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A new look at the discouragement and the added worker hypotheses

Applying a trend-cycle decomposition to unemployment

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Abstract

Using German data this study applies an unobserved-components approach to disentangle the unemployment rate into a (stochastic) trend and a cyclical part and to estimate the influence of these components on labor participation. The persistent trend component of unemployment, which triggers permanent reactions of the workers, is likely connected to a structural discouragement effect. The cyclical component, which reflects more fluctuant changes, can be linked to a shorter-term added worker effect. By splitting up the participation effect of changes in the unemployment rate our analysis differs profoundly from previous studies that present the net of both or only a single effect.

For the total working population both a discouragement and an added worker effect were identified. In detailed analyses we find that the former was relevant for older workers, whereas the latter especially concerns prime aged and younger females. As many OECD countries are facing an ageing population as well as rising importance of women in the labor market, these age- and gender-specific results might be of particular interest.

Zusammenfassung

Die vorliegende Analyse zerlegt mit einem „unobserved-component"-Ansatz die Arbeitslosenrate in eine (stochastische) Trendkomponente und eine zyklische Komponente und schätzt deren Einfluss auf die Erwerbspartizipation. Die persistente Trendkomponente, die dauerhafte Reaktionen der Erwerbspersonen erfasst, bildet den „discouragement effect" ab. Die zyklische Komponente stellt die mehr wechselhaften Veränderungen dar. Sie wird als Ausdruck des „added worker effects" aufgefasst. Die Aufteilung des Partizipationseffektes als Folge von Änderungen in der Arbeitslosigkeit unterscheidet unsere Analyse erheblich von bisherigen Studien, die entweder den Nettoeffekt aus „discouragement" und „added worker effect" untersuchten oder nur einen einzelnen Effekt darstellten.

Die Ergebnisse belegen für die Erwerbsbevölkerung insgesamt, dass „discouragement" und „added worker effect" gleichzeitig auftreten können. Disaggregierte Analysen ergaben, dass vor allem Ältere von „discouragement" betroffen sind, während bei Frauen im mittleren und jüngerem Alter insbesondere der „added worker effect" zu finden ist. Nachdem viele OECD-Länder vor dem Problem einer alternden Bevölkerung stehen und zugleich die Frauenerwerbsbeteiligung zunimmt, dürften diese alters- und geschlechtsspezifischen Resultate besonders wichtig sein.

1 Introduction

The response of the labor force to fluctuations in unemployment has been discussed for decades. On the one hand, due to the discouragement hypothesis workers drop out when the labor market deteriorates (e.g. Dernburg/Strand 1966). On the other hand, some additional labor force participants may enter the labor market, e.g. to ensure the family income (e.g. Lundberg 1985). Empirical studies produced discordant results (for a discussion see Gong 2011). One reason might be that typically only the net effect of the unemployment influence on labor participation is estimated (e.g. Agbola 2005, Filatriau/Reynès 2012). Which effect dominates depends on the relative strength of discouragement and added worker effect (AWE) and is thus an empirical question.[1]

This study constructs an unobserved-components (UC) model to disentangle the unemployment rate into a (stochastic) trend and a cyclical part (see Morley et al. 2003) and to estimate the influence of these components on labor participation. The persistent trend component of unemployment thus triggers permanent reactions of the workers, likely connected to a structural discouragement effect. In contrast, the cyclical component reflects more fluctuant changes, which can be linked to a shorter-term AWE. By splitting up the participation effect of changes in the unemployment rate our analysis differs profoundly from previous studies that present the net of both or even only a single effect. For example, using Swedish time series, Österholm (2010) found evidence for a long-run (cointegration) relationship between unemployment and labor participation that favors a discouragement effect. In our UC approach, this is equivalent to the trend component (for a separation of the AWE, see Tano 1993).

We analyze data from Germany, which is an interesting example for significant developments of both labor participation and unemployment. For the total working population we are able to separate and identify both discouragement and AWE. In detailed analyses we find that the former is relevant for older workers, whereas the latter especially concerns prime aged and younger females. As many OECD countries are facing an ageing population as well as rising importance of women in the labor market, these age- and gender-specific results might be of particular interest.

2 Data

Monthly unemployment rates are defined according to the Federal Employment Agency (FEA) with standard seasonal adjustment. Participation rates are obtained from the German labor force survey (LFS). Until 2004, they are observed every 12th month, afterwards we observe an annual average every 12th month. The data covers the period from 1970:1 to 2011: 9.[2]

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[1] In addition there seem to be some cultural and social differences, so the outcome might vary by region (see Lundberg 1985).

[2] Age specific time series for the unemployment rate covering a long sample are not available.

The overall participation rate has steadily risen since the 1970s (see Figure 1). The main driving factor was the labor participation of prime aged women, which increased strongly in the past. In addition, labor participation of the elderly has improved a lot, especially in the last decade. In contrast, the participation rate of the younger, especially of females, peaked in the early 1990s and declined afterwards. This picture of labor participation is quite similar to many EU-countries and the US as well. Unemployment in general followed a rising path with several steps upward, some swings and an essential step downward in the course of the strong labor market development in the recent years. Two breaks in 1992 and 2005 will be accounted for in the next section.

Figure 1
Labor Participation and Unemployment
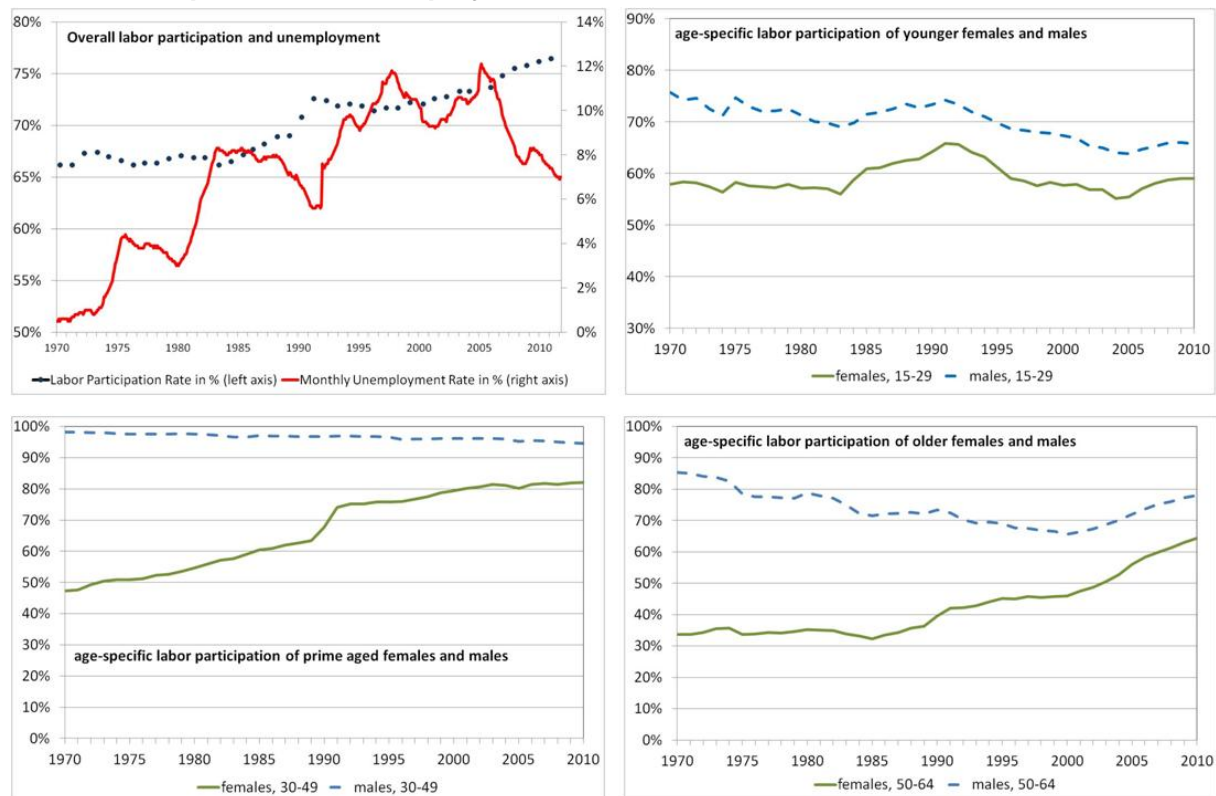
Sources: LFS and FEA 1970-2011

3   The model

The model is formulated for a monthly frequency. Observations of the annual participation series are treated as missing in a state space framework.

We denote the observed participation rates (see previous section) by $\bar{p}_t$ and the corresponding monthly state variable by p_t (see equation 1a). The unemployment rate u_t is decomposed into the state variables unemployment trend ut_t and cycle uc_t (see equation 1b). In addition, we take into account shifts with known timing at the German reunification (shift92) and the Hartz reforms (shift05) due to a statistical redefinition.

(1a) $\quad \bar{p}_t = \begin{cases} p_t & \text{until } 2004 \\ \frac{1}{12}\sum_{i=0}^{11} p_{t-i} & \text{from } 2005 \end{cases}$

(1b) $\quad u_t = ut_t + uc_t + c_1 shift92_t + c_2 shift05_t$

The key equation (2) of our model connects the participation rate to unemployment. Representing an error correction form, it considers the first difference of p_t on the left hand side and two non-stationary[3] variables – p_{t-1} and ut_{t-1} – on the right hand side. Thus, the participation rate and the stochastic unemployment trend can cointegrate, i.e. the linear combination $c_4 p_{t-1} + c_6 ut_{t-1}$ would be covariance-stationary. Furthermore, the stationary unemployment cycle may affect the participation rate. Deterministics are a constant term, a linear time trend and a local trend (trend90), which linearly increases from 89:11 until 91:01 and then stays on the reached level (compare the reunification effect in Figure 1).

(2) $\quad \Delta p_t = c_3 + c_4 p_{t-1} + c_5 t + c_6 ut_{t-1} + c_7 uc_{t-1} + c_8 trend90_{t-1} + e_{1t}$

The unemployment trend is modeled as a random walk with drift and the cycle as a stationary autoregressive process of order one ($|c_{10}| < 1$). The shocks are allowed to be correlated according to Σ as in Morley et al. (2003).

(3a) $\quad ut_t = c_9 + ut_{t-1} + e_{2t}$

(3b) $\quad uc_t = c_{10} uc_{t-1} + e_{3t}$

(3c) $\quad \begin{pmatrix} e_{1t} \\ e_{2t} \\ e_{3t} \end{pmatrix} \sim N(0, \Sigma)$

The model is cast in state space form and estimated by maximum likelihood using the Kalman filter. The long-run (cointegration) effect of a one-unit shock in ut_t on p_t is obtained as $-c_6/c_4$. For a shock in uc_t we calculate the impulse response of p_t from the whole equation system. As the cycle is transitory, this impulse response eventually decays after reaching a peak; we report the maximum value as our relevant measure.

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[3] Unit root test results are available upon request.

4 Empirical results

Table 1 highlights the estimated participation effects due to unit shocks in the trend and the cycle of unemployment (see equation 2). A negative sign of the trend implies a long-run reduction of the participation rate when the labor market worsens (and vice versa) and can be interpreted as discouragement. A positive sign of the cycle (i.e., the peak of the impulse response) covers the AWE.

The analysis starts with the total working population. The results are in line with the expectations from the literature. First, there is a substantial discouragement effect visible, as a one-percentage-point increase of the unemployment trend reduces the overall participation rate by 0.28 percentage points. This is comparable to other long-run results (e.g. Österholm 2010). Second, the positive sign of the cycle reflects increasing labor participation because of the AWE. As this variable captures the cyclical influence, the effect is temporary and vanishes after the maximum has been reached within two years.

This result favors the hypothesis that discouragement and AWE can exist simultaneously. It is the merit of the UC-approach to disentangle the gross effects of both.

Table 1
Results from the UC-analysis by age and sex

	all	females, 15-29	females 30-49	females, 50-64	males, 15-29	males, 30-49	males, 50-64
Trend effect[1]	-0,28***	n.s.	n.s.	-2,08***	n.s.	n.s.	-2,7**
Cyclical effect[2]	0,17***	0,69*	0,57***	n.s.	0,29**	0,1**	n.s.

1) Long-run (permanent) effect of an unit shock in the trend component (ut_t) on labor participation

2) Maximum impulse response of a shock in the cyclical component (uc_t)
Significant at the *** 1 %, ** 5 %, * 10 % level, respectively; n.s. non-significant
Source: Own calculation.

Disaggregating by gender and age sheds further light on this issue. Labor participation of older workers reacts quite strongly negatively to the trend component, whereas the cyclical component is insignificant. Thus, older workers become discouraged after a structural deterioration of the labor market, which suggests the relevance of social security (O´Brien 2000). For the elderly being retired is an alternative social role to work (Benati 2001).[4] In particular, for those receiving sufficient pensions there are usually no financial needs to take up a job for family reasons. That is why one should not expect a significant AWE. As the findings show that labor participation of the elderly is influenced by the structural component of unemployment, discouragement of older workers might be interpreted as a longer lasting "structural hidden unemployment" (O'Brien 2000).

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[4] Note that some retired persons might seek a job and therefore count to the labor force.

In recent years the German labor market setting improved fundamentally, causing a sharp reduction in structural unemployment. Our model results predict that by such a development many elderly are *en*couraged to (re-)enter the labor market. Indeed, job opportunities and participation of the elderly have already improved considerably. Since this represents a permanent effect, one could expect that a rising number of (older) workers will help to dampen unfavorable demographic effects that Germany will face like most other OECD countries (see e.g. Carone et al. 2005 for Europe or Tossi 2012 for the US). This influence resembles the "reversed discouraged-worker effect" reported by Österholm (2010) for women. Lowering structural unemployment has a double-positive effect in this respect.

We uncover a compelling positive cyclical effect for prime aged females. This agrees in principle with the literature, where an AWE was often found for women (e.g. Tano 1993). In addition, a weak cyclical effect for the prime aged males can be demonstrated. Neither for prime aged females nor males, however, a significant trend influence was found. So the existence of a discouragement effect cannot be confirmed for the prime aged.

The decomposition shows a cyclical effect in the labor participation of the young, but no significant permanent effect. This favors the interpretation that in case of the younger short term reactions to the labor market are typical. Short term adjustments, like the AWE, seem to be a reasonable behavior, as, e.g., within the household context, students can take up a marginal job for financing their study. Staying outside the labor market for a longer time due to discouragement should not be a worthwhile prospect for young people.

There is probably a close connection between the labor market and the educational system. Assuming an inverse relationship between labor participation and enrollment in education, a negative influence of unemployment on participation could be expected for the younger (Clark 2011). However, the German institutional setting explains our finding: the majority of school leavers take up a vocational training, which statistically counts to the labor force. These youngsters are likely to be rather unaffected by the discouragement.

In sum, our analyses confirm that both the discouragement and the added worker effect exist, but different age groups respond differently to permanent and transitory changes in the unemployment rate. One implication is that policy makers should bear in mind the complex dependency of labor participation and unemployment. Above all disaggregating by gender and age as well as by short and long run seems to be productive in studies that aim to evaluate reactions of (potential) workers to unemployment shocks. Finally, a declining unemployment will promote some additional labor force and can alleviate the projected demographic shocks. In future research, we will investigate the role of long-term unemployment in this context.

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