IMF Working Paper

WP/98/152

INTERNATIONAL MONETARY FUND

European I Department

The Effects of Tax Wedges on Hours Worked and Unemployment in Sweden

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October 1998

Abstract

The paper investigates the relationship between labor taxation and unemployment in Sweden by estimating a labor market model that includes a wage-setting locus and labor demand and supply relationships. The study simulates the effect of a 1 percentage point increase in the payroll tax and in total tax rates. The increase in the payroll tax pushes up labor costs by about ½ percent over a 5–10 year time horizon. Hours worked fall by 0.5 percent and the unemployment rate rises by 0.3 percentage point. The increase in total tax rates generates a similar result. Therefore, it appears that increases in taxes have adversely affected employment and unemployment in Sweden.

JEL Classification Numbers: J3

Keywords: payroll taxes, total labor taxes, labor cost, employment, unemployment

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Contents Page

Summary

In recent years labor taxation has come to the fore in policy discussions as one of the major determinants of the significant rise in unemployment in European countries over the past quarter century. This partly reflects the concurrent increase in both labor taxes and unemployment across a wide variety of OECD countries: between 1978 and 1992 taxes on labor rose by 2½ percent on average, with particularly large increases for Canada, Finland and Italy (see OECD, 1995). A rise in labor taxation increases the cost of labor, and, as a result, it reduces the demand for labor. Tthere is considerable debate, however, about the length of time required for the labor market to adjust to an increase in the labor tax rate.

The paper investigates the relationship between payroll and total labor taxes and unemployment in Sweden by estimating a labor market model that includes a wage-setting locus and labor demand and supply relationships. The study simulates the effect of a 1 percentage point increase in the payroll tax and in total tax rates on labor costs, employment, and the unemployment rate. In response to an increase in the payroll tax rate, the cost of labor rises by about ½ percent over the medium term, generating a 0.5 percentage point decline in total hours worked and a 0.3 percentage point rise in the unemployment rate over a 5–10 year period. Following an increase in the total tax rate, the labor cost rises by 0.4 percent over the medium term, generating a 0.3 percentage point decline in total hours worked and a 0.2 percentage point rise in the unemployment rate over a 5–10 year period.

I. INTRODUCTION

The rise in unemployment across a wide variety of industrialized countries over the past 25 years has led analysts to look for determinants of the phenomenon on a cross-country basis. One of the determinants that has come to the fore in policy discussions is labor taxation. This partly reflects the concurrent increase in both labor taxes and unemployment across a wide variety of OECD countries: between 1978 and 1992 taxes on labor rose by 2½ percent on average with particularly large increases for Italy, Finland, and Canada (see OECD 1995). Many analysts have argued that the rise in labor taxation is related to the rise in unemployment because it increases the cost of labor and as a result, it reduces the demand for labor. However, there is considerable debate about the length of time required for the labor market to adjust to an increase in the labor tax rate.

In standard theoretical models, the effects of changes in taxes on employment and on unemployment depend on whether the reservation wage is related to unemployment benefits or to non-wage benefits more generally. In the former case, an increase in taxes will affect both the employee wage and the reservation wage and should therefore have little effect on unemployment in the long run. In the latter case an increase in taxes will decrease the wage compared to the reservation wage and lead to a decline in employment and a rise in unemployment (see Pissarides (1998) for a more detailed discussion of this issue).

The empirical literature on the incidence of labor taxation is mixed. In a study of 10 OECD countries, Knoester and Van den Windt (1987) find that the costs of increased social security contributions are shifted forward onto the employees through lower net wages. Moreover, Calmfors and Nymoen (1990) find only a short-term impact of the tax wedge on wages in Denmark, Sweden, and Norway, and Eriksson et al. (1990) find only a weak long-term link between the tax wedge and wages for Finland. On the other hand, Tyrvainen (1995) argues that the responsiveness of the employee real wage to changes in payroll taxes in Canada and Germany is very weak, and Andersen and Risager (1990) find a significant effect of payroll taxes on gross wages in Denmark.

The purpose of this paper is to discuss the theoretical and empirical effects of labor taxes on the real wage, employment and unemployment in Sweden. Previous work on Sweden indicate a wide range of estimates of the effects of tax changes on unemployment, comparable to those found in other OECD countries. In particular, Bean, Layard, and Nickell (1986), Calmfors and Forslund (1990), and Pencavel and Holmlund (1989) find that the long-run effect of a 1 percent increase in the tax wedge on the gross real wage is between 0.4-0.6 percent whereas Holmlund (1990) and Tyrvainen (1995) find no effect. Moreover, Pencavel and Holmlund (1989) find that a 1 percentage point increase in payroll taxes lowers employment by approximately ½ percentage point and Tyrvainen documents comparable employment effects from changes in income taxation (in contrast to the negligible effects found from changes in the payroll tax rate). This paper finds that each percentage point increase in payroll and total taxes raises the cost of labor by about ½ percent and lowers total hours worked by ½ and 0.3 percentage point respectively over a 5–10 year horizon.

II. DESCRIPTION OF THE SWEDISH LABOR MARKET AND THE LABOR TAX RATE

From the late 1970s through the 1980s, the Swedish labor market offered contrasting developments to those in most European countries. While the unemployment rate in the latter rose to double digit levels, the Swedish unemployment rate remained fairly stable between 2–3 percent although the real wage remained fairly flat. However, the vaunted Swedish model which combined active labor market policies, an unemployment insurance system with a fixed duration of benefits, and centralized wage bargaining to deliver wage moderation, began to break down in the early 1990s.

Since the mid 1970s, the real wage in Sweden has been maintained at a fairly stable level, notwithstanding cyclical fluctuations. In the mid-1970s large wage increases were triggered by imported price increases associated with the world-wide inflation (Figure 1, panel 1). However, the growth of real wages far out paced the growth of labor productivity, leading to a sharp fall in the profit share, a serious external balance problem, and significant losses of export market shares. In response to the deteriorating economic situation, a series of discretionary exchange rate devaluations (in 1976, 1977, 1981, and 1982) were undertaken which resulted in a decline in real wages to more moderate levels. During the late 1980s real wages picked up strongly only to falter at the onset of the recession in the early 1990s. Since then, the real wage has remained essentially flat except for a sizeable increase in 1996.

The behavior of private sector employment over this period has been disappointing, evidenced by a gradual downward trend (Figure 1, panel 2). Up until the early 1990s continuous increases in public sector employment compensated for the downward trend in private sector employment. However, following the financial crisis in the early 1990s, public and private employment fell by roughly 10 percent, the open unemployment rate rose by roughly 7 percentage points to 8.2 percent in 1993 while participation in active labor market programs peaked at 5.1 percent of the labor force in 1994 (Figure 2, panel 1). Up until early 1997, the modest gains in the booming manufacturing sector associated with a depreciated krona were offset by employment declines in the public sector so that the open and total unemployment rates remained stable at around 8 and 13 percent respectively. However, the subsequent strong upturn in the economy and the decline in the participation rate associated with more generous education allowances have contributed to a decline in the open unemployment rate to 6.9 percent in June 1998.

A number of factors have been advanced to explain the sudden rise in Swedish unemployment since the early 1990s. These include cyclical factors associated with the substantial fall in house prices and the large increase in precautionary savings, labor shedding by firms to remain competitive in the face of a fixed exchange rate vis-a-vis the ECU, and the contraction of public sector employment. Structural factors for the rise in unemployment include the break down of the centralized wage bargaining system in the early 1980s, which was replaced with wage setting arrangements at the industry and local level, arguably, the type of wage bargaining framework which is least conducive to employment creation (see, in particular, the work of Calmfors and Driffil). The continuous rise in labor taxation has also been put forward

as a strong causal factor for the recent high unemployment level not least because labor taxes in Sweden are considerably higher than the average among OECD countries, although this situation has been prevalent for a long time.[1] Assarsson and Jansson (1998) also argue that hysteresis has become noticeable in Sweden in recent years.

Currently, Sweden conducts a pay-as-you-go pension system financed through social security contributions. Contributions are also earmarked for health insurance and sick-pay benefits which are related to income Traditionally, payroll taxes were paid entirely by employers, with a contribution rate in 1997 of 32.9 percent of wage and salary costs (31.2 percent of net income for the self-employed). However, since the beginning of 1997, employees have also contributed 1 and 4.95 of their wage income (below SKr 277,500) towards pension and health insurance premiums respectively with the contribution projected to rise by an additional percentage point in 1999.

During the 1970s and 1980s personal income taxes were steadily raised to cover increases in social expenditures. However, this situation changed drastically in 1991 when a new tax reform was introduced. Under the reform, the tax on employment and business income is 20 percent of incomes above a limit of SKr 200,000, which is periodically indexed to inflation. When added to the 31 percent municipal tax, the maximum marginal tax on earned income is now 51 percent compared to 80 percent for the top income brackets before the reform took place. Figure 2, panel 2 shows the steep decline in the average tax rate as a result of the reform in 1991, with slight increases since then.[2]

III. THEORETICAL EFFECTS ON THE LABOR MARKET OF CHANGES IN LABOR TAXES

In labor market models which allow for unemployment in equilibrium, the extent to which a change in taxes leads to a change in employment depends on the wage setting process. Under the assumption that wages are determined in a union bargaining framework, an upward sloping wage-setting curve can be generated. This wage-setting curve, combined with a downward sloping labor demand curve and an upward sloping labor supply curve, defines a labor market model with unemployment. Text figure 1 presents a graphical depiction of such a labor market prior to and following a rise in taxes. The initial equilibrium is at A with unemployment L_{s0} -L_{e0}. In response to a rise in taxes, firms will hire less labor at the initial net

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[1] According to the OECD Jobs Study, the average tax wedge in Sweden was approximately 50 percent in the early 1990s, compared to an OECD average slightly above 30 percent.

[2] Data on the personal income tax was provided by a Swedish academic who has calculated an average tax rate from a sample of 8000 households over the 1983-93 period. Data for the other periods was estimated based on a relationship between this data and the ratio of household direct taxes to gross wages.

wage W_0 because wage costs have increased as a result of the increase in taxes.[3] The resulting short-run equilibrium at B at the intersection of LD_1 and WS_0 is characterized by a slight reduction in the net wage to make workers more attractive to firms. However, this does not represent a long-run equilibrium because over time unemployed workers are expected to bid down wages further. For example, the wage-setting locus may shift downwards from WS_0 to WS_1 leading to a new equilibrium at C. The relative importance of the unionized employees versus the unemployed workers in the wage setting process is a key factor in determining the ultimate degree of wage adjustment and the extent to which a rise in taxes reduces employment.

The degree of wage adjustment also affects labor supply decisions because the decline in the net wage received by employees generated by a rise in taxes will lead to a reduction in the labor force. For example, labor supply at the long-run equilibrium C is lower than at the initial equilibrium A. Therefore the extent to which a rise in taxes affects unemployment depends both on the behavior of labor demand and supply.

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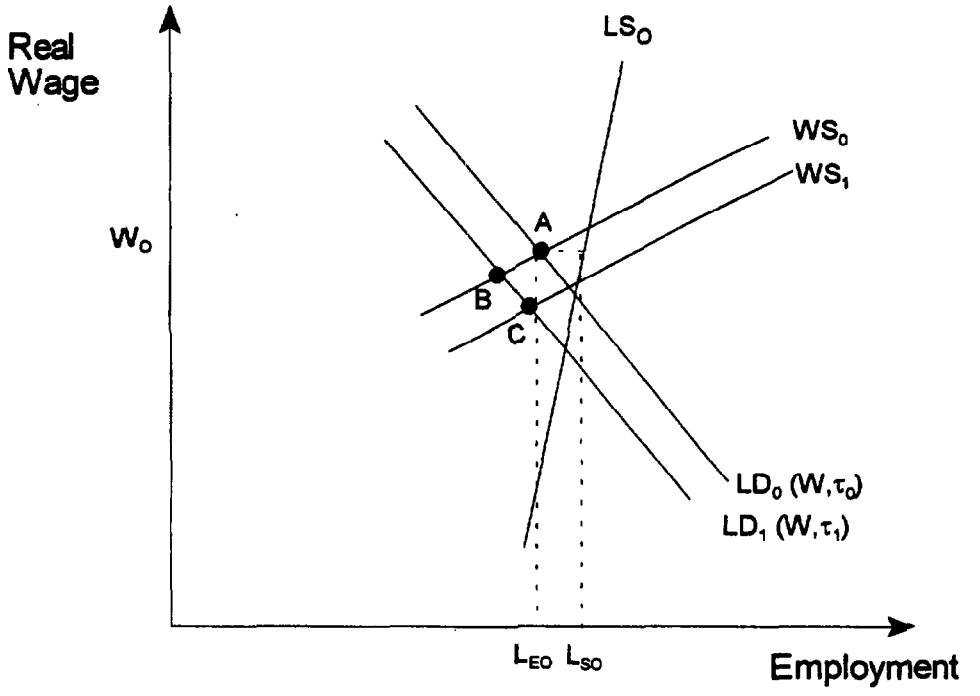
[3] In the case of an increase in payroll taxes, gross wage costs to the firm immediately rise by the amount of the tax. In situations where the personal income tax rate is increased, the incidence depends on the extent to which the unions can insulate themselves from an increase in the income tax rate through bargaining with employers for higher wages. Therefore, increases in the payroll tax have more direct effects on the gross wage than comparable increases in income taxes.

Figure 1. Sweden: The Labor Market



IV. EMPIRICAL LABOR MARKET MODEL

The estimated labor demand function comparable to LD_0 is as follows:

$$h=\zeta(w,pty) \tag{1}$$

where h is the total number of hours worked in the private sector, w is the aggregate real wage per hour worked inclusive of payroll taxes, and pty is aggregate labor productivity per hour worked. The productivity variable is included in the specification because in the standard two factor model with labor and capital, the firm's choice of whether to increase employment depends on the capital stock (or equivalently on labor productivity) as well as the real gross wage.

The wage setting equation is an upward sloping relationship between the level of real wages and hours worked; both the payroll and total tax rates are included to isolate the effects of

taxes and the open and total unemployment rates control for the effects of cyclical conditions on the real wage.[4]

$$w=\xi(h,\tau,accr,u) \tag{2}$$

where τ is the payroll/total tax rate, accr is the accommodation rate ie. the ratio of labor market program participants to the total stock of unemployed, and u is the aggregate unemployment rate.

The labor supply equation is an upward sloping relationship between the level of net wages and labor force participation and includes the growth rate of output to capture cyclical movements in the participation rate.

$$pr=\psi(w(1-\tau),\Delta gdp) \tag{3}$$

where pr is the labor force participation rate and Δgdp is the growth in output.

The above equations were estimated using annual data over the period 1970 to 1996. Weighted Symmetric and DF t test statistics indicate that, with the exception of the level of productivity, which, according to the DF test statistic is stationary in levels, all of the variables are borderline stationary in first differences (Table 1). Therefore, it is necessary to consider the extent to which the relationships are cointegrated. Cointegration tests based on the Johansen methodology were conducted on the two systems of equations which differ in the inclusion of the payroll or total tax rate. The tests revealed the existence of four cointegrating vectors for both systems of equations (Table 2) so that all three equations can be reparameterized in log levels.

The estimated system of equations is as follows, with two sets of coefficient estimates for the wage and participation rate equations depending on whether the payroll tax rate or the total tax rate was used.

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[4]In a number of empirical applications productivity is also included as a determinant of wages. However, the inclusion of this variable makes it impossible to separately identify the labor demand and wage setting equations unless the system is recursive. Manning (1993) presents a number of theoretical models of the labor market that exclude productivity from the wage setting equation and argues that this exclusion allows the proper identification of both the labor demand and wage setting curves. We therefore adopt this approach in this paper.

$$h_t = a_0 + \sum_{i=1}^{n} b_i h_{t-i} + \sum_{i=1}^{n} c_i w_{t-i} + \sum_{i=1}^{n} d_i pty_{t-i} + \epsilon_t \tag{4}$$

$$w_t = \sum_{i=1}^{n} f_i w_{t-i} + \sum_{i=1}^{n} h_i \tau_{t-i} + \sum_{i=1}^{n} i_i h_{t-i} + \sum_{i=1}^{n} j_i u_{t-i} + k_1 accr_{t-1} + \epsilon_t \tag{5}$$

$$pr_t = \sum_{i=1}^{n} l_i pr_{t-i} + \sum_{i=1}^{n} m_i w(1-\tau)_{t-i} + n_0 gdp_t + \epsilon_t \tag{6}$$

The choice of lag length for estimation purposes is always a subjective issue. In this paper each equation was estimated with two lags for each variable. This choice was based on averaging the variety of optimal lag lengths identified by the Schwarz-Bayes and Akaike criterion for the system of equations (Table 3). In an OLS regression of nonstationary variables the standard estimate of the variance-covariance matrix is invalid because the off-diagonal elements are non-zero. Therefore it is necessary to use a Generalized Method of Moments estimator which eliminates the autocorrelations on the off-diagonal of the variance-covariance matrix. Tables 4 and 5 present the estimated coefficients and the corresponding t-statistics corrected for autocorrelation.

In the wage setting equation of the specification using the payroll tax rate, both lags of the dependent and payroll tax variables are significant. Moreover, the coefficients on the lags of the payroll tax variable partially offset each other so that an increase in payroll taxes raises the gross wage by a factor of 1.4 after the first year, but this increase is mostly reversed in the following year. The hypothesis of equal but offsetting coefficients was rejected indicating that changes in payroll taxes have long run effects on the net wage. The coefficients on the total unemployment rate also offset each other although the second lag is considerably larger than the first lag so that when account is taken of the offsetting effects, increases in the unemployment rate raise the real wage. This effect may be influenced by recent developments in which real wage outcomes have been unresponsive to the high level of unemployment. The variable representing the ratio of participants in labor market programs to the total number of unemployed (the accommodation rate) is significantly positive indicating that a rise in the unemployment rate on account of an increase in labor market program participants leads to upward pressure on the real wage. This finding is also supported by the work of Calmfors and Nymoen (1990) on Sweden. They argue that systematic government policies to offset unemployment cushion workers and weaken incentives for unions concerned with employment to restrain wages. Nymoen, Rodseth, Raaum and Wulfsberg (1997) also find a significant positive effect of the accommodation rate on the real wage in Norway. Finally, dummy variables were also included for the periods 1983–85 and 1992–96 respectively to control for low real wage growth during the devaluation period of the mid-1980s and for the

uncharacteristically high real wage increases during the early 1990s. The coefficients on the dummy variables indicate that, controlling for other influences, the real wage over the 1983–85 period was not significantly different than at other times whereas the real wage over the 1992–96 period was 3 percentage points higher.

In the labor demand equation, both employment and productivity lags are significant, together with the second lag on the real wage. The sum of the two coefficients on the real wage is small however (about -0.13), although this generates a sizeable long-run labor demand elasticity of -0.45.

To trace the dynamic path of the variables in response to changes in payroll taxes, it is useful to examine impulse response functions computed using the coefficient estimates and corresponding confidence intervals based on replications of Monte-Carlo simulations.[5] The panels in Figure 3 show the impulse response functions and corresponding confidence intervals for the real gross wage and total hours worked in response to a permanent 1 percentage point rise in the payroll tax rate. Within one year the gross wage rises by the amount of the tax increase. Over time, the effect of the tax on the gross wage gradually weakens settling at 0.5 percent over the medium-term ie. a 0.5 percent decline in the net wage. The initial sharp rise in the gross wage generates a 0.6 percent decline in total hours worked after seven years which is subsequently reduced to 0.25 percent as the gross wage stabilizes. [6] The results derived in this paper are comparable to those of Pencavel and Holmlund (1989) who analyze wage and employment behavior in the mining and manufacturing sectors. They find that the long-run effect on the gross real wage of a 1 percent increase in the payroll tax rate is 0.6 and this leads to a ½ percentage point decline in employment in these sectors.

Substituting the total tax variable for the payroll tax variable in the wage equation mainly generates changes to the estimates of the tax variable itself. The first lag of the total tax rate is significantly below unity at 0.79 and its effect on the real wage is partially moderated by the negative coefficient on the second lag. The lagged coefficients on the wage term are considerably smaller than in the specification with payroll taxes so that a positive impulse to the real wage does not build up as rapidly. The other changes to the coefficient estimates include a greater responsiveness to the unemployment rate and a considerably larger real wage estimate for the 1992-96 period. In terms of the impulse responses, the effect on the real wage of a 1 percentage point increase in the total tax rate is more moderate than for a comparable payroll tax hike, leveling off at about a 0.4 percent increase compared to 0.5 percent increase in response to the payroll tax increase (Figure 4). The trough of the decline in hours worked

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[5]One thousand replications were conducted and averaged.

[6]The delayed response of employment to changes in payroll taxes is the result of excluding contemporaneous variables from the system of equations to minimize endogeneity problems. Excluding the dummy variables has little effect on the impulse responses.

occurs after 8 years at 0.35 percent and the effect levels off at 0.2 percent over the medium term (slightly below the hours response to the payroll tax hike at 0.25 percent).

Changes in payroll taxes also affect the supply of labor. In order to determine its effects on the unemployment rate, it is necessary to consider the impact of taxes on the participation rate. The coefficients in Table 4 indicate that the participation rate responds to an increase in the net wage in the previous period but that this response is offset in the following period. Moreover, when the wage is expressed net of income tax payments, the initial effect on the participation rate is even weaker (Table 5). The coefficient on the growth rate of output is significantly positive indicating that a 1 percentage point increase in the growth of output leads to a 0.3 percentage point increase in the participation rate. The participation rate has traditionally been very flexible in the Nordic countries partly on account of the open labor market which operates between them.

The impulse response for the participation rate was derived by subtracting the 1 percentage point increase in the tax rate from the profile of the gross wage and feeding the resulting net wage profile through the coefficient estimates of the participation rate equation. The impulse response profiles indicate that the participation rate falls in response to the permanent decline in the net wage in both specifications (Figure 5).

The net effect on the unemployment rate of changes in employment and in the participation rate can be derived by assuming that the population and yearly average hours worked are fixed and using the following identity between total hours worked, yearly average hours worked, the participation rate, population and the unemployment rate.

$$u = 1 - \left(\frac{thrs/ahrs}{pop.pr} \right) \tag{7}$$

Where u is the unemployment rate, *thrs* and *ahrs* refer to total and average hours worked, *pop* is the working-age population and *pr* is the participation rate.

In the simulation with the payroll tax hike, the increase in the unemployment rate peaks at 0.5 percentage point eight years following the shock to payroll taxes but the effect subsides to a 0.2 percentage point increase in the long-run (Figure 5). In the simulation with the total tax hike, the increase in the unemployment rate peaks at 0.25 percentage point eight years following the shock to payroll taxes, but falls to 0.15 percentage point above the baseline in the long-run. Tyrvainen (1995) in his analysis of 10 OECD countries finds no effect of payroll tax hikes on the gross wage and hence on employment but finds that a 1 percentage point rise in the total tax rate is completely passed through to the employer, generating a 0.5 percentage point rise in the unemployment rate in the long-run.

The above discussion has focussed on the effects on the labor market of an increase in payroll taxes and the question arises whether these effects are symmetric. It is difficult to isolate the

effects of a reduction in taxes in Sweden because they have risen almost continuously over the past quarter century. Nevertheless, a number of studies have based simulations on the effects of a reduction in payroll taxes on the assumption that the historical relationships would continue to hold in future (see for example, the work of the Employers Association). Commentaries and results from other countries are less sanguine, however. Kesselman (1996) argues that reducing employer payroll taxes in Canada may yield much less boost to employment than the employment lost from a comparable size of tax increase. This is because there is much less resistance to wage hikes than wage cuts, making the adjustment process more rapid for the former. Moreover, Gruber (1995) has found in analyzing a recent large discrete cut in employer tax rates in Chile that the entirety of the cut was reflected quickly in higher gross pay for employees. On the other hand, a reduction in the tax rate could have significant beneficial effects in Sweden if it was implemented as part of a social compact with all parties aware of the employment gains that could result by not offsetting payroll tax cuts with wage increases.

V. Conclusion

This paper has described the effects of taxes on the real wage, employment and unemployment using a standard labor market model and has estimated these effects using Swedish data. The extent to which changes in taxes affect employment in the long run depends on institutional features of the labor market. If the wage setting locus shifts in response to changes in taxes, the effects on the labor market are short-lived. If, on the other hand, the wage setting locus does not respond to eliminate the effects of changes in taxes on the gross wage, employment and unemployment will be affected permanently.

The paper finds that increasing payroll and total labor taxes raises the cost of labor by about ½ percent and lowers total hours worked by about ½ and 0.3 percentage point respectively over a 5–10 year horizon. Therefore, it appears that increases in taxes have adversely affected employment and unemployment in Sweden. In future work it would be interesting to decompose the effects of payroll taxes on high and low wage sectors separately to ascertain whether concentrating payroll tax reductions on low wage sectors would stimulate employment more than imposing an economy-wide reduction.

Table 1. Sweden: Unit Root Tests 1/

Variable	Weighted Symmetric τ Test	Dickey-Fuller τ Test
h	-2.1	-2.7
Δh	-3.1*	-0.3
w	-1.8	0.3
Δw	-2.2	-4.7*
pty	-1.3	-11.6*
Δpty	-2.9	-3.1
τ	-2.3	-2.2
Δτ	-2.9	-4.1*
pr	-1.5	0.4
Δ pr	-2.7	-1.6
u	-1.3	-2.8
Δu	-1.1	-1.8

1/ See text for data definitions. The Weighted Symmetric τ test involves a weighted double-length regression in which the dependent variable is regressed on leads and lags of its own changes. See Pantula (1994) for more details. The Dickey-Fuller τ test involves regressing the dependent variable on its own lags and its own lag level; asymptotic probability values for the DF τ test were obtained from Mackinnon (1994). An asterisk denotes significance at the 10 percent level.

Table 2. Sweden: Johansen Maximum Likelihood Tests of the System of Equations

(Cointegration likelihood ratio test based on trace of the stochastic matrix)

Null hypothesis	Alternative	Test Statistic
System with Payroll Tax Rate		
$r=0$	$r\geq 1$	512*
$r\leq 1$	$r\geq 2$	437*
$r\leq 2$	$r\geq 3$	326*
$r\leq 3$	$r\geq 4$	164*
$r\leq 4$	$r\geq 5$	17.1
System with Total Tax Rate		
$r=0$	$r\geq 1$	257*
$r\leq 1$	$r\geq 2$	220*
$r\leq 2$	$r\geq 3$	183*
$r\leq 3$	$r\geq 4$	159*
$r\leq 4$	$r\geq 5$	12.8

An asterisk denotes significance at the 10 percent level.

Table 3. Sweden: Criteria for Selecting Lag Length

Model Criteria	Number of Lags 1	2	3
Labor demand equation:			
Akaike	-9.6	-9.7	-9.5
Schwarz	-14.9	-14.7	-14.1
Wage setting equation:			
Akaike	-9.5	-10.1	-10.1
Schwarz	-14.6	-14.8	-14.4
Labor supply equation:			
Akaike	-10.4	-11.6	-11.3
Schwarz	-15.6	-16.7	-16.2

Table 4. Labor Market Model Using Payroll Tax Rate 1/

	Dependent Variable		
	Real Wage	Employment	Participation Rate
w (-1)	0.62 *	0.17	
w (-2)	-0.21 *	-0.30 *	
w(1-τ)(-1)			0.08 *
w(1-τ)(-2)			-0.06
h (-1)	-0.11	1.32 *	
h (-2)	0.23	-0.61 *	
pty (-1)		0.42 *	
pty (-2)		-0.38 *	
τ (-1)	1.44 *		
τ (-2)	-1.09 *		
PR (-1)			1.57 *
PR (-2)			-0.62 *
u(-1)	-0.77		
u (-2)	1.19 *		
accr(-1)	0.03 *		
dum8385	-0.01		
dum9296	0.03 *		
Δgdp			0.30 *
		Goodness of Fit Statistics	
R^2	0.91	0.88	0.97
DW	1.93	2.27	2.44

1/ An asterisk denotes a variable or test statistic that is significant at the 10 percent level.

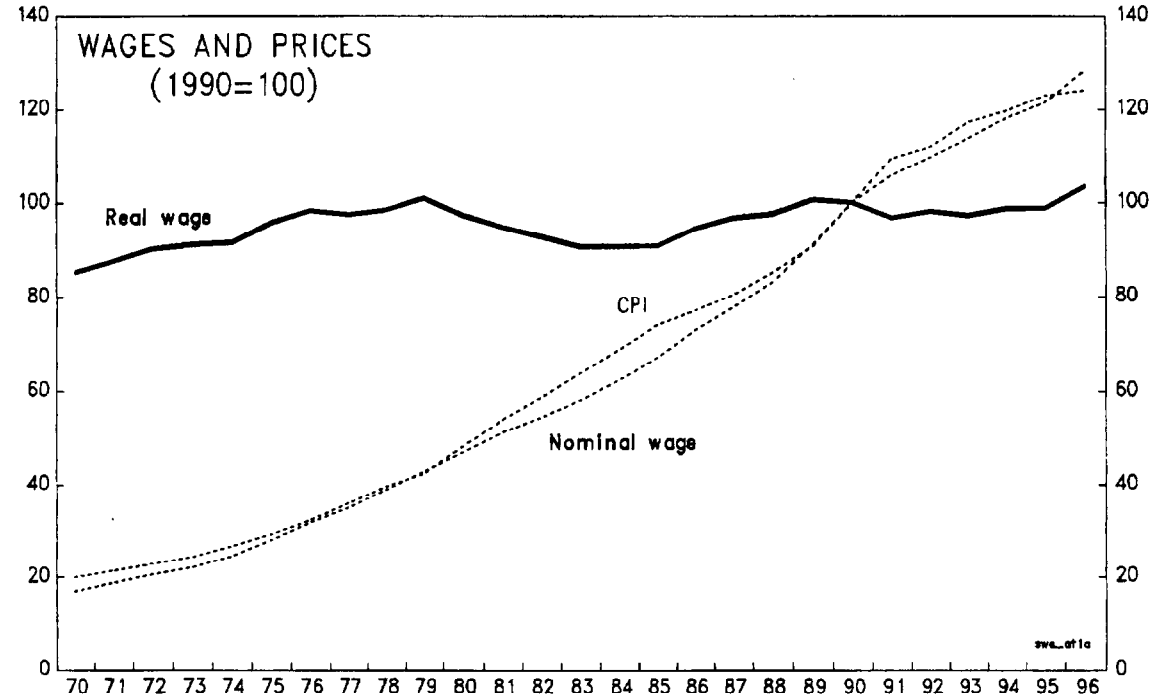
Table 5. Labor Market Model Using Total Tax Rate 1/

	Dependent Variable		
	Real Wage	Employment	Participation Rate
w (-1)	0.30 *	0.17	
w (-2)	-0.001	-0.30*	
w(1-τ)(-1)			0.02
w(1-τ)(-2)			-0.01
h (-1)	-0.39	1.32*	
h (-2)	0.51	-0.61*	
pty (-1)		0.42*	
pty (-2)		-0.38*	
τ (-1)	0.79*		
τ (-2)	-0.50*		
PR (-1)			1.60*
PR (-2)			-0.63*
u (-1)	-1.41*		
u (-2)	1.50*		
accr(-1)	0.04*		
dum8385	-0.02*		
dum9296	0.06*		
Δgdp			0.33*
		Goodness of Fit Statistics	
R^2	0.94	0.88	0.96
DW	1.92	2.27	2.97

1/ An asterisk denotes a variable or test statistic that is significant at the 10 percent level.

FIGURE 1
SWEDEN

WAGES AND HOURS WORKED



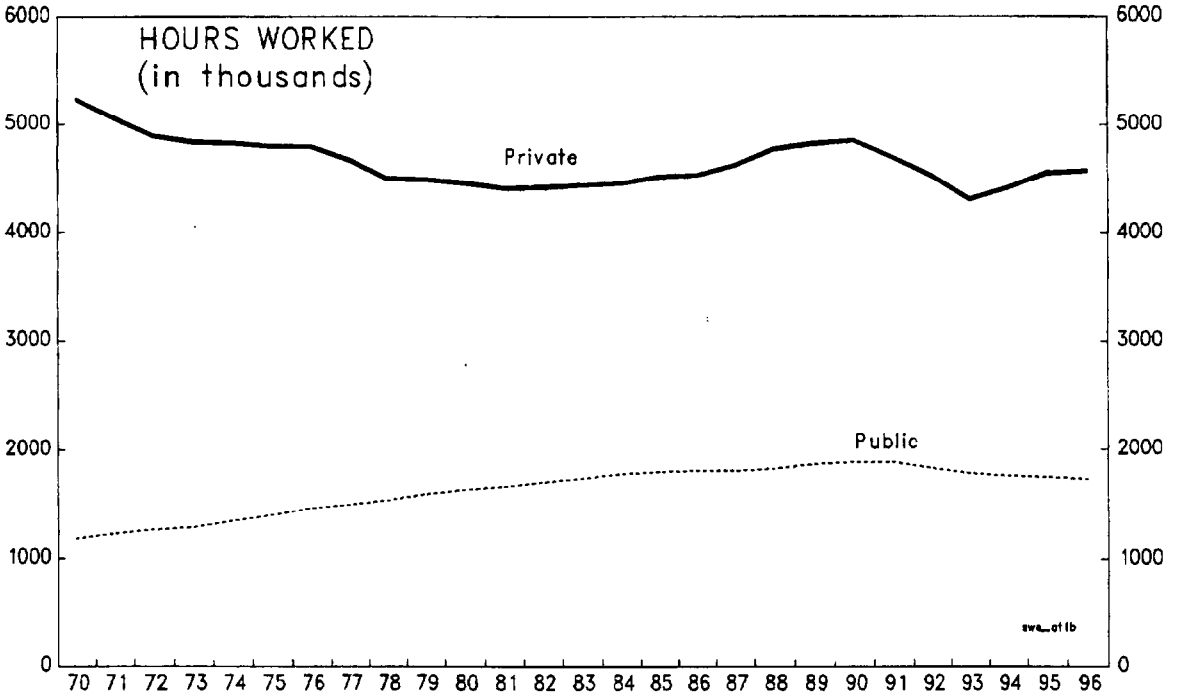
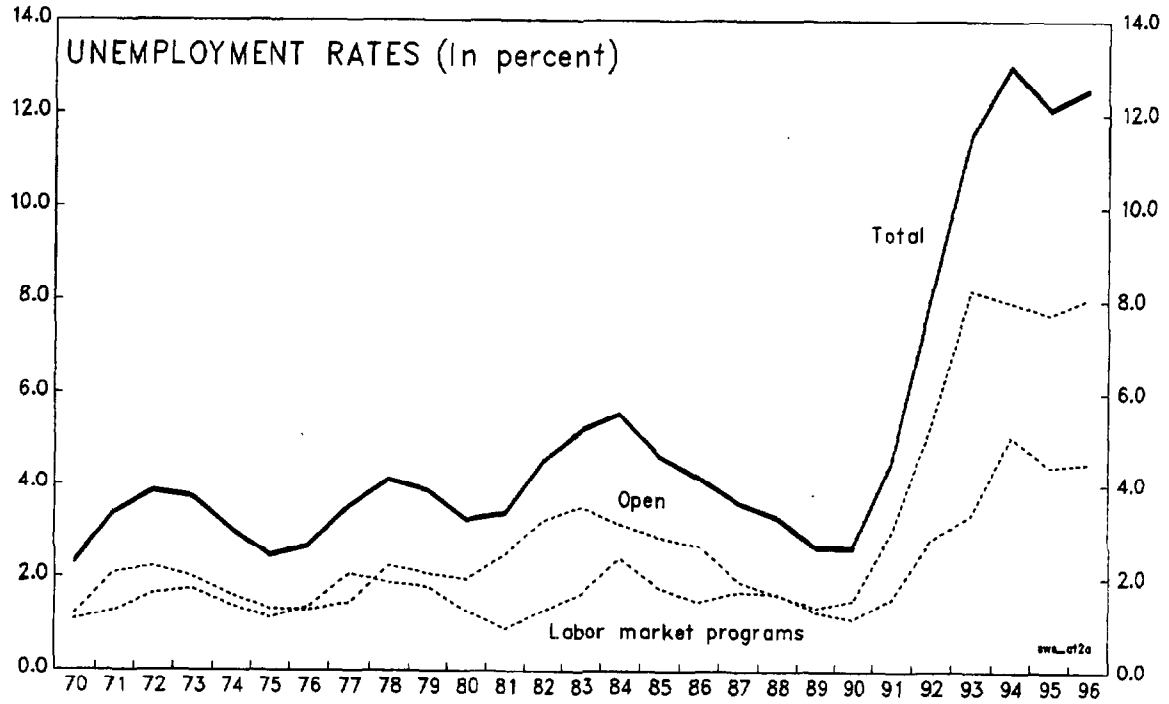


FIGURE 2
SWEDEN

UNEMPLOYMENT AND TAX RATES



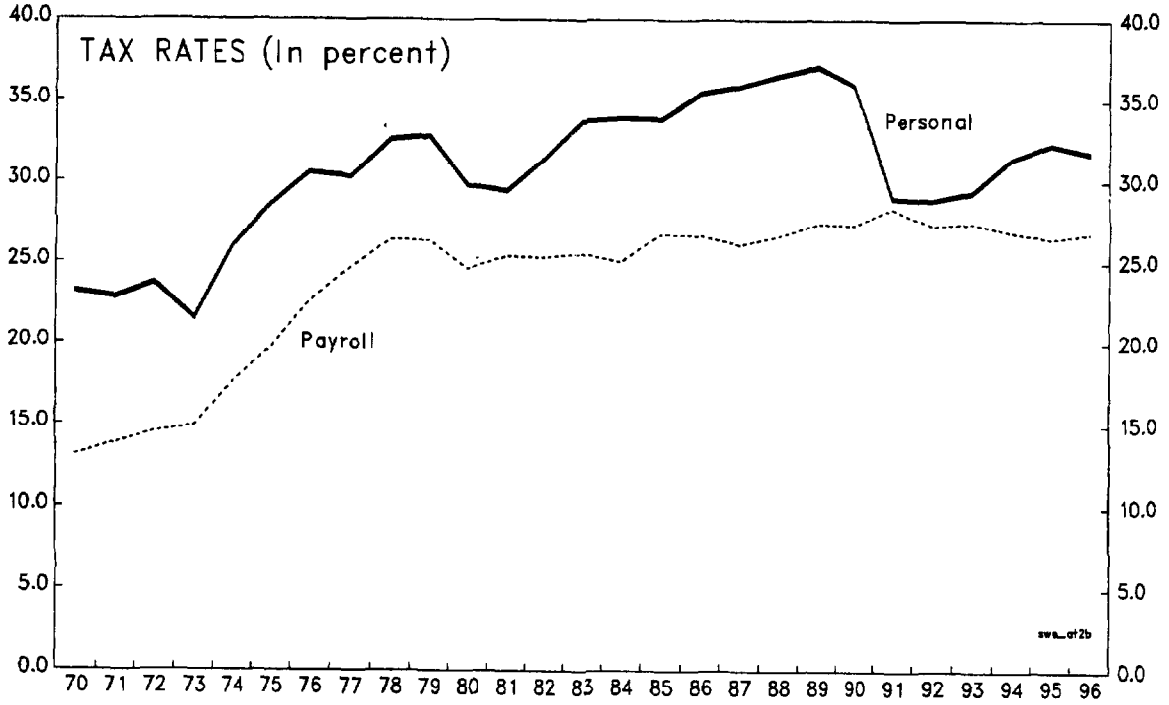
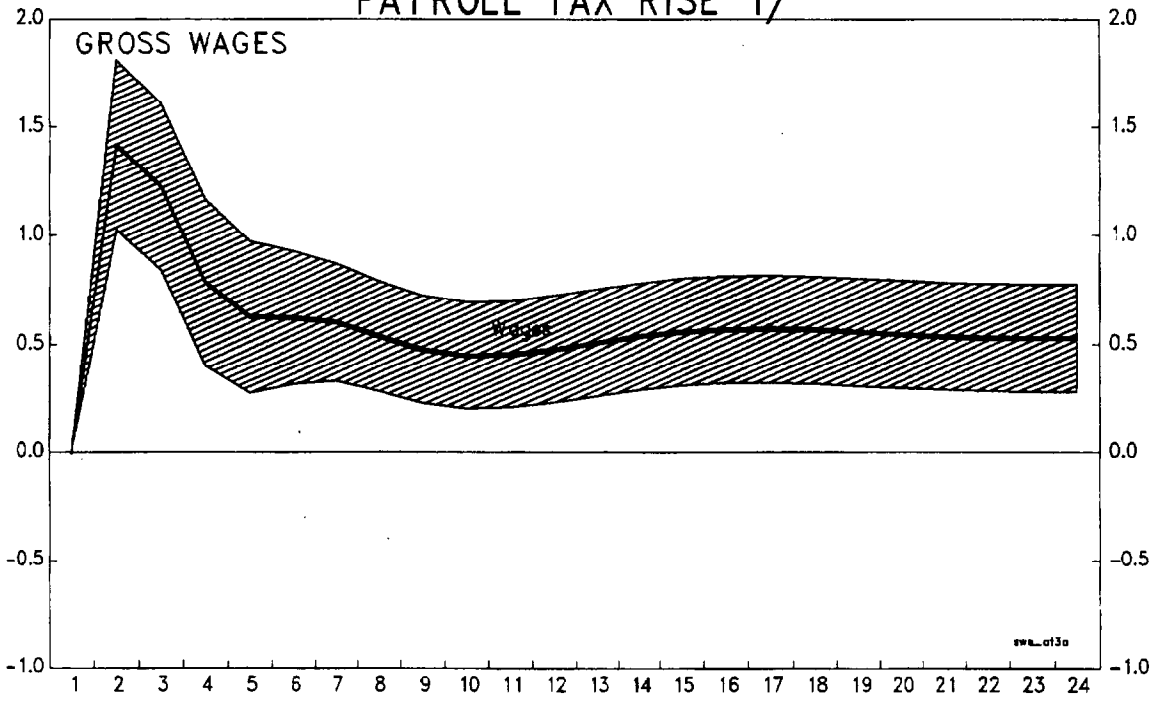
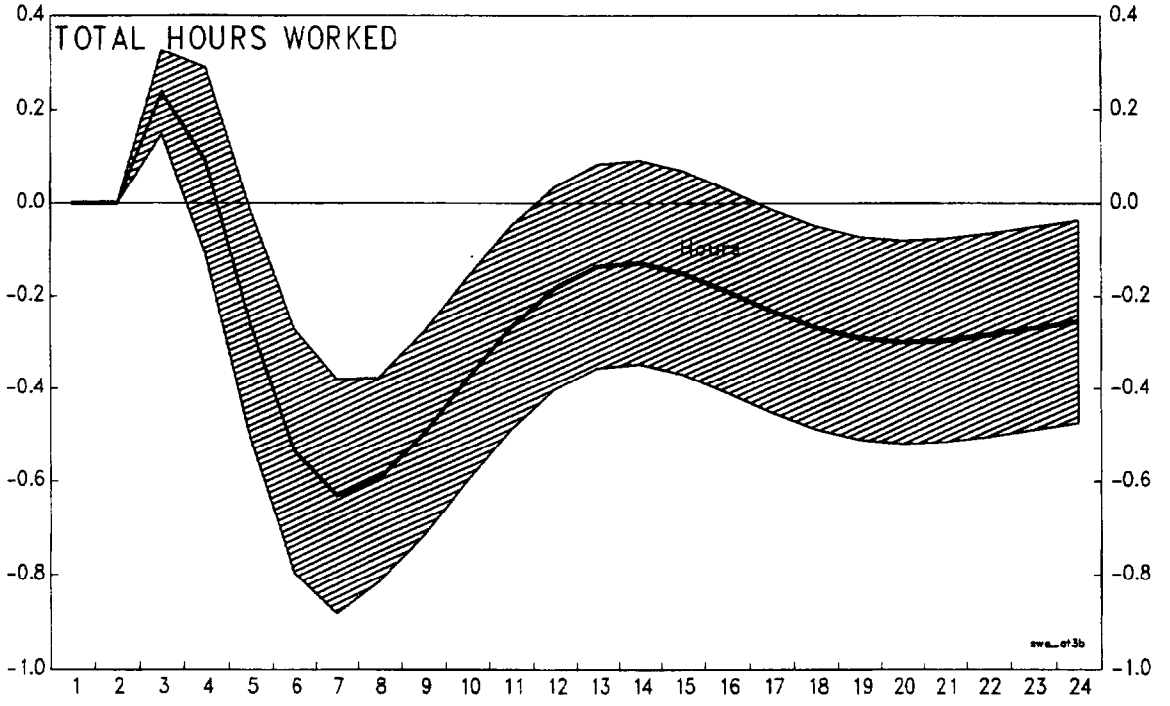


FIGURE 3
SWEDEN

IMPULSE RESPONSES IN RESPONSE TO PAYROLL TAX RISE 1/

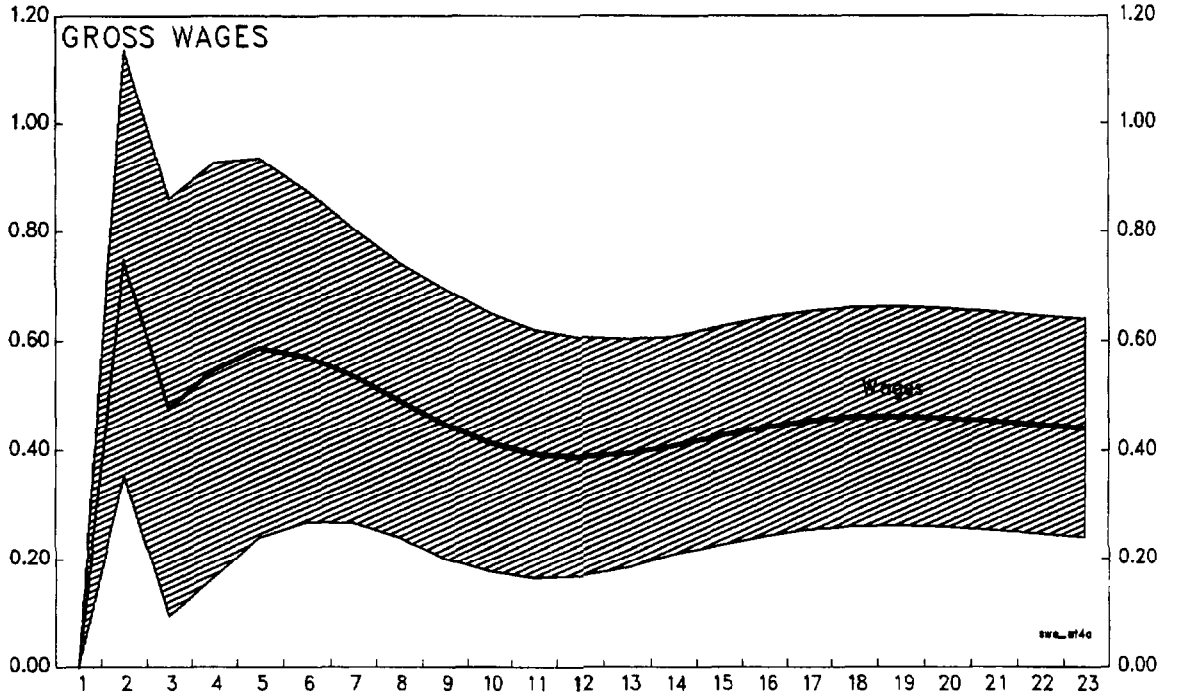


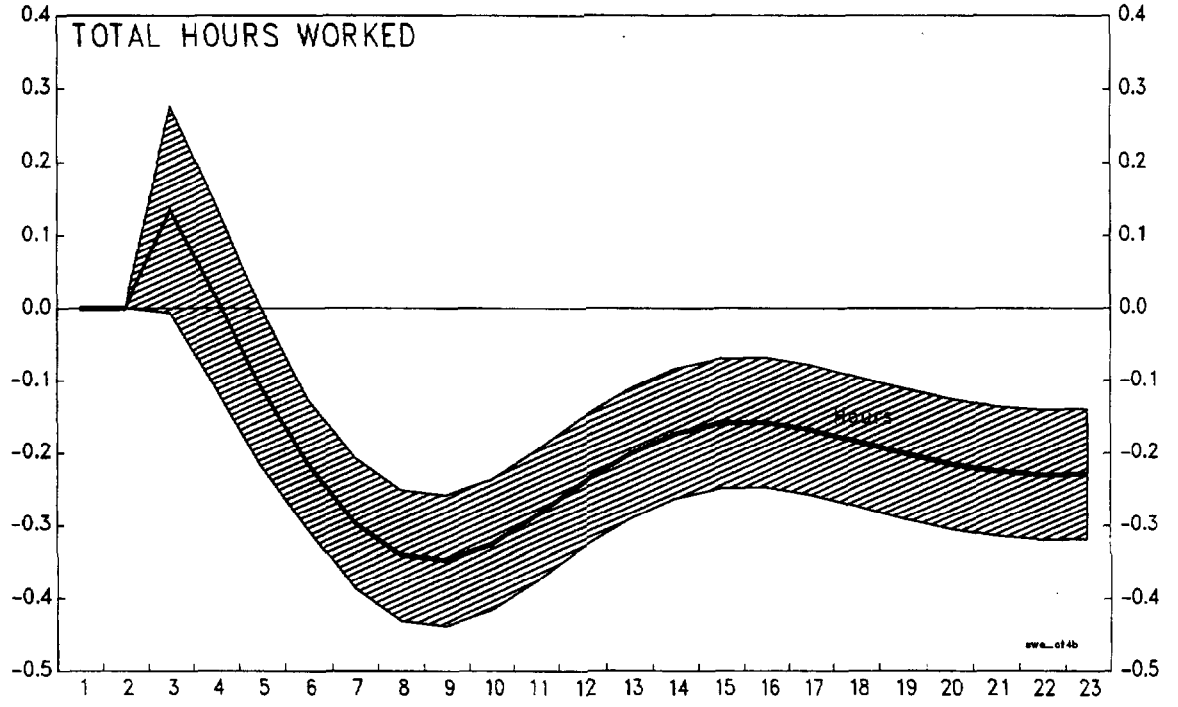


1/ Shaded area indicates confidence interval.

FIGURE 4
SWEDEN

IMPULSE RESPONSES IN RESPONSE TO TOTAL TAX RISE 1/

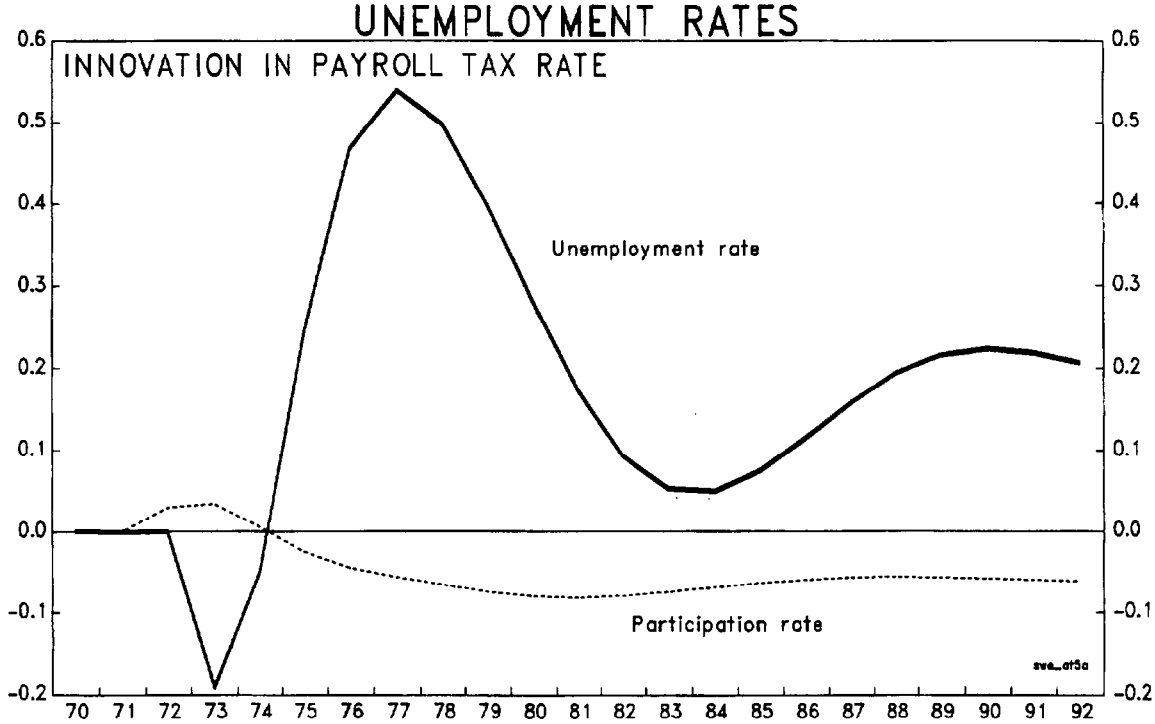


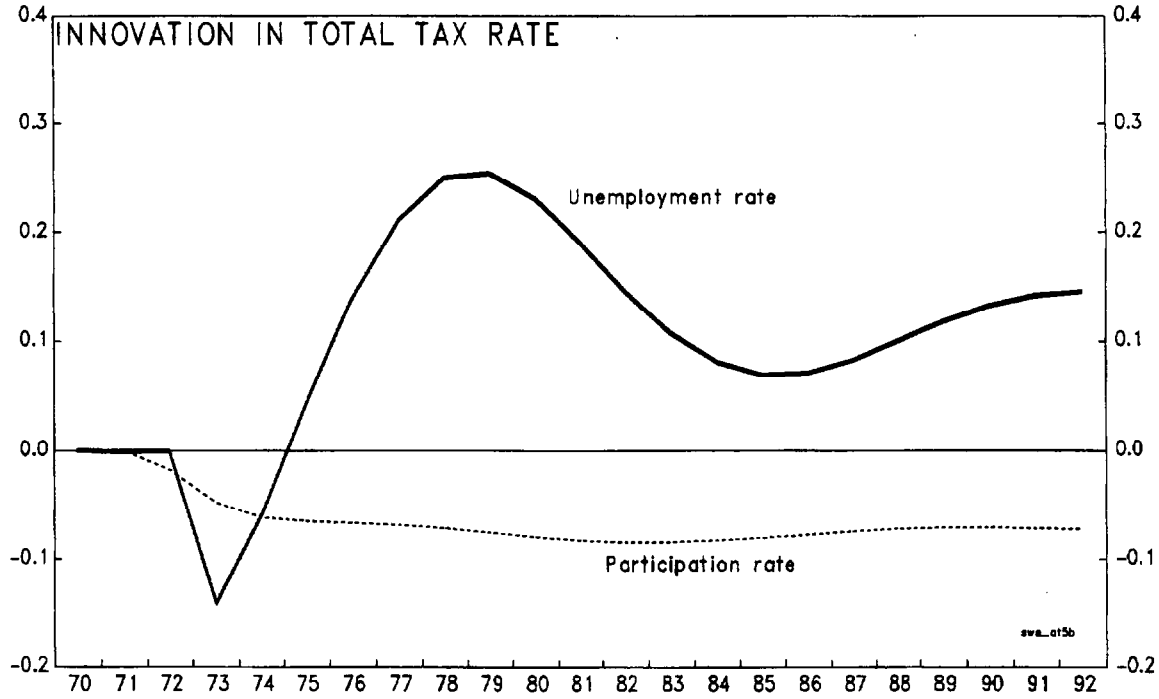


1/ Shaded area indicates confidence interval.

FIGURE 5
SWEDEN

IMPULSE RESPONSES FOR PARTICIPATION AND UNEMPLOYMENT RATES





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