SVERIGES RIKSBANK
WORKING PAPER SERIES 194

SVERIGES RIKSBANK

Testing Theories of Job Creation: Does Supply Create Its Own Demand?

Mikael Carlsson, Stefan Eriksson and Nils Gottfries

MAY 2006

WORKING PAPERS ARE OBTAINABLE FROM

Sveriges Riksbank • Information Riksbank • SE-103 37 Stockholm
Fax international: +46 8 787 05 26
Telephone international: +46 8 787 01 00
E-mail: info@riksbank.se

Testing Theories of Job Creation: Does Supply Create Its Own Demand?*

Mikael Carlsson[a], Stefan Eriksson[b] and Nils Gottfries[c]

Sveriges Riksbank Working Paper Series

No. 194

May 2006

How well do alternative labor market theories explain variations in net job creation? According to search-matching theory, job creation in a firm should depend on the availability of workers (unemployment) and on the number of job openings in other firms (congestion). According to efficiency wage and bargaining theory, wages are set above the market clearing level and employment is determined by labor demand. To compare these models we estimate an encompassing equation for net job creation on firm-level data. The results support demand-oriented theories of job creation, whereas we find no evidence in favor of the search-matching theory.

Keywords: Job Creation, Involuntary Unemployment, Search-Matching, Labor Demand.

JEL classification: E24, J23, J64.

* We are grateful for helpful comments from Per-Anders Edin, Peter Fredriksson, Bertil Holmlund, Oskar Nordström Skans and seminar participants at Stockholm University, Uppsala University and Sveriges Riksbank. We thank Björn Andersson and Kerstin Johansson for providing some of the data. Carlsson gratefully acknowledges financial support from the Jan Wallander and Tom Hedelius Foundation and Eriksson from the Institute for Labour Market Policy Evaluation and the Swedish Council for Working Life and Social Research. The views expressed in this paper are solely the responsibility of the authors and should not be interpreted as reflecting the views of the Executive Board of Sveriges Riksbank.

a) Research Department, Sveriges Riksbank, SE-103 37, Stockholm, Sweden, mikael.carlsson@riksbank.se.
b) Department of Economics, Uppsala University, PO Box 513, SE-751 20, Uppsala, Sweden, stefan.eriksson@nek.uu.se.
c) Department of Economics, Uppsala University, PO Box 513, SE-751 20, Uppsala, Sweden, CESifo and IZA, nils.gottfries@nek.uu.se.

1. Introduction

The traditional Keynesian view of the labor market is that wages are sticky and set above the market clearing level. There is excess supply in the labor market and medium-term fluctuations in employment are determined by labor demand. An increase in labor supply increases employment only if wages fall, so that labor demand increases. In the last two decades, this demand-oriented view has been challenged by search-matching theory, which explains unemployment by frictions in the labor market. Demand plays no role in the standard search-matching model but supply creates its own demand; if labor supply increases, firms open more vacancies and more matches are formed.

While search-matching theory has come to dominate labor economics in recent years, very few attempts have been made to compare the empirical relevance of different theories of the labor market. The purpose of this paper is to arrange a 'horse race' between the two main paradigms for thinking about unemployment. To do this, we formulate an empirical equation for net job creation, which encompasses both sets of theories, and estimate it on firm-level data.

Efficiency wage and bargaining theories of unemployment have a Keynesian flavor.[1] They predict wages to be above the market clearing level so there will typically be excess supply in the labor market. Firms can hire the workers they want. Unemployed workers are available, waiting for work, but there are simply too few jobs to go around. In the following, we refer to these theories as *demand-oriented theories* of job creation.

According to *search-matching theory*, unemployment arises because it takes time for workers and firms to find each other.[2] Once they do, all mutually beneficial trades are carried out, so without frictions there would be no unemployment. If labor supply increases, firms open new vacancies, and more jobs are filled. Importantly, this will happen even if wages do not adjust.[3]

Relative to pre-existing bargaining and efficiency wage theories, the key novelty in search theory is the notion that unemployment is productive. Unemployed workers are not

---

[1] See e.g. Salop (1979), Shapiro and Stiglitz (1984), Akerlof and Yellen (1986), Blanchard and Summers (1986), Gottfries and Horn (1987), Calmfors-Driffill (1988), Lindbeck and Snower (1988), Layard, Nickell and Jackman (1991), Gottfries (1992), Oswald (1993), Holden (1994), Eriksson and Gottfries (2005). Minimum wages is another reason why wages may be above the market clearing level.

[2] See e.g. Mortensen and Pissarides (1994) and Pissarides (2000).

[3] Suppose that the number of vacancies is determined by the zero profit condition $c = qJ(w)$ where c is the cost of keeping a vacancy, $J(w)$ is the value of a filled job, and q is the probability to fill a vacancy. Let the latter be determined by $q = m(U/V)^{\alpha}$. Then we can solve for vacancies: $V = (mJ(w)/c)^{1/\alpha}U$. For a given wage, the number of vacancies will be *proportional* to unemployment, and so will the number of matches. Assuming a constant separation rate and using the flow equilibrium condition one can easily show that if c goes to zero or α goes to infinity, unemployment will disappear.

just a passive ‘reserve army’ waiting for jobs, but their search activity contributes to job creation. This is the essence of the matching function: hiring depends not only on the number of job openings, but also on unemployment. Also, some unemployment is desirable because search is a productive activity, which increases the matching rate so that vacant jobs are filled more quickly.

The two sets of theories yield fundamentally different predictions about what determines job creation. *Demand-oriented models* point to wages and aggregate demand as key factors, while *search-matching theory* predicts that labor supply (unemployment) should have a direct effect on job creation. In order to compare the empirical relevance of the two theories, we formulate an empirical equation for net job creation, which encompasses both theories, and estimate it on Swedish firm-level data. The equation includes a firm-specific measure of wage cost per worker relative to an index of competitors’ prices (competitiveness), a measure of product demand, as well as unemployment and vacancies in the local labor market area. If employment is determined by labor demand, product demand should be an important determinant of job creation. If frictions are important, high unemployment should induce firms to open more vacancies so that more matches are formed.

When we consider estimation, a basic identification problem arises. Unobserved common shocks, which affect employment in all firms, may affect aggregate consumption and investment, and hence be correlated with demand. In order to be sure that the demand variable can be taken as exogenous, we first consider Swedish manufacturing firms that sell at least 75 percent of their output in the export market and use an index of foreign activity as a measure of demand. If we take Sweden to be a small open economy, shocks affecting Swedish firms’ employment decisions should not spill over to international demand.

The sample period is the 1990s, a period with large macroeconomic fluctuations in Sweden. Large changes in exchange rates generated large changes in wages relative to foreign competitors’ prices, which should help us to identify the effect of wages on net job creation. A severe downturn in the domestic market led to a dramatic increase in unemployment which, from the point of view of export-oriented firms, must be viewed as a major labor supply shock.

The result of our ‘horse race’ is strong support for the demand-oriented theories of job creation. We find wages and foreign demand to have statistically significant and quantitatively large effects on job creation. There is no evidence that an increase in unemployment has a positive effect on net job creation in export oriented firms. Supply does not create its own demand.[4] Nor do we see any evidence of congestion effects when there are many vacancies in the labor market.

When we use data for only export-oriented firms, the sample is quite small. Therefore we perform a similar analysis where we include all firms in the sample and construct a measure of demand that weights together aggregate domestic demand with international demand using firm-specific weights. In this case we include time dummies to capture unobserved shocks that affect all firms. The identification problem is handled in a different way, but the result is the same: wages and demand affect job creation, but we find no effect of unemployment or vacancies in the local labor market.

Burgess (1993) conducts a similar exercise to ours and finds support for the search-matching model. He uses aggregate data and estimates a time series model with a large number of explanatory variables. Also, his specification is fundamentally different from ours.[5] A quite recent literature investigates whether the search-matching model is capable of generating the observed cyclical fluctuations in unemployment and vacancies. Shimer (2005) finds that the standard search-matching model cannot explain such variation and argues that this is because wages are continuously renegotiated.[6] If wages are made sticky, the fit of the model improves significantly (Shimer (2004)). Our results underline the importance of wages,[7] but lead us to question the importance of search frictions in the labor market.[8]

The rest of the paper is organized as follows. In Section 2 we derive equations for net job creation from two different models: a labor demand model with adjustment costs, and a search-matching model. We also formulate an encompassing empirical specification. In Section 3 we present the data and in Section 4 we discuss identification and estimation issues. Section 5 contains the results and Section 6 concludes.

[4] An increase in unemployment will lead to wage moderation, and this will increase employment, but this effect would arise in any labor market model that we know of.

[5] Burgess argues that the key implication of search-matching is that hiring costs depend on the state of the labor market. A slack labor market will reduce hiring costs and *speed up the adjustment* towards the desired level of employment. This is reasonable when the desired employment adjustment is positive (hiring) but less obvious when the desired change is negative.

[6] See Shimer (2005) for a review of other papers in this literature.

[7] For arguments why wages are rigid and play an allocative role, see Gottfries (1992), Oswald (1993), Gottfries-Sjöström (1999).

[8] A somewhat related literature is concerned with the labor market impact of immigration (e. g. Card (1990)). Most of this literature exploits geographical differences in immigration and finds small effects of immigration on wages and job opportunities of natives. As emphasized by Borjas (2003), studies of this kind say little about how the labor market as a whole adjusts to immigration because immigrants may be attracted to regions where there are many jobs and native workers may move out of an area in response to immigration.

2. Theories of Job Creation and Empirical Specification

Below we formulate two simple models of job creation: a labor demand model with adjustment costs and a search-matching model. The purpose is to clarify which factors determine job creation in each model and to highlight the differences between the two models. In both models, firms belong to different sectors but hire in the same local labor market and wages are taken as given.[9]

2.1. A Labor Demand Model with Adjustment Costs[10]

The model is set in discrete time, the economy consists of many sectors, and each sector consists of many firms. The production function is $Q_{i,t} = N_{i,t}$, where $Q_{i,t}$ is production, and $N_{i,t}$ is the number of workers employed, in firm *i*. Demand for the firm's product is $Q_{i,t} = D_{j,t} - \frac{1}{\eta}\frac{P_{i,t}}{P_{j,t}^C} + \nu_{i,t}$ where $D_{j,t}$ is sector-specific demand, $P_{i,t}$ is the price set by firm *i*, $P_{j,t}^C$ is the average price level of the firm's competitors in the markets relevant for sector *j* and $\nu_{i,t}$ is a firm-specific idiosyncratic i.i.d. demand shock. The shock is observed by the firm before it sets employment. It is costly for the firm to adjust its employment level, and the cost is given by $cP_{j,t}(N_{i,t} - N_{i,t-1})^2/2$. The profit maximization problem facing firm *i* is:

$$\max \ \mathrm{E}_t \sum_{\tau=t}^{\infty} \beta^{\tau-t} \frac{1}{P_{j,\tau}^C}\left[(P_{i,\tau} - W_{i,\tau})N_{i,\tau} - \frac{cP_{j,\tau}^C}{2}(N_{i,\tau} - N_{i,\tau-1})^2\right]$$

$$s.t.\ N_{i,\tau} = D_{j,\tau} - \frac{1}{\eta}\frac{P_{i,\tau}}{P_{j,\tau}^C} + \nu_{i,\tau} \qquad (1)$$

where the wage in firm *i* is denoted $W_{i,t}$.[11] The first order condition for the optimal employment level in period *t* is a second-order difference equation from which we can derive the following labor demand function (see *Appendix 1*):

[9] In the labor demand model we assume the wage to be above the market clearing level so firms can always hire the workers they want. We do not consider the wage setting explicitly, but rather assume that the wage is predetermined. It may, for example, be set in a negotiation with a trade union prior to the employment decision.
[10] Models of this type are presented and discussed by Sargent (1979), Nickell (1986), Hamermesh (1993), and others. It is presented here to simplify the comparison with the search-matching model.
[11] To simplify the model, we assume that the firm deflates future profits by the market price.

$$N_{i,t} = \lambda_1 N_{i,t-1} + \frac{\lambda_1}{c} E_t \sum_{i=0}^{\infty} \left(\frac{1}{\lambda_2}\right)^i \left(\eta(D_{j,t+i} + \nu_{i,t+i}) - \frac{W_{i,t+i}}{P^C_{j,t+i}}\right), \tag{2}$$

where λ_1 and λ_2 are functions of the parameters β, η and c; $\lambda_1 < 1$ and $\lambda_2 > 1$. Employment in firm *i* is determined by three factors: employment the previous period, sector-specific demand, and the wage relative to the competitors' prices (competitiveness).

2.2. A Search-Matching Model

In the standard search-matching model, firms are identical and hire at most one worker. In reality, firms face different prices and most of them hire many workers. To derive an employment equation that can be implemented empirically, we therefore consider a search-matching model with multi-employee firms facing different wages and prices. The model is a large-firm version of the standard search-matching model (e.g. Pissarides, 2000), except that we assume vacancy costs to be quadratic. This assumption is made to avoid the extreme - and counterfactual - implication that all vacancies are opened by the most profitable firm.

The economy consists of many sectors and each sector consists of a large number of price-taking firms situated in different regional labor markets. All firms hire in the same local labor market, but firms in different sectors face different prices, $P^C_{j,t}$. Job destruction varies stochastically across firms. The timing of events is as follows:

(i) At the start of a period, firms choose the number of vacancies to open. Firm *i* in sector *j* opens $V_{i,t}$ vacancies, and incurs total vacancy costs given by $P^C_{j,t} c V^2_{i,t} / 2$.

(ii) Matching of previously unemployed workers (U_{t-1}) and total vacancies (V_t) takes place in the local labor market. The matching process between vacancies and unemployment is described by a conventional constant-returns matching function: $M_t = U^{\alpha}_{t-1} V^{1-\alpha}_t$ where M_t is the total number of matches in period *t*. Hence the probability of filling a vacancy is $q_t = M_t / V_t = (U_{t-1} / V_t)^{\alpha}$.

(iii) A firm-specific separation shock is realized. Total separations in firm *i* are given by $(\lambda + \xi_{i,t}) N_{i,t}$ where the shock, $\xi_{i,t}$, is i.i.d with mean zero.

(iv) Production takes place.

Firm *i* in sector *j* chooses vacancies so as to solve the following profit maximization problem:

$$\max \ \mathrm{E}_{\mathrm{t}} \sum_{\tau=\mathrm{t}}^{\infty} \beta^{\tau-t} \frac{1}{P_{j,\tau}^{C}} \left[(P_{j,\tau}^{C} - W_{i,\tau}) N_{i,\tau} - \frac{P_{j\tau}^{C} c}{2} V_{i,\tau}^{2} \right]$$

$$s.t. \quad N_{i,\tau} = q_{\tau} V_{i,\tau} + (1 - \lambda - \xi_{i,t}) N_{i,\tau-1}. \tag{3}$$

At the optimum, the marginal cost of opening one more vacancy should be equal to the marginal benefit of opening a vacancy:[12]

$$cV_{i,t} = q_t E_t \sum_{\tau=t}^{\infty} \left[\beta^{\tau-t} (1-\lambda-\xi_{i,t})^{\tau-t} (1 - \frac{W_{i,\tau}}{P_{j,\tau}^{C}}) \right]. \tag{4}$$

Using the constraint in (3) and the expression for q_t we find actual employment in firm *i*:

$$N_{i,t} = \frac{1}{c} \left(\frac{U_{t-1}}{V_t} \right)^{2\alpha} \left(E_t \sum_{\tau=t}^{\infty} \left[\beta^{\tau-t} (1-\lambda)^{\tau-t} \left(1 - \frac{W_{i,\tau}}{P_{j,\tau}^{C}} \right) \right] \right) + (1-\lambda-\xi_{i,t}) N_{i,t-1}. \tag{5}$$

Job creation in firm *i* depends on the previous level of employment and on the firm's competitiveness. It increases with the level of unemployment because high unemployment makes it easier for firms to find workers, and decreases with the total number of vacancies in the relevant labor market because of congestion.

2.3. An Encompassing Empirical Specification

Comparing the equations for job creation derived from our two models we see that wages and the previous level of employment play a role in both. The key difference is that according to the labor demand model, demand is important for firms' hiring decisions, while the search-matching model emphasizes labor supply. Unemployment has a direct effect on job creation in the search-matching model. Since our main purpose is to investigate the relative importance of the various factors, our baseline empirical specification encompasses both models:

[12] This condition can be derived by substituting for vacancies in the objective function, maximizing with respect to expected employment, and iterating on the resulting difference equation.

$$\ln N_{i,t} = \alpha_i + \beta_1 \ln N_{i,t-1} + \beta_2 (\ln W_{i,t} - \ln P_{j,t}^C) + \beta_3 \ln D_{j,t} + \beta_4 \ln U_{t-1} + \beta_5 \ln V_t + \varepsilon_{i,t}. \quad (6)$$

In both models, it is current and expected future wages, prices etc. that determine employment. Since we have a somewhat short panel, we simply use current values. Both models predict $0 < \beta_1 < 1$ and $\beta_2 < 0$. According to the labor demand model $\beta_3 > 0$ and $\beta_4 = \beta_5 = 0$, while the search-matching model implies $\beta_3 = 0$, $\beta_4 > 0$ and $\beta_5 < 0$.

These differences arise because of different assumptions concerning the functioning of product *and* labor markets. In the labor demand model, the product market is assumed to be imperfectly competitive and there are no frictions in the labor market. In the search-matching model, the product market is assumed to be perfectly competitive and there are frictions in the labor market. These are the typical combinations considered in the literature. The modern literature on bargaining treats the product market as imperfectly competitive and the same applies to leading textbook presentations of Keynesian macroeconomic theory.[13] The search-matching literature treats product markets as perfectly competitive, downplaying the role of demand factors.[14]

One can consider other combinations, however, e.g. an efficiency wage model with perfect competition in the product market (e.g. Shapiro and Stiglitz (1984)) or a search-matching model with imperfect competition in the product market. Thus we should be aware that β_3 sheds light on the nature of product market competition while β_4 and β_5 tell us how important frictions are in the labor market. To understand job creation we need to understand both markets.

Our theoretical models imply very simple dynamics. To allow for more complicated dynamics, we include extra lags of each of the explanatory variables as a robustness check.[15] To take account of differences in productivity growth, we include firm-specific productivity trends in all regressions.

[13] See e.g. Calmfors and Driffill (1988), Blanchard and Summers (1986), Gottfries and Horn (1987), Layard, Nickell and Jackman (1991), Eriksson and Gottfries (2005) and the textbook by Blanchard (2003).

[14] E.g. Pissarides (2000) never considers the case where there is imperfect competition in the goods market.

[15] The period in the models is shorter than one year, which is the data period. Ideally we would like to have data on higher frequency, but given the high persistence in the explanatory variables, it is very unlikely that such data would lead to qualitatively different results.

3. Data

We estimate equation (6) for two samples of firms. One sample includes only export-oriented firms; the other includes all types of firms. We start by defining the variables that are common to both samples and then we consider the variables that differ. Some illustrations of the data can be found in *Appendix 2*.

Firm specific variables are taken from a firm-level dataset provided by Statistics Sweden and administered by Sveriges Riksbank. This dataset contains annual information for the years 1990-2000 on all Swedish *industrial firms* with 20 or more employees and a sample of smaller firms. The database is constructed by merging information from several sources: Registry Based Labor Market Statistics (RAMS), Survey Based Statistics for Industry Plants (Industristatistiken) and Survey Based Statistics for Firms (Finansstatistiken 1990-1996, Företagsstatistiken 1997-2000). Since we want to identify the labor market area where the firm is situated, we consider only firms with a single plant, which do not move during the sample period. We use only data for firms for which we have all the relevant information and this gives us a full sample of 461 ongoing firms.[16]

Employment: $N_{i,t}$ is measured as the average number of workers employed in firm *i* in year *t*.

Unemployment: We assume that firms compete for unemployed workers primarily with other firms in the same local labor market area. Local labor market areas consist of one or more municipalities and are constructed by Statistics Sweden using commuting patterns (we use the 1993 definition). U_t is defined as the total number of unemployed workers in the local labor markets area relevant for firm *i* and is collected from the Swedish Labour Market Board (AMS).

Vacancies: V_t is constructed using monthly vacancy data from the Swedish Labour Market Board (AMS), which measures the number of unfilled vacancies at the start of the month in each local labor market area. Here, we take the average over the year as our measure of vacancies.

Productivity: We construct a firm-specific productivity trend as $\tau_i T_t$ where $\tau_i = (\ln(Y_{i,2000} / N_{i,2000}) - \ln(Y_{i,1990} / N_{i,1990}))$, $Y_{i,t}$ is the firm's real sales and T_t is a linear time trend.

[16] To decide which firms to include in the export sample and to construct our demand index for the full sample (see below) we need the export share of the firm, and this is available only for firms with 50 employees or more. Therefore we have to omit many small firms. An alternative would be to use the export share for the industry but this is less appealing because export shares vary substantially between firms within an industry.

3.1. Export-Oriented Firms

Export-oriented firms are defined as firms that sold, on average, at least 75 percent of their production abroad over the time period 1990-2000.[17] With this definition we have 68 ongoing firms.

Competitiveness: $\ln W_{i,t} - \ln P_{j,t}^{C}$, is computed using the firms' total labor costs per employee (including wage costs and collective fees) as a measure of $W_{i,t}$. The competitor product price in SEK is computed as: $\ln P_{j,t}^{IC} = \sum_{m} \omega_{j,m} (\ln E_{m,t} + \ln P_{j,m,t}^{F})$, where $\omega_{j,m}$ is industry j's average share of export going to country m during 1990-1994 ($j \in \{31, 32,..,38\}$, SNI69 industry classification). Export shares are computed using the available trade data for the classification of goods (varusni69) matching the SNI69 industry (production) classification. The countries, *m*, are Sweden's 13 main trading partners.[18] The competitor product price in foreign currency, $P_{j,m,t}^{F}$, is computed as the implicit value-added deflator for industry *j* in country *m* taken from the OECD industrial database STAN. $E_{m,t}$ is the exchange rate (SEK per country *m's* currency) taken from the OECD Annual National Accounts vol. I.

International demand is calculated as $\ln D_{j,t}^{I} = \sum_{m} \omega_{j,m} \ln Y_{j,m,t}$, where $Y_{j,m,t}$ is real value-added for industry *j* in country *m* taken from the OECD industrial database STAN.

3.2. All Firms

To measure *competitiveness,* $\ln W_{i,t} - \ln P_{j,t}^{C}$, we use the same measure for the wage as above, but the competitor price is now calculated as: $\ln P_{j,t}^{C} = (1-\delta_i) \ln P_{j,t}^{D} + \delta_i \ln P_{j,t}^{IC}$, where δ_{i} is the average export share over the sample period for firm *i* and $P_{j,t}^{D}$ is the industry-level producer price index for the domestic market (SNI92 two-digit industry classification). The *demand* variable is $\ln D_{j,t} = (1-\delta_i)[(1-\phi_j^C - \phi_j^I)\ln Y_t + \phi_j^C \ln C_t + \phi_j^I \ln I_t] + \delta_i D_{j,t}^{I}$, where $\phi_{\mathrm{j}}^{\mathrm{C}}$ is the industry specific share of output going to final consumption in total domestic use, $\phi_{\mathrm{j}}^{\mathrm{I}}$ is the corresponding share going to investment and $1-\phi_j^C - \phi_j^I$ is the corresponding share used as intermediate goods (SNI92 two-digit industry classification). The shares are computed as the average value from the 1995 and 2000 Input-Output tables provided by Statistics Sweden.

[17] Note that this fraction refers to *direct* sales abroad. If a firm delivers intermediate goods to other exporting firms its effective (direct and indirect) export dependence is even higher.

[18] That is, Germany, France, Italy, the Netherlands, Belgium, UK, Denmark, USA, Canada, Japan, Norway, Finland and Austria. These countries absorb about 80 percent of Sweden's exports.

Y, C, and I are aggregate variables. Y_t is a volume index of industrial production, C_t is real private consumption and I_t is real private sector gross fixed investment.

4. Identification and Estimation

Can we plausibly identify the effects we are interested in? There is a potential simultaneity problem with respect to demand. To see this, suppose that all firms suffer an unobserved shock in period *t* that induces them to reduce employment. This could be a common technology shock, a tax increase, or a change in laws and regulations. When less people are employed, demand for goods is reduced. If employment shocks influence demand in this way, we have a serious simultaneity problem.

One solution to this problem is to limit the analysis to firms for which demand can be regarded as reasonably exogenous. We first focus on export-oriented firms only, assuming that international demand can be taken as exogenous relative to unobserved shocks affecting Swedish firms.[19] We then include all firms, but include time dummies to capture common shocks. As we will argue later, this also allows us to handle the endogeneity problem with respect to demand.

Lagged unemployment, wages, and prices, are taken to be predetermined. There is ample evidence that wages and prices are rigid in the short run.[20]

There are two problems associated with using data for the number of vacancies. First, we should expect this variable to be measured with errors. Many job openings are not officially registered, so vacancies are a relatively poor measure of the number of job openings. Second, we may have a simultaneity problem since unobserved common shocks, which affect all firms create a positive correlation between aggregate vacancies and job growth in firm *i*. We therefore use the real manufacturing industry wage relevant for the local labor market $(\ln W_{j,t} - \ln P_{j,t})$ as an instrument for vacancies. This variable is constructed by weighting together (log) manufacturing industry-specific real wages, deflated with producer price indices, taken from Statistics Sweden, for each local labor market, using the local labor market's industry composition as weights (SNI92 two-digit industry classification). The weights are constructed by using RAMS data on the number of employees in each sector (by local labor market SNI92 two-digit industry classification). By the same argument as for competitiveness, we treat this wage as predetermined.

[19] This presupposes that unobserved *world-wide* shocks to employment are unimportant.

[20] See Forslund, Gottfries and Westermark (2006) for evidence of substantial nominal wage rigidity in the Nordic countries.

Since our empirical specification includes lagged dependent variables as well as fixed effects, we use an Arellano-Bond (1991) estimator.[21] Thus, the fixed effect is eliminated by taking first differences. This procedure introduces a first-order MA process in the residual $\Delta\varepsilon_{i,t}$, so that the first difference of the lagged dependent variable and the residual are correlated. But provided that $\varepsilon_{i,t}$ is not serially correlated, we can use (suitably chosen) lags of the dependent variable as instruments. We test for serial dependence to make sure that this approach is valid. Also, since $\ln U_{t-1}$ and $(\ln W_{i,t} - \ln P^{C}_{j,t})$ may be affected by $\varepsilon_{\mathrm{i,t-1}}$, we instrument them with their own lags. We treat the demand variable as exogenous.

As is generally the case for an asymptotically efficient GMM estimator, the instrument set grows with the number of time periods. However, as the lag order increases, lags become less informative as instruments. To avoid including irrelevant instruments, it is sensible not to include the whole history of lags. We do not use instruments further back than five years relative to the variable that is to be instrumented. Finally, we recognize that the micro-data we use for firm-level employment and competitiveness may contain measurement errors and the instrument set is consequently adjusted to solve for this problem. Taking account of all the considerations above, we chose the instrument set listed in *Tables 1* and *2*.

5. Results

5.1. Results for Export-Oriented Firms

Table 1 shows the results using the sample of exporting firms only. The results for the labor demand model are shown in Column I, the results for the search-matching model are shown in Column II, and Column III shows the results for the encompassing model. The AR(2) test of second-order serial dependence in the first differenced residuals indicates that we do not have a problem with serial dependence in the residual in any of the specifications. The result of the Hansen test of the joint hypothesis of the model specification and instrument validity cannot reject the joint hypothesis that the model is correctly specified and that the instruments are valid, thus again confirming that serial dependence in the error term is not a problem. Also, when computing partial R^2:s we find that the instrument set works very well in terms of

[21] We have also tried using the System-GMM estimator suggested by Blundell and Bond (1998). However, the diagnostic tests (i.e. Hansen tests) indicate that the data does not square well with the restrictions imposed on the initial conditions process.

relevance: the partial R^2:s are 0.32 for competitiveness, 0.46 for vacancies and 0.57 for unemployment.[22]

A pure labor demand model is supported by the data (Column I). International demand has a clear positive effect on employment and competitiveness has a clear negative effect. For the search-matching model, we see that unemployment and vacancies have positive effects on employment (Column II). The positive effect from unemployment is in line with the predictions of the search-matching model, whereas the positive effect of vacancies (congestion) is not. These results in Column II thus provide some support for the search-matching model.

Table 1: Results for Export-Oriented Firms

	I	II	III	IV
$\ln N_{i,t-1}$	0.727** (0.096)	0.815** (0.074)	0.750** (0.099)	0.682** (0.101)
$\ln W_{i,t} - \ln P^C_{j,t}$	-0.247** (0.071)	-0.124* (0.056)	-0.199** (0.066)	-0.383* (0.161)
$\ln D^I_{j,t}$	0.389** (0.108)	-	0.306* (0.129)	0.226 (0.213)
$\ln U_{t-1}$	-	0.039** (0.014)	0.019 (0.016)	-0.128* (0.065)
$\ln V_t$	-	0.040* (0.019)	0.004 (0.021)	0.032 (0.028)
Time Dummies	No	No	No	Yes
Number of obs.	612	612	612	612
AR(2) (P-value)	0.624	0.901	0.725	0.779
Hansen (P-value)	1.000	1.000	1.000	1.000

Note: Sample period 1992-2000, 68 firms. ** and * denotes significance at the 1 and 5 percent levels respectively. The estimation is performed using the Arellano and Bond (1991) GMM estimator calculated with DPD 1.21 for Ox. The firm-specific productivity trends are included in all regressions. The GMM-type instruments used are: $\ln N_{i,t-s}$ where s = 3, …,6. $\ln U_{t-s}$ where s = 2, 3, …,6. $\ln W_{i,t-s} - \ln P^C_{j,t-s}$ where s = 2, …, 5. $\ln W_{j,t-s} - \ln P_{j,t-s}$ where s = 1, 2, …, 5. Second-step coefficients with robust Windmeijer (2005) finite-sample corrected standard errors in parenthesis. AR (2) denotes the p-value for the test of second-order autocorrelation in the first differenced residuals. Hansen denotes the p-value of the joint test of the model specification and instrument validity.

When we include factors from both models in the same regression, the coefficients stemming from the labor demand model – competitiveness and international demand - are highly significant with the expected signs (Column III). In contrast, none of the variables that are unique to the search-matching model play a significant role. The coefficients for unemployment and vacancies are now much smaller and clearly insignificant. Thus, the results in Column II that appear supportive of the pure search-matching model seem to be the result of a misspecification of the true model due to omitted variables, whereas the results

[22] The relevance statistics are calculated using a static instrument set. We also tried to add a richer lag structure for the right hand side variables in the encompassing specification and found all such lags to be insignificant.

supporting the labor demand model in Column I remain virtually unchanged. If we want to model employment changes in individual firms, we do not gain any explanatory power by including the variables suggested by the search-matching model.

These results can be criticized by arguing that they may be specific to this particular and rather small sample of exporting firms. Also, there is a risk of spurious correlations arising because of omitted aggregate shocks. We tried to include time dummies and the result was that the international demand variable became insignificant (Column IV). This may be due to the fact that 57 percent of the firms in this sample belong to the same sector (SNI38) so they have the same international demand variable. In the next section we look at a much larger set of firms and include time dummies to capture common shocks.

5.2. Results for All Firms

In the previous section, we tried to deal with potential endogeneity problems by considering only export-oriented firms. Here we employ an alternative strategy in order to identify the relevant effects. This strategy allows us to include all firms, giving us a much bigger sample.

When we include all firms in the analysis we need to modify our demand variable so that it captures both international and domestic demand. As explained in Section 4, demand variables are constructed using aggregate consumption, investment and production together with industry specific weights. To deal with the simultaneity problem arising from common shocks, we include time dummies. These will pick up all unexplained variation that is common across firms. Hence we identify the demand effect from idiosyncratic variation in demand driven by differences in firms' export shares as well as in differences across sectors in the composition of domestic demand across types of final use and international demand. Provided that cross firm differences in the demand index are independent of unobserved shocks to employment, this setup will ensure identification of the demand effects.

When we run the regression on the full sample, the AR(2)-test indicates that we have a problem with second-order serial dependence in the residuals (see *Table 2*, Column I). It may be that our stylized theoretical models do not fully capture the dynamic adjustment, or there are omitted variables. By including three additional lags of employment in the regressions we are able to remove any signs of serial dependence in the residual.[23] The Hansen test does not reject the joint hypothesis that the model is correctly specified and that the instruments are valid. Examining the relevance of the instrument set, we find that the

[23] When experimenting with a richer lag structure for other variables than lagged employment, we find all such lags to be insignificant. Also, we could not eliminate the serial dependence mentioned above by adding lags of other explanatory variables than lagged employment.

partial R^2:s are 0.07 for competitiveness, 0.12 for vacancies and 0.51 for unemployment. Thus, we should keep in mind that the relevance of the instrument set is somewhat low for competitiveness and vacancies in this specification.[24]

Table 2: Results for All Firms

	I	II	III	IV
$\ln N_{i,t-1}$	0.785** (0.039)	0.443** (0.082)	0.491** (0.079)	0.439** (0.081)
$\ln N_{i,t-2}$	-	0.135 (0.075)	0.138 (0.077)	0.131 (0.074)
$\ln N_{i,t-3}$	-	0.065 (0.034)	0.066 (0.034)	0.067* (0.033)
$\ln N_{i,t-4}$	-	-0.006 (0.022)	-0.009 (0.022)	-0.006 (0.022)
$\ln W_{i,t} - \ln P^C_{j,t}$	-0.166 (0.117)	-0.442** (0.115)	-0.440** (0.119)	-0.438** (0.114)
$\ln D_{j,t}$	0.209* (0.092)	0.410** (0.123)	-	0.407** (0.123)
$\ln U_{t-1}$	-0.075 (0.051)	-	-0.045 (0.060)	-0.040 (0.058)
$\ln V_t$	0.011 (0.019)	-	0.003 (0.024)	-0.001 (0.023)
Time Dummies	Yes	Yes	Yes	Yes
Period	1992-2000	1995-2000	1995-2000	1995-2000
Number of obs.	4149	2766	2766	2766
AR(2) (P-value)	0.013	0.055	0.056	0.060
Hansen (P-value)	0.131	0.097	0.056	0.074

Note: The sample is 461 firms. ** and * denote significance at the 1 and 5 percent levels respectively. The estimation is performed using the Arellano and Bond (1991) GMM estimator calculated with DPD 1.21 for Ox. The firm-specific productivity trends are included in all regressions. The GMM-type instruments used are: $\ln N_{i,t-s}$ where s = 3, …,6. $\ln U_{t-s}$ where s = 2, 3, …,6. $\ln W_{i,t-s} - \ln P^C_{j,t-s}$ where s = 2, …,5. $\ln W_{j,t-s} - \ln P_{j,t-s}$ where s = 1, 2, …, 5. Second-step coefficients with robust Windmeijer (2005) finite-sample corrected standard errors in parenthesis. AR (2) denotes the p-value for the test of second-order autocorrelation in the first differenced residuals. Hansen denotes the p-value of the joint test of the model specification and instrument validity.

The main results from the previous analysis continue to hold. A labor demand model is supported by the data: both demand and competitiveness have clear effects on employment with the predicted signs (*Table 2*, Column II). In contrast, the search-matching model is not consistent with the data: unemployment and vacancies are both insignificant and have the wrong signs (Column III). Again, the encompassing model only confirms the results for the labor demand model (Column IV).

[24] The partial R^2 is still high for unemployment. While unemployment rates are highly correlated across regions, there is about the same cross section variation in unemployment as there is in demand (*Appendix 2, Table A2*).

5.3. Robustness

To evaluate the robustness of the results we have performed a series of robustness checks. To test whether our results are sensitive to our choice of estimation method, we estimate by OLS using a within transformation to remove fixed effects. Columns I and II in *Table 3* show the results for the sample of exporting firms with and without time dummies, and Columns III and IV shows the results for the sample with all firms.

Table 3: Within Estimates Using OLS

	I	II	III	IV
$\ln N_{i,t-1}$	0.755** (0.044)	0.748** (0.045)	0.728** (0.033)	0.720** (0.033)
$\ln N_{i,t-2}$	-	-	-0.081* (0.036)	-0.073* (0.037)
$\ln N_{i,t-3}$	-	-	0.050 (0.038)	0.044 (0.039)
$\ln N_{i,t-4}$	-	-	-0.010 (0.025)	0.000 (0.025)
$\ln W_{i,t} - \ln P_{j,t}^C$	-0.174** (0.054)	-0.195* (0.077)	-0.244** (0.045)	-0.231** (0.049)
$\ln D_{j,t}$	0.227** (0.069)	0.144* (0.069)	0.199** (0.054)	0.254** (0.069)
$\ln U_{t-1}$	0.025* (0.013)	-0.053 (0.037)	0.009 (0.019)	-0.038 (0.029)
$\ln V_t$	0.007 (0.012)	0.008 (0.015)	-0.010 (0.008)	-0.004 (0.009)
Time Dummies	No	Yes	No	Yes
Number of obs.	680	680	3227	3227

Note: Columns I and II use the sample of export-oriented firms. Column III and IV use the sample of all firms. The firm-specific productivity trends are included in all regressions. Robust standard errors are in parentheses. ** and * denotes significance at the 1 and 5 percent levels respectively.

Wages and demand have significant effects in all regressions, but the coefficients are smaller compared to the IV estimates. This may be due to measurement errors for wages, in which case all the coefficients in the regression will be biased. In the regression for exports without time dummies, unemployment is barely significant on the 5 percent level. This result is clearly not robust and may be due to biases which arise when we disregard measurement errors.[25]

In the regression for all firms we can exclude the time dummies without affecting the qualitative results. In practice, the simultaneity problem arising from common shocks to employment may not be very serious.

[25] Some of the adjustment in the labor market occurs via wages. If, in our estimation, we do not take account of measurement errors in wages, the coefficient will be too small and we will understate the importance of wages. This may lead us to interpret employment adjustment as a direct effect of unemployment. (See discussion in the Concluding Remarks.)

6. Concluding Remarks

In the long run, supply creates its own demand. Given tastes and technology, a 10 percent increase in labor supply should bring about a 10 percent increase in employment - eventually. This is implied by all reasonable theories of the labor market. But labor market theories offer different explanations of *how* the adjustment occurs and what drives medium-term variations in employment. The traditional Keynesian view is that wage adjustment and aggregate demand are important determinants of employment. In contrast, search-matching theory predicts an increase in supply to bring about more jobs even if there is no adjustment of wages. In this paper we compare the relevance of the two theories by estimating an equation for net job creation that combines factors emphasized by each of these theories.

As predicted by bargaining and efficiency wage models, wages and demand have important effects on job creation. There are no indications that the search-matching model offers any value added when it comes to explaining job creation on the firm level. Instead, because the search-matching literature typically takes the product market to be perfectly competitive, it distracts attention from the important role of aggregate demand.

A large number of studies have estimated "matching functions" and found a positive effect of unemployment on hiring.[26] Does this result contradict our findings? In our view it does not. Estimated matching functions say very little about *how* employment adjustment comes about. Any labor market theory, which implies some mean reversion in unemployment, implies that hiring tends to be high when unemployment is high. In a regression of hiring on unemployment, we should expect a positive coefficient, independently of which is the correct theory of the labor market. Vacancies are a very imperfect measure of job openings, so the coefficient on unemployment is likely to remain positive even if we include vacancies in the regression.

To separate different labor market theories, we need to know whether employment adjustment occurs because of wage changes, fiscal and monetary policy, exchange rate changes, or because high unemployment by itself induces firms to create more vacancies.[27] We have tried to separate some of these factors. If we omit the demand variable, we find a positive effect of unemployment, but once we include an index of product demand, we find no evidence that unemployment has a direct effect on job creation.

---

[26] See Petrongolo and Pissarides (2001) for a survey this literature. Blanchard and Diamond (1989) estimate a matching function and conclude that "... employment is not simply determined by demand".

[27] Wages are omitted from standard matching functions because it is assumed that "… wages play no allocational role in individual matches, merely dividing rents between firms and workers" (Blanchard and Diamond (1989)). See Oswald (1993), Gottfries (1992), Gottfries-Sjöström (1999) for arguments why wages play an allocative role in a bargaining model.

References

Akerlof, G. A. and J. J. Yellen, (1986). *Efficiency Wage Models of the Labor Market,* Cambridge University Press, Cambridge, U. K.

Arellano, M. and Bond, S. (1991). Some tests of specifications for panel data: Monte carlo evidence and application to employment equations, *Review of Economic Studies* **58**: 277-297.

Blanchard, O. J. (2003). *Macroeconomics*, third edition, Prentice Hall.

Blanchard, O. J. and P. Diamond, (1989). The Beveridge Curve, *Brookings Papers on Economic Activity* 1989:1 1-60.

Blanchard, O. J., and L. H. Summers, (1986). Hysteresis and the European Unemployment Problem, NBER *Macroeconomics Annual*, 1, MIT press, Cambridge, MA.

Blundell, R. and S. Bond, (1998). Initial Conditions and Moment Restrictions in Dynamic Panal Data Models, *Journal of Econometrics*, **87:** 115-143.

Borjas, G. J. (2003). The Labor Demand Curve IS Downward Sloping: Reexamining the Impact of Immigration on the Labor Market, *The Quarterly Journal of Economics*, **118:** 1335-1374.

Burgess, S. (1993). Labour Demand, Quantity Constraints or Matching – The Determination of Employment in the Absence of Market-Clearing, *European Economic Review*, **37:** 1295-1314.

Calmfors, L. and J Driffill, (1988). Centralisation of Wage Bargaining and Macroeconomic Performance, *Economic Policy*, **6:** 13-61.

Card, D. (1990). The Impact of the Mariel Boatlift on the Miami Labor Market, *Industrial and Labor Relations Review*, **43:** 245-257.

Eriksson, S and Gottfries, N (2005), Ranking of Job Applicants, On-the-job Search, and Persistent Unemployment, *Labour Economics* **12**: 407-428.

Forslund, A., N. Gottfries and A. Westermark, (2006). *Real and Nominal Wage adjustment in Open Economies*, CESifo working paper 1649.

Gottfries, N. (1992), Insiders, Outsiders, and Nominal Wage Contracts, *Journal of Political Economy* **100**, 252-270.

Gottfries, N. and Horn H. (1987). Wage Formation and the Persistence of Unemployment, *Economic Journal* **97**, 877-884.

Gottfries, N and Sjöström, T. (1999), Insider Bargaining Power, Starting Wages, and Involuntary Unemployment, *Scandinavian Journal of Economics* **102**, 669-688.

Hamermesh, D. (1993). *Labor Demand*, Princeton University Press, Princeton, NJ.

Holden, S. (1994). Wage Bargaining and Nominal Wage Rigidities, *European Economic Review* 38, 1021-1039.

Layard, R., Nickell, S. and Jackman, R. (1991). *Unemployment - Macroeconomic Performance and the Labour Market*, Oxford University Press, Oxford.

Lindbeck, A. and D. J. Snower (1988), Cooperation, Harassment and Involuntary Unemployment: An Insider-Outsider Approach, *American Economic Review* 78, 167-188.

Mortensen, D. and Pissarides, C. (1994). Job Creation and Job Destruction in the Theory of Unemployment, *Review of Economic Studies* **61**, 397-415.

Nickell, S. J. (1986). Dynamic Models of Labour Demand, in O. Ashenfelter and R. Layard (eds.) *Handbook of Labour Economics* (North-Holland, Amsterdam).

Oswald, A. (1993). Efficient Contracts are on the Labour demand curve: Theory and Facts, *Labour Economics* 1, 85-113.

Petrongolo, B. and Pissarides, C. A. (2001). Looking into the Black Box: A Survey of the Matching Function, *Journal of Economic Literature*, **39:** 390-431.

Pissarides, C. A. (2000). *Equilibrium unemployment theory*, MIT Press, Cambridge MA.

Salop, S.C. (1979). A Model of the Natural Rate of Unemployment, *American Economic Review* **69**: 117-125.

Sargent, T. J. (1979). *Macroeconomic Theory*, Academic Press, New York.

Shapiro, C. and Stiglitz, J.E. (1984). Equilibrium Unemployment as a Worker Disciplinary Device, *American Economic Review* **74**: 433-444.

Shimer, R. (2004). The Consequences of Rigid Wages in Search Equilibrium, *Journal of the European Economic Association*, **2:** 469-479.

Shimer, R. (2005). The Cyclical Behavior of Equilibrium Unemployment and Vacancies, *American Economic Review*, **95:** 25-49.

Windmeijer, F. (2005). A Finite Sample Correction for the Variance of Linear Efficient Two-Step GMM Estimators, *Journal of Econometrics* **126**: 25-51.

Appendix 1. Derivation of the Job Creation Equations

The Labor Demand Model:

This derivation follows Sargent (1979) closely. Using the constraint to eliminate $P_{i,\tau}$ in the objective function and taking the first-order condition for period *t* we get:

$$E_t \left\{ \eta(D_{j,t} - 2N_{i,t} + \nu_{i,t}) - \frac{W_{i,t}}{P^C_{j,t}} - c(N_{i,t} - N_{i,t-1}) + \beta c(N_{i,t+1} - N_{i,t}) \right\} = 0 ,$$

By the law of iterated expectations, this holds if we take expectations at time *t* for future periods. Since this is linear we can solve the problem as if future variables were known with certainty. Using lag operators, this can be rewritten as:

$$\beta \left[1 + \frac{\phi}{\beta} L + \frac{1}{\beta} L^2 \right] N_{i,t+1} = -\frac{\eta}{c}(D_{j,t} + \nu_{i,t}) + \frac{1}{c}\frac{W_{i,t}}{P^C_{j,t}} .$$

where $\phi = -[1 + \beta + 2\eta / c]$. The expression within the brackets can be factorized:

$$\beta[(1-\lambda_1 L)(1-\lambda_2 L)]N_{i,t+1} = -\frac{\eta}{c}(D_{j,t} + \nu_{i,t}) + \frac{1}{c}\frac{W_{i,t}}{P^C_{j,t}} ,$$

where λ_1 and λ_2 are functions of β, η and c. This can be rewritten as:

$$N_{i,t+1} = \lambda_1 N_{i,t} + \frac{\lambda_1}{c} \sum_{i=0}^{\infty} \left(\frac{1}{\lambda_2} \right)^i \left(\eta(D_{j,t+1+i} + \nu_{i,t+1+i}) - \frac{W_{i,t+1+i}}{P^C_{j,t+1+i}} \right) .$$

One can show that the same expression holds for period *t*.

The Search-Matching Model

Using the constraint to eliminate $V_{i,\tau}$ in the objective function and maximizing with respect to planned employment to get the following first-order condition for period τ :

$$E_{\tau}\left\{(1-\frac{W_{i,\tau}}{P^{C}_{j,\tau}})-c\left(\frac{N_{i,\tau}-(1-\lambda-\xi_{i,\tau})N_{i,\tau-1}}{q^{2}_{\tau}}\right)+(1-\lambda)\beta c\left(\frac{N_{i,\tau+1}-(1-\lambda-\xi_{i,\tau+1})N_{i,\tau}}{q^{2}_{\tau+1}}\right)\right\}=0.$$

Using the same conditions for subsequent periods and the law of iterated expectations we can derive planned employment in period *t*:

$$E_{t}\left(N_{i,t}\right)=\frac{q^{2}_{t}}{c}E_{t}\sum_{\tau=t}^{\infty}\left[\beta^{\tau-t}(1-\lambda-\xi_{i,\tau})^{\tau-t}\frac{P^{C}_{j,\tau}-W_{i,\tau}}{P^{C}_{j,t}}\right]+(1-\lambda)N_{i,t-1}\ .$$

Appendix 2. Illustration of the data

Table A1: Number of Firms, Average Export Share and Share Used for Consumption, Investment and Intermediate Goods for each Industry

SNI92	Number of firms	Average export share	Consumption	Investment	Intermediate
15	22	0.11	0.58	0	0.42
16	0	0.06	1	0	0
17	15	0.63	0.28	0	0.72
18	7	0.79	0.89	0	0.11
19	4	0.73	0.39	0	0.61
20	44	0.52	0.02	0	0.98
21	22	0.65	0.03	0	0.97
22	18	0.04	0.16	0	0.84
23	3	0.50	0.40	0	0.60
24	19	0.69	0.28	0	0.72
25	26	0.52	0.07	0	0.93
26	5	0.30	0.03	0	0.97
27	17	0.54	0.01	0	0.99
28	68	0.28	0.02	0.14	0.84
29	92	0.64	0.02	0.40	0.58
30	4	0.74	0.04	0.80	0.16
31	9	0.70	0.06	0.17	0.77
32	7	0.78	0.04	0.35	0.61
33	12	0.62	0.02	0.49	0.49
34	28	0.66	0.28	0.20	0.52
35	9	0.69	0.12	0	0.88
36	29	0.46	0.38	0.20	0.42
37	1	0	0	0	1

Table A2: Share of Variation Explained by Time Dummies

Variable	Share of variation explained by the time dummies	
	Export firms	All firms
Change in international demand	0.62	-
Change in demand	-	0.83
Change in competitiveness	0.39	0.14
Change in unemployment	0.86	0.86
Change in vacancies	0.36	0.30

Note: Ordinary least squares regressions with time dummies as the only explanatory variables

Figure A1: Change in Domestic Consumption, Domestic Investment, Domestic Production and International Demand (sni69=38)

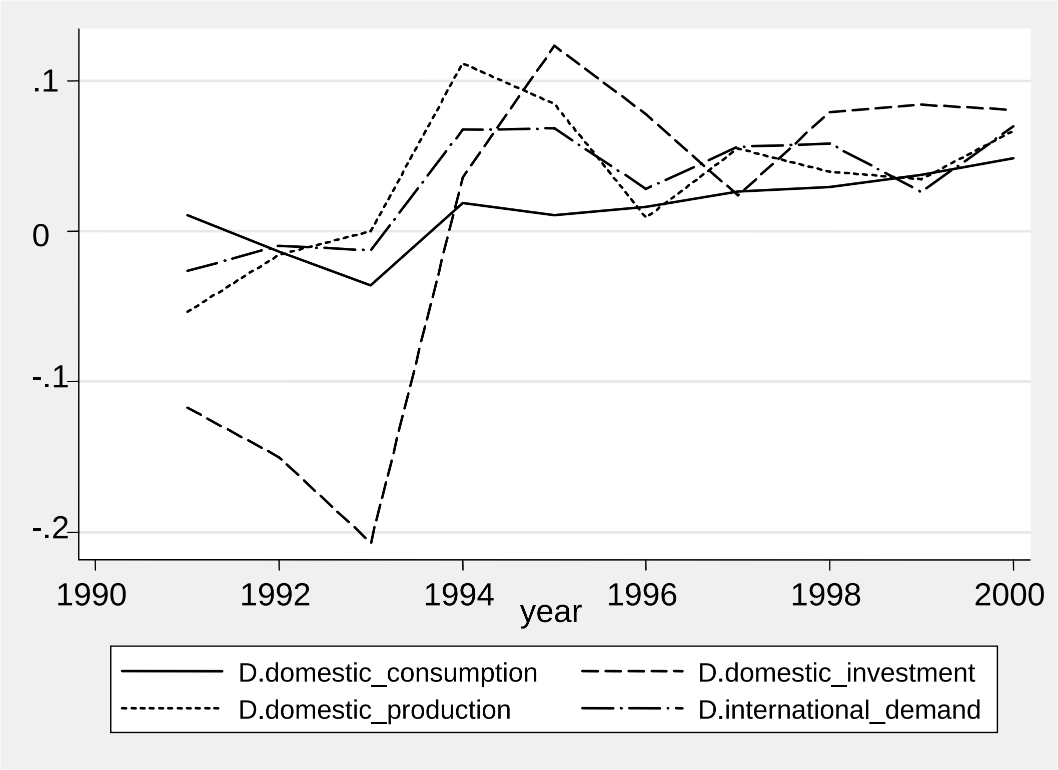


Figure A2: Change in Competitiveness for the Food (sni92=15) and the Machine Industries (sni92=29)

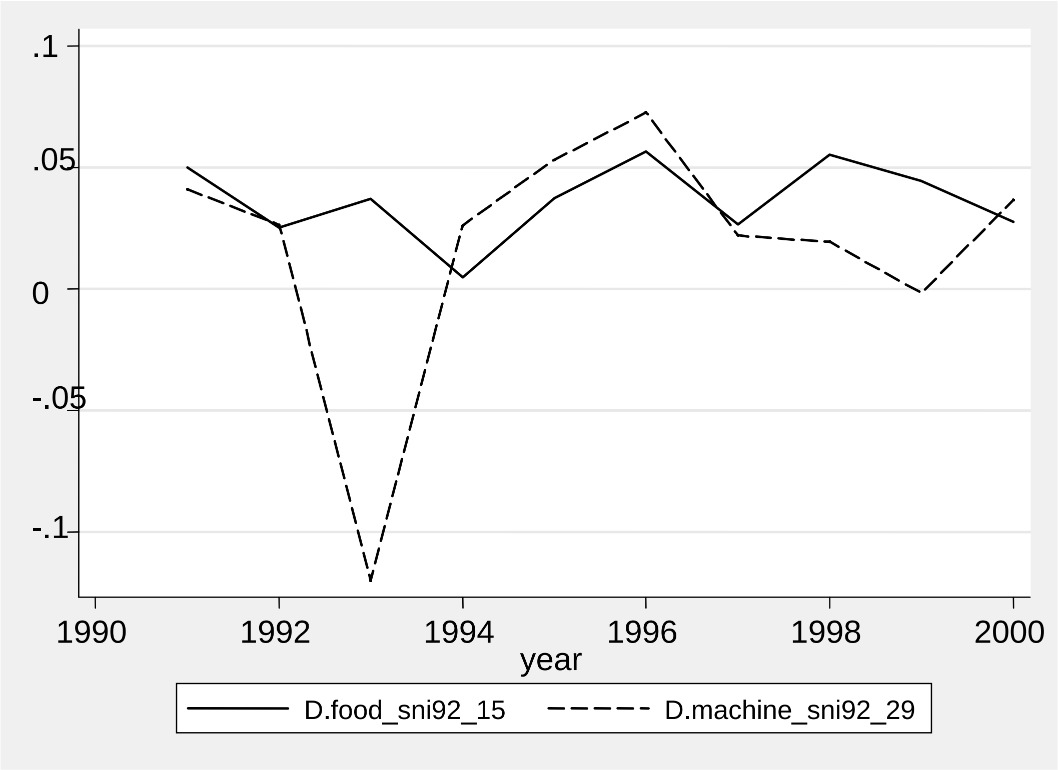
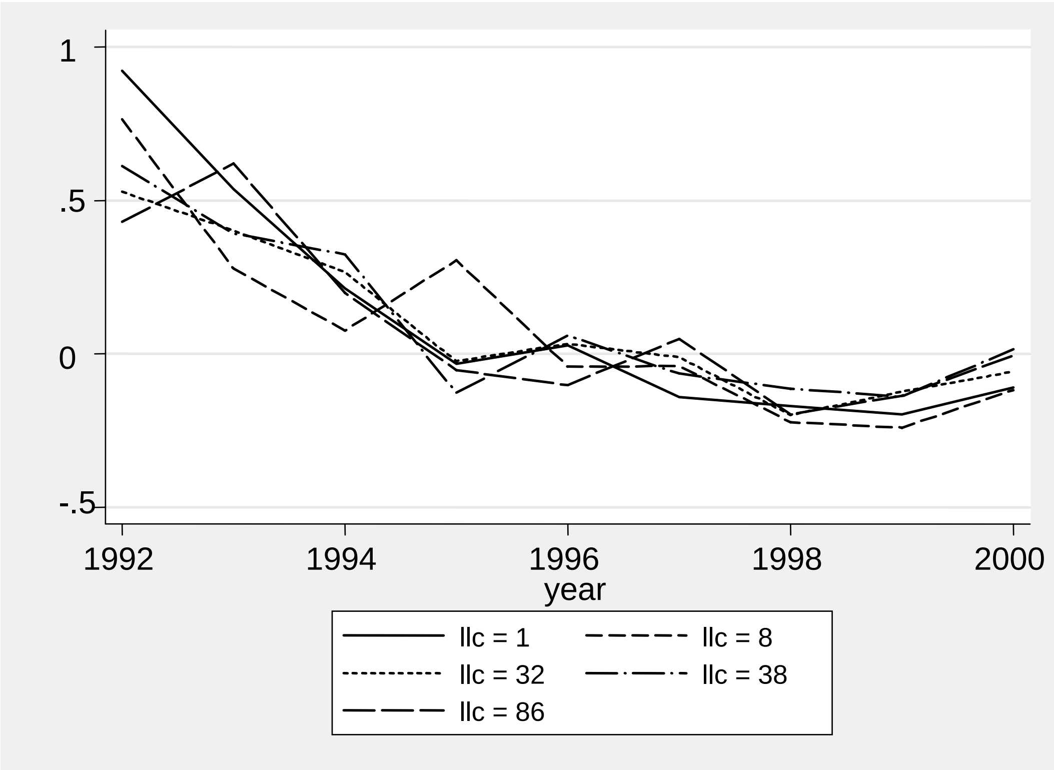
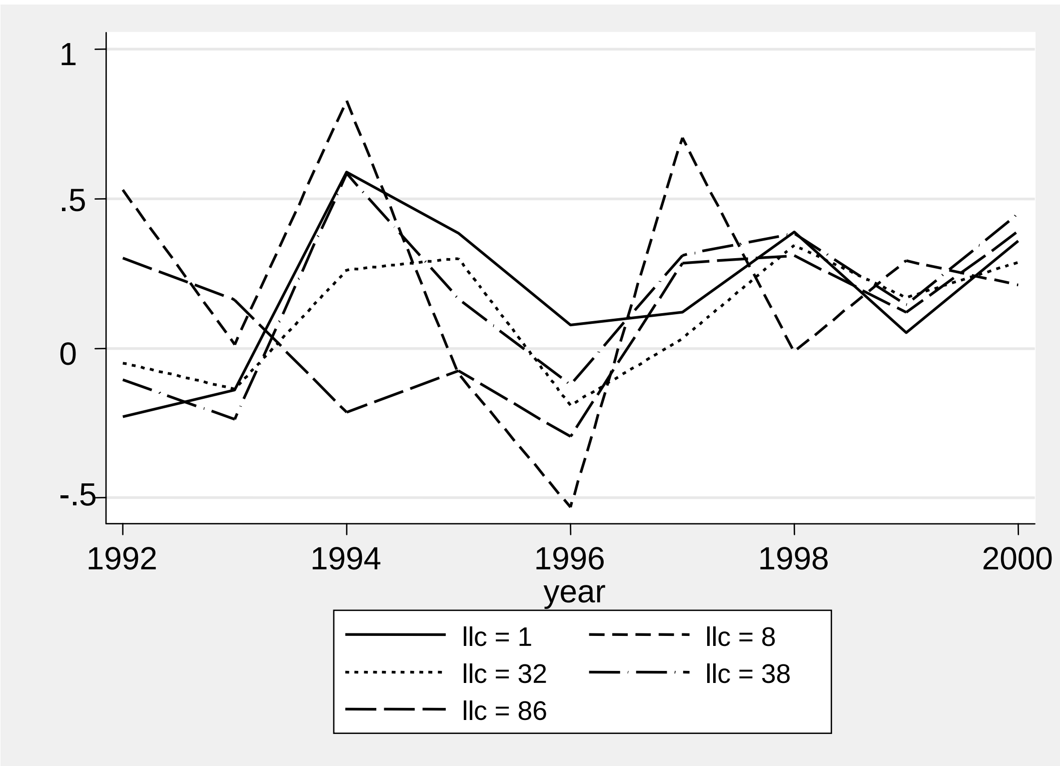


Figure A3: Change in Unemployment for some Local Labor Markets



Note: The local labor market areas used for this illustration are Stockholm (llc=1), Gnosjö (llc=8), Malmö (llc=32), Göteborg (llc=38) and Örnsköldsvik (llc=86).

Figure A4: Change in Vacancies for some Local Labor Markets



Note: The local labor market areas used for this illustration are Stockholm (llc=1), Gnosjö (llc=8), Malmö (llc=32), Göteborg (llc=38) and Örnsköldsvik (llc=86).

Earlier Working Papers:

For a complete list of Working Papers published by Sveriges Riksbank, see www.riksbank.se

Sveriges Riksbank
Visiting address: Brunkebergs torg 11
Mail address: se-103 37 Stockholm

Website: www.riksbank.se
Telephone: +46 8 787 00 00, Fax: +46 8 21 05 31
E-mail: registratorn@riksbank.se

ISSN 1402-9103 Riksbank Printing Office Stockholm 2006