LABOR MARKET POLICY, UNEMPLOYMENT, AND WAGES*
A VAR-model for Sweden 1969–1990

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Abstract

I estimate a six variable VAR-model on Swedish labor market data 1969:3–1990:2. First, I find that job creation programs can push unemployment down in the short run without making real wages increase faster. The confidence interval, in other words, rules out complete crowding out, but it also rules out no crowding out. Second, shocks to unemployment leads to increases in job creation programs while labor market training is not affected.

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1 Background

This text was originally written as a section in a summary of the research project "Job creation measures as stabilization policy measure". Contrary to the other sections, which summarized research papers, this was original work. It was published in Swedish in an official government report, Ohlsson (1993). Recently the report has been translated to English, my contribution is Ohlsson (1995).

Some colleagues have found the work interesting, but also that the account of the estimations results are not thorough enough to allow for independent interpretation. The objective of this note is to remedy this. There are two main additions to the previous text: First, the discussion about crowding out as illustrated by Figure 1b. Second, the detailed report of the univariate estimation results (Table 2) and the corresponding residual correlations (Table 3). Otherwise, there are only editorial changes.

2 Evidence

The question that this note addresses is how the volume of job creation programs affects important macroeconomic target variables. How, above all, have the programs affected unemployment and wages in the short and long run? To study the relationships between job creation programs and other macro variables, I have estimated a vector autoregression model (a VAR model) for the period from the 3rd quarter of 1969 to the 2nd quarter of 1990.

The model variables of the model are the number of unemployed, the number of people in job creation programs, and the total number of people included in labor market training and youth teams. These variables are calculated as shares of the labor force. Three more variables are also included. The first is the percentage change in the real product wage, i.e. the companies' labor costs (including taxes) per hour relative to the sales prices which they receive. The second variable is the percentage change in productivity, i.e. production per hour, and the third is the percentage change in the price/tax wedge.[1]

To estimate a VAR model means seeking patterns in available data, with no assumptions. As opposed to empirical specifications derived from theoretical models which predict the way the variables will affect each other, this approach puts no theoretical restrictions on the way the variables affect one another internally. Instead, earlier values for all the variables are included as explanatory variables in all the equations. For example, in the equation

[1]This wedge is the difference between the real product wage and the real consumption wage, which is the households' net wage per hour in relation to the households' purchase prices (including tax) per consumed unit. The price/tax wedge changes if indirect or direct taxes change, and if the companies' profit margins change.

where unemployment is the dependent variable, unemployment in previous quarters is included as an explanatory variable together with the values of the other five variables for previous quarters. In the model, values with lags up to three quarters are included.[2] The VAR model is characterized by its emphasis on the importance of lagged values. The strength of the VAR model is its broad approach, while a weakness is that by definition it is not based on any theory.

With the help of the estimated VAR model we can study such things as the effects of changes in policy, e.g. of changes in labor market policy. We will concentrate primarily on two so-called impulse response experiments with the estimated model. An impulse response calculation means examining how a shock to one of the variables included affects all the other variables in the model, both in the short run and later when the shock reproduces itself through the model and gives rise to indirect effects. The channels for these responses are the previous values of the variables that are included as explanatory variables. With this model it is possible to make six different experiments – that is, shocks to each one of the variables. It is possible to obtain a time profile for each variable in each experiment.

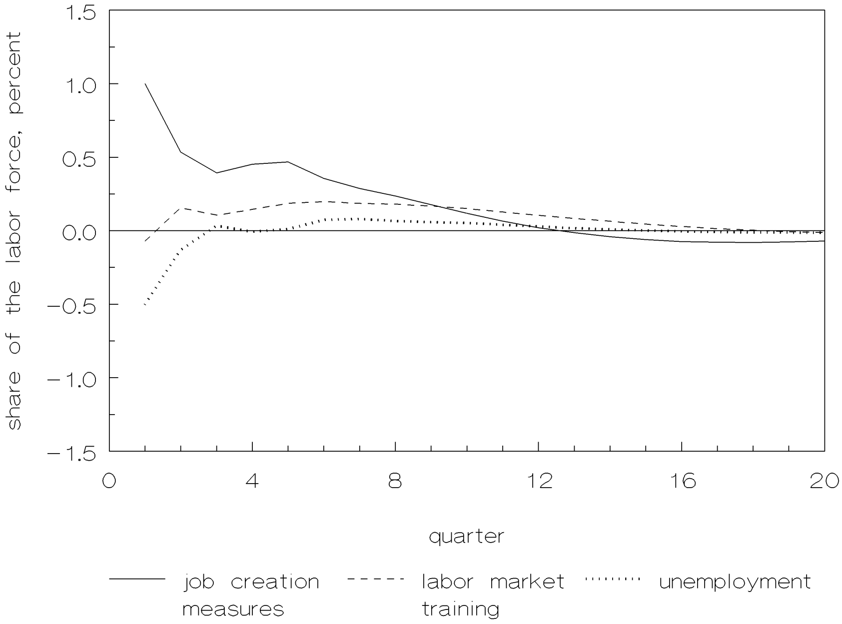
Let us begin by looking at what happens in the model when a shock occurs to the number of people in job creation programs. It must be emphasized that it is a question of shock, not of increased sensitivity to unemployment. Suppose that the increase in the share of people in job creation programs corresponds to one percent of the labor force. Figure 1a shows the time profile for unemployment, job creation programs and labor market training. Unemployment falls during the first quarter, while labor market training remains unchanged. In the longer run, when the effects of all interdependencies have worked through the system, the job creation programs return slowly to their original level while unemployment returns to its earlier level considerably faster.

It is possible to compute the standard deviations for impulse responses.[3] It then appears that the increase in the share of people in programs during the first five quarters and the decrease of unemployment in the first quarter differ more than two standard deviations from zero. On the other hand, the other impulse responses are zero. The real wage increases are positive in the first two quarters, becoming negative again later. However, the impulse responses do not differ from zero in a statistical sense.

Figure 1b shows the two standard deviations confidence intervals for the impulse responses of unemployment. The first quarter response to an

[2]The approach used is the simplest possible: apart from those variables that have been described, only seasonals are included. There are considerably more sophisticated approaches, for instance using the levels of all the variables, making use of the fact that some variables can have common trends, identifying the system in a way that has a more structural interpretation, etc.

[3]This can be done with the help of so-called Monte Carlo simulations.



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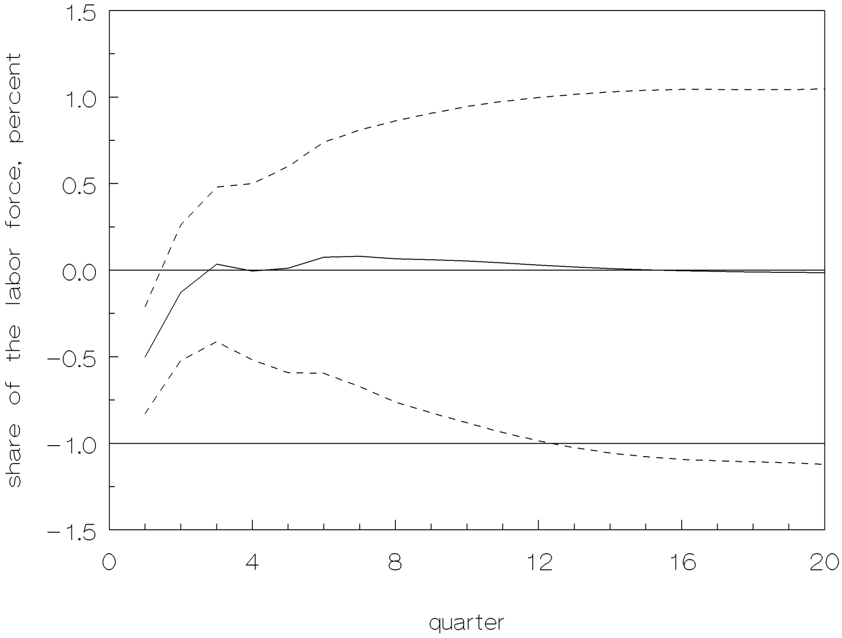

b

Figure 1: The effects of a one percent increase in the share of people in job creation programs during quarter 1

increase in job creation programs, corresponding to one percent of the labor force, is an unemployment reduction of a half percent of the labor force. This suggest that the crowding out is 50 percent. The confidence interval rules out full crowding out (impulse response = 0) but also no crowding out (impulse response = -1). The interval is from -0.2 percent to -0.8 percent of the labor force.

The most important conclusion to be drawn from this experiment is that job creation programs can push unemployment down in the short run without making real wages start to rise faster. The question of how the volume of the labor market policy measures influences wage setting is a controversial one. Various empirical investigations have produced different results. The results for the period in question, with the approach used here, are clear-cut. They conform to those studies which suggest that there is room for an active labor market policy without there being any effect on wage setting.

A second experiment starts with a shock to unemployment during the first quarter, corresponding to one percent of the labor force. In the short run unemployment is still higher during the following quarters, see Figure 2. For the first six quarters the increases in unemployment are more than two standard deviations above zero. The increase in unemployment leads an increase in the share of people in job creation programs.[4] This increase is significantly different from zero until quarter 6. The share in labor market training, however, is not much affected by the increase in unemployment. None of the impulse responses deviates from zero in a statistical sense. This is another expression of the fact that it is job creation programs rather than labor market training which have been the main stabilization policy measure, as a part of the overall labor market policy, during the period studied. Admittedly the real wage increases in the second and third quarters are positive, after which they become negative; note, however, this experiment produce impulse responses for real wage changes that are significantly different from zero.

A shock to the share of people in labor market training does not cause significant impulse responses for unemployment, job creation programs or real wage changes. However, the share in labor market training will be significantly higher during five quarters.

To sum up: these experiments with the estimated model thus show that a shock to the share of people in job creation programs pushes unemployment down in the short run, without causing bigger wage increases. Further, a shock to unemployment leads to a rise in the share of people in job creation programs. Both the share of unemployed and the share in job creation

[4]To identify the model, the number of contemporaneous effects during the first quarter must be restricted to zero. I decided among other things to set the contemporaneous effect of unemployment on job creation programs to zero.

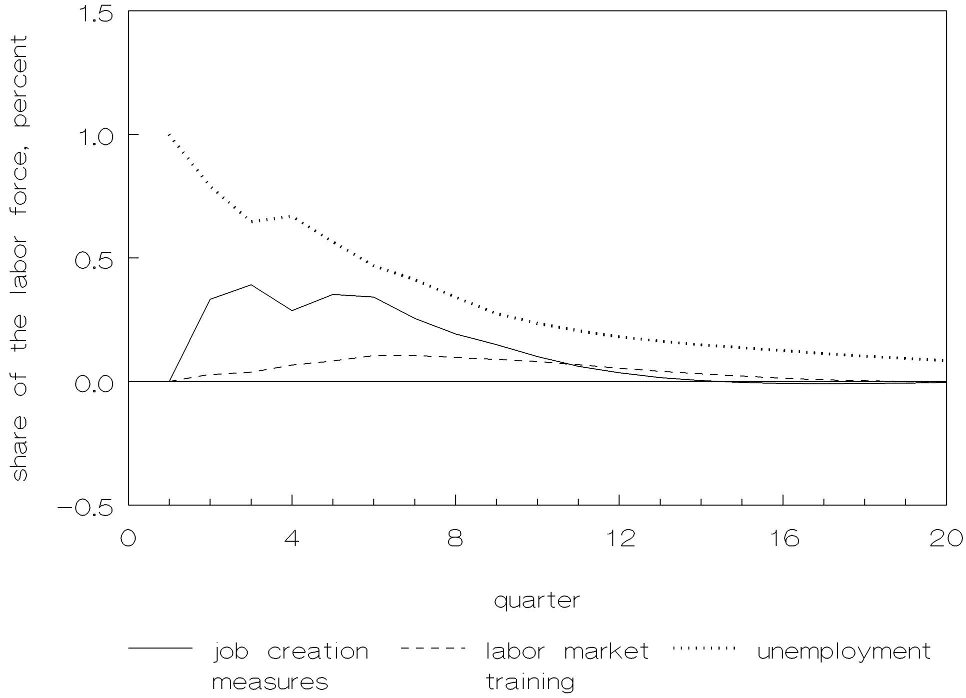

Figure 2: The effects of a one percent increase in the share of unemployed people during quarter 1

programs are significantly higher for six quarters.

The properties of estimated VAR models are also often described with the help of variance decomposition. To make such a decomposition, it is first necessary to transform the shocks (or error terms) that influence each of the dependent variables, so that the shocks to the respective variables are not correlated with each other. (The interpretation of impulse responses is also facilitated if the shocks are independent of each other.) In our case this implies for example that the shocks to the equation where unemployment is the dependent variable shall not be correlated with the shock to the equation for job creation programs. When this transformation has been made, the forecast errors generated by the model are computed for a certain amount of future time. This is performed for all the variables. Finally, the shares of these errors which can be attributed to changes in respective variables are computed.

Table 1 shows the variance decompositions for three time horizons, one, four and twenty quarters. As is clear from the table, the largest shares of variances are explained by the own shocks. Apart from this, the variance for four quarters ahead for job creation programs depends to a relatively large extent on the shocks to unemployment. The importance of unemployment is at its peak at a time horizon of six quarters. In the long run, however, its importance declines. Further, shocks to job creation programs are important to the variance of labor market training in the longer run. The contribution to the variance is at its peak at a time horizon of twelve quarters.

In the long run, shocks to real wage changes are of great importance to the unemployment variance. The job creation programs are very important in the very short perspective: for a time horizon of one quarter, the share is 14 percent.

Table 2 reports the univariate estimation results. It should, however, be stressed that the basic idea of a VAR model is the multivariate approach. The properties of the estimated model are best studied using, e.g., impulse responses and variance decompositions. The properties of a single estimated equation may say very little about how the full model behaves.

The Q-tests shows that there is no residual autocorrelation except for the tax wedge equation. Two tests for each variable group (lag 1 – lag 3) are reported, a t-test for the sum of the estimated coefficients and an F-test for excluding the group. The sum of the unemployment coefficients in the job creation programs equation are only on the border of being significant (t-value $= 1.85$) while excluding the group of variables is rejected (p-value of F-test $= 0.002$). The seemingly contradictory results are because the estimated coefficients have different signs.

If we instead look at the estimated job creation programs coefficients in the unemployment equation, the sum is not significant and exclusion cannot be rejected. How can this be reconciled with the results of the impulse response? It is important to remember that the right hand side variables

Table 1: Variance decomposition, 1969:3–1990:2.

variance for	quarters ahead	depends on shocks to (percent) jcp	lmt	Δq	$\Delta\theta$	u	Δw
job creation programs	1	100	0	0	0	0	0
	4	67	2	5	2	22	1
	20	32	11	13	14	16	15
labor market training	1	2	98	0	0	0	0
	4	10	80	5	2	2	2
	20	24	48	7	5	9	7
productivity change	1	0	1	99	0	0	0
	4	3	1	75	1	7	13
	20	4	3	65	4	10	14
tax wedge change	1	0	0	13	87	0	0
	4	2	2	12	81	3	0
	20	3	3	12	71	5	6
unemployment	1	14	0	1	0	85	0
	4	5	1	6	5	73	9
	20	2	4	16	17	30	32
real wage change	1	0	1	0	11	0	88
	4	2	1	2	8	5	82
	20	2	2	4	12	7	73

Note: the abbreviations in the table are as follows:
jcp = share in job creation programs
lmt = share in labor market training and youth teams
Δq = percentage change of productivity
$\Delta\theta$ = percentage change in price/tax wedge
u = share of unemployed
Δw = percentage change in real product wage

Table 2: The estimated model, 1969:3–1990:2.

	jcp	lmt	Δq	Δθ	u	Δw
sum of estimated coefficients (lag 1 – lag 3):						
job creation programs	0.816	0.137	0.004	0.011	0.064	-0.006
	(8.66)	(3.01)	(0.32)	(0.66)	(0.50)	(0.28)
	[0.000]	[0.001]	[0.214]	[0.154]	[0.340]	[0.508]
labor market training	-0.194	0.797	-0.013	-0.004	-0.122	0.002
	(1.28)	(10.9)	(0.68)	(0.15)	(0.59)	(0.05)
	[0.038]	[0.000]	[0.889]	[0.501]	[0.649]	[0.995]
productivity change	0.280	0.172	0.628	0.148	-3.183	0.046
	(0.30)	(0.38)	(5.52)	(0.92)	(2.50)	(0.22)
	[0.377]	[0.895]	[0.000]	[0.628]	[0.100]	[0.313]
tax wedge change	0.296	-0.415	0.045	0.439	2.789	-0.382
	(0.35)	(1.00)	(0.43)	(2.98)	(2.39)	(1.96)
	[0.971]	[0.570]	[0.820]	[0.000]	[0.113]	[0.188]
unemployment	0.093	-0.024	0.007	-0.013	0.905	-0.010
	(1.85)	(1.01)	(1.12)	(1.50)	(13.3)	(0.87)
	[0.002]	[0.567]	[0.144]	[0.146]	[0.000]	[0.257]
real wage change	0.086	0.387	0.213	0.047	-1.781	0.654
	(0.11)	(1.07)	(2.33)	(0.36)	(1.74)	(3.84)
	[0.720]	[0.686]	[0.089]	[0.948]	[0.358]	[0.001]
R^2	0.87	0.92	0.57	0.47	0.90	0.38
adj R^2	0.82	0.90	0.43	0.29	0.87	0.17
SEE	0.155	0.075	0.019	0.027	0.211	0.035
Durbin–Watson	2.23	1.94	2.09	2.16	1.97	1.99
$Q(22)$, p-value	0.099	0.067	0.687	0.000	0.397	0.370
F, p-value	0.006	0.000	0.000	0.002	0.000	0.036

Notes. 84 observations, 62 degrees of freedom. Absolute t-values within parentheses, p-values for F-test when excluding the group of variables within brackets. Constants and seasonals are included in all estimations. The row for $Q(22)$ reports the marginal significance level for Ljung–Box' Q-statistics for residual autocorrelation with 22 degrees of freedom. The null hypotheses are that the residuals are white noise.

Table 3: The estimated correlation matrix of residuals.

	lmt	Δq	$\Delta\theta$	u	Δw
job creation programs	-0.15	-0.02	0.03	-0.37	0.07
labor market training		-0.07	0.01	0.07	0.07
productivity change			-0.37	0.12	-0.07
tax wedge change				-0.03	0.33
unemployment					-0.01

are all lagged. The impulse response suggests a contemporaneous effect of job creation program on unemployment. By construction, this is the result of the estimated cross equation residual correlations and not directly of the estimated coefficients.

Table 3 reports correlation matrix of the residuals. The correlation between job creation program residuals and unemployment residuals is -0.37. This is what drives the impulse response result. There are two more correlations that are of considerable size, those between the productivity change residuals and the tax wedge change residuals and between the tax wedge change residuals and the real wage change residuals.

3 Conclusions

I estimate a six variable VAR-model on Swedish labor market data 1969:3–1990:2. First, I find that job creation programs can push unemployment down in the short run without making real wages increase faster. The confidence interval, in other words, rules out complete crowding out, but it also rules out no crowding out. Second, shocks to unemployment leads to increases in job creation programs while labor market training is not affected.

References

Ohlsson, H., (1993), Sysselsättningsskapande åtgärder som stabiliseringspolitiskt medel (Job creations measures as a stabilization policy measure), in *Politik mot arbetslöshet*, betänkande av expertgruppen för arbetsmarknadspolitiska utvärderingsstudier (*Policy against unemployment*, official government report). SOU 1993:43.

Ohlsson, H., (1995), Job creation programmes as stabilization policy measures, in EFA, *Labour market policy at the crossroads*, forthcoming.