering all workers and all types of work without exception. The actual level of TT$7.00 was derived by taking into consideration (1) the few already-existing minimum wages, as noted above; (2) the cost of basic ingredients for a well-balanced diet; and (3) the most recent estimate of the poverty line, deemed to be TT$623.00 per month for a single household. The national minimum wage was finally introduced on April 6, 1998, at the rate of TT$7.00 per hour, covering all employment regardless of its nature. Since then it has remained

at this level, although recently there has been some discussion on increasing it to TT$10.00 an hour.

Two other points regarding the implementation of the minimum wage are important. First of all, one should note that the national minimum wage was largely unanticipated at the time, or at least its implementation seemed at first to have lacked credibility. For instance, although a draft of the proposed minimum wage order was officially published in January 1998, the subsequent required public meeting, which was announced and published in all major newspapers, was surprisingly poorly attended.[20] Moreover, few organizations submitted official comments. It was only after implementation that individual employers and employer organizations voiced considerable disapproval and sought either a delay in implementation or a total discarding of the legislation.[21] Given this historical background, we can credibly argue that, in Trinidad and Tobago, the introduction of a minimum wage constituted an at least weakly exogenous legislative change and that, given that the minimum wage was equal for all workers, the variation in the gap between the wage and the minimum wage across workers was also exogenous.

Second, actual implementation and enforcement were far from perfect. There may have been confusion and uncertainty in terms of the actual details of the law. The final draft that was implemented was, in many regards, quite different from the draft published in January. In particular, the draft made no mention of how to define work days or work weeks, nor was there any mention of how to treat overtime work. Moreover, even in the final draft, these issues appear to have been somewhat confusing to employers or at least to have prompted them to stall implementation until clarity was achieved.[22]

The public perception has been that employers in many cases simply chose to ignore the new legislation.[23] In some instances, this went as far as employers making their employees sign documents for labor inspectors stating that they were being paid the minimum wage when in fact they were not. Moreover, detection of compliance and actual enforcement were poor at best.[24] It must also be noted that the maximum penalty for noncompliance was probably not a strong deterrent—until the year 2000, the maximum penalty was either TT$2,000 in fines or 2 years of imprisonment. For example, in the first year after implementation, the Ministry of Labor was able to collect only TT$30,000 from some 400 employers, and the first charge of noncompliance did not occur until February of 1999.[25]

III. Data
Our data source is the Continuous Sample Survey of Population (CSSP). The CSSP was designed as a multipurpose household survey in 1963, with its primary objective being to provide on a continuing basis up-to-date data on the labor force characteristics of the population of Trinidad and Tobago. It has served as the primary source for aggregate statistics on the Trinidad and Tobago labor market, collecting a wide array of information relevant to the labor market on members of the households surveyed. Since 1987, the CSSP

has been carried out on a quarterly basis, with the duration of each quarter lasting exactly 3 months, each month consisting of two periods of a fortnight's duration. Moreover, it is a rotational survey in that households are surveyed three times—a year after the first interview and then (the last time) during the quarter subsequent to the second interview. This latter aspect allows us to create short panels for a large number of individuals.[26] We gained access to the data of the 1996–98 CSSP surveys, from which we have excluded for all calculations the self-employed and those working in the government sector.[27]

Our key variable is the hourly wage rate, and hence its calculation deserves specific attention. Our data set only provides us with gross monthly income and hours worked in the previous week, as placed in a number of hour categories. In calculating the hourly wage rate, we thus assumed the actual hours worked in the categories to be the midpoint of each category; we multiplied this number by four and then divided monthly gross income by the number of estimated hours worked that month.[28] Given that it is likely that many full-time workers' hours are around 40 hours per week, we also defined the hours of all workers that fall in the 33–40 category as 40 per week. Each quarter of our data set gives us, on average, observations on wages for 3,000 individuals.

Another important distinction made in our analysis is between workers employed in large firms and those working in small firms. In developing countries, there is usually a sizable informal sector that may in many cases escape the regulatory umbrella under which large firms must operate. Information on the "formality" of the firm in which a worker is employed is typically hard to obtain, particularly from labor-force surveys. However, according to the International Labour Organization, one of the defining characteristics of firms operating in the informal sector is their size; generally, they employ fewer than 10 persons.[29] Given this, and that our data only allowed us to determine whether workers worked in firms less than or equal to more than 10 workers, we used 10 employees as the cutoff point between what we considered to be large and small firms. Our firm size variable may thus serve as a crude proxy for whether the firm potentially operates in the informal sector.

IV. Potential Cost

An important determinant of compliance to a minimum wage is the cost involved in complying. L. Squire and S. Suthiwart-Narueput note that, in the private sector, this will involve weighing the returns to noncompliance relative to its detection costs, the latter being determined by both the probability of detection and the penalty associated with detection.[30] We have already noted that monitoring in Trinidad and Tobago was likely to be poor and that penalties associated with detection were fairly low. The returns to noncompliance are, of course, just the avoidance of compliance costs. As noted by Squire and Suthiwart-Narueput, several cases indicate that noncompliance rises with the

costs of compliance.[31] For example, in Puerto Rico aggregate noncompliance rose from 20% to 35% when the minimum wage rose by 30%.[32] Similarly, Bell finds that noncompliance in Mexico fell when the real minimum decreased in the late 1980s.[33]

In order to estimate the potential cost of the minimum wage in Trinidad and Tobago, we proceed as follows. The potential cost in any particular industry is assumed to constitute the impact on that industry's wage bill if the minimum wage were fully enforced and employment remained constant. The wage bill, WB, in aggregate, or by any subsector, is given by

$$\text{WB} = \sum_{i=1}^{j} w_i l_i + \sum_{k=j+1}^{n} w_k l_k, \tag{1}$$

where w_i and l_i are the hourly wage rate and employment (measured as employment times hours worked) at that wage level for workers working for less than w^{MW}, that is, TT\$7.00 an hour, who are referred to throughout the text as low-wage workers. Similarly, w_k and l_k are, respectively, the wage rates and employment levels for workers working above the minimum wage level. If firms were forced to pay the minimum wage then, ceteris paribus, the percentage change in the wage bill holding employment of all workers and the wage rate of high-wage workers fixed in any given period t would be

$$PC_t = \left[\frac{\sum_{i=1}^{j} (w^{\text{MW}} - w_{it}) l_{it}}{\sum_{i=1}^{j} w_i l_i + \sum_{k=j+1}^{n} w_k l_k} \right] \times 100, \tag{2}$$

where w^{MW} is the minimum wage level. This measure allows us to take into account both the incidence and degree of wages being paid below the minimum level prior to the implementation of the minimum wage as factors of the potential cost. In essence, it is the potential increase in the wage bill if employment were held constant and full compliance took place.

Using employment wage levels from the last 2 quarters in the year prior to the minimum wage, we calculated the potential cost, measured in terms of the average monthly wage bill in 1998 second-quarter prices, and the proportion of low-wage employment for the total sample and various subsamples. These are shown in table 2.[34] First of all, as can be seen in the table, nearly 36% of workers (weighted by monthly hours worked) at the end of 1997 were being paid less than the minimum wage level that would be introduced less than a year later. The proportion is higher for females in both large and small firms and dramatically higher in small firms relative to large firms regardless of gender. In small firms, 56.4% of males and 79.9% of females were paid less than the minimum wage. This gives some support to our contention that a significant proportion of small firms operate in the informal sector, offering low-wage jobs potentially outside the regulatory umbrella. If all small firms

TABLE 2

Potential Costs in Aggregate

Firm Size	Total Employment (%)	Low-Wage Employment (%)	Potential Cost (%)
Male (large)	41.3	14.7	1.4
Male (small)	23.8	56.4	9.3
Female (large)	21.3	24.9	3.3
Female (small)	13.5	79.9	23.8
Total	100.0	35.6	6.4

Note.—Potential cost refers to potential change in wage bill if employment remains constant. Data used for the calculation are those of the third and fourth quarters of 1997.

were actually in the informal sector, then this sector would constitute about 38% of the labor force in Trinidad and Tobago.

Our potential cost calculation reveals that, ceteris paribus, under full compliance the wage bill in the Trinidad and Tobago economy would have increased by 6.4%. On average, the potential cost of compliance would have been higher for those employing more females. Moreover, small firms would have carried most of the burden—for example, in the case of females, the wage bill would have increased by nearly 80%.

We also calculated the proportion of low-wage workers and the potential cost of the national minimum wage across broad one-digit industry groups given data on the last 2 quarters of 1997. We show the results in table 3. As can be seen, there is considerable variation in terms of the potentially affected proportion of employment across these industrial categories. Low-wage workers were most dominant in agriculture and the services sectors, and, accordingly, the potential cost of a national minimum wage at TT$7.00 was highest in these sectors. One should note, however, that the agricultural sector, al-

TABLE 3

Potential Costs by Broad Industry Group

Industry	Total Employment (%)	Low-Wage Employment (%)	Potential Cost (%)
Agriculture, hunting, forestry, and fishing	7.0	54.8	19.1
Mining and quarrying	2.5	4.7	.2
Manufacturing	11.9	32.1	5.1
Electricity, gas, and water	1.5	1.1	.1
Construction	12.3	22.7	3.0
Wholesale and retail trade, restaurants and hotels	19.0	65.0	17.3
Transport storage and communication	7.2	21.7	2.2
Financing, insurance, and real estate	8.6	15.7	1.4
Community, social, and personal services	30.0	32.8	6.2

Note.—Potential cost refers to percentage change in wage bill if employment remains constant. Data used for the calculation are those of the third and fourth quarters of 1997.

though having the highest potential cost, constituted only 3.5% of the total Trinidad and Tobago labor force.

V. Actual Compliance: Aggregate Evidence on Employment and the Wage Distribution

A. *Employment*

One way to assess actual compliance is to examine the change in the proportion of low-wage workers after implementation. Using our data for the years 1996–98, we calculated and graphed the quarterly proportion of total hours worked by low-wage workers (those paid less than TT$7.00 an hour) in large and small firms for the full sample and by gender over time to crudely assess the employment effects of the national minimum wage. We show this in figure 1. Accordingly, there appears to have been a downward trend in the proportion of low-wage workers in both small and large firms even prior to the introduction of the national minimum wage. This indicates that there may have been positive real wage growth for low-wage workers for the latter half of our sample period even in the absence of a minimum wage, a fact which makes estimating the degree of compliance with the minimum wage more difficult. In general, even if we divide our sample into females and males, it is difficult to gauge a direct effect of the minimum wage on the proportion of low-wage workers. Part of the reason for this is that there appears to be some seasonal effects in the trends, making it difficult to disentangle general trends and sudden changes.

The most striking feature of figure 1 for all subgroups is the proportion of workers being paid below the minimum level even after implementation in the third last quarter. This suggests a large degree of noncompliance, particularly in small firms, where, on average, 60% of the workforce continued to be paid below the minimum level. We also find that noncompliance was common across gender groups. For example, over 70% of the female workers received less than the minimum wage level even after implementation of the national legislation.

The average gap between the actual wage rate and the minimum level for our total sample and subgroups is indicated for low-wage workers in figure 2. Accordingly, there is no discernible dip in the average gap in the final 2 quarters of 1998 for all of these. Together, figures 1 and 2 indicate that the minimum wage did not affect most low-wage workers.

B. *Wage Distribution*

Another manner of assessing compliance is to examine the wage distribution. A standard, nonparametric approach of studying the wage distribution is to calculate kernel density estimates according to the following formula:

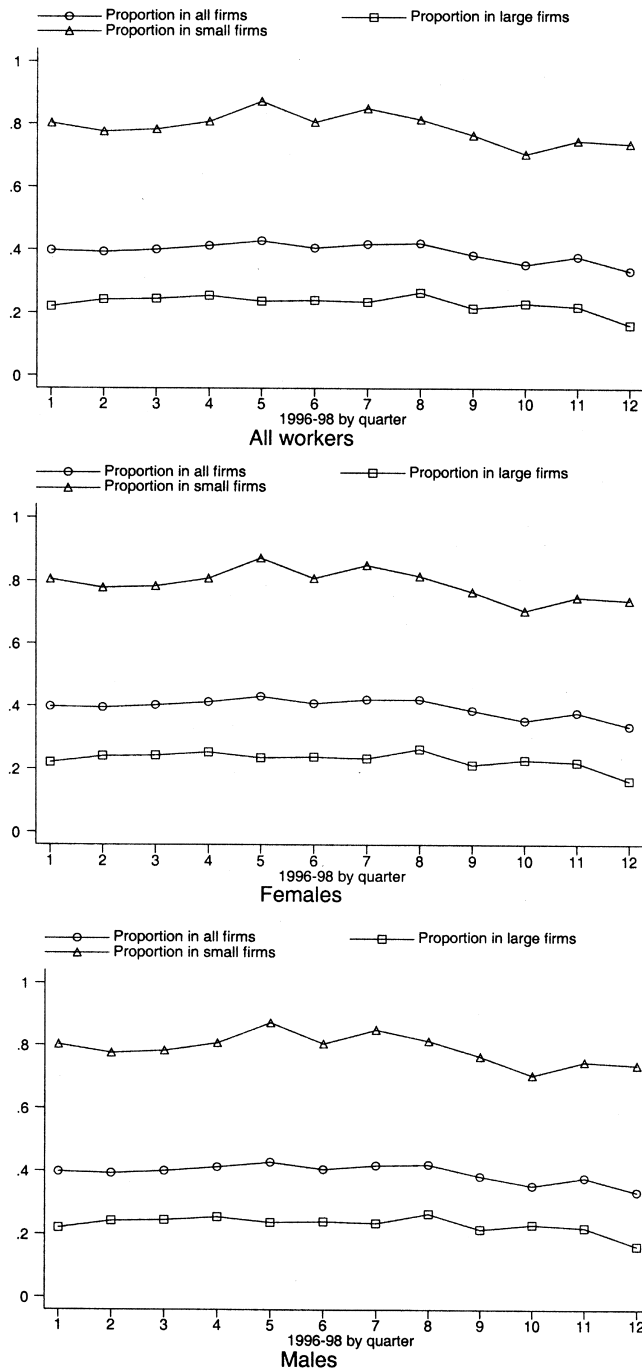$$f_k = \frac{i}{nh} \sum_{i=1}^{n} K\left[\frac{x = X_i}{h}\right], \tag{3}$$

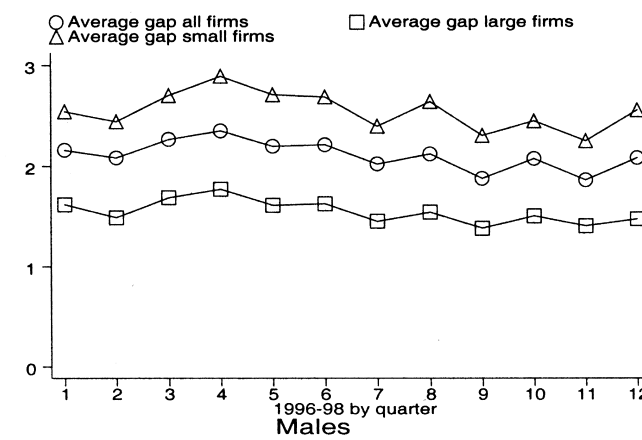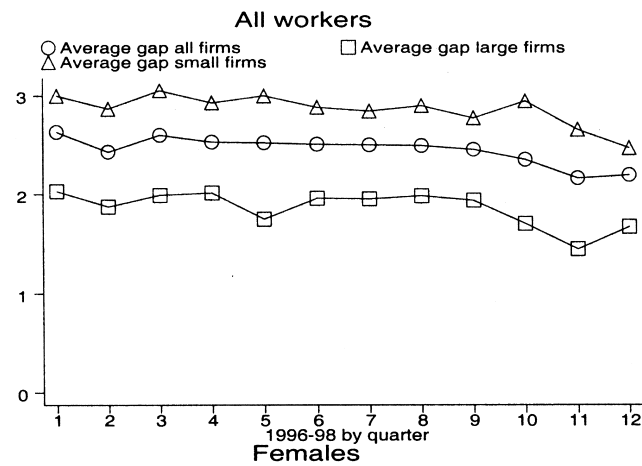FIG. 1.—Fraction of low-wage workers by gender and firm size. Sample 1–4: 1996; sample 5–8:1997; sample 9–12:1998.

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○ Average gap all firms   □ Average gap large firms
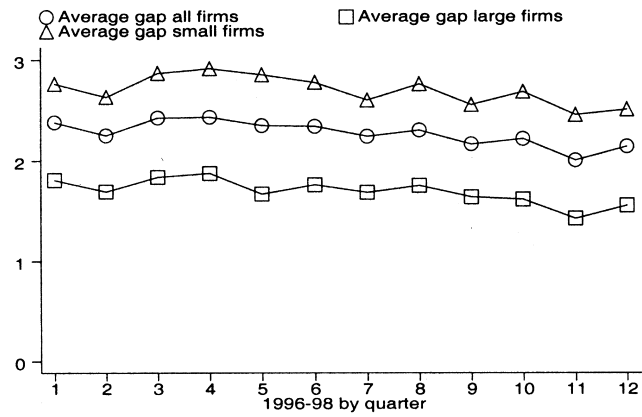△ Average gap small firms

3

2

1

0

1 2 3 4 5 6 7 8 9 10 11 12
1996-98 by quarter

All workers

○ Average gap all firms   □ Average gap large firms
△ Average gap small firms

3

2

1

0

1 2 3 4 5 6 7 8 9 10 11 12
1996-98 by quarter
Females

○ Average gap all firms   □ Average gap large firms
△ Average gap small firms

3

2

1

0

1 2 3 4 5 6 7 8 9 10 11 12
1996-98 by quarter
Males

FIG. 2.—Average gap between wage rate and minimum level for low-wage workers by gender and firm size. Sample 1–4:1996; sample 5–8:1997; sample 9–12:1998.

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where f_k are probability estimates of wages falling at or near different values, X_i, and the range of the data is broken into overlapping bands of width h (which is chosen to minimize the mean squared error). The kernel function thus attaches weight to each of the n observations in the bandwidth, with less weight going to points farther from the midpoint of the bandwidth. In addition, we weighted each wage rate observation by the number of hours worked.

In the empirical literature, there have been a number of approaches to estimating the impact of minimum wages on the wage distribution using kernel density estimates. The main challenge has been to find an appropriate counterfactual distribution for pre– and post–minimum wage comparison purposes. Using data for the United States, R. Meyer and D. Wise adopt a parametric approach that involves assuming that the tail of the distribution left of the minimum wage disappears.[35] Given our focus on noncompliance, this approach is clearly not suitable here. J. Dinardo, N. Fortin, and T. Lemieux adopt a semiparametric approach to examine what role changes in minimum wages played in wage inequality over the 1980s in the United States.[36] Specifically, they assume that there was no employment loss or spillover effects associated with changes in the minimum wages, and, except for allowing for changes in the distribution of worker characteristics, they take the initial wage distribution as the counterfactual wage distribution. In contrast, given the intricacies of our case study, we adopt a much less restrictive and, for our purposes, more natural approach in that we simply take the wage distributions prior to the minimum wage as the counterfactual distributions. Implicitly, we are thus assuming that neither the quantities for worker characteristics nor their prices, on the whole, have changed substantially over our relatively short sample period.

Kernel density estimates of the wage distribution of the third and fourth quarters of 1996, 1997, and 1997–98 are given in figure 3.[37] As can be observed, there is little difference between the wage distributions in 1996 and 1997. This is confirmed by a Kolmogorov-Smirnov equality of distributions test (K-S test), the P value of which was 0.11.[38] In contrast, there is a slight shift in the lower part of the wage distribution, that is, a movement of the peak toward the minimum wage level in 1998.[39] There is also some indication of positive spillover effects on workers just above the minimum.[40] The similarity of the distributions over the 3 years apart from changes in the lower tail in large firms, which can arguably be associated with implementation of the minimum wage, lends credence to our assumption that the wage distribution of the previous years is a reasonable counterfactual wage distribution.

Figures 4 and 5 depict the kernel density estimates for the third and fourth quarter of 1997–98 by firm size and gender. The overall distributions for 1996 and 1997 are almost identical, as are the distributions between 1997 and 1998, apart from a small shrinking in the left-hand tail and a movement of the peak up to TT$7.00 in 1998. The wage distribution for workers of either gender in small firms is practically identical before and after the minimum wage, indicating that small firms were largely unaffected and did not
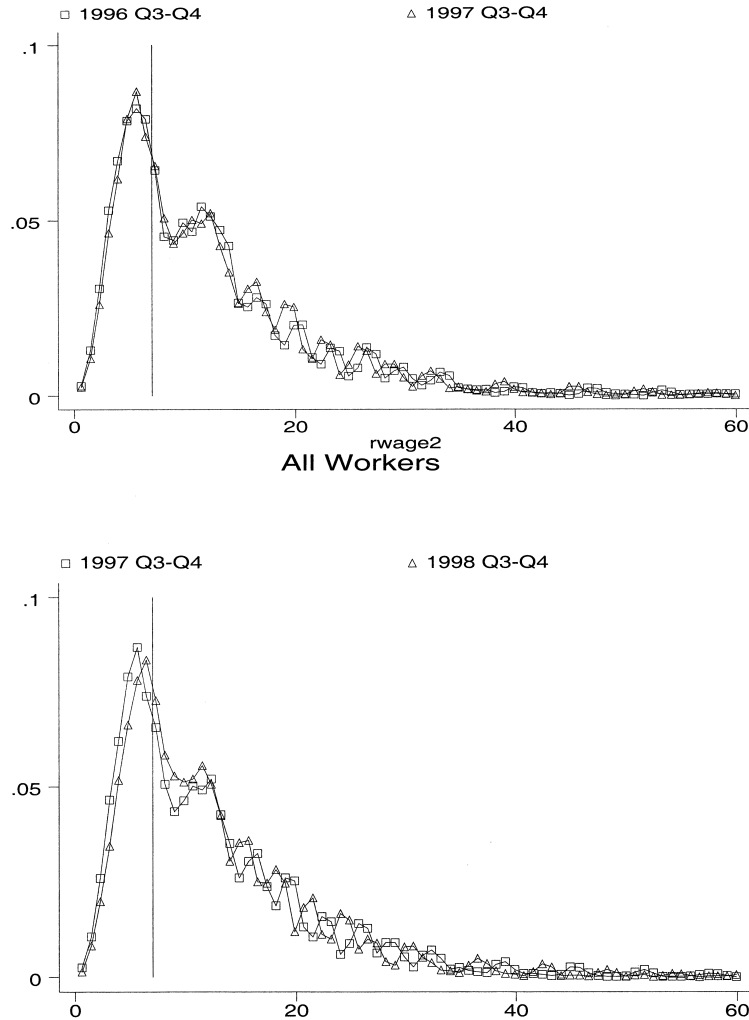
Fig. 3.—Kernel density estimates of total real hourly wage rate distribution

implement the minimum wage. For large firms, there is some evidence of a spike at the minimum wage and a shrinking of the lower tail of the distribution, particularly for females, indicating that there was some enforcement in large firms. The K-S tests we conducted suggest that the male distributions are not too dissimilar, while equality can be rejected at the 5% level for the female distributions.

VI. Longitudinal Evidence on Compliance
Our aggregate results suggest that there was little compliance to the minimum wage. The longitudinal nature of our data allows us to further investigate this
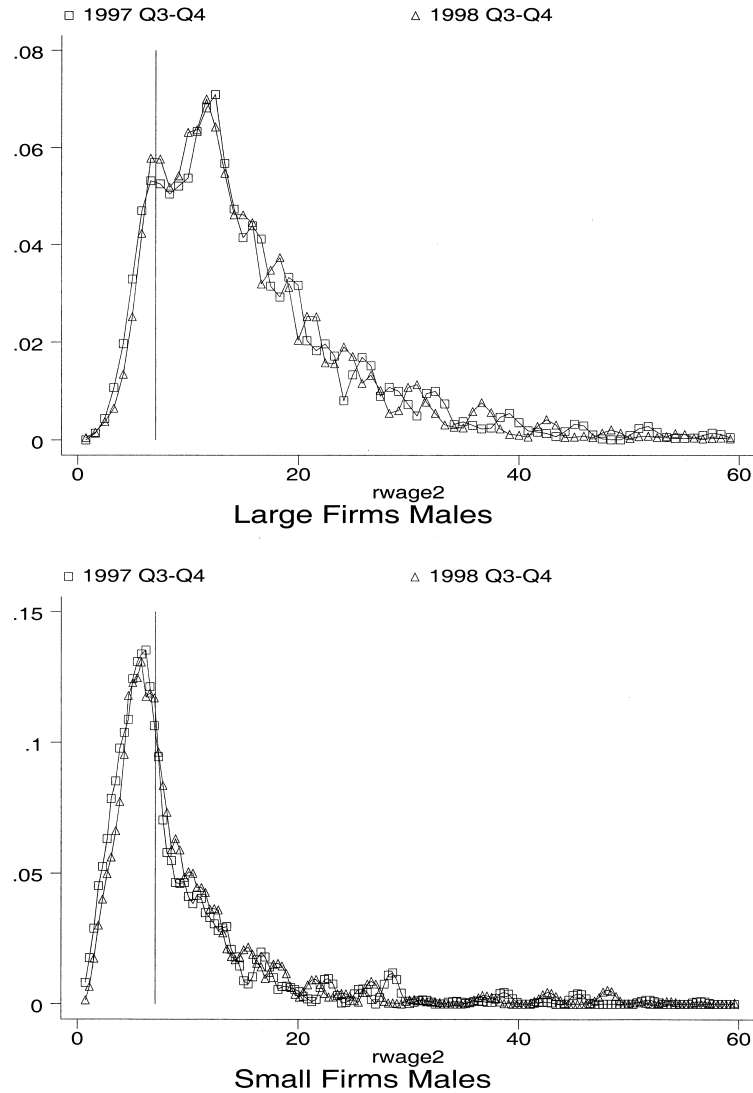
FIG. 4.—Kernel density estimates of male real hourly wage rate distribution in total and by firm size.

at the individual level. Specifically, we are able to link observations on workers in 1996 and 1997 who were paid less than TT$7.00 to their wage rates taken from their second interview, conducted a year later if these individuals remained employed.[41] Thus the second interview for those whose first observation was after April 1997 will have taken place after the implementation of the national minimum wage, and their probability of being paid above the minimum wage can be compared with that of others in the sample to assess
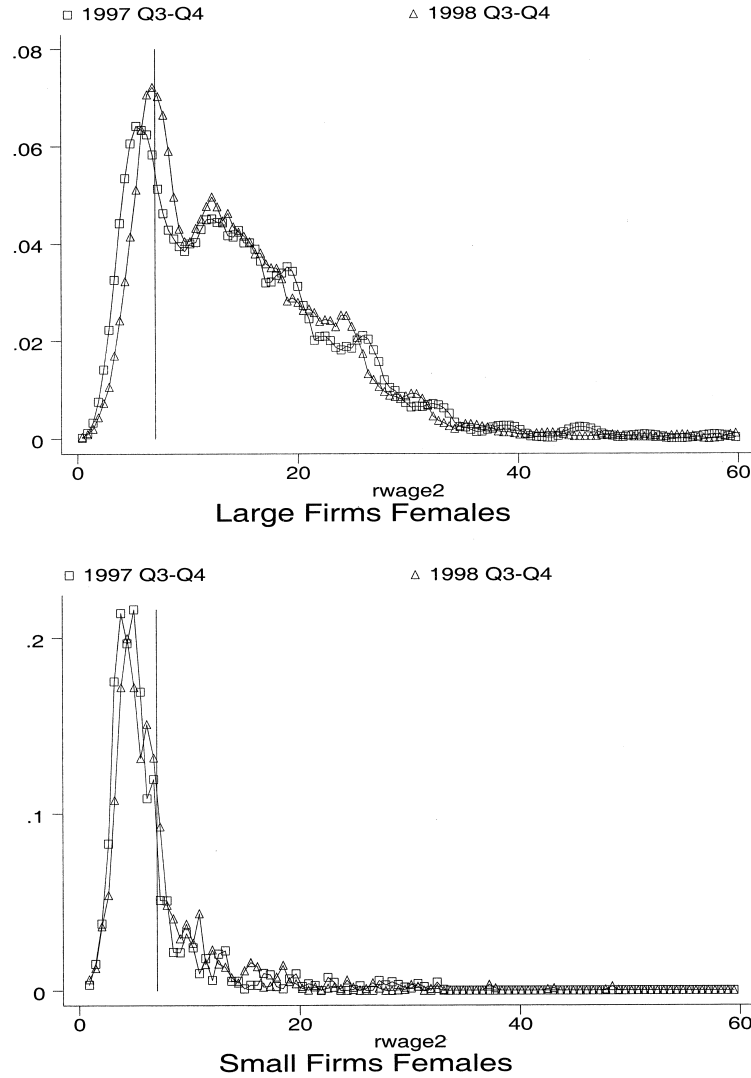
Fig. 5.—Kernel density estimates of female real hourly wage rate distribution in total and by firm size.

the impact of the minimum wage. In particular, we model the probability of low-wage workers remaining below the minimum level of TT\$7.00 as

$$y = f(\mathbf{X}, \mathbf{Z}, \mathrm{MW}), \tag{4}$$

where y is an indicator variable taking on the value of one if an individual's wage rate was at least TT\$7.00 a year later, and zero otherwise; X and Z are vectors of worker and firm characteristics, respectively; and MW is a zero-one type dummy taking on the value of one if the second observation of a

worker is after the implementation of the minimum wage, that is, any time after April 1998. One should note that, given the nature of our data, for those persons whose second observations fall at a time after implementation of the minimum wage, this second observation may be straight after implementation or any time up to 8 months after the minimum wage was introduced. In using a zero-one type dummy variable to proxy the effect, we are thus assuming that the impact would have been the same regardless of how long after implementation the second observation falls.

Given that other factors are important in determining an individual's wage rate and wage rate growth, we control for the following worker characteristics, as available from the CSSP: *Male* is a zero-one type dummy indicating whether the individual is male; *Age* is the individual's age, for which we also allow for nonlinearity by including its value squared; *Mar* is a zero-one type marital status dummy variable; and *SecondaryO, SecondaryA,* and *Primary* are all zero-one type dummies indicating whether the highest completed level of schooling was secondary school O levels, secondary school A levels, or primary school, respectively. Additionally, the following job characteristics were included: *UrbanW* is a zero-one type dummy indicating whether the person works in an urban area, and *FSize* takes on the value of one if the firm at which the individual works has more than 10 employees, and zero otherwise.

As noted earlier, Tybout makes a compelling case that the size of a firm is an important distinction in developing countries. One may expect that compliance to the minimum wage could be different across firm sizes.[42] To investigate this, we also included an interaction term, MW × *Fsize,* between our minimum wage and firm-size dummies. In all specifications, we included one-digit occupation and industry dummies and also time, seasonal, and regional dummies.

The results of our base specification of this probit model, where coefficients are reported as marginal effects, for male and female low-wage workers are provided, respectively, in the first and third columns of table 4. In the case of males, we find that, of the worker characteristics, only age is a significant determinant of whether a low-wage worker will be pushed up to at least the minimum level a year later. Specifically, younger low-wage workers are less likely to experience a wage increase that would bring them above the TT$7.00 threshold, although this effect occurs at a decreasing rate. Whether the firm is located in an urban area or is a large firm are, on their own, not significant influences.

Most important, however, we find, as indicated by the significance of our interaction term between the firm-size and minimum-wage dummies, that the introduction of the national minimum wage acted to increase the likelihood of low-wage male workers experiencing an increase in their wage rate to at least TT$7.00—however, such compliance occurred only in large firms. Specifically, the coefficient implies that low-wage males working in large firms are 18.7% less likely to remain below the minimum wage level after intro-

TABLE 4

Pʀᴏʙɪᴛ Mᴏᴅᴇʟ ᴏғ Cᴏᴍᴘʟɪᴀɴᴄᴇ

	Mᴀʟᴇs		Fᴇᴍᴀʟᴇs	
Vᴀʀɪᴀʙʟᴇ	(1)	(2)	(1)	(2)
MW1	−.107	−.107	.205*	.201*
	(.093)	(.093)	(.092)	(.093)
MW1 × *Fsize*	.187*	.187*	−.116	−.118
	(.088)	(.088)	(.083)	(.083)
Wage (initial)		.007		.041*
		(.017)		(.020)
Age	.053**	.052**	−.011	−.014
	(.014)	(.014)	(.010)	(.010)
Age^2	−.001**	−.001**	.000	.000
	(.000)	(.000)	(.000)	(.000)
Mar	.031	.030	.170**	.169**
	(.066)	(.066)	(.058)	(.058)
Primary	.086	.083	.112+	.093
	(.061)	(.062)	(.064)	(.065)
SecondaryA	.079	.075	.139+	.120
	(.075)	(.075)	(.077)	(.077)
SecondaryO				
UrbanW	.044	.043	.010	−.005
	(.047)	(.047)	(.047)	(.048)
Fsize	−.023	−.027	.073	.056
	(.059)	(.060)	(.063)	(.064)
No. observations	584.00	584.00	527.00	527.00
F-test	71.77	71.93	48.22	52.33
R^2	.09	.09	.07	.07
Observed probability	.52	.52	.39	.39
Predicted probability	.53	.53	.38	.38

Nᴏᴛᴇ.—Coefficients reported as marginal effects. All regressions include industry, occupation, regional, seasonal, and year dummies. Standard errors are given in parentheses.
+ Significant at 10% level.
* Significant at 5% level.
** Significant at 1% level.

duction of the national minimum wage legislation. This appears to be a plausible result if, indeed, smaller firms, because many of them are operating outside the regulatory umbrella, are less likely to fear detection and, therefore, less likely to practice compliance. Moreover, their potential costs were shown earlier to be substantially greater than for their larger counterparts. It is also consistent with the evidence from figures 1 through 3 discussed above in that it was generally only in large firms that there was any noticeable compliance.[43]

For females, we find that married low-wage workers and those whose highest level of education was either primary or secondary (O levels) are less likely to remain low-wage workers. While workplace characteristics, as for males, do not on their own affect such wage growth, we find that the introduction of the national minimum wage acted to increase the probability of receiving at least TT$7.00 by 20.5%, regardless of whether the female was

working in a large or small firm. It is surprising that the interaction of co-
efficient on firm size interaction with the minimum-wage dummy in the female
regression is negative, although insignificant, given the kernel density esti-
mates, which show a large spike at the minimum wage for women in large
firms and no effect for women in small firms. However, it should be pointed
out that there are a number of weaknesses in this analysis. First, the probits
are conditional on the worker being employed before and after the imple-
mentation of the minimum wage and they thus do not account for the pos-
sibility that complying firms may reduce employment of low-wage workers
or increase employment of higher skill workers just above the minimum wage.
Second, given the weaknesses in generating the hourly wage variable discussed
above, the dependent variable in the compliance probits may be sensitive to
measurement error. The extent and impact of these factors may possibly differ
across gender.[44]

Given the high potential for measurement error in our wage variable
(and hence in our measure of compliance) because of the nature of our data
source, we also estimated the probit model of compliance for males and
females, including a measure of the initial hourly wage rate to determine
whether this will alter our results. Specifically, one may suspect that many
persons whose wage rate is below but near the minimum wage rate may
simply be misclassified. If, once the minimum wage was introduced, there
are a larger number of these than our coefficient on MW and its interaction
with firm size, this may be biased. However, as the second and fourth columns
of table 4 show, including the initial wage rate in the model does not sig-
nificantly alter our previous conclusions with regard to compliance.[45]

VII. Longitudinal Evidence on Job Loss

Clearly one possible route with which firms may avoid at least some of the
increase in wage costs caused by compliance is to simply lay off or fire some
or all of their low-wage workers, thus decreasing the share of low-wage
workers in total employment and overstating, at least in aggregate, the degree
of compliance. To investigate this, we used the longitudinal nature of our data
to model the probability of job loss in Trinidad and Tobago over our sample
period in the spirit of J. Currie and B. Fallick.[46] Using the total linked worker
sample, we estimated the following for males and females:

$$\Pr(\text{JL}) = f(\mathbf{X}, \mathbf{Z}, \text{MW2}), \tag{5}$$

where JL takes on the value of one if the individual lost his or her job, either
due to layoff or being fired, a year later, and zero otherwise, and the vectors
X and *Z* are as defined above.[47] Additionally, as in J. Currie and B. Fallick,
we included a variable *Bound,* taking on the value of one if the worker involved
is a low-wage worker (for the first observation) and his second observation
falls after implementation of the minimum wage.[48] This variable is intended
to control for a change in the probability of employment loss for those directly

affected by the minimum wage, namely, low-wage workers who were employed prior to, and whose second observation falls after, implementation.

Two further points with regard to this variable are noteworthy. First, given the lack of information on job tenure, we are unable to distinguish those who may have suffered an involuntary job loss but, before the second interview, found alternative employment and those who remained in the same job unless there was a change in occupation or industry. As we noted earlier, there were few cases in which such classification changes were apparent from industry and occupation affiliation, and the exclusion of these did not alter our results. At any rate, this aspect of our data is likely to understate the impact of the minimum wage on job loss. Moreover, some of those who lost their jobs may have done so prior to the implementation of the minimum wage, given the long time lag, of a year between interviews. Using information on when the person last worked, we excluded persons who had lost their job prior to April 1998.

Of course, in terms of the potential cost, the farther the worker's wage is from the minimum level, the more costly it will be for the employer to comply and the more likely the employer is to lay off or fire this worker as compared with other low-wage workers whose wage may be relatively higher, ceteris paribus. To allow for such differences in the impact of the minimum wage on job loss among low-wage workers, we, following Currie and Fallick, also experimented with another proxy, *Wagegap*.[49] This variable takes on the absolute value of the difference between an individual's initial wage and TT$7.00 evaluated at constant prices, whenever *Bound* equals one, and zero otherwise, thus indicating the distance between a low-wage workers' initial wage and the TT$7.00. To allow for different effects across firm sizes, both *Bound* and *Wagegap* were interacted with our firm-size dummy variable. In all specifications, we also controlled for seasonal and year-specific effects.

Before proceeding to the econometric results, we note that, in the male and female samples used for our econometric analysis, the raw probability of job loss was 12% and 15%, respectively. These probabilities are larger for low-wage than for high-wage workers, standing at 24% and 28% for males and females, respectively. Moreover, these raw probabilities are essentially the same whether or not the workers' second observation falls prior to the introduction of the minimum wage. Of course, they are not measured ceteris paribus, and any more definite conclusions must be drawn from our econometric model.

Our results for males and females for our econometric model are given in table 5. In terms of our human capital control variables, we find that, for males, only marital status and whether the worker's highest level of education was secondary A levels are significant factors for probability of job loss. While whether a male works in an urban area does not significantly alter his probability of remaining in a job, clearly, larger employers are less likely to lay off or fire their workers. The positive and significant sign on *Bound*

TABLE 5

Probit Model of Job Loss

Variable	Males		Females	
	(1)	(2)	(1)	(2)
Bound	.090+		.023	
	(.046)		(.046)	
Bound × *Fsize*	.012		.119+	
	(.043)		(.084)	
Wagegap		.023*		.020
		(.010)		(.013)
Wagegap × *Fsize*		.024		.037+
		(.016)		(.020)
Age	−.005	−.004	.006	.007
	(.004)	(.004)	(.007)	(.007)
Age^2	.000	.000	.000	.000
	(.000)	(.000)	(.000)	(.000)
Mar	−.067**	−.065**	−.021	−.020
	(.017)	(.017)	(.026)	(.026)
Primary	−.028	−.027	−.066*	−.073**
	(.022)	(.022)	(.029)	(.028)
SecondaryA	−.046*	−.044*	−.097*	−.101*
	(.021)	(.021)	(.042)	(.041)
SecondaryO	−.053	−.053	−.097**	−.095**
	(.035)	(.035)	(.023)	(.023)
UrbanW	.009	.009	.000	.004
	(.015)	(.015)	(.025)	(.024)
Fsize	−.043+	−.053*	−.104**	−.098**
	(.022)	(.022)	(.037)	(.035)
No. of observations	1,287	1,287	695	695
F-test	154.63	159.56	107.16	113.57
R^2	.16	.17	.18	.19
Observed probability	.12	.12	.15	.15
Predicted probability	.08	.08	.10	.10

Note.—Coefficients are reported as marginal effects. All regressions include industry, occupation, regional, seasonal, and year dummies. Standard errors are given in parentheses.

+ 10% significance level.
* 5% significance level.
** 1% significance level.

suggests that the national minimum wage increased the probability of involuntary job loss among those directly affected, that is, low-wage workers, over the sample period. Specifically, a male working for less than the minimum level experienced a 9% increase in the probability of being laid off or fired after implementation of the minimum wage. This also holds true when we allow for different effects among low-wage workers, depending on their initial wage level, as shown by our alternative specification with *Wagegap.* The coefficients on the interaction of these variables with firm size and the minimum wage are insignificant, indicating that there was no differential impact across firm sizes.

For females, we find that the greater the level of education, regardless of which level, the less likely a female is to lose her job. Similar to males,

those employed by large firms are less likely to be laid off or fired. In terms of the impact of the minimum wage, we find that, unlike for males, only large firms were more likely to lay off or fire female workers after the introduction of the minimum wage. One should note that this may provide one explanation as to why we do not find a differential impact across firm size in our model of compliance in the previous section, namely, in that some larger firms responded to the minimum wage by laying off low-wage female workers.[50]

VIII. Concluding Remarks

In this article, we investigated the degree of compliance with a first-time national minimum wage introduced in Trinidad and Tobago. We found that the potential costs of full compliance were large. It is not surprising then that, given this and the fact that the probability of detection of noncompliance and associated penalties appear to have been small, noncompliance was in reality high—around 33% even 6 months after implementation. An issue that has been prevalent recently in the literature is the possibility that regulation may hinder some firms from reaching their optimal size by creating the incentive to remain small in order to be unregulated, leading to a "missing middle" in the firm-size distribution.[51] Our results also suggest that firm size, possibly indicative of the "formality" of the firm or its ability to remain outside the regulatory umbrella, is an important determinant in matters of compliance.

Although overall compliance is found to be low, our microlevel evidence indicates that the minimum wage was still binding for some workers. Males working in large firms tended to have their wage increased to at least the minimum level, while employers for both large and small firms in some cases responded to the minimum wage by laying off workers. Although an examination of the wage distribution suggests that compliance generally took place only in large firms for females, as for males, our study of the individual level suggests that some females in both large and small firms experienced a wage increase because of implementation of the minimum wage. This discrepancy can at least in part be reconciled with the fact that we find that larger employers responded to the minimum wage by laying off the female workers who were directly affected.

Notes

1. See C. Brown, "Minimum Wages, Employment, and the Distribution of Income," in *The Handbook of Labor Economics,* vol. 3B, ed. O. Ashenfelter and D. Card (Amsterdam: Elsevier, 1999), pp. 2101–63, for a survey.

2. For instance, N. Lustig and D. McLeod ("Minimum Wages and Poverty in Developing Countries: Some Empirical Evidence," in *Labor Markets in Latin America,* ed. S. Edwards and N. Lustig [Washington, D.C.: Brookings Institution, 1997], pp.

62–103) find that, for a cross section of developing countries, higher minimum wages are associated with lower levels of poverty.

3. L. Bell, "The Impact of Minimum Wages in Mexico and Columbia," *Journal of Labor Economics* 15, suppl. (1997): S102–S105.

4. M. Rama, "The Consequences of Doubling the Minimum Wage: The Case of Indonesia" (World Bank, Washington, D.C., 1996, mimeographed).

5. D. Card ("Do Minimum Wages Reduce Employment? A Case Study of California," Working Paper no. 3710 [National Bureau of Economic Research, Cambridge, Mass., 1991]) finds that noncompliance in the U.S. labor market was less than 2%.

6. L. Bell, "The Impact of Minimum Wages in Mexico and Columbia," Policy Research Working Paper no. 1514 (World Bank, Washington, D.C., 1994). See A. Harrison, "Morocco Private Sector Assessment: The Labor Market, 1993" (World Bank, Research Department, Washington, D.C., 1993, mimeographed).

7. C. Morrisson, "Le probleme de bas salaries et du salarie minimum dans les pais en developpment" (The problem of compliance and the minimum wage in developing countries) (Organization for Economic Cooperation and Development, Paris, 1993, mimeographed). It must be noted, however, that the degree of noncompliance among the informal sector appears to be particularly high in sub-Saharan Africa. In contrast, the same author finds that the equivalent figures for Thailand and Ecuador were 10% and 11%, respectively.

8. A. Harrison and E. Leamer, "Labor Markets in Developing Countries: An Agenda for Research," *Journal of Labor Economics* 15, suppl. (1997): S1–S19.

9. P. Jones, "The Impact of Minimum Wage Legislation in Developing Countries Where Coverage Is Incomplete," Working Paper no. WPS 98.2 (University of Oxford, Centre for the Study of African Economies, 1998).

10. Harrison and Leamer; Jones; L. Squire and S. Suthiwart-Narueput, "The Impact of Labor Market Regulations," *World Bank Economic Review* 11 (1997): 119–43.

11. Squire and Suthiwart-Narueput.

12. J. Tybout, "Manufacturing Firms in Developing Countries: How Well Do They Do, and Why?" *Journal of Economic Literature* 38 (2000): 11–44.

13. Most of the information on the Trinidad and Tobago labor market is taken from A. Rambarran, "Labor Market Adjustment in an Oil-Based Economy: The Experience of Trinidad and Tobago," in *Economic Liberalization and Labor Markets,* ed. P. Dabir-Alai and M. Odekon (Westport, Conn.: Greenwood, 1998), pp. 217–37.

14. The government does, in some cases, provide temporary work for unemployed persons, although this will only last a few weeks at a time and certainly cannot be considered an adequate form of unemployment compensation.

15. Rambarran, p. 210.

16. Ibid.

17. In 1998, the Trinidad and Tobago dollar (TT$1.00) was equal to about US$.16, so that the minimum wage rate was set roughly at the equivalent of US$1.11.

18. For instance, even though the set minimum wage for the security industry was TT$5.50, most companies were still paying their workers only between TT$3 and TT$4 an hour; see *Express* (July 29, 1995), p. 3.

19. World Bank, "Poverty and Unemployment in an Oil Based Economy," Poverty Assessment Report no. 14382–TR (World Bank, Washington, D.C., October 27, 1995).

20. This fact arose out of conversations with Lennox Marcelle, legal counsel to the Ministry of Labor and Cooperatives.

21. It is instructive in this regard to note the lack of articles in the three major newspapers, *Guardian, Newsday,* and *Express,* on the matter until shortly after implementation.

22. See *Newsday* (April 14, 1998).

23. See, e.g., *Guardian* (June 16, 1998), *Newsday* (November 25, 1998), and *Guardian* (May 10, 1998).

24. According to Lennox Marcelle, the main problems were that there was not a specific labor court to deal with matters in this regard, labor inspectors were given little to no instruction on how to detect noncompliance, and workers were fearful of losing their jobs if they did complain.

25. *Newsday* (May 14, 2000); *Newsday* (February 25, 1999).

26. Given the CSSP's close parallel in structure to the Current Population Survey of the United States, we used an algorithm similar to that proposed by B. C. Madrian and L. J. Lefgren ("A Note on Longitudinally Matching Current Population Survey (CPS) Respondents," Technical Working Paper no. 247 [National Bureau of Economic Research, Cambridge, Mass., 1999]) to link individuals over time. This involves using questionnaire, household, and time invariant individuals information to link individuals and then using age and its anticipated possible range of changes over time to double check the merges. This allowed us to link 64,700 individuals, of which about 46,000 were of working age.

27. The only variable we were denied access to was that of the ethnic background of the individuals surveyed. This is a standard procedure at the Trinidad and Tobago Central Statistics Office. However, it is unlikely that our inability to control for ethnic differences will significantly bias our results. First, Trinidad and Tobago prides itself on being one of the foremost (racially) nondiscriminatory and racially harmonious societies. Second, over the past generations there has been a considerable amount of racial intermixing so that it would be difficult to divide individuals into separate ethnic categories without a considerable amount of error.

28. For the final category, 70+ hours, we simply added 3.5 hours, half the distance between most categories.

29. See Jones (n. 9 above).

30. Squire and Suthiwart-Narueput (n. 10 above).

31. Ibid.

32. Of course, to associate this pattern with causality would require no changes in other relevant factors, including the intensity of enforcement.

33. Bell (n. 6 above).

34. We chose to use the last 2 quarters in 1997 rather than the first or first 2 quarters in 1998 to avoid potential seasonal effects biasing our results.

35. R. Meyer and D. Wise, "Discontinuous Distributions and Missing Persons: The Minimum Wage and Unemployed Youth," *Econometrica* 61 (1983): 1677–98.

36. J. DiNardo, N. Fortin, and T. Lemieux, "Labor Market Institutions and the Distributions of Wages, 1973–1992: A Semi-parametric Approach," *Econometrica* 64 (1996): 1001–44.

37. We focus on the distribution in the third and fourth quarters given that the minimum wage was implemented in the second quarter of 1998 and to abstract from seasonal effects. The vertical line in all kernel density graphs identifies the minimum wage level.

38. In essence, this is a combined test of whether values in one distribution are smaller and larger than in another.

39. The *P* value of the K-S test, 0.00, suggests that the two distributions are significantly different.

40. Such positive "spillover" effects have been noted in numerous occasions in the minimum wage literature. Specifically, as argued by Brown in "Minimum Wages, Employment, and the Distribution of Income" (n. 1 above), an increase in the wages of those workers directly affected will make substitutes for these workers more attractive and hence raise the demand for the wages of those already working and more may be pulled into the labor force. Given our focus here on compliance, a detailed

study of such spillover effects, although admittedly worthy in its own right, is beyond the scope of the present article.

41. One should note that we are implicitly assuming that workers remained in the same job over the same period. Apart from checking the individual occupation and industrial code, we were unable to investigate the validity of this assumption directly since the CSSP does not provide information on job tenure. However, using the occupation and industry of the individual, we found few job changes as indicated by changes in these variables. Excluding observations on these did not alter our results in any significant manner.

42. Tybout (n. 12 above).

43. To verify that our minimum-wage dummy was not simply capturing overall wage growth in the last 2 quarters, we ran a regression of the determinants of wage growth for high-wage workers and found that the minimum wage dummy was insignificant in this specification.

44. One possibility is that using the midpoint of our hour categories as a proxy for the actual number of hours worked may be less appropriate for females. However, alternative hours definitions produced similar results—these are available on request.

45. We also tried interacting the initial wage rate with the minimum-wage dummy, but, for both males and females, this variable turned out to be insignificant and again did not alter our conclusions.

46. J. Currie and B. Fallick, "The Minimum Wage and the Employment of Youth," *Journal of Human Resources* 31 (1996): 404–28.

47. Those who voluntarily left their jobs were excluded from the analysis.

48. Currie and Fallick.

49. Ibid.

50. One should note that our results on job loss suggest that the minimum wage had negative employment effects in Trinidad and Tobago. Given the lack of consensus in this regard in general in the literature, as mentioned in the introduction, it is not clear whether this specific result is due to differences in the Trinidad and Tobago context relative to labor markets in other countries.

51. See Tybout (n. 12 above) for a discussion.