University of Leicester

DEPARTMENT OF ECONOMICS

ANTICIPATED EFFECTS OF THE MINIMUM WAGE ON PRICES

Sara Lemos, University of Leicester

Working Paper No. 04/25
August 2004

Anticipated Effects of the Minimum Wage on Prices

Sara Lemos*†

University of Leicester

August 27, 2004

Abstract

There is little empirical evidence on the effect of minimum wage increases on prices, particularly for developing countries. This paper estimates this effect using monthly Brazilian household and firm data over 18 years. As minimum wage increases in Brazil are large, frequent and affect a sizable fraction of the labor force, they affect aggregate prices. Because of this expected price effect, rational agents may take such increases as a signal for future price and wage bargains. Indeed, robust results indicate that the minimum wage raises overall prices not only on the month of the increase, but also in the two months before.

Keywords: minimum wage, labor costs, price effect, cost shock, Brazil.

JEL code: J38.

*Dr. Sara Lemos, University of Leicester, Economics Department, University Road, Leicester LE1 7RH, England, +44 (0)116 252 2480, +44 (0)116 252 2908 (fax), sl129@leicester.ac.uk.

†Special thanks to Alan Krueger, Arthur Van Soest, Charles Brown, Chin Lee, Christian Dustman, Costas Meghir, Daniel Hamermesh, David Wittenburg, Donald Verry, Fabio Soares, Jerzy Szroeter, Kenneth Couch, Mathew Slaughter, Michael Baker, Michael Krause, Miguel Foguel, Nicholas Rau, Penny Goldberg, Ron Smith, Sourafel Girma, Stephen Nickell, Walter Wessels, and Wendy Carlin. Also thanks to comments of various participants in the following conferences: IZA-Germany, ESPE-Germany, SPiE-Lisbon, SOLE-America, ESPE-Spain, EEA-Italy, LAMES-Brazil, LACEA-Spain, RES-England, SBE-Brazil, LACEA-Mexico.

1 Introduction

Despite much effort to reconcile the available empirical evidence with the theoretical prediction of disemployment following a minimum wage increase (Neumark, and Wascher, 1992; Williams, 1993; Card and Krueger, 1995; Brown, 1999; Machin et al., 2003), few attempts have been made to test the theoretical prediction that such an industry wide cost shock will be passed through to prices. With small employment responses becoming prevalent in the literature (Freeman, 1996; Brown, 1999), higher prices are an obvious response to minimum wage increases. Nonetheless, there has been little empirical evidence on the minimum wage price effect in the international literature (Card and Krueger, 1995; Aaronson, 2001; Machin et al., 2003), and none for developing countries. Lemos (2004b) surveyed this (mainly US) literature and concluded that a 10% increase in the minimum wage raises food prices by no more than 4% and overall prices by no more than 0.40%. However, this evidence might not carry out to other developed and developing countries, and further empirical evidence is urged.

This paper's main contribution is to provide this much needed evidence. The effect of minimum wage increases on prices is estimated using Brazilian household and firm data over a fairly long 18 years period with extensive variation on the minimum wage. In Brazil, not only are minimum wage increases large and frequent – unlike the typically small increases studied in most of the literature – but also the minimum wage binds on a sizable fraction of the labor force. Consequently, these nominal wage shocks have an important impact on aggregate price movements. Because of this expected price response, rational agents may take nominal minimum wage increases as a signal for future price and wage bargains. It is then not surprising that even when wage shocks are sizeable, employment effects can be small (Lemos, 2004a; Neumark et al., 2003; Carneiro, 2002).

Indeed, the evidence here indicates that the minimum wage raises overall prices not only on the month of the increase, but also in the two months before. Minimum wage indexation and reinforced inflationary expectations was a phenomenon first noticed by Gramlich (1976) and Cox and Oaxaca (1981), and more recently discussed by Card and Krueger (1995) and Freeman (1996). The remainder of this paper is organized as follows. Section 2 presents the data. Section 3 discusses the empirical equation (Section 3.1), discusses identification (Section 3.2), presents the results (Section 3.3) and performs robustness checks (Section

3.4). Section 4 concludes.

2 Data and Descriptive Analysis

The minimum wage data shows that coverage of the minimum wage legislation in Brazil is full. There are no differentiated minimum wage rates for specific demographic groups, labor market categories or regions. Figures 1 and 2 show the nominal and real minimum wage between 1982 and 2000 (the timing of the five stabilization plans, discussed below, are indicated in the horizontal axis). The real minimum wage fell over time because of its impact on both inflation and the public deficit.

First, the minimum wage has often triggered a wage-price inflation spiral in Brazil. That is because after the dictatorship installed in 1964 associated high inflation with wage adjustments, the nominal minimum wage was systematically held constant and used as a deflationary policy, via erosion of the real minimum wage. Conversely, nominal minimum wage increases were inflationary, as rational agents have often taken such increases as a signal for future price and wage bargains – even after law forbade its use as *numeraire* in 1987. Minimum wage indexation and reinforced inflationary expectations was a phenomenon first noticed by Gramlich (1976) and Cox and Oaxaca (1981), and more recently discussed by Card and Krueger (1995) and Freeman (1996). Maloney and Mendez (2004) show that the indexer and *numeraire* effects are a general phenomenon in Latin America. Second, the minimum wage has often affected the uncontrollably large and growing public deficit in Brazil via benefits, pensions and the public sector wage bill. As a result, the fiscal impact of the minimum wage has been a constraint to the size of the increase.

With the end of the dictatorship in 1985, nominal minimum wage adjustments were subject to the rules of five different stabilization plans. This resulted in the saw-toothed pattern observed in Figure 2: nominal minimum wage increases were large and frequent, but quickly eroded by the subsequent inflation. For example, in early 1986, the nominal minimum wage was increased by 15% and bi-annually adjusted initially, but then adjusted whenever inflation was higher than 20%. Despite of that, the real minimum wage was 25% lower in mid 1987 than it was in early 1986. The nominal minimum wage was then initially frozen for three months before it was indexed monthly by past inflation. In early 1989, it was again frozen, and in mid 1989 it was again indexed monthly. In early 1990, the real minimum wage was 45% lower than it was in early 1989. In late 1991, the nominal minimum wage was again monthly indexed. In 1993, adjustments were bi-monthly and then monthly. In early 1994, adjustments were made daily, which did not prevent the real minimum wage from falling to 40% lower in mid 1994. In mid 1995 the nominal minimum wage was increased by 42%, and since then it has been annually adjusted.

The wage data is from PME (Monthly Employment Survey), a rotating panel data for six Brazilian metropolitan regions (Salvador, Recife, Belo Horizonte, Rio de Janeiro, Sao Paulo and Porto Alegre) between 1982 and 2000, similar to the US CPS (Current Population Survey). The data was aggregated across regions and across months.

The price data is the Consumers Price Index (IPC) across the same six metropolitan regions. Figure 3 shows that the pattern of IPC and of the nominal minimum wage in differences is remarkably synchronized, with a raw correlation of 0.55; this synchronized pattern was also documented for the US (Aaronson, 2001). Although consumer price indices suffer from several drawbacks to study price responses (Poterba, 1996), they have been used in the exchange rate, sale taxes, and minimum wage price pass through literature (Poterba, 1996; Card and Krueger, 1995).

The remaining cost and productivity data is from PIM (Monthly Industrial Survey) and SONDA (Industrial Survey) aggregated across the same six metropolitan regions. The interest rate data is from BACEN (Brazilian Central Bank). All data is available from the IBGE (Brazilian Institute of Geography and Statistics) and FGV (Getulio Vargas Foundation).

3 Empirical Specification and Identification

3.1 Empirical Specification

The large empirical literature on the price response to industry wide shocks – such as sales taxes, exchange rates (Poterba, 1996; Goldberg and Knetter, 1997) and more recently minimum wage (Aaronson, 2001) – commonly uses the inverse of the profit maximizing condition under imperfect competition as the theoretical grounding for the empirical price equation. This equation expresses prices as a markup over costs:

$$P = \left(\frac{e}{1+e}\right) C$$

where P is prices, C is costs and e is the price elasticity of demand. Approximating this theoretical equation by a logarithmic function and modeling time and regional fixed effects using dummies, the following reduced form empirical equation is obtained:

$$\Delta \ln P_{it} = \alpha + \varsigma \Delta \ln C_{it} + f_i + f_t + v_{it}$$

where for region i and time t: f_i is regional fixed effects; f_t is time fixed effects; and v_{it} is the error term. As the main components of costs are wages (and minimum wage) and interest rate, these are used as empirical measures of costs. In addition, a measure of power consumption cost and a measure of productivity are included. The new equation is:

(1) $\Delta \ln P_{it} = \alpha + \sum_{l=-k}^{L} \beta_l \Delta \ln MW_{t-l} + \gamma \Delta \ln W_{it} + \delta \Delta r_{it} + \epsilon \Delta \ln E_{it} + \mu \Delta \ln A_{it} + \sum_{m=1}^{M} \rho_m \Delta \ln P_{it-m} + f_i + f_t + w_{it}$

where MW_t is nominal minimum wage; W_{it} is average of nominal wages; r_{it} is real interest rate, defined as the national nominal interest rate minus regional inflation; E_{it} is industrial power consumption; A_{it} is the total industrial production divided by total number of workers directly employed in production in the metallurgic industry; and w_{it} is the new error term. Assuming that the static specification is valid at each period, two forms of dynamics are allowed: lags and leads of the shock variable are included to allow the effect of the minimum wage on prices to be complete; and lags of the dependent variable are included to account for lagged adjustment in prices due to the inability to adjust other inputs instantaneously to minimum wage increases. The number of lags and leads is an empirical matter and is discussed in Section 3.3.

The starting place is an *ad hoc* specification where α and β_0 only are allowed to be nonzero in Equation (1). Then Equation (1) is estimated using two different production functions, $Y = f_L(L)$ and $Y = f_{LK}(L,K)$, where L is labor and K is capital. Assuming that labor is the only variable factor in the long run is equivalent to constraining the coefficients of the real interest rate (δ) to zero. All models in the paper are sample size weighted to account for the relative importance of each region (and for heteroskedasticity arising from aggregation), and also corrected for serial correlation across and within regions, assuming an autoregressive process specific to each region.[1]

3.2 Identification

Because the nominal minimum wage is constant across regions in Brazil, it cannot be used as the shock variable in Equation (1). "Kaitz index" is the shock variable commonly used in minimum wage studies, defined as the ratio of the minimum wage to average wages adjusted for coverage of the legislation (Kaitz, 1970). Although "Kaitz index" varies across regions, the variation in average wages is what drives the variation in the ratio. As a result, the effect of the inverse of average wages on prices is what would ultimately be estimated (Welch and Cunningham, 1978). Another shock variable commonly used in minimum wage studies is "fraction affected", defined as the proportion of workers earning a wage between the old and the new minimum wage (Card, 1992). Card and Krueger (1995) and Spriggs and Klein (1994) used "fraction affected" in their price equations for the US. However, "fraction affected" is constant when the nominal minimum wage is constant, and does not capture the erosion of the later in relation to other wages and prices.

A variable closely related to "fraction affected" is "fraction at" the minimum wage, defined as the proportion of workers earning one minimum wage (Dolado et al., 1996) (plus or minus 0.02%, to account for rounding approximations). "Fraction at" is conceptually related to "fraction affected" but does not suffer from the same drawback, as it can be defined even when the minimum wage is constant. Beyond statistical identification, "fraction at" is a measure of wage (price) inflation and thus well suited to study minimum wage price effects. Its correlation with the real minimum wage and the Kaitz index in the sample period is respectively 0.61 and 0.67.

[1] An alternative reduced form empirical price equation can be delivered by a simple general equilibrium model, assuming perfect competition in the input and output markets, where price is modeled as a function of minimum wage, real interest rate, capital stock, labor supply shifters and aggregate demand shifters. The results in Sections 3.3 and 3.4 were robust to this alternative specification. Card and Krueger (1995) argue that assuming perfect or imperfect competition in the output market makes little difference for the purposes of estimating the effect of an industry wide shock such as minimum wage increases on prices and employment.

Thus, to ensure identification of the effect of the minimum wage on prices, "fraction at" replaces log nominal minimum wage in Equation (1). To reflect a 10% increase in the minimum wage, all estimates in the paper are multiplied by 0.6, which is the approximate elasticity of "fraction at" with respect to the minimum wage.[2] Card and Krueger (1995) interpret their "fraction affected" estimates in a similar manner.

3.3 Results

Panel A of Table 1 shows positive and significant WLS β estimates, which are robust across specifications. The estimate using the *ad hoc* specification suggests that a 10% increase in the minimum wage raises prices by 0.02%. This is robust when using the more complete specifications (see column 1 of Panel A), whether or not the real interest rate is controlled for, i.e. whether assuming $Y{=}f_{LK}(L{,}K)$ or $Y{=}f_L(L)$.

Columns 2 and 3 of Panel A show that the anticipated effects of the minimum wage on prices are significant. Two leads of the shock variable immediately before the month of the minimum wage increase are significant; further leads were not statistically different from zero. A 10% increase in the minimum wage raises prices by 0.03% (0.02%) one month before the increase, and by 0.02% (0.02%) two months before, when controlling (not controlling) for the real interest rate. The long run effect is 0.07% (0.06%).

Column 4 of Panel B of Table 1 shows that lagged effects of the minimum wage on prices are not significant. In addition to the two leads included in Panel A, one lag of the shock variable immediately after the month of the increase was included. Neither the first nor further lags were statistically significant. The estimates are now marginally larger and more robust when the real interest rate is not controlled for, but unchanged when it is controlled for, both in the short and long run. This suggests that all adjustment in prices in response to minimum wage increases happen in the two months leading up to the increase and no lagged adjustments follow the increase. To test this further, a different form of lagged dynamics was allowed. Panel C of Table 1 shows that some lagged prices response might be captured

[2] The 0.6 estimate is the coefficient of the nominal minimum wage on a regression of "fraction at" on the difference of log nominal minimum wage and the other regressors in Equation (1). However, because the nominal minimum wage does not vary across regions in Brazil, the Kaitz index (using not only average wage, but also median wage as the denominator) was used instead. The 0.6 estimate was remarkably robust across specifications.

when two lags of the dependent variable are included. The estimates are now smaller when the real interest rate is not controlled for, but once again unchanged when it is controlled for in the short run. In the long run, the estimates are larger and more robust; they are 0.10% (0.08%) when controlling (not controlling) for the real interest rate.

Even though the rapid wage-price spiral in Brazil discussed in Section 2 suggests shorter dynamics, other factors such as the minimum wage indexer and *numeraire* roles, and long inflationary memory in Brazil might perpetuate the minimum wage effect on prices over time, even though all models include time and region fixed effects to account for unusually high inflation periods. Aaronson (2001) included lags and leads in his specifications and found that most of the prices response occurs in the two month period immediately after a minimum wage increase, while the remainder occurs in a two month window around this. They argue that these are short dynamics for the US and that they are due to the fact that minimum wage changes do not generate the sort of coordination failure and stickiness in prices that other costs or demand shocks produce.

The preferred specification is the one including both leads of the shock variable and lags of the dependent variable, as well as controlling for the real interest rate (second row of Panel C of Table 1). First, this specification allows for two different forms of dynamics to account for anticipated and lagged price adjustments in response to minimum wage increases. Second, the estimates are more robust when controlling for the real interest rate, suggesting that the minimum wage variable is picking up some of the negative effect of the real interest rate on prices when $Y = f_L(L)$ is assumed. Using this specification, a 10% increase in the minimum wage raises prices by 0.02% in the month of the increase, and by 0.08% after accounting for a two month window around the increase for anticipated and lagged adjustment in prices. Incidentally, the other specifications produce similar results, which is reassuring that the estimates are not too sensitive to whether or not the interest rate is held constant and to whether or not lagged dynamics are allowed.

3.3.1 Are Price Effects Small in Brazil?

The 0.08% price effect above is in line with theory and with previous empirical evidence on overall price effects in the international literature ranging from 0.20% to 0.40% (Sellekaerts, 1981; MacCurdy and McIntyre, 2001), which use US data and an entirely different methodology. Nonetheless, this result is smaller than that in the literature and smaller than that expected for Brazil. That is because in Brazil, not only are minimum wage increases large, frequent and affect a sizable fraction of the labor force, but also the minimum wage has been used as *numeraire* and as indexer (see Section 1). This deserves two considerations.

First, although small, this is a robust effect. Not only is the effect of other common macro shocks, the effect of regional specific growth trends, and the effect of the interest rate separated from the effect of the minimum wage on prices; but also anticipated and lagged price adjustments are accounted for following a minimum wage increase. This is quite a demanding specification, in which most of the variation in prices is explained by dynamics, region and time fixed effects. Thus, confidence is great that the remaining variation in prices really is due to minimum wage changes – all estimates are consistently significantly different from zero and thus did not happen due to chance alone.

Second, although these effects are small when compared to the effects in the literature, they can amount to quite sizeable inflation effects in Brazil. For example, the average minimum wage increase over the sample period was 31%, suggesting that minimum wage increases, on average, raised overall prices by 0.25% after accounting for a two month widow of price adjustments around the increase (see column 5 of Panel C of Table 1). Another example is that the average (largest) cumulative increase within the year in the sample period, without accounting for compound effects, was 135% (360%). This suggests that, on average across years, overall prices increased by 108% solely in response to minimum wage increases after accounting for a two month widow of price adjustments around the increase.

3.4 Robustness Checks

3.4.1 Further Identification Strategies

Although the specifications discussed in Section 3.3 control for region specific growth trends and for common macro shocks that could be confounded with the effect of the minimum wage on prices, they do not control for regional shocks correlated to changes in the minimum wage and wages or prices. To account for this, Equation (1) is modified to include the interaction of "fraction at" with the 20^{th} percentile of the log nominal wage distribution. This is a measure of the change in the wage of low paid workers across regions caused by changes in variables other than the minimum wage. That is because the minimum wage variable – recall that "fraction at" is the proportion of workers earning one minimum wage (see Section 3.2) – can be affected by both minimum wage changes and by other regional variable changes. Thus, including a variable to control for changes in wages of the low paid across regions separates the effects of regional shocks from the effect of the minimum wage (on the wages of low paid and thus) on prices. That way, in addition to controlling for region specific growth trends and common macro shocks, regional shocks are now also controlled for. The new equation is:

(2) $\Delta \ln P_{it} = \alpha + \sum_{l=-k}^{L} \beta_l \Delta F_{it-l} + \beta^{FW} \Delta F_{it} \Delta \ln W_{it}^{20} + \beta^{W} \Delta \ln W_{it}^{20} + \gamma \Delta \ln W_{it} + \delta \Delta r_{it} + \epsilon \Delta \ln E_{it} + \mu \Delta \ln A_{it} + \sum_{m=1}^{M} \rho_m \Delta \ln P_{it-m} + f_i + f_t + u_{it}$

where, F_{it} is "fraction at", W_{it}^{20} is the 20^{th} percentile of the log nominal wage distribution and u_{it} is the new error term.

Panel D of Table 1 shows positive and significant WLS β estimates, which are comparable to estimates in Panel A of Table 1. The estimates controlling for the real interest rate are virtually the same, which is very reassuring of the previous results. The β^{FW} estimates are not statistically different from zero. An alternative specification, replacing the 20^{th} by the 10^{th} percentile of the log nominal wage distribution in Equation (2) produced results qualitatively similar, although a little less robust. Equation (2) is a demanding specification and the results are remarkably robust. Thus, the main conclusion from previous sections that the minimum wage raises overall prices in Brazil is maintained.

3.4.2 Low Inflation

A further robustness check is to re-estimate Equation (1) excluding the high inflation period prior to July of 1994. Panel E of Table 1 shows that the minimum wage does not affect overall prices in Brazil when inflation is low. The change in the magnitude and significance of the estimates is quite dramatic, even though all specifications in Section 3.3 included time and region fixed effects to account for the unusually high inflation periods. This suggests that firms are more able to adjust prices following a minimum wage increase in an environment of high inflation. It also suggests that agents no longer anticipate the increase, and that the minimum wage is no longer used as *numeraire* and indexer in low inflation periods (see Section 2). This is in line with the evidence found by Aaronson (2001) that the high inflation in the 1970s and 1980s partially drives the positive minimum wage price effect in the US and Canada. Weiss (1993) argues that price adjustments differ in countries that have experienced low and high inflation.

In summary, minimum wage increases significantly increase overall prices in Brazil. This effect is larger in the long run when anticipated and lagged adjustments have taken place and thus the minimum wage effect on prices is complete. When inflation is high the effect is also larger when (a) firms are more able to pass the higher labor costs through to prices associated to minimum wage increases; and (b) agents anticipate minimum wage increases and take such increases as a signal for future wage and price bargains. These findings are robust across a number of specifications. They are in line with theory and with the international empirical literature.

4 Conclusion

This paper fills a gap in the literature by providing new evidence on the price effects of the minimum wage using household and firm data for a long 18 year period for a key developing country, Brazil. In Brazil, not only are minimum wage increases large and frequent but also the minimum wage binds on a sizable fraction of the labor force. Consequently, these nominal wage shocks have an important impact on aggregate price movements. Because of this expected price response, rational agents may take nominal minimum wage increases as a signal for future price and wage bargains.

Indeed, the evidence here indicates that the minimum wage raises overall prices not only on the month of the increase, but also in the two months before. A 10% increase in the minimum wage raises prices by 0.02% in the month of the increase and by a further 0.02% in each of the two months leading up to the increase. After accounting for anticipated and lagged adjustments in prices during a two month window around the increase, overall prices rise by 0.08%. This result is remarkably robust to various identification strategies and is thought to capture the effect of the minimum wage on prices over and above other changes in the economy that might have happened together with the minimum wage change.

Although in line with theory, this is small when compared to the 0.20% to 0.40% effect in the international literature. If overall price effects are small in a country where minimum wage increases are large and frequent, where the fraction of the labor force affected is large, and where the minimum wage has been used as *numeraire* and indexer, then this suggests that the minimum wage has a concrete policy potential to alleviate inequality and poverty without undesirable side effects.

A fruitful avenue for future research is to estimate price effects for industries overpopulated by minimum workers in Brazil. That is the usual strategy in the US literature, which concentrates on the food industry. Estimates for low wage industries are not available for Brazil, and aggregate estimates might have diluted more positive price effects affecting such industries.

References

[1] AARONSON, D. (2001): "Price Pass-through and the Minimum Wage," *Review of Economics and Statistics*, 83, 158-169.

[2] BROWN, C. (1999): "Minimum Wages, Employment, and the Distribution of Income," in *Handbook of Labor Economics*, ed. by O. Ashenfelter, and D. Card. Amsterdam; New York and Oxford: Elsevier Science, North-Holland, 2101-2163.

[3] CARD, D. (1992): "Do Minimum Wages Reduce Employment? A Case Paper of California, 1987-89," *Industrial and Labor Relations Review*, 46, 38-54.

[4] CARD, D. E., and A. B. KRUEGER (1995): *Myth and Measurement: The New Economics of the Minimum Wage*. Princeton: Princeton University Press.

[5] CARNEIRO, F. G. (2002): "Uma Resenha Empirica Sobre Os Efeitos Do Salario Minimo No Mercado De Trabalho Brasileiro," *The Jobs Report, The World Bank,* Washington, D.C.

[6] COX, J., and R. OAXACA (1981): "Effects of Minimum Wage Policy on Inflation and on Output, Prices, Employment and Real Wage Rates by Industry," *Report of the Minimum Wage Paper Commission*, 6, 171-210.

[7] DOLADO, J., and ET AL. (1996): "The Economic Impact of Minimum Wages in Europe," *Economic Policy: A European Forum*, 23, 317-357.

[8] FREEMAN, R. (1996): "The Minimum Wage as a Redistributive Tool," *Economic Journal*, 106, 639-649.

[9] GRAMLICH, E. M. (1976): "Impact of Minimum Wages on Other Wages, Employment, and Family Incomes," *Brookings Papers on Economic Activity*, 2, 409-451.

[10] GOLDBERG, P. K., and M. M. KNETTER (1997): "Goods Prices and Exchange Rates: What Have We Learned?," *Journal of Economic Literature*, 35, 1243-1272.

[11] KAITZ, H. (1970): "Experience of the Past: The National Minimum, Youth Unemployment and Minimum Wages," *US Bureau of Labor Statistics Bulletin*, 1657, 30-54.

[12] LEMOS, S. (2004a): "A Menu of Minimum Wage Variables for Evaluating Employment Effects: Evidence from Brazil", *IZA Discussion Paper 1069.*

[13] — (2004b): "A Survey of the effect of the Minimum Wage on Prices", *IZA Discussion Paper, 1072.*

[14] MACHIN, S., A. MANNING, and L. RAHMAN (2003): "Where the Minimum Wage Bites Hard: Introduction of Minimum Wages to a Low Wage Sector," *Journal of The European Economic Association*, Inaugural Issue, 154-180.

[15] MACURDY, T., and F. MCINTYRE (2001): "Winners and Losers of Federal and State Minimum Wages," *Employment Policies Institute Foundation Paper*, 6/01.

[16] MALONEY, W., and J. MENDEZ (2004): "Minimum Wages in Latin America," in *Law and Employment: Lessons from Latin America and the Caribbean*, ed. by J. Heckman, and C. Pagés. Cambridge, MA.: NBER and University of Chicago.

[17] NEUMARK, D., and W. WASCHER (1992): "Employment Effects of Minimum and Subminimum Wages: Panel Data on State Minimum Wage Laws," *Industrial and Labor Relations Review*, 46, 55-81.

[18] NEUMARK, D., W. CUNNINGHAM, and L. SIGA (2003): "The Distributional Effects of Minimum Wages in Brazil: 1996-2001," *Unpublished Paper.*

[19] POTERBA, J. M. (1996): "Retail Price Reactions to Changes in State and Local Sales Taxes," *National Tax Journal*, 49, 165-176.

[20] SELLEKAERTS, B. (1981): "Impact of Minimum Wage Legislation on Wage and Price Inflation," *Report of the Minimum Wage Paper Commission*, 6, 1-17.

[21] SPRIGGS, W., and B. KLEIN (1994): "Raising the Floor - the Effects of the Minimum Wage on Low-Wage Workers," *Unpublished Paper.*

[22] WEISS, Y. (1993): "Inflation and Price Adjustment: A Survey of Findings from Micro-Data," in *Optimal Pricing, Inflation, and the Cost of Price Adjustment,* ed. by E. Sheshinski, and Y. Weiss. Cambridge and London: MIT Press, 3-17.

[23] WELCH, F. R., and J. CUNNINGHAM (1978): "Effects of Minimum Wages on the Level and Age Composition of Youth Employment," *Review of Economics and Statistics*, 60, 140-145.

[24] WILLIAMS, N. (1993): "Regional Effects of the Minimum Wage on Teenage Employment," *Applied Economics*, 25, 1517-1528.

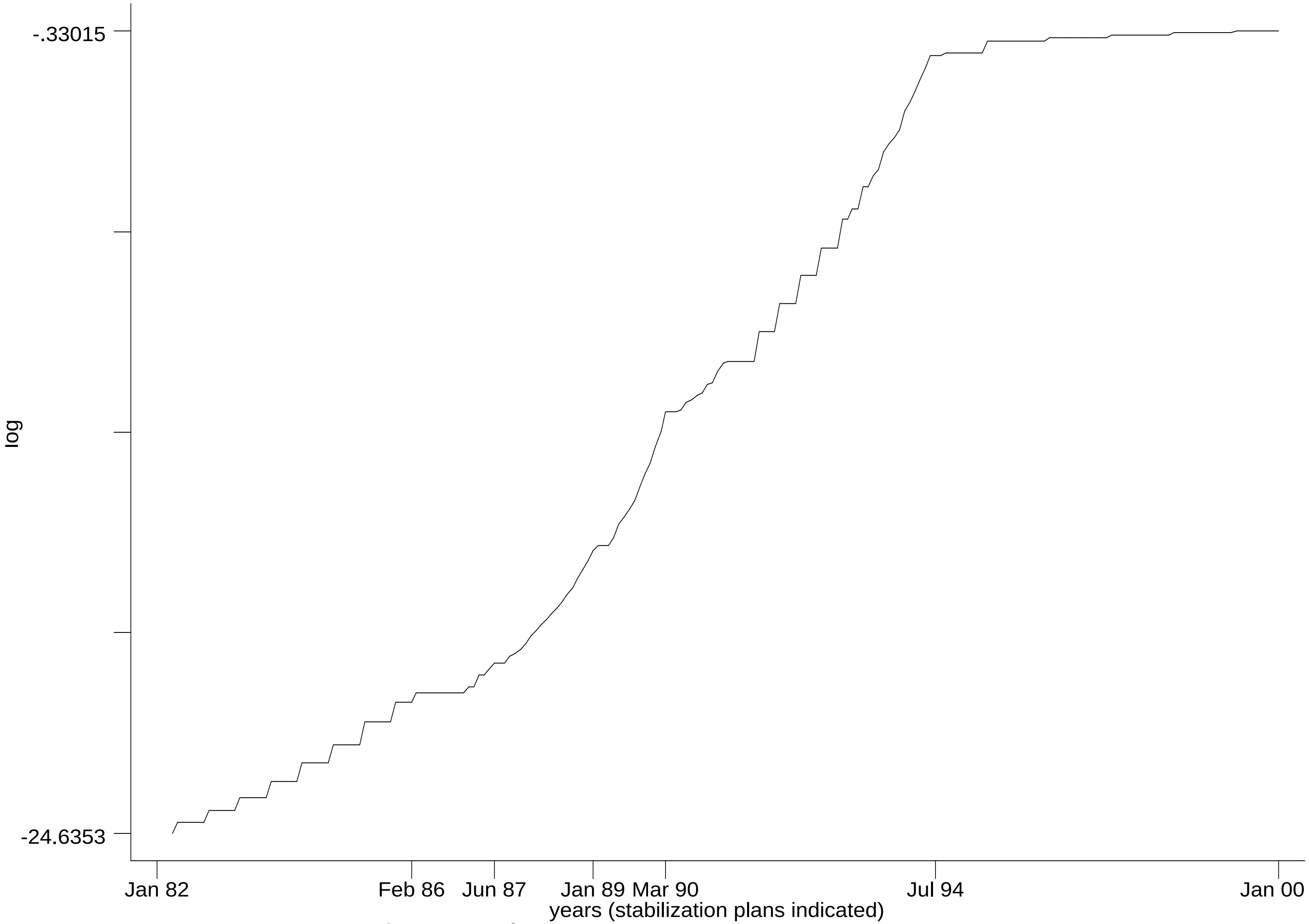

Figure 1 - log NOMINAL MINIMUM WAGE

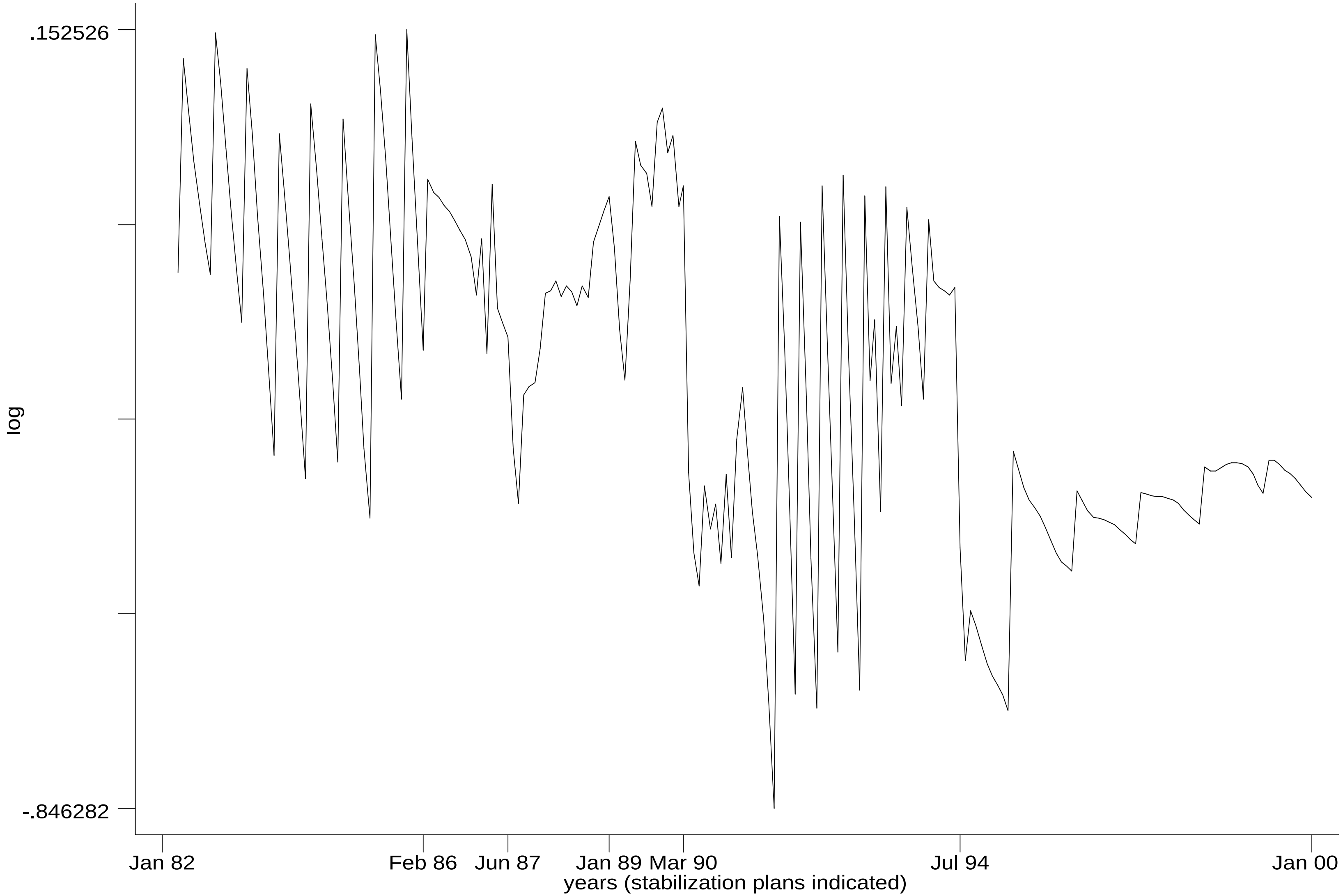

Figure 2 - log REAL MINIMUM WAGE

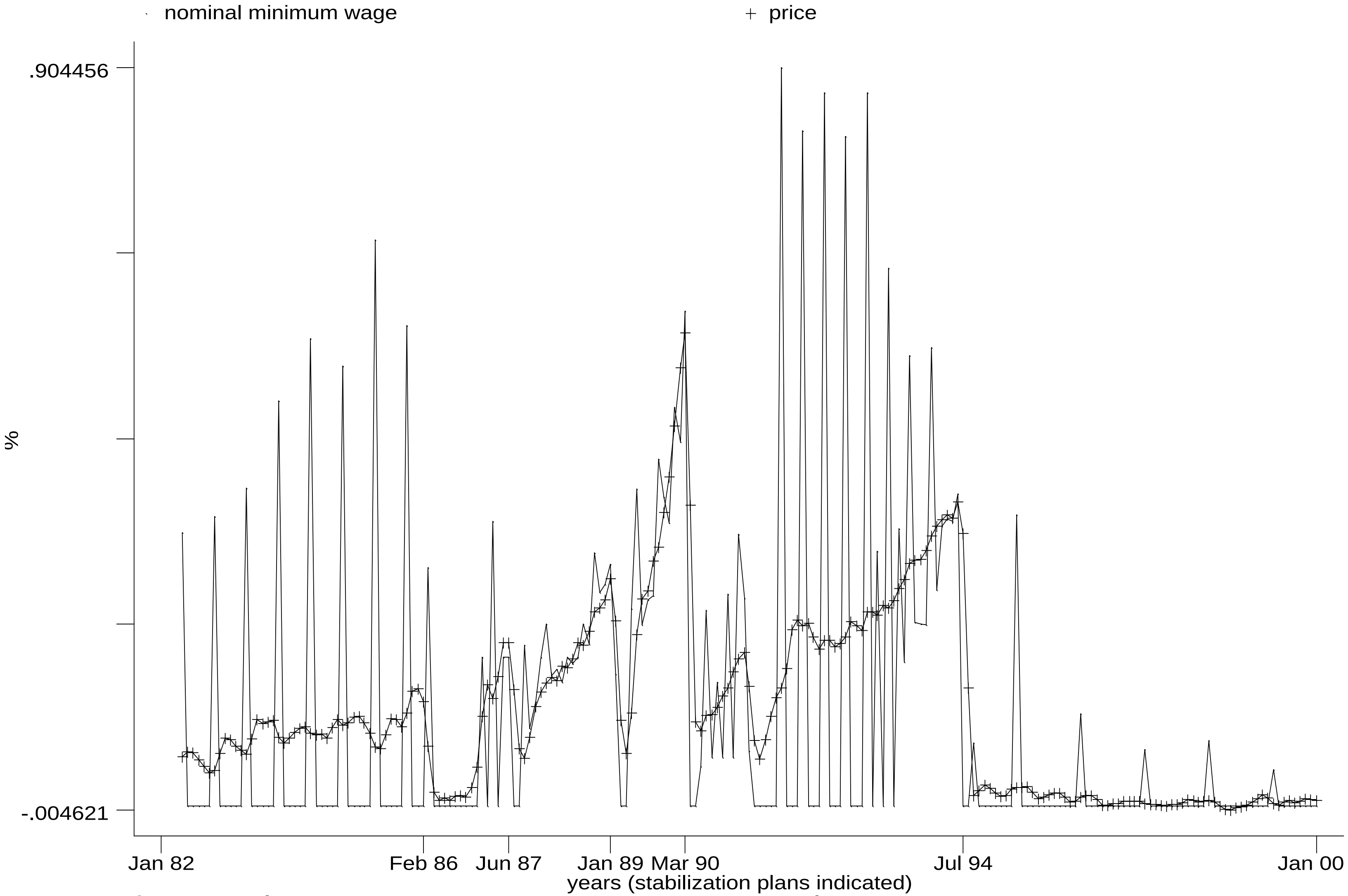

Figure 3 - log NOMINAL MINIMUM WAGE AND log PRICE IN DIFFERENCES

Table 1 - EFFECT OF A 10% MINIMUM WAGE INCREASE ON PRICES

models			first lead		second lead		first lag		*lr*	
	coef	se	**coef**	se	**coef**	se	**coef**	se	*coef*	*se*
	(1)		(2)		(3)		(4)		*(5)*	
(A) BASE SPECIFICATION										
ad hoc	**0.02**	0.01								
$Y=f_L(L)$	**0.02**	0.01	**0.03**	0.01	**0.02**	0.01			***0.07***	*0.02*
$Y=f_{LK}(L,K)$	**0.02**	0.01	**0.02**	0.01	**0.02**	0.01			***0.06***	*0.02*
(B) ADDING RHS LAGGED DYNAMICS										
$Y=f_L(L)$	**0.03**	0.01	**0.03**	0.01	**0.02**	0.01	**0.01**	0.01	***0.09***	*0.03*
$Y=f_{LK}(L,K)$	**0.02**	0.01	**0.02**	0.01	**0.02**	0.01	**0.00**	0.01	***0.06***	*0.03*
(C) ADDING LHS LAGGED DYNAMICS										
$Y=f_L(L)$	**0.02**	0.01	**0.02**	0.01	**0.02**	0.01			***0.10***	*0.03*
$Y=f_{LK}(L,K)$	**0.02**	0.01	**0.02**	0.01	**0.02**	0.01			***0.08***	*0.03*
(D) INTERACTING THE MINIMUM WAGE VARIABLE WITH THE 20th PERCENTILE OF THE WAGE DISTRIBUTION										
$Y=f_L(L)$	**0.03**	0.01	**0.03**	0.01	**0.02**	0.01			***0.07***	*0.02*
$Y=f_{LK}(L,K)$	**0.02**	0.01	**0.02**	0.01	**0.02**	0.01			***0.06***	*0.02*
(E) LOW INFLATION PERIOD										
$Y=f_L(L)$	**0.00**	0.01	**0.01**	0.01	**0.00**	0.01			***0.01***	*0.02*
$Y=f_{LK}(L,K)$	**0.00**	0.01	**0.00**	0.01	**0.00**	0.01			***0.00***	*0.02*

(a) The dependent variable is the difference of logs of prices. The shock variable is the "fraction at".

(b) Time effects are modeled with month dummies, region effects are modeled with region dummies; cost shifters are included as controls, depending on which of two production functions are used, $Y=f_L(L)$ or $Y=f_{LK}(L,K)$.

(c) Panels A to E show estimates of "fraction at", its leads and its lags, for respectively a base specification, and specifications allowing for RHS lagged dynamics, LHS lagged dynamics, interaction with the 20th percentile of the wage distribution, and using a low inflation period subsample.

(d) These are GLS estimates, where the weights are the squared root of the inverse of the sample size. Standard errors are corrected for serial correlation across and within regions (assuming an autoregressive process specific to each region).

(e) Column 1 shows coefficient estimates for static models, columns 2 to 4 show respectively the contemporaneous, leads and lags coefficient estimates for dynamic models, and column 5 shows long run coefficient estimates associated to columns 2 to 4. The interaction term is not significantly different from zero in all specifications and is therefore not reported here.

(f) To reflect a 10% increase in the minimum wage, the estimates and standard errors were multiplied by 0.6, which is the approximate elasticity of the minimum wage with respect to "fraction at".