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Labor market programs, the discouraged-worker effect, and labor force participation

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Abstract

This paper estimates the macroeconomic effect of labor market programs on labor force participation. Labor market programs could counteract business-cycle variation in the participation rate that is due to the discouraged-worker effect, and they could prevent labor force outflow. An equation that determines the participation rate is estimated with GMM, using panel data (1986-1998) for Sweden's municipalities. The results indicate that labor market programs have relatively large and positive effects on labor force participation. If the number of participants in labor market programs increases temporarily by 100, the labor force increases immediately by around 63 persons. The effect is temporary so the number of participants in the labor force returns to the old level in the next period. If the number of participants in programs is permanently increased, the labor force increases by about 70 persons in the long run. Programs are reducing the business-cycle variation in labor force participation because the effect is positive and programs are counter-cyclical and

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they counteract the discouraged-worker effect in the long run. The results indicate that programs could prevent labor force outflow; participants who would have left labor force in the abscence of programs are may now be participating because of the programs. Wages and vacancies have positive long- and short-run effects on participation rate. Open unemployment, the job destruction rate, and proportions of persons between ages 18-24 and 55-65 have negative long run effects on the participation rate.

- Keywords: Labor supply, Labor market programs, Dynamic panel data
- JEL-Code: E64, J68, J22

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1 Introduction

Sweden's labor force participation rate (the number of persons in the labor force relative to the number of persons in the working age population) decreased sharply in the 1990s, from on average 84 % during the late 1980s to 79 % in the 1990s. This decrease in the participation rate occurred while the unemployment rate, measured in terms of the working age population, increased from on average 2 % to almost 6 %. A large increase in the number of persons participating in labor market programs paralleled the rise in unemployment. The number of participants in labor market programs in relation to the working age population rose from around 1 % in the late 1980s to more than 3 % in the 1990s.

Part of the large increase in labor market programs has been evaluated, see the overview by Calmfors, Forslund, and Hemström (2002). Results from studies of macro-economic effects of labor market programs on the Swedish labor market indicate that labor market programs affect labor demand. For example, Dahlberg and Forslund (1999) find significant direct displacement effects on regular employment from use of labor market programs. The results in Forslund and Kolm (2000) indicate that the number of persons in labor market programs does not affect wage setting. This study focuses on effects of programs on labor supply. This question has become more important in recent years, when labor shortage has been a problem - not high unemployment as in the early the 1990s. One positive effect of labor market programs is that they could prevent labor force outflow, which could be important as Sweden's labor force is expected to decrease, because of the demographic structure.

Labor market programs may affect the labor force participation in several ways: (1) programs could affect income of the unemployed. For some programs, program participants are paid more than the unemployment benefits; (2) programs could result in a higher job-offer probability, by, for example, affecting participants qualifications and thus increasing future income; (3) programs have been used to qualify for new periods of unemployment benefits. Taken together, programs could increase labor force participation, because they directly or indirectly could increase income and thus the value of labor force participation. Labor market programs have been used extensively in Sweden, so their effect on participation could be non-negligible.

Labor force participation data have a clear pattern, where changes in the participation rate are strongly and positively correlated with changes in employment, which indicates strong business-cycle variation in the participation rate. Flows between nonparticipation and employment are also pro-cyclical. Business-cycle variation in real wages in Sweden is relatively small, so shocks to real wages could not be the only explanation behind pro-cyclical movements of the participation rate. The discouraged-worker effect is a candidate for explaining business-cycle fluctuation in the participation rate. According to the discouraged-worker effect, the participation rate will decrease when it is difficult to get a job and increase when it is easy to find a job so that people move in and out of labor force - depending on the state of the business cycle. Labor market programs can reduce variation in labor force participation that is due to the discouraged-worker effect because programs are typically counter-cyclical.

Empirical studies indicate that the discouraged worker effect is present. The effect of labor market programs on labor force participation has not been studied internationally, but some attempts were made on Swedish data. Using Swedish time series data, Wadensjö (1993) finds that unemployment and labor market programs affect the change in labor force participation. Labor market programs have a positive effect and unemployment has a negative effect on labor force participation. He concludes that more studies must be done because the estimated sizes of the effects are sensitive to the specification and to the included trend term in the equation. Using Swedish time series data, Johansson and Markowski (1995) estimate an equation for the change in labor force participation rate with the change in regular employment and the change in labor market programs - divided by the change in the working-age population. Both employment and labor market programs have a positive effect on labor force participation. Dahlberg and Forslund (1999) estimate direct displacement effects of labor market programs in Sweden, and their results indicate that labor market programs are increasing labor force participation, because the estimated displacement effect is larger when employment is divided by labor force than when divided by population. Taken together, empirical results on Swedish data indicate that the state of the business cycle and labor market programs have effects on labor force participation.

This paper estimates the macro-economic effect of labor market programs on labor force participation. Swedish empirical results, regarding the effect of labor market programs on labor force participation, are either obtained indirectly, as in Dahlberg and Forslund (1999), or obtained using time series data. In this study, the focus is on effects on the participation rate during the extreme labor market situation in the 1990s. The data set is richer than those used by Johansson and Markowski (1995) and Wadensjö (1993), and instrument variables are used in the estimation.

The rest of the paper is organized like this: Section 2 presents the theoretical background for the estimations. Section 3 contains a description of the data, and Section 4 contains the estimation results. Section 5 presents a discussion of the results.

2 The theoretical model

This section presents a theoretical model for how the labor force participation decision is determined. In the empirical analysis, the theoretical implications are used to suggest which variables to include in the estimation and to determine the theoretical effect on participation rate. The model is based on Holmlund and Lindén (1993) and Calmfors and Lang (1995), and extended with endogenously determined labor force participation, as in Pissarides (1990). Holmlund and Lindén (1993) and Calmfors and Lang (1995) study the macroeconomic effects of labor market programs. In Holmlund and Lindén, participants in programs are assumed to search less effectively than the openly unemployed. In Calmfors and Lang programs prevent lower search effectiveness. Here, the search effectiveness of program participants is unrestricted.

It is assumed that individuals compare the value of non-participation with the value of labor force participation when deciding whether or not to participate in the labor force. Nonparticipants decide to participate in the labor force if the value of participating is greater than the value of nonparticipation. Likewise, participants decide to leave the labor force if the value of nonparticipation is greater than the value of participating. More people will participate in the labor force if the value of participation increases. Working hours are assumed to be fixed.[1].

The value of nonparticipation is for example the value of leisure, the value of education, or values of other activities in which nonparticipants are engaged. The value of nonparticipation, l_i, consists of two parts: (1) one common component, $f(z)$, that describes the impacts of variables out-

[1]The reason for this assumption is that in the empirical analysis data on number of hours worked are not available.

side the theoretical model, for example age, number of children and supply of day-care services; (2) one individual-specific component, modelled as a stochastic shock to preferences, which is uniformly distributed between $\eta_{\min}$ and $\eta_{\max}$. The value of nonparticipation for an individual is

$$l_i = f(z) + \eta_i. \tag{1}$$

It is assumed that $f'(z)$ is positive[2]. η_i is the realization of the individual-specific shock. The labor force participant who is indifferent between labor force participation and nonparticipation has $l_i = \delta\Lambda$, where Λ is the value of participating in labor force and δ the discount factor. The cut-off value, η_*, for the marginal participant is given by

$$\eta_* = \delta\Lambda - f(z). \tag{2}$$

The number of participants is the integral of the density function for η up to the cutoff value:

$$\int_{-\infty}^{\eta_*} \frac{1}{\eta_{\max} - \eta_{\min}} d\eta = \frac{\eta_* - \eta_{\min}}{\eta_{\max} - \eta_{\min}} \tag{3}$$

η is assumed to be uniformly distributed, so the solution to equation (3) is the participation rate. The participation rate is the number of participants in labor force, $lf = \eta_* - \eta_{\min}$, divided by the number of persons in the working age population, $pop = \eta_{\max} - \eta_{\min}$. Substitute the expression for η_* in equation (2) in equation (3) to express the participation rate as a function of the variables in the model:

$$\frac{lf}{pop} = \frac{\delta\Lambda - f(z) - \eta_{\min}}{\eta_{\max} - \eta_{\min}}. \tag{4}$$

The participation rate depends positively on the discounted value of participating in labor force, $\delta\Lambda$. The effect of $f(z)$ on the participation rate is negative, because $f'(z)$ is assumed to be positive and $f(z)$ and $\delta\Lambda$ do not contain the same variables.[3]. To summarize, the model predicts that the

[2]This assumption is not restrictive because variables that increase value of leisure could be included in the z-vector with a negative sign.

[3]If Λ and $f(z)$ contain the same variables, it is assumed that the positive effect of variables in Λ is small relative to the negative effect of $f(z)$. In a model with endogenously determined value of leisure, the value of leisure depends on parameters in the utility function. The value of leisure will be increasing in wealth; a variable that could be affected by the same variables as Λ. It is assumed that possible effects from wealth are small.

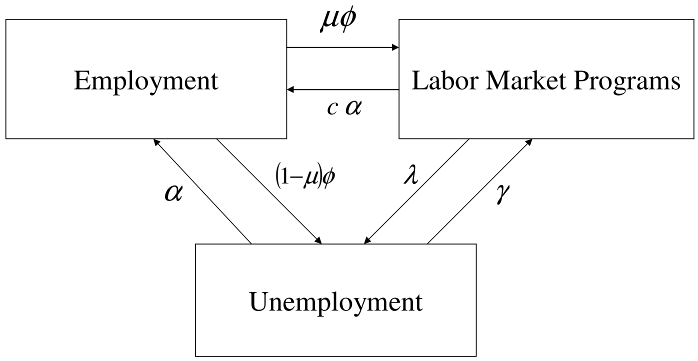

Figure 1: The states and flows in the labor market for labor force participants

participation rate increases in the same variables that increase the value of labor force participation, Λ.

Figure 1 describes the states and flows in the labor market for labor force participants. The number of persons in each state is expressed in terms of the working-age population, and the population is assumed to be fixed. Labor force participants could be employed, e, openly unemployed, u, or participating in labor market programs, r. The states and the flows are the same as in Holmlund and Lindén (1993).

The job separation rate is denoted ϕ and represents exogenously given negative shocks to the firms that result in decreased regular employment. A fraction $(1-\mu)$ of the number of persons that are separated from a job become unemployed, and a fraction μ is placed in a program.[4] The probability of getting a place in a program if openly unemployed is γ, and the probability of becoming unemployed after program participation is λ.

The firms are opening vacancies, and the openly unemployed and participants in labor market programs search for vacant jobs.[5] The number of matches depends on the number of vacancies and on the number of searchers, that is, the number of openly unemployed and participants in labor market programs. Increased labor market tightness, θ, (the number of vacancies divided by the number of searchers) increases the probability of getting a job offer, $\alpha(\theta)$.[6]

[4]It is possible to go directly from regular employment to a program. This is so because data are yearly and sometimes only a short period of unemployment was required to be eligible to participate in a program.

[5]There is no on-the-job search in the model.

[6]To see this, assume that the number of hirings is determined by $h = h(v, s) =$

The probability of getting a job differs between the unemployed and the participants in labor market programs; the c parameter captures this difference. If c is greater than one, labor market programs have positive effects on the job-offer probability for the program participants compared to the openly unemployed. If c is less than one, program participants have smaller chances of getting a job offer than the openly unemployed. One reason could be that program participants search less than openly unemployed.

The discounted value of the different states (employment, $\delta\Lambda_e$, open unemployment, $\delta\Lambda_u$, and program participation, $\delta\Lambda_r$) is computed as the discounted income in each state - accounting for the probability of changing state and the income in the new state.

$$\delta\Lambda_e = [w + (1-\mu)\,\phi\,(\Lambda_u - \Lambda_e) + \mu\phi\,(\Lambda_r - \Lambda_e)] \tag{5}$$

$$\delta\Lambda_r = [\rho_r w + c\alpha\,(\Lambda_e - \Lambda_r) + \lambda\,(\Lambda_u - \Lambda_r)] \tag{6}$$

$$\delta\Lambda_u = [\rho_u w + \alpha\,(\Lambda_e - \Lambda_u) + \gamma\,(\Lambda_r - \Lambda_u)] \tag{7}$$

Employed workers earn w and the conditional probabilities of open unemployment or participation in a program are $(1-\mu)\,\phi$ and $\mu\phi$. Participants in labor market programs earn $\rho_r w$ and with probabilities $c\alpha$ and λ they become employed or openly unemployed. Openly unemployed earn $\rho_u w$, and with probabilities α and γ they become employed or placed in a labor market program. Equations (5)-(7) are used to calculate the value

$h(v, cr+u)$. The number of vacancies, v, and the number of effective searchers, $s = cr + u$, increase the matching function. Assume that all hirings come from the stock of searchers, $h = \alpha s = \alpha(cr+u)$. Then, the job offer arrival rate is $\alpha = h/s = h(v,s)/s$. If constant returns to scale is assumed for the h-function, we can express the job offer probability α as a function of labor market tightness, $\theta = v/s$. With constant returns to scale $\alpha = h(v,s)/s = h(v/s,1) = h(\theta,1) = \alpha(\theta)$, where $\theta = v/s$, is the labor market tightness. The job-offer probability α is increasing in labor market tightness θ.

of the states for labor force participants.[7]

Program participants accept a job offer if the value of employment is greater than the value of participating in a program, $\Lambda_e \geqslant \Lambda_r$. The condition is:

$$\phi(1-\mu)(\rho_r-\rho_u)+(\alpha+\gamma+\delta)(\rho_r-1)+\lambda(\rho_r-1)\leqslant 0 \qquad (8)$$

In the most realistic case when $\rho_u \leqslant \rho_r \leqslant 1$, the condition could be violated if the difference between the replacement rates is large enough. If $\rho_u < \rho_r = 1$, the condition in (8) is satisfied if $\phi(1-\mu) \geqslant \lambda$, so the flow from employment into unemployment must be greater than or equal to the flow from programs into unemployment. For the special case when $\rho_r = \rho_u = \rho$, the condition in (8) is satisfied if $\rho \leqslant 1$.

Unemployed accept a place in a program if $\Lambda_r \geqslant \Lambda_u$. The condition is:

$$(\phi+\delta)(\rho_r-\rho_u)+\alpha((\rho_r-1)-c(\rho_u-1))\geqslant 0 \qquad (9)$$

When $\rho_r = \rho_u < 1$, the condition in (9) is satisfied if $c \geqslant 1$. The parameter c captures all differences in the probability of getting a job-offer between program participants and openly unemployed. The job-offer probability for program participants has to be at least as large as for openly unemployed, because the replacement rates, and therefore income, is the same. On the other hand, if $c < 1$, program participants have to be compensated for the decreased probability of getting a job, so $\rho_r > \rho_u$. Note that if programs are used to qualify unemployed for new periods of unemployment benefits, it would increase the value of Λ_r. This effect of programs is not included in the model.

[7] The expression for the values of the states are the following:

$$\begin{aligned}
\Lambda_e &= w(\delta\Delta)^{-1}\{[\phi((1-\mu)(\delta+c\alpha)+\lambda)]\rho_u+[\phi(\mu(\alpha+\delta)+\gamma)]\rho_r+ \\
&\quad +\delta[\delta+\alpha(c+1)+\gamma+\lambda]+\alpha[\lambda+c(\gamma+\alpha)]\} \\
\Lambda_r &= w(\delta\Delta)^{-1}\{[\delta(\gamma+\delta+\alpha+\phi)+\phi(\gamma+\mu\alpha)]\rho_r+ \\
&\quad +[\phi(\lambda+c\alpha(1-\mu))+\delta\lambda]\rho_u+\alpha[c(\alpha+\delta+\gamma)+\lambda]\} \\
\Lambda_u &= w(\delta\Delta)^{-1}\{[(\delta+\phi+\lambda+c\alpha)\delta+\phi(c(1-\mu)\alpha+\lambda)]\rho_u+ \\
&\quad +[\phi(\gamma+\mu\alpha)+\delta\gamma]\rho_r+[\delta+c(\gamma+\alpha)+\lambda]\alpha\} \\
\text{where } \Delta &= (\delta+c\alpha+\lambda)(\delta+\phi+\alpha)+\gamma(\delta+\phi+c\alpha)+(1-c)\alpha\mu\phi.
\end{aligned}$$

Unemployed accepts a job offer if $\Lambda_e \geqslant \Lambda_u$. The condition is:

$$\mu\phi\left(\rho_r - \rho_u\right) + \gamma\left(\rho_r - 1\right) + \left(\delta + \lambda + c\alpha\right)\left(\rho_u - 1\right) \leqslant 0 \qquad (10)$$

When $\rho_r = \rho_u = \rho$, the condition in (10) is satisfied if $\rho \leqslant 1$. Taken together, the self selection constraints imply that $\Lambda_e \geqslant \Lambda_r \geqslant \Lambda_u$. Restrictions on the policy parameters, $\lambda, \gamma, \mu, \rho_r$, and ρ_u are needed to satisfy the selection constraints.

The labor force participation rate depends positively on the value of participating in the labor force, Λ, see equation (4). Flow from nonparticipation into regular employment is allowed if the value of nonparticipation for the marginal participant is equal to the value of being employed, Λ_e.[8] So the cutoff value, η_*, in equation (2) is the value where $l_i = \delta\Lambda_e$. *Table* 1 displays how the values of the states in the labor market and the participation rate are affected by changes in the model's parameter.

An increase in wages, w, increases the value of participation and thus increases the labor force participation. The number of participants in labor market programs, r, is formulated in terms of the flows. Increased inflows into programs, γ and μ, have positive effects if the value of participating in a program is larger than being openly unemployed, that is, $\Lambda_r - \Lambda_u \geqslant 0$. And increased outflows from programs into unemployment, λ, have negative effects if $\Lambda_r - \Lambda_u \geqslant 0$. It will be better to participate in a program than being openly unemployed if obtained benefits are higher when in a program than when openly unemployed, see the selection constraint in (9). This has been the case for some programs. Often, participants in job creation programs are paid more than the unemployment benefit, while participants in training programs receive the unemployment benefit. It will also be better to participate in a labor market program than being openly unemployed if programs increase the job-offer probability. Furthermore, if programs are used to qualify for new periods of unemployment

[8]Normally it is assumed that nonparticipants do not search for jobs. The value of participating in the labor force, Λ, is then the value of unemployment, Λ_u, because one period of unemployment - and search - is necessary to get a job-offer. Empirically, the flow from nonparticipation directly to regular employment is large and procyclical in many countries, see for example Burda and Wyplosz (1994). To allow for flow from nonparticipation into regular employment, the value of participating in labor force is Λ_e. Λ_u is the value of being registered at an employment office. The empirical implications are the same, irrespective of the definition of the value of labor force participation, because the signs of the effects of changes in the model's variables are the same for all states.

Table 1: Effects on the labor force participation rate

Increase in	**Effect on**				
	Λ_u	Λ_r	Λ_e	participation rate	
w	+	+	+	+	
γ	+	+	+	+	if $\Lambda_r - \Lambda_u \geqslant 0$
μ	+	+	+	+	if $\Lambda_r - \Lambda_u \geqslant 0$
λ	-	-	-	-	if $\Lambda_r - \Lambda_u \geqslant 0$
$\alpha(\theta)$	+	+	+	+	
ϕ	-	-	-	-	if $\rho_r, \rho_u \leqslant 1$
ρ_r	+	+	+	+	
ρ_u	+	+	+	+	
c	+	+	+	+	if $\Lambda_e - \Lambda_r \geqslant 0$

benefits, the value of programs relative open unemployment increases. These direct effects of programs are positive.

An increase in *labor market tightness*, $\theta = (v/(u + cr))$, that is, the number of vacancies divided by the number of effective job-searchers, increases the job-offer probability. The value of being employed is higher than the value of being unemployed or in a program. So the value of labor force participation is increased if it is easy to find a job. An increased number of vacancies, v, increases the probability of finding a job and is expected to have a positive effect on labor force participation. An increased number of openly unemployed, u, increases the number of persons searching for jobs and, for a given number of vacancies, it is now more difficult to find a job. So an increase in open unemployment is expected to have a negative effect on the labor force participation rate. It is the dependence of the job-offer probability, $\alpha(\theta)$, on labor market tightness that gives rise to the discouraged worker effect in the model because labor market tightness is pro-cyclical. An increased number of program participants increases the number of job-searchers for given numbers of vacancies and openly unemployed and a given relative effectiveness of programs, c. This is expected to decrease the labor force participation rate because the probability of getting a job decreases.

An increased job separation rate, that is, negative employment shocks, ϕ, increases the probability of being openly unemployed. This is expected to have a negative effect on the labor force participation rate because the probability of getting a lower income has increased since unemployment benefits are lower than wages. ρ_r and ρ_u are the replacement rates (income as a fraction of earnings) during program participation or unemployment. Higher replacement rates increases the value of labor force participation in the same way as increased wages. Finally, if labor market programs increase the job-offer probability, which is captured by the parameter c, an increase in labor force participation is expected, given that $\Lambda_e - \Lambda_r \geqslant 0$.

To summarize, we would expect that higher wages, an increased number of vacancies, an increased number of labor market programs participants, a higher level of unemployment benefits, and increased job-offer probability for program participants positively affect the labor force participation rate. Increased unemployment and negative employment shocks are expected to decrease labor force participation.

3 Data

The previous section concludes that the following variables should affect labor force participation rate: wages, w, vacancies divided by the working-age population, v, open unemployment divided by the working-age population, u, the number of participants in labor market programs divided by the working-age population, r, negative employment shocks, ϕ, the replacements rates, ρ_r and ρ_u, and finally the relative effectiveness of the labor market programs, c.

The data set is a panel consisting of yearly observations from 1986 to 1998 for Sweden's municipalities. The dataset includes 3 692 observations (13 years times 284 municipalities). Description of the dataset, summary statistics and plots of the data are given in Appendix.

3.1 Definition of variables

The number of persons in the labor force is calculated as the sum of the number of persons employed, unemployed and in labor market programs. Nonparticipants are the working age population, ages 18-65, excluding those in the labor force. With this definition, all participants in labor market programs are in the labor force.[9]

[9] This is a difference compared to labor force surveys, where participants in some programs are defined as students and thus outside labor force.

The overall wage, w, is measured by the real average annual labor income, among the employed, in each municipality. Unemployment, u, is measured as the number of unemployed that are registered at an employment office divided by the working-age population. The measure of unemployment is different from labor force surveys, where individuals who search actively are regarded as unemployed.[10] The number of persons registered at an employment office is somewhat smaller than unemployment according to labor force surveys. The aggregate time series variation is almost the same for the two definitions of unemployment, however. Vacancies, v, is measured by the total number of vacancies reported to the labor market office divided by the working-age population. The empirical measure of the number of vacancies covers only a part of the total number of vacancies, because not all vacant jobs are reported to the labor market office.

The constant returns to scale assumption of the hiring function, $h(v, cr + u)$, implies that the job offer probability could be expressed as a function of tightness, $\alpha(\theta) = \alpha(v/cr + u)$. The constant returns to scale restriction is not imposed in the estimation because the number of effective searchers is not observable since data on c are not available. Vacancies, v, open unemployment, u, and program participants, r, are therefore included separately.

The parameters, γ, μ, and λ, describe flows into and out from labor market programs. Data on gross flows are not available; data on stocks are used in the estimation. Therefore, it is not possible to separate positive effects of inflow into programs from negative effects of outflow from programs, because the flow parameters are summarized by the stock. In general, there is no one- to- one correspondence between the stock and the flow parameters in the theoretical model. In steady state, the expression for the stock of participants in labor market programs is $\phi e \frac{\gamma+\mu\alpha}{\alpha(\lambda+c\alpha+\gamma c)}$, where e is employment. It is possible to generate a simple relation between the stocks and the flows where the accommodation ratio, the number of program participants divided by the number of searchers, could be interpreted as the probability of being placed in a program. The accommodation ratio is not used in the estimation because strong restrictions on the flows in and out from labor market programs are needed together with the assumption that $c = 1$,implying that the probability of getting a job-offer

[10] Active search means that contact with an employer should have been taken during the last four weeks.

is the same for openly unemployed and labor market program participants.[11] The number of program participants divided by the working-age population, r, excluding participants in programs directed towards people with disabilities, are used in the estimation. The number of participants in labor market programs captures two effects: (1) one direct positive effect because the value of labor market participation increases with the number of persons in programs; and (2) one indirect negative effect through the job-offer probability, whereby an increased number of participants in labor market programs will increase the number of searchers, which will have a negative competition effect for a given number of vacancies.

The negative shock to employment, ϕ, is measured by the job destruction rate. The job destruction is defined as the absolute sum of negative employment changes in the plants in each municipality. The job destruction rate is calculated as job destruction divided by average employment at each plant in period t and *t-1*. Negative employment changes are not a perfect measure of job destruction; if the number of unfilled vacancies is increased temporarily, it is counted as a negative change in employment; full time jobs and part time jobs can not be separated; job flows within one year and substitution between jobs with different positions within the plant are not considered in the calculation. Data on replacement rates, ρ_r and ρ_u, are not available at the municipality level. So time dummies capture the effect of unemployment benefits. The effectiveness parameter, c, and the discount factor, δ, are also unobservable, and captured by the time dummies.

Some demographic variables are also included in the estimation. They are assumed to have negative effects on the participation rate, and they are included in the z-vector, see equation (4). These variables are the number of persons between ages 18-24 and 55-65, in relation to the number of persons in the working age population, ages 18-65. These age groups have

[11] If inflow rates into programs are the same for openly unemployed and employed, $\gamma = \mu = \varphi$, and if the probability of getting a job-offer is the same for openly unemployed and labor market program participants, $c = 1$, the accomodation ratio, $r/(r+u)$, could be written as $\varphi\frac{1+\alpha}{\varphi+\lambda+\alpha}$. Restrictions on the outflow rate from programs, λ, is needed to obtain a simpler expression. The probability of remaining in the program state, given the job offer rate, could be restricted to be the same as the probability of entering the program state, $1-\lambda = \varphi$. That is, the probability of getting a place in a program is the same for unemployed, employed, and program participants. Then, the accomodation ratio $r/(r+u)$ is equal to the flow parameter φ, and the accomodation ratio could be interpreted as the probability of being placed in a program.

lower participation rates than the average, which reflects the number of students among the younger and that the likelihood of early retirement and sickness pensions increases with age.

The labor force, vacancies, unemployment, and the number of persons in labor market programs are divided by the lagged number of persons in the working-age population $(pop1865)_{t-1}$ instead of current population, to account for the fact that the explanatory variables could affect migration between the municipalities. For example, if the number of vacancies increases both labor force and population, the estimated effect on the participation rate will be lower than the effect on labor force, because population is also increased. If migration is affected, the estimated coefficients will be a mixture of two effects when the variables are divided by current population, because both the numerator and the denominator of the dependent variable is affected. The demographic variables are divided by the current working-age population, and they are included lagged one period. All variables, except the demographic ones, are measured in November each year. The demographic variables are based on the population in the municipalities in December each year. *Table 2* summarizes definitions of the variables in the estimations and the expected effects on the participation rate.

Table 2: Variable definitions

Variable	**Definition**	**Effect**
lf	number of persons in labor force$_t$/pop1865$_{t-1}$	
w	real annual income for employed$_t$	+
v	number of vacancies$_t$/pop1865$_{t-1}$	+
u	number of unemployed$_t$/pop1865$_{t-1}$	-
r	number of persons in	
	labor market programs$_t$/pop1865$_{t-1}$	+
jdr	job destruction rate$_t$	-
$p1824$	number of persons 18-24 year$_t$/pop1865$_t$	-
$p5565$	number of persons 55-65 year$_t$/pop1865$_t$	-

4 Empirical results

The labor force participation rate is the dependent variable in the estimation, and it is allowed to be affected by wages, vacancies, open unemployment, participants in labor market programs, the job destruction rate and the number of persons between ages 18-24 and 55-65. The model is formulated in steady state and lagged variables are included in the estimation to allow for time to adjust the labor force participation.[12] Therefore, the expected effects from the theoretical model refer to the long run effects in the empirical model. The estimated dynamic panel data model takes the form:

$$\begin{aligned} lf_{i,t} &= \sum_{j=1}^{j=p} a_{1j} lf_{i,t-j} + \sum_{j=0}^{j=p} a_{2j} w_{i,t-j} + \sum_{j=0}^{j=p} a_{3j} v_{i,t-j} + \\ & \sum_{j=0}^{j=p} a_{4j} u_{i,t-j} + \sum_{j=0}^{j=p} a_{5j} r_{i,t-j} + \sum_{j=0}^{j=p} a_{6j} jdr_{i,t-j} + \\ & + a_7 p1824_{i,t-1} + a_8 p5565_{i,t-1} + k_i + k_t + \varepsilon_{i,t}, \end{aligned} \tag{11}$$

where k_i is an unobserved municipality specific effect, and k_t is a time-varying aggregate effect. The model is differenced before estimation, allowing all variables to be correlated with the unobserved municipality specific fixed effect, k_i.

The demographic variables are assumed to be exogenously determined. The economic variables could be endogenously determined, in the main through the definition of the labor force as the sum of employed, openly unemployed and participants in labor market programs. An IV-estimator is also needed because of the lagged dependent variable. The GMM estimator for dynamic panel data models suggested by Arellano and Bond (1991), is used in the estimation. Endogenous variables in levels in *t-2* or earlier are valid instruments for the model in differences.

Lagged economic variables and current and lagged demographic variables are used as instruments in the estimation. Actually, the rules for how Sweden's Labor Market Board allocates money to the local level imply that lagged unemployment and lagged number of program participants

[12] The expression for the participation rate is a long, complicated, nonlinear function of the variables in Λ_e. The estimated dynamic model could be interpreted as an linear approximation of the participation rate.

affect spending on labor market programs, see the discussion in Dahlberg and Forslund (1999). So, use of lagged variables as instruments for the policy variable (the number of participants in labor market programs) is justified by the allocation of spending. One extra instrument that captures municipality-specific employment shocks is used in the estimation. Each industry share of employment in each municipality is calculated. Then, the average aggregate change in employment at each two-digit industry level is applied to the industry share of employment, lagged two periods.

4.1 Estimation results

First, a preliminary model, where all variables are included with two lags, was estimated. The number of lags in the preliminary model is determined as the smallest model that is accepted by the Sargan-statistic and the correlation-test.[13] *Table 3* presents the estimation results. The reported standard errors and p-values for the second-step estimation, are calculated with the small sample correction suggested by Windmeijer (2000).[14]Time dummies and a constant are included in the model. The estimation period is 1989-1998.

First we can note that the Sargan statistic and the correlation tests accept the model, and that the estimated coefficients and standard errors are almost the same in the first- and second-step estimation. Insignificant variables, at the 10 % level, were then deleted from the preliminary model. Lagged vacancies are kept because the p-value in the first-step estimation is lower than 10 %. The zero-restrictions in the preliminary model that is implied by the reduced model is not rejected by a formal test. The p-value for a Wald test of the hypothesis of zero coefficients on the variables that are deleted from the preliminary model is 0.402 in the second-step

[13] The model was estimated with lags from four to zero. Models with three and two lags are accepted by the Sargan statistic and the correlation tests. Difference Sargan-tests for the number of lags do not reject any of the hypothesis tested.

[14] The instrument matrix contains the endogenous variables at time *t-2* up to *t-4*, the exogenous demographic variables at t up to *t-4*, and the aggregate employment shock at t. This is the smallest number of lagged endogenous variables as instruments that is accepted by the Sargan statistic. The package DPD for Ox, see Doornik, Arellano, and Bond (2001), is used in the estimation. The correlation tests are the m_1 and m_2 statistics, suggested in Arellano and Bond (1991). The differencing of the model, due to the fixed effect, will introduce a moving average error. Therefore, the AR(1) test should indicate correlation, while the AR(2) test should not. It is assumed that enough lags are included in the level equation, which is assumed to have uncorrelated errors.

Table 3: Estimation results, preliminary model

	First-step estimation			Second-step estimation		
Variable	**Coeff**	**p-val**	**SE**	**Coeff**	**p-val**	**SE**
lf_{t-1}	0.358	0.000	0.039	0.347	0.000	0.041
lf_{t-2}	0.046	0.044	0.023	0.040	0.092	0.024
w_t	0.008	0.038	0.004	0.008	0.050	0.004
w_{t-1}	-0.007	0.121	0.004	-0.007	0.126	0.004
w_{t-2}	-0.000	0.792	0.000	-0.000	0.773	0.000
v_t	0.081	0.583	0.147	0.108	0.476	0.151
v_{t-1}	0.152	0.077	0.086	0.137	0.117	0.088
v_{t-2}	-0.030	0.514	0.046	-0.034	0.447	0.045
u_t	0.483	0.000	0.062	0.497	0.000	0.059
u_{t-1}	-0.524	0.000	0.058	-0.523	0.000	0.063
u_{t-2}	-0.160	0.000	0.043	-0.145	0.001	0.044
r_t	0.622	0.000	0.068	0.649	0.000	0.059
r_{t-1}	-0.218	0.000	0.060	-0.209	0.001	0.063
r_{t-2}	-0.048	0.277	0.044	-0.037	0.389	0.044
jdr_t	-0.127	0.000	0.022	-0.127	0.000	0.021
jdr_{t-1}	-0.012	0.103	0.007	-0.012	0.076	0.007
jdr_{t-2}	-0.000	0.986	0.006	-0.001	0.856	0.006
$p1824_{t-1}$	-0.403	0.000	0.056	-0.395	0.000	0.058
$p5565_{t-1}$	-0.158	0.001	0.049	-0.160	0.001	0.049
Sargan	674.4	0.000		259.6	0.392	
$AR(1)$	-10.0	0.000		-7.5	0.000	
$AR(2)$	2.3	0.024		11.8	0.066	

estimation. The estimation results for the reduced model are presented in *Table 4.*

First we can note that the second lag of the dependent variable is insignificant, but it is included because otherwise the AR(2) test indicates serial correlation. The estimated adjustment coefficient is 0.60.[15] As expected, the effect of the wage is positive. The number of vacancies enters lagged one period, and as expected the effect is positive. The estimated contemporaneous coefficient on unemployment is positive, while the lagged and long run effects are negative. According to the theoretical model, which is formulated in steady state, the effect of unemployment is expected to be negative. The immediate effect of the number of participants in labor market programs is positive, the lagged effect is negative, and the long run effect is positive, as expected. The immediate and lagged effects of the job destruction rate are negative, as expected. And the effect of the demographic variables, the proportions of persons ages 18-24 and 55-65 are negative, as expected.

Table 5 presents the immediate and long-term effects, together with 90 % confidence intervals[16]. The effect of the wage is positive and significant in both the short and long run. The long-term effect of the wage corresponds to an income elasticity of 0.049 (see *Table 6*). The long-term effect of the number of vacancies is significantly different from zero. The point estimate indicates that if the number of vacancies is permanently increased by 100, the number of participants in labor force increases by 29 persons in the long run. The estimated long-run effect of unemployment is negative (-0.33), while the estimated immediate effect is positive. If unemployment increase by 100, the number of participants in labor decreases by 33 persons in the long run. The estimated long-run effect of unemployment is about the same size as the long-run effect of vacancies with opposite sign. The estimated long-term effect of labor market programs is slightly higher than the immediate effect. If the number of participants in labor market programs is increased permanently by 100, the labor force increases immediately by 63 persons and by 70 persons in the long run.

[15]The adjustment coefficient is calculated as one minus the sum of coefficients on lagged participation rate, that is (1-0.361-0.035). The long run effect of a variable is calculated as the sum of the coefficients on the variable divided by the adjustment coefficient.

[16]The calculation of confidence interval is based on the adjusted standard errors in the second step estimation.

Table 4: Estimation results, reduced model

	First-step estimation			**Second-step estimation**		
Variable	**Coeff**	**p-val**	**SE**	**Coeff**	**p-val**	**SE**
lf_{t-1}	0.362	0.000	0.039	0.361	0.000	0.039
lf_{t-2}	0.035	0.114	0.022	0.035	0.137	0.023
w_t	0.004	0.071	0.002	0.004	0.083	0.002
v_{t-1}	0.177	0.032	0.082	0.176	0.042	0.086
u_t	0.487	0.000	0.059	0.483	0.000	0.058
u_{t-1}	-0.549	0.000	0.053	-0.547	0.000	0.056
u_{t-2}	-0.153	0.000	0.042	-0.138	0.002	0.044
r_t	0.624	0.000	0.066	0.634	0.000	0.069
r_{t-1}	-0.214	0.000	0.058	-0.212	0.000	0.059
jdr_t	-0.121	0.000	0.021	-0.121	0.000	0.021
jdr_{t-1}	-0.012	0.046	0.006	-0.012	0.042	0.006
$p1824_{t-1}$	-0.417	0.000	0.056	-0.409	0.000	0.057
$p5565_{t-1}$	-0.158	0.001	0.049	-0.150	0.002	0.049
$const$	-0.0045	0.000	0.0011	-0.0044	0.000	0.0011
$t1990$	-0.0019	0.215	0.0016	-0.0019	0.256	0.0016
$t1991$	-0.0203	0.000	0.0022	-0.0208	0.000	0.0023
$t1992$	-0.0083	0.006	0.0030	-0.0086	0.007	0.0032
$t1993$	-0.0241	0.000	0.0029	-0.0247	0.000	0.0031
$t1994$	0.0292	0.000	0.0029	0.0286	0.000	0.0032
$t1995$	0.0077	0.000	0.0021	0.0071	0.002	0.0023
$t1996$	-0.0055	0.000	0.0014	-0.0055	0.000	0.0015
$t1997$	-0.0068	0.000	0.0018	-0.0071	0.000	0.0018
$t1998$	0.0110	0.000	0.0017	0.0110	0.000	0.0017
$Sargan$	743.0	0.000		268.6	0.343	
$AR(1)$	-10.5	0.000		-8.1	0.000	
$AR(2)$	2.4	0.018		1.6	0.122	

Table 5: Immediate and long run effects

Variable	Immediate			Long run		
w	0.004	[0.008]	[0.002]	0.007	[0.012]	[0.003]
v			-	0.291	[0.526]	[0.056]
u	0.483	[0.579]	[0.388]	-0.332	[-0.013]	[-0.677]
r	0.634	[0.747]	[0.521]	0.699	[1.081]	[0.317]
jdr	-0.121	[-0.087]	[-0.155]	-0.219	[0.162]	[-0.601]
$pop1824$	-0.401	[-0.316]	[-0.502]	-0.676	[-0.265]	[-1.087]
$pop5565$	-0.150	[-0.069]	[-0.230]	-0.247	[0.225]	[-0.720]

If a permanent increase in open unemployment is followed by a permanent increase in the number of program participants by 100, the total long run effect on labor force is 37. The estimation results indicate that labor market programs are reducing business-cycle variation in the labor force, because the effect is positive and programs are counter-cyclical, that is, they tend to be increased when unemployment is high, see Figure 6. The long-term effect of an increased number of participants in programs is positive, which means that some labor force participants who would have left the labor force in the absence of programs are now participating because of the programs. The estimation results suggest that if the number of participants in programs is permanently increased, it will have a relatively large effect on labor force participation. The immediate negative effect of the job destruction rate is smaller than the long run effect, -0.12 compared to -0.22. If the number of destroyed jobs is increased by 100, 22 persons will leave labor force in the long run. The long-run effect of the job destruction rate is not significantly different from zero. And the long-run effects of the demographic variables are negative and larger than the short-run effects. The long-run effect of the proportion of 55 to 65 years old is not significantly different from zero, while the long-run effect of the proportion 18 to 24 years old is significant. To summarize, the estimated

Table 6: Immediate and long run elasticities

Variable	**Immediate**	**Long run**
w	0.030	0.049
v	-	0.003
u	0.029	-0.020
r	0.019	0.021
jdr	-0.016	-0.029
$pop1824$	-0.073	-0.121
$pop5565$	-0.032	-0.052

long-run effects are of the expected signs, and the largest effects are found for labor market programs and the proportion of persons between ages 18 and 24.

The implied effect of programs on regular employment and open unemployment is -0.37 in the short run and -0.30 in the long run, which is the effect on the labor force if all program participants are defined as out of labor force. If open unemployment is held constant, the estimation results also imply an indirectly estimated displacement effect. If labor market programs increase by 100, the labor force increases immediately by 63 persons, according to the estimated coefficient. Then, the regular employment must decrease by 37 persons, implying a short-run displacement effect of 0.37. In the long run, the implied displacement effect is 0.30. Dahlberg and Forslund (1999) estimate immediate, direct, displacement effects to be about 0.65 and the long-run effect to be around 0.75 for programs with subsidized employment. They also found that the displacement effect of training programs is insignificant, which could partly explain the difference, because training programs are included in the measure of labor market programs that is used in this study. This comparison relies on the assumption that labor market programs do not affect open unemployment.

In *Table 6,* the estimates are converted into elasticities, evaluated at the mean of the variables. In general, the estimated elasticities are small. At the same time, the average percentage change in the labor force participation rate is small too, -0.6 %. To illustrate the magnitudes of the estimated effects, an experiment is carried out, where the variables are increased permanently with one standard deviation. A one standard de-

Table 7: Effect of changes with one standard deviation

Variable	**Immediate**	**Long run**
w (*9%*)	12 196	20 226
v (46 %)	-	6 752
u (53 %)	70 333	-48 295
r (50 %)	43 325	47 744
jdr (20 %)	-14 195	-25 755
pop1824 (4 %)	-14 439	-23 883
pop5565 (3 %)	-4 461	-7 366

viation shock is selected because it measures the size of a typical shock during the sample period. In the experiment, employment and the number of persons in the working age population are assumed to be constant.

From *Table 7* we can note that the standard deviations are low for the population ratios, implying that "normal" shocks are relatively small. The standard deviations for the number of vacancies, unemployment, and labor market programs are around 50 %, which reflects the huge increase in unemployment in the early 1990s. The variation in the job destruction rate and wages are about 20 and 10 %, respectively. Results from the experiment indicate that in the long run, labor market programs and unemployment have about the same effect but with opposite signs. So programs could offset a permanent increase in open unemployment.

4.2 Alternative estimations

This section presents results from alternative estimations of the model to examine if the estimation results are sensitive to estimation methods and assumptions made in the estimation. The following potential problems are considered:

1. The small sample performance of the estimator could be problematic if data are persistent. The model is therefore estimated with an alternative estimator that could perform better in small samples when data are persistent, which is often the case with macrodata.

2. All available information are not used in the estimation because only instrument dated $t-2$ to $t-4$ are used. The model is thus estimated

with all available instruments to examine if the results are affected by the choice of instruments.

3. Several assumptions are made in the estimation. In the computation of standard errors it is assumed that the errors are independent between municipalities, although they are allowed to be heteroskedastic. Furthermore, the parameters are assumed to be constant for different time periods and for different municipalities. The assumptions of independent errors and constant coefficients in the time and municipality dimension are relaxed in alternative estimations.

4. The estimated coefficient on labor market programs measures two effects; one direct positive effect of the value of participating in a program and one negative indirect negative effect of an increased number of searchers. An attempt to distinguish the two effects from each other is made by assigning values to an unobserved parameter.

Results with the SYS-estimator The GMM estimator for dynamic panel data models by Arellano and Bond (1991) that is used here, could have poor performance in small samples if the variables are persistent, because the instruments are weak if data is highly autoregressive, see Blundell, Bond, and Windmeijer (2000) and Blundell and Bond (1998). Macrodata are used in this study and they could be persistent. Blundell and Bond (1998) propose a linear GMM estimator (SYS) as an alternative to the Arellano and Bond (1991) first-differenced linear GMM estimator (DIF), when data are persistent.[17]

AR(1) models, including time dummies, are estimated to examine the rate of persistence in data.[18] The point estimates could only indicate if variables are persistent because the models are rejected by the Sargan

[17]The SYS-estimator uses lagged differences as instruments for the model in levels, in addition the instruments used by the DIF-estimator - lagged levels as instrument for the differences. Formally, the validity of the extra instrument used by the SYS estimator could be tested for using a difference Sargan test. But simulation results in Blundell, Bond, and Windmeijer (2000) indicate that the Sargan statistic for this test could be oversized when data are persistent. So it is difficult to reject the validity of the extra instruments used by the SYS estimator.

[18]The AR(1) models are estimated with the DIF- and the SYS-estimator, with instruments up to lag *t-4* and all available instruments. In general, the models are rejected by the Sargan statistic. The difference between the estimated coefficients with the DIF- and the SYS-estimator and with different number of instruments is small.

statistic. The estimation results indicate that wages may be persistent. The labor force participation rate, unemployment, and labor market programs seem to be moderately autoregressive, with estimated autoregressive coefficients between 0.4 and 0.6. The autoregressive coefficients on vacancies and job destruction rate are probably small.

Table 10 in Appendix B presents the estimation results for the preliminary model with the SYS-estimator. The corresponding results with the DIF-estimator is presented in *Table 3.* Except for the coefficients on unemployment, the estimation results do not change when the SYS-estimator is used. The estimated long run effect on open unemployment is -1.05 with the SYS-estimator compared to -0.28 with the DIF-estimator in the preliminary model. All other point estimates of the long run effect, including the effect of programs, are within the 90 % confidence bands for the reduced model estimated with the DIF-estimator (see *Table 5*).

Results with the full instrument matrix The number of lagged instruments that is used in the estimation is the smallest number of lags that is accepted by the Sargan statistic, which are instruments dated *t-2* to *t-4*. So information contained in further lags of the variables are not used in the estimation. To examine if the parameter estimates are sensitive to the number of instruments, the model is estimated with the total number of instruments available, that is, all available lags for each observation. *Table 11* in Appendix B presents the estimation results of the preliminary model with the full instrument matrix. In general, the parameter estimates are not sensitive to the number of lagged instruments in the estimation. The estimated long run effect of programs is smaller when the full instrument matrix is used, 0.35 compared to 0.66, but within the 90 % confidence band for the reduced model.

Results when the errors are correlated between municipalities In the calculation of the standard errors, it is assumed that the errors, $\varepsilon_{i,t}$, in equation (11) are independent between municipalities. This assumption is not valid if shocks to the labor force participation rate in one municipality affect shocks to the labor force participation rate in other municipalities. To account for this possibility, the model is estimated with the assumption that municipalities within the same local labor market[19] are allowed to have correlated errors, while errors between different local labor markets are uncorrelated.

The model is estimated with an ordinary IV-estimator to examine if the standard errors are affected. The estimation is carried out in Stata, using the ivreg command with the cluster option. The reduced model is estimated in differences, with lagged levels of the endogenous variables dated *t-2* to *t-5* as instruments.[20] *Table 12* in Appendix B presents the estimation results. The cluster option, which is used when local labor markets are allowed to be correlated, is only available with the robust option in Stata. The robust option calculates the standard errors by down-weighing the importance of outliers. The p-values are practically the same for normal and robust standard errors. The significance of the parameters do not change when the cluster option is used to calculate the p-values. So the conclusions do not change when errors are allowed to be correlated between municipalities in the same local labor market.

Results for different sample periods In the estimation it is assumed that the parameters are constant over time. The preliminary model is estimated on different sub-samples, to examine if the estimates change. The first and the last period were gradually deleted from the model. *Table 13* in Appendix B presents the estimation results from the second-step estimation when the sample is divided into two periods, 1989-94 and 1994-98.[21] The estimated coefficients, except on open unemployment, are about the same size as when the whole sample is used. The estimated sum of the coefficients on open unemployment differs between the sample periods. The estimated long run effect of open unemployment is positive when the model is estimated during 1994-98. The estimated long term effect of labor market programs is about the same in the different sample periods.

[19] The definition of local labor markets are based on commuting areas. There are 81 local labor markets.

[20] The introduction of one more lagged level as instruments is necessary to obtain parameter estimates that are similar to the GMM-estimates. The estimation period is 1991-98.

[21] The Sargan statistic does not accept the models. When the estimation periods are extended to 1989-96 and 1992-98, the models are accepted by the Sargan statistic.

Results for different sizes of municipality populations In the estimation it is assumed that the parameters are the same in all municipalities. To examine if the estimation results are sensitive to the size of the population in each municipality, the preliminary model is estimated excluding municipalities with populations larger than 95 000, 50 000, and 20 000. About 95 %, 85 %, and 57 % of Sweden's population is covered. Municipalities with populations less than 7 500, 12 500 and 15 000 are also excluded, leaving samples covering about 90 %, 75 %, and 55 % of Sweden's population. *Table 14* in Appendix B presents the estimation results excluding larger municipalities and *Table 15* presents the estimation results where the smaller municipalities have been left out.

The point estimates, except for unemployment, do no change when municipalities with large populations are excluded. The point estimates of the long run effects of open unemployment vary between -0.12 to -0.19, which should be compared with -0.33 when the whole sample is used, indicating that labor force participation in small municipalities could be less sensitive to municipality unemployment. The point estimated, except for vacancies, do no change when municipalities with small population are excluded. The point estimates of the long run effect of municipality vacancies vary between 0.5 and 1.3, which should be compared with 0.3 when the whole sample is used, indicating larger business cycle variation in the participation rate in large municipalities.

To summarize, the participation rate could be more pro-cyclical in large municipalities, because the effect of open unemployment is lower when large municipalities are excluded and the effect of vacancies is larger when small municipalities are excluded. The variables in the estimations are measured at the municipality level. Therefore, larger coefficients on vacancies in municipalities with larger population do not necessarily indicate that the effect is larger. It could be the case that it is, for example, vacancies at the local labor market, and not at the municipality level as in the estimation, that matters.

Decomposition of the effect of labor market programs The estimated coefficients on the number of participants in programs measure two effects; one positive direct effect from the value of programs and one indirect negative effect from the number of effective searchers, $u + cr$. The parameter c in the theoretical model reflects differences in the probability of getting a job-offer between program participants and open unemployed.

The two different effects could be separated by assigning values of c such that the number of effective searchers could be calculated. *Table 16* in Appendix B presents estimation results for the reduced model when the c-parameter is set to 0.5, 1, and 1.5 respectively. The number of effective searchers, $u + cr$, should measure the negative competition effect and the number of program participants, r, should measure the direct positive effect of programs. The direct and indirect effect are only separated empirically in the long run because the estimated immediate effect of the number of effective searchers is positive and not negative as expected. The estimated long run indirect effect is negative and direct effect is positive.

Table 17 in Appendix B presents the estimated immediate and long run direct and indirect effects of the number of participants in labor market programs for different values of c, where the coefficients on $u + cr$ are multiplied with the value of c. The total effect of programs is about the same size as in the estimation where c is unrestricted. The long run competition effect, calculated from the coefficient on $u + cr$, is increasing in c, as expected. The estimated long run direct effects of programs are also larger if programs are more effective, as expected.

Long run effect of labor market programs in the alternative estimations *Table 8* presents a summary of the estimated long run effects of labor market programs in the alternative estimations. In the reduced model, the estimated long run effect of programs is 0.70, see *Table 4*. None of the alternative estimation results in estimated long run effects that are significantly different from the one obtained in the reduced model. The point estimates are between 0.35 and 1.02, and most of the point estimates are close to 0.70. That is, the effect of labor market programs is very robust to different specifications and estimation methods. The smallest effect is obtained when the larger instrument matrix is used. The largest effect is obtained when the smallest municipalities are excluded from the model.

The estimated long run effect of open unemployment is larger when the SYS-estimator is used, positive when the model is estimated between 1994-98, and smaller when municipalities with large population are excluded. It is difficult to determine the size of the discouraged worker effect, because the size of the long run effect of open unemployment vary between some of the different estimation methods and models.

Table 8: Estimated long run effect of labor market programs

	Long run effect of programs
Reduced model	0.699
90 % confidence band	[1.081] [0.317]
SYS-estimator	0.495
All instruments used	0.348
Sample period 89-94	0.752
Sample period 94-98	0.660
$Pop \leqslant 95\ 000$	0.630
$Pop \leqslant 50\ 000$	0.731
$Pop \leqslant 20\ 000$	0.694
$Pop \geqslant 7\ 500$	1.022
$Pop \geqslant 12\ 500$	0.900
$Pop \geqslant 15\ 000$	0.577
$c = 1.0$	0.683
$c = 1.5$	0.723
$c = 0.5$	0.572

4.3 Comparison with other studies

Large effects from labor market programs are also found in other studies. Dahlberg and Forslund (1999) use the same kind of data as in this study but consider a shorter sample period. In their estimation, the implied short run effect on labor force participation from labor market programs is around 0.60, which is about the same magnitude as results obtained here. The estimates in Johansson and Markowski (1995), who use Swedish time series data between 1970-92, indicate that a 50 % increase of the number of participants in labor market programs cause an immediate[22] increase in labor force with 27 300 persons, evaluated at the mean of the sample used here. The effect is smaller than the one obtained here, 43 000 persons; see *Table 7*. Wadensjö (1993) obtains the result that a 1 % increase in labor market programs increases labor force with slightly more than 1 %. This effect is much larger than the results obtained here, where the long run elasticity is estimated to 0.02, see *Table 6*. He notes that the sizes of the estimated effects are sensitive to the specification of the equation.

5 Discussion of the results

The estimated coefficients on labor market programs suggest that they have relatively large positive long- and short-run effects on the labor force participation rate. The positive effects from programs are robust against different specifications, different choices of the instrument matrix, and different estimation methods. The estimated long run effects of programs in different alternative estimations are not significantly different from the one in the reduced model. Furthermore, the estimated size of the effect of labor market programs is very robust, most of the point estimates in the alternative estimations are very close to the result in the reduced model. The size of the discouraged worker effect is more difficult to determine because the estimated long run effect of open unemployment differ in some of the alternative estimations.

The positive effects on the labor force participation rate indicate that labor market programs reduce business-cycle variation in labor force participation because programs are counter-cyclical. The positive long run effect of programs is larger than the absolute value of the long run effect

[22]The long run effect from labor market programs is restricted to zero in their estimation.

of unemployment, so programs counteract the discouraged-worker effect. A permanent increase in the number of persons in labor market programs during a downturn in the economy could prevent people from dropping out of the labor force, because participants who would have left labor force in the absence of programs are now maybe participating because of the programs.

In practice, labor market programs have been used to qualify unemployed for new periods of unemployment benefits, which causes difficulties in interpreting estimation results. The true effect of labor market programs on the effective labor supply is probably smaller than the estimated coefficients indicate,because we do not know the extent of dropouts in absence of labor market programs used for renewal of benefits periods.[23] And it should be pointed out that the estimation results do not measure the effect of programs on the effective labor force, because we do not know if labor force participants, who choose to participate in the labor force because of labor market programs, search for jobs to the same extent as other labor force participants. If they search less, the effect on the effective labor force will be smaller than the estimated coefficient indicates. Furthermore, the estimated coefficients measure the partial effects on the labor supply, so it is impossible to conclude that an increased number of participants in labor market program is an effective way to increase labor force participation. For this to be done, programs' costs, for example, must be accounted for.

Because labor force participation is increasing in labor market program participation, the book keeping relation between employment, unemployment, labor market programs and labor force should not be used when forecasting the labor market situation. For example, political targets for open unemployment, which have been used in Sweden, are harder to reach by increasing the number of participants in labor market programs, because open unemployment is not reduced by the same amount.

[23]The benefits from the unemployment insurance is larger than the social allowance.

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A The data

The data set is a panel consisting of yearly observations from 1986 to 1998 for Sweden's municipalities. The dataset includes 3 692 observations (13 years times 284 municipalities). The advantage with this dataset, compared to aggregate time series, is that the extreme situation during the 1990s is covered at the same time as the time dimension is sufficiently large to capture some business cycle variation, but without having to assume that the estimated parameters are constant over a long time horizon.

Employment, population by age, and annual labor income are obtained from Statistics Sweden. Observations on employment and labor income are based on the RAMS register, and they are measured in November. Municipality population is measured at the end of December each year. Data on the number of vacancies, unemployed, and labor market program participants are obtained from the National Labor Market Board (Ams). The number of unemployed and participants in programs are available on monthly basis. The number of vacancies between 1985 and 1990 in November are obtained manually from microfiches at National Labor Market Board central archives, and from august 1991 monthly data are obtained from the National Labor Market Board. Data on employment at the plant level that are used to calculate the job destruction rate, are obtained from a database at IFAU. Employment at the plant level is only available in November.

Employment and wages are only available in November, population in December, and the other variables each month, except for the number of vacancies, which have to be obtained manually from microfiches before august 1991. November data on vacancies, employment, and labor market programs are used in the estimation. The use of November data could be problematic if the seasonal pattern differs so that observations are not representative. It is likely that the variables have approximately the same seasonal pattern because all variables are related to the labor market. Alternatively, yearly data on vacancies, unemployment and program participants could be used, assuming that November observations on employment, wages and job destruction rate are representative for the whole year. The variations in employment and wages are probably small during a year, but the variation in the job destruction rate could be large, so that November observations on job destruction rate is not representative for the whole year.

A.1 Summary statistics

Table 9 presents descriptive statistics for the variables used in the estimation. All variables are divided by the number of persons in the working-age population. The overall standard deviation is calculated using the total number of observations (3 692). The overall variability could be divided into the variability between and within the municipalities. The variation between the municipalities is calculated as the deviation of the mean over time for each municipality from the total mean. The variation within municipalities is calculated as the deviation of each observation in each municipality from the mean over time in each municipality.

The variability between municipalities is larger than the within variability for the number of persons between ages 55-65. Both the between and within variability contribute to total variance in labor force, wages, and labor market programs. The within variance is larger for vacancies, open unemployment, and job destruction rate, implying that the difference over time is larger than the difference between municipalities.

Table 9: Summary statistics of the variables in the estimations

Variable		**Mean**	**Std. Dev**	**Min**	**Max**
lf	Overall	0.855	0.037	0.667	0.969
	Between		0.020	0.742	0.932
	Within		0.030	0.769	0.931
w	Overall	6.161	0.823	4.410	13.223
	Between		0.626	5.144	10.208
	Within		0.536	4.488	9.176
v	Overall	0.009	0.006	0.000	0.131
	Between		0.003	0.004	0.028
	Within		0.006	-0.007	0.123
u	Overall	0.051	0.031	0.001	0.144
	Between		0.014	0.019	0.105
	Within		0.027	-0.009	0.114
r	Overall	0.030	0.020	0.002	0.126
	Between		0.012	0.007	0.090
	Within		0.016	-0.013	0.078
jdr	Overall	0.107	0.042	0.028	0.528
	Between		0.015	0.067	0.152
	Within		0.039	0.018	0.483
$p1824$	Overall	0.146	0.017	0.099	0.214
	Between		0.011	0.119	0.190
	Within		0.013	0.100	0.182
$p5565$	Overall	0.193	0.027	0.101	0.298
	Between		0.025	0.123	0.280
	Within		0.011	0.153	0.251

A.2 Plots of data

Figure 2 - *Figure 9* show the Box-Whiskers plots of the data. Box-Whiskers plots presents the time-series pattern together with the distribution over municipalities. The box contains data between 25th to 75th percentiles, and the line in the box represents the median. Some extreme observations are dropped in the Figures. For the labor force participation rate 3 observations that are less than 0.7 are dropped, 11 observations on vacancies that are greater than 0.4 are dropped, 9 observations on labor market programs that are greater than 0.1 are dropped, and 4 observations on the job destruction rate greater than 0.4 are dropped.

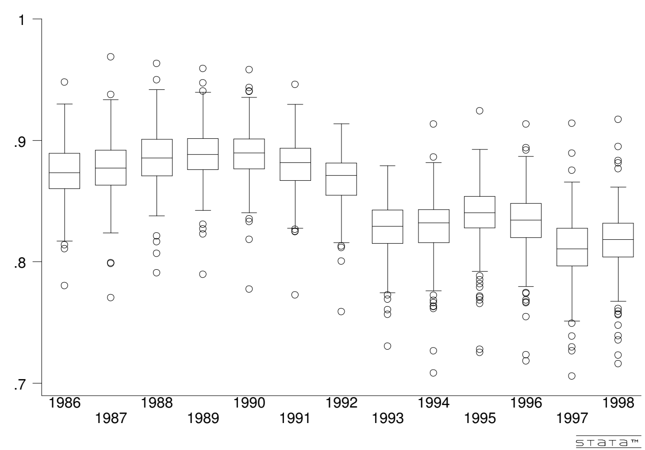

Figure 2: Labor force participation rate

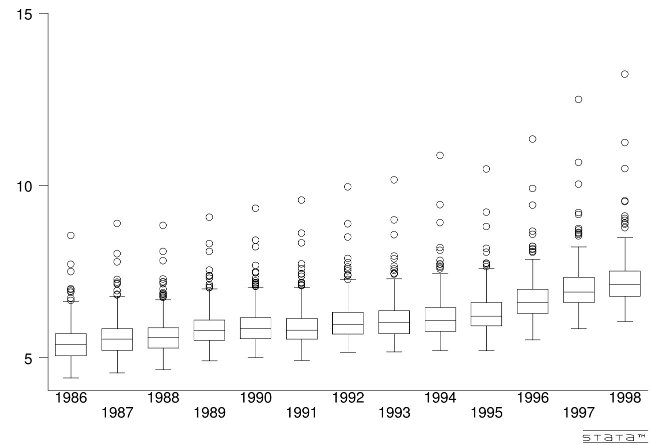

Figure 3: Real income for employed

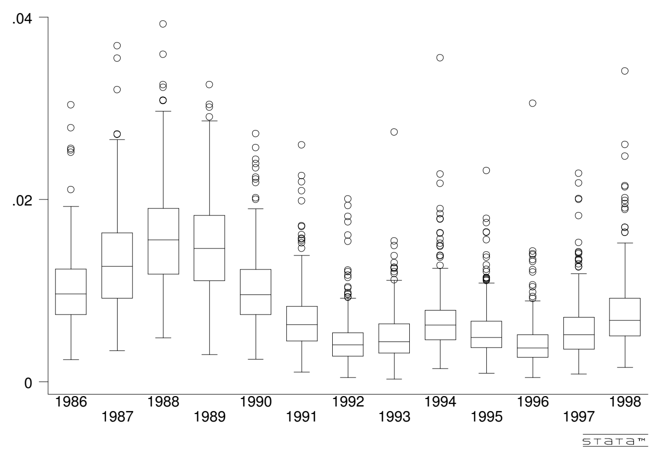

Figure 4: Vacancies divided by working-age population

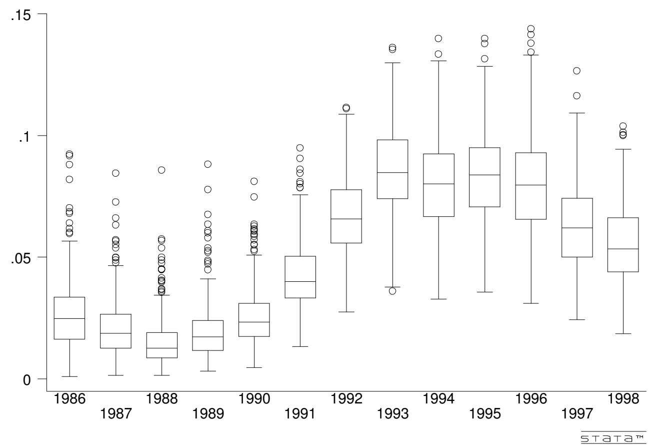

Figure 5: Unemployment divided by working-age population

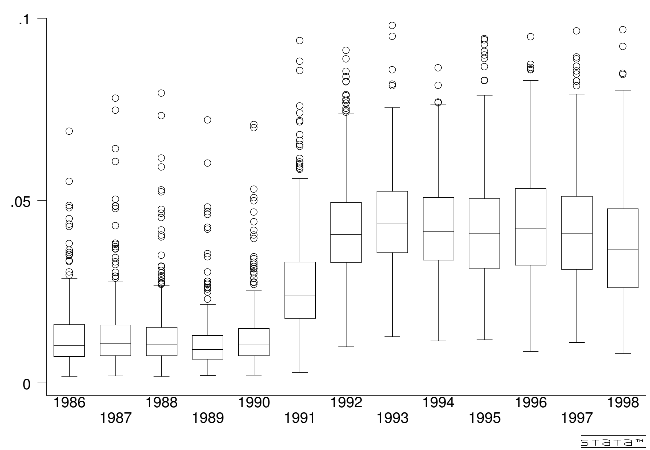

Figure 6: Participants in labor market programs divided by working-age population

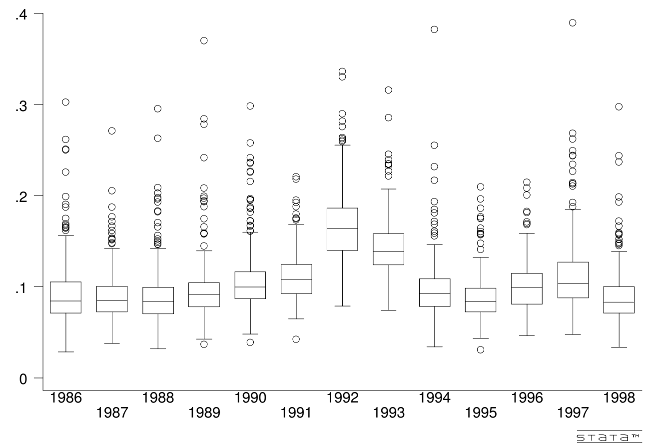

Figure 7: Job destruction rate

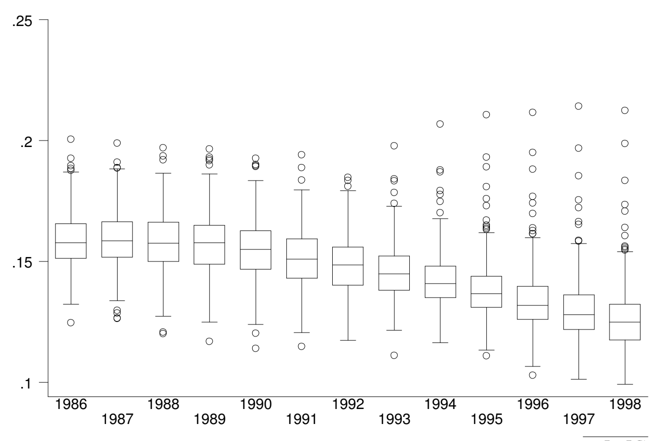

Figure 8: Population in ages 18–24 divided by working-age population

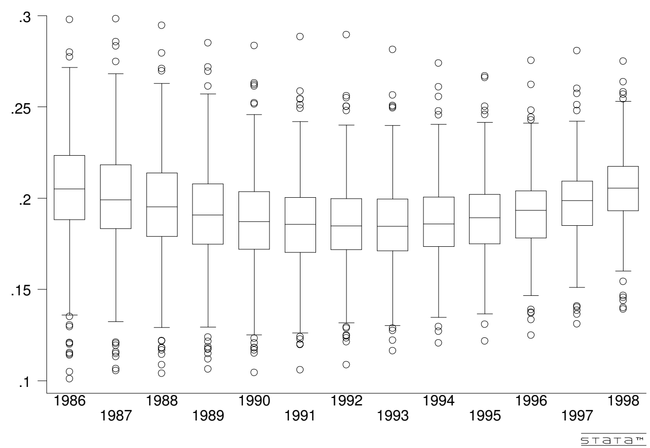

Figure 9: Population ages 55–65 divided by working-age population

B Results from alternative estimations

Table 10: Estimation results, preliminary model, SYS estimator

	First-step estimation			**Second-step estimation**		
Variable	**Coeff**	**p-val**	**SE**	**Coeff**	**p-val**	**SE**
lf_{t-1}	0.582	0.000	0.029	0.591	0.000	0.031
lf_{t-2}	0.120	0.000	0.026	0.116	0.000	0.027
w_t	0.007	0.060	0.004	0.007	0.075	0.004
w_{t-1}	-0.007	0.089	0.004	-0.007	0.107	0.004
w_{t-2}	-0.000	0.737	0.000	-0.000	0.645	0.000
v_t	0.060	0.675	0.144	0.062	0.700	0.162
v_{t-1}	0.145	0.086	0.084	0.153	0.096	0.092
v_{t-2}	-0.096	0.090	0.057	-0.121	0.052	0.062
u_t	0.333	0.000	0.060	0.347	0.000	0.066
u_{t-1}	-0.559	0.000	0.055	-0.571	0.000	0.063
u_{t-2}	-0.097	0.018	0.041	-0.079	0.074	0.044
r_t	0.562	0.000	0.066	0.571	0.000	0.071
r_{t-1}	-0.341	0.000	0.062	-0.373	0.000	0.068
r_{t-2}	-0.064	0.129	0.042	-0.053	0.251	0.046
jdr_t	-0.109	0.000	0.021	-0.108	0.000	0.021
jdr_{t-1}	-0.013	0.070	0.007	-0.012	0.136	0.008
jdr_{t-2}	-0.001	0.872	0.007	-0.002	0.776	0.007
$p1824_{t-1}$	-0.350	0.000	0.048	-0.357	0.000	0.052
$p5565_{t-1}$	-0.110	0.000	0.031	-0.123	0.000	0.034
Sargan	1006	0.000		261	1.000	
$AR(1)$	-11.7	0.000		-8.8	0.000	
$AR(2)$	1.8	0.073		1.2	0.214	

Table 11: Estimation results, all available instruments

	First-step estimation			**Second-step estimation**		
Variable	**Coeff**	**p-val**	**SE**	**Coeff**	**p-val**	**SE**
lf_{t-1}	0.461	0.000	0.028	0.458	0.000	0.035
lf_{t-2}	0.046	0.053	0.024	0.048	0.111	0.030
w_t	0.003	0.241	0.002	0.003	0.252	0.003
w_{t-1}	-0.001	0.662	0.002	-0.001	0.684	0.003
w_{t-2}	-0.000	0.548	0.000	-0.000	0.452	0.000
v_t	0.097	0.360	0.106	0.119	0.388	0.138
v_{t-1}	0.131	0.109	0.082	0.153	0.157	0.108
v_{t-2}	-0.101	0.060	0.054	-0.089	0.256	0.078
u_t	0.449	0.000	0.047	0.458	0.000	0.053
u_{t-1}	-0.550	0.000	0.046	-0.549	0.000	0.050
u_{t-2}	-0.071	0.070	0.039	-0.065	0.183	0.049
r_t	0.486	0.000	0.052	0.514	0.000	0.064
r_{t-1}	-0.292	0.000	0.052	-0.304	0.000	0.066
r_{t-2}	-0.035	0.391	0.041	-0.038	0.438	0.049
jdr_t	-0.094	0.000	0.018	-0.092	0.000	0.019
jdr_{t-1}	-0.012	0.070	0.007	-0.014	0.069	0.007
jdr_{t-2}	-0.001	0.801	0.006	-0.002	0.765	0.006
$p1824_{t-1}$	-0.374	0.000	0.047	-0.354	0.000	0.068
$p5565_{t-1}$	-0.163	0.000	0.038	-0.174	0.002	0.055
Sargan	1109	0.000		269	1.000	
$AR(1)$	-12.0	0.000		-8.8	0.000	
$AR(2)$	3.2	0.001		1.9	0.062	

Table 12: Estimation results, IV-estimator

Variable	**Coeff**	**p-val ordinary**	**p-val robust**	**p-val cluster**
lf_{t-1}	0.282	0.000	0.001	0.001
lf_{t-2}	0.037	0.254	0.318	0.350
w_t	0.005	0.405	0.366	0.139
v_{t-1}	0.243	0.034	0.065	0.075
u_t	0.883	0.000	0.000	0.000
u_{t-1}	-0.413	0.036	0.032	0.011
u_{t-2}	-0.063	0.227	0.236	0.136
r_t	0.712	0.000	0.000	0.001
r_{t-1}	-0.192	0.201	0.197	0.107
jdr_t	-0.140	0.041	0.057	0.054
jdr_{t-1}	-0.020	0.021	0.023	0.020
$p1824_{t-1}$	-0.484	0.000	0.000	0.000
$p5565_{t-1}$	0.132	0.164	0.188	0.131

Table 13: Estimation results, different sample periods

	89-94		94-98	
Variable	**Coeff**	**p-val**	**Coeff**	**p-val**
lf_{t-1}	0.253	0.000	0.210	0.05
lf_{t-2}	0.009	0.845	0.038	0.292
w_t	0.006	0.372	0.012	0.094
w_{t-1}	0.008	0.373	-0.016	0.065
w_{t-2}	-0.000	0.195	0.000	0.610
v_t	0.149	0.492	0.304	0.304
v_{t-1}	0.185	0.129	0.378	0.163
v_{t-2}	-0.003	0.952	0.013	0.944
u_t	0.245	0.091	0.785	0.000
u_{t-1}	-0.571	0.000	-0.147	0.144
u_{t-2}	-0.128	0.097	-0.041	0.479
r_t	0.550	0.000	0.624	0.000
r_{t-1}	-0.070	0.549	-0.100	0.337
r_{t-2}	0.075	0.327	-0.027	0.602
jdr_t	-0.117	-0.000	-0.147	0.000
jdr_{t-1}	-0.016	0.114	-0.022	0.168
jdr_{t-2}	-0.007	0.402	-0.003	0.817
$p1824_{t-1}$	-0.439	0.000	-0.466	0.000
$p5565_{t-1}$	-0.203	0.019	-0.096	0.268
$Sargan$	190	0.005	156	0.005
$AR(1)$	-4.6	0.000	-3.4	0.001
$AR(2)$	1.5	0.125	0.9	0.370

Table 14: Estimation results, exclusive of large muncipalities

	pop $\leqslant$ 95 000		**pop $\leqslant$ 50 000**		**pop $\leqslant$ 20 000**	
	$n = 271$		$n = 241$		$n = 161$	
Variable	**Coeff**	**p-val**	**Coeff**	**p-val**	**Coeff**	**p-val**
lf_{t-1}	0.303	0.000	0.273	0.000	0.303	0.000
lf_{t-2}	0.022	0.365	0.027	0.323	0.080	0.041
w_t	0.008	0.103	0.012	0.040	-0.006	0.573
w_{t-1}	0.000	0.959	0.006	0.433	0.003	0.773
w_{t-2}	-0.001	0.056	0.001	0.766	-0.001	0.850
v_t	0.175	0.249	0.102	0.565	0.262	0.241
v_{t-1}	0.138	0.135	0.127	0.203	0.136	0.429
v_{t-2}	-0.034	0.433	-0.067	0.235	-0.017	0.855
u_t	0.518	0.000	0.529	0.000	0.632	0.000
u_{t-1}	-0.495	0.000	-0.455	0.000	-0.529	0.000
u_{t-2}	-0.151	0.001	-0.152	0.002	-0.179	0.014
r_t	0.625	0.000	0.647	0.000	0.601	0.000
r_{t-1}	-0.177	0.004	-0.120	0.086	-0.164	0.106
r_{t-2}	-0.025	0.581	-0.015	0.763	-0.009	0.903
jdr_t	-0.121	0.000	-0.108	0.000	-0.075	0.005
jdr_{t-1}	-0.012	0.107	-0.010	0.242	-0.013	0.323
jdr_{t-2}	0.000	0.997	0.001	0.835	0.001	0.902
$p1824_{t-1}$	-0.340	0.000	-0.291	0.000	-0.327	0.025
$p5565_{t-1}$	-0.180	0.000	-0.167	0.004	-0.091	0.307
$Sargan$	246.7	0.616	222.5	0.923	143.8	1.000
$AR(1)$	-7.5	0.000	-7.4	0.000	-5.7	0.000
$AR(2)$	1.5	0.128	1.4	0.156	0.8	0.441

Table 15: Estimation results, exclusive of small muncipalities

	pop ⩾7 500		**pop ⩾ 12 500**		**pop ⩾ 15 000**	
	$n = 245$		$n = 175$		$n = 144$	
Variable	**Coeff**	**p-val**	**Coeff**	**p-val**	**Coeff**	**p-val**
lf_{t-1}	0.390	0.000	0.442	0.000	0.448	0.000
lf_{t-2}	0.020	0.463	-0.008	0.814	0.008	0.841
w_t	0.007	0.067	0.004	0.141	0.002	0.401
w_{t-1}	-0.004	0.249	0.000	0.959	0.002	0.493
w_{t-2}	-0.000	0.400	-0.000	0.768	0.000	0.736
v_t	0.260	0.122	0.496	0.014	0.354	0.116
v_{t-1}	0.097	0.251	0.069	0.427	0.286	0.057
v_{t-2}	-0.058	0.217	0.007	0.903	0.050	0.721
u_t	0.482	0.000	0.418	0.000	0.417	0.000
u_{t-1}	-0.595	0.000	-0.461	0.000	-0.522	0.000
u_{t-2}	-0.124	0.011	-0.041	0.465	-0.050	0.483
r_t	0.896	0.000	0.647	0.000	0.520	0.000
r_{t-1}	-0.348	0.000	-0.212	0.008	-0.247	0.005
r_{t-2}	0.055	0.298	0.075	0.285	0.041	0.581
jdr_t	-0.118	0.000	-0.094	0.000	-0.067	0.000
jdr_{t-1}	-0.012	0.125	-0.017	0.056	-0.013	0.158
jdr_{t-2}	0.001	0.854	-0.005	0.433	-0.003	0.672
$p1824_{t-1}$	-0.462	0.000	-0.495	0.000	-0.532	0.000
$p5565_{t-1}$	-9,125	0.033	-0.160	0.077	-0.242	0.032
Sargan	227.1	0.887	151.5	1.000	122.2	1.000
$AR(1)$	-7.0	0.000	-6.0	0.000	-5.1	0.000
$AR(2)$	0.7	0.496	0.6	0.534	-0.3	0.751

Table 16: Estimation results, different assumptions about c

Variable	**Coeff c=1**	**p-val**	**Coeff c=1.5**	**p-val**	**Coeff c=0.5**	**p-val**
lf_{t-1}	0.356	0.000	0.357	0.000	0.366	0.000
lf_{t-2}	0.038	0.106	0.039	0.095	0.038	0.104
w_t	0.004	0.084	0.004	0.081	0.004	0.103
v_{t-1}	0.181	0.040	0.181	0.040	0.191	0.034
$u_t + cr_t$	0.482	0.000	0.446	0.000	0.475	0.000
$u_{t-1} + cr_{t-1}$	-0.534	0.000	-0.524	0.000	-0.513	0.000
$u_{t-2} + cr_{t-2}$	-0.140	0.001	-0.141	0.002	-0.113	0.005
r_t	0.156	0.084	-		0.417	0.000
r_{t-1}	0.330	0.000	0.578	0.000	-	
r_{t-2}	0.120	0.034	0.188	0.011	-	
jdr_t	-0.124	0.000	-0.125	0.000	-0.126	0.000
jdr_{t-1}	-0.012	0.041	-0.012	0.044	-0.012	0.048
$p1824_{t-1}$	-0.408	0.000	-0.410	0.000	-0.407	0.000
$p5565_{t-1}$	-0.153	0.002	-0.151	0.003	-0.162	0.001
Sargan	266.3	0.364	266.0	0.386	265.5	0.410
$AR(1)$	-8.0	0.000	-8.1	0.000	-8.2	0.000
$AR(2)$	1.4	0.154	1.5	0.133	1.6	0.115

Table 17: The direct and indirect effects of r

		$u + cr$	r	*total*
$c = 1$	immediate	0.482	0.156	0.638
	long run	-0.317	1.000	0.683
$c = 1.5$	immediate	0.669	-	0.669
	long run	-0.545	1.268	0.723
$c = 0.5$	immediate	0.238	0.417	0.655
	long run	-0.128	0.700	0.572
unrestricted	immediate			0.634
	long run			0.699

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