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# An alternative micro-based output gap measure for Turkey: The capacity utilisation gap

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## HIGHLIGHTS

- Capacity utilisation gap is proposed as an alternative output gap measure.
- It relies on firm-level micro data provided by the Central Bank of the Republic of Turkey.
- The capacity utilisation gap is timely and revision-free.
- It gives information about the economy one quarter earlier than the alternatives.

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## ABSTRACT

We propose a capacity utilisation gap as an alternative measure of the output gap in the Turkish economy on the basis of firm-level micro data. Estimation results provide supporting evidence for the adequacy of a capacity utilisation gap as an alternative indicator for assessing the overall state of the business cycle and inflation pressures.



## 1. Introduction

From a policy perspective, not only the level of output but also its position relative to the economic potential is important because the gap between actual and potential output is considered a measure of inflationary pressure. For this reason, an output gap, which is defined as the difference between the actual output of an economy and potential output, plays a central role in the design of monetary policy.

Measuring an output gap is important but is not easy because, unlike actual output, potential output is unobservable. Both statistical and economic-based methodologies are used to estimate potential output, however, these approaches contain either randomness or uncertainty and are exposed to significant revisions. Moreover, all these methodologies yield an estimate that is the most uncertain for the most recent period, which has the greatest importance for policy makers.

In this study, we propose a capacity utilisation gap as an alternative measure of an output gap. For this purpose, a non-inflationary rate of capacity utilisation (NIRCU) is derived from firm-level survey data and used as a proxy for potential output following the study of Köberl and Lein (2011). Köberl and Lein (2011) use survey data to derive a non-inflationary rate of capacity utilisation (NIRCU) for Switzerland and find it performs very well as an indicator of inflationary pressure. Following Köberl and Lein (2011), Fessler et al. (2014) and Crosilla et al. (2014) derive a NIRCU for Austria and Italy, respectively, and they both find that it performs well as an indicator of inflationary pressure in various Phillips curve estimations. For practical purposes, the capacity utilisation gap has several advantages over other measures of

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**Table 1**
BTS questions used in constructing NIRCU.

| Question | Answer Choices |
|---|---|
| At what capacity is your company currently operating (as a percentage of full capacity)? | ____% |
| How do you expect your domestic market selling prices to change over the next three months? They will … | Increase, Remain Unchanged, Decrease |
| Considering your current order books and the expected change in demand over the coming months, how do you assess your current production capacity? The current production capacity is … | More than sufficient, Sufficient, Not sufficient |

inflationary pressure. First, it is directly measured from the survey data. Second, it is not subject to any revisions. Third, it is timely because it is observable before the release of official gross domestic product (GDP) figures. And, finally, it gives signals about the direction of the economy one quarter earlier than other output gap measures, as shown by lead/lag structures, which have not been studied in the earlier literature on the NIRCU.

The remainder of this paper is organised as follows. Section 2 introduces the firm-level data set used in the analysis and discusses the methodology used for the derivation of the capacity utilisation gap for the Turkish economy. Section 3 investigates the performance of the capacity utilisation gap by comparing it with alternative output gap measures. Finally, Section 4 concludes.

## 2. Data and methodology

In this study, firm-level data from the Business Tendency Survey (BTS) for Turkish manufacturing are used. The Central Bank of the Republic of Turkey conducts the BTS with the aim of producing indicators that will show the short-term tendencies in manufacturing, considering the assessments of senior managers, about the recent past and the present, and their expectations regarding future business conditions. The BTS comes in two different forms, including the monthly and quarterly surveys, which have been conducted since 2007. On average, it covers 2,000 firms, which correspond to at least 85% of total production value.

We use all observations from the quarterly survey from 2007 onward, consisting of an unbalanced panel of 3,165 firms with a total of 97,824 observations. To derive the micro-based NIRCU, we use answers to the questions listed in Table 1.

Köberl and Lein (2011) define the NIRCU as the rate of capacity utilisation that is consistent with a zero investment gap and associated with a stable price level. The question about an assessment of current production capacity considering the current order books and the expected change in demand over the coming months helps us to identify which firms operate at high (low) capacity because of a need to adjust capital stock. Köberl and Lein (2011) state that a firm has a positive (negative) investment gap when its current production capacity is not (more than) sufficient. Thus, the investment gap ($INV_{gap}$) measures the pressure on firms to invest. Following Köberl and Lein (2011), we define the firm-level NIRCU of firm $i$ in quarter $t$ as follows[1]:

$$NIRCU_{i,t} = CU_{i,t} | E_t \left(P_{i,t+1}\right) = 0, INV_{gap} = 0.$$

It is assumed that a firm operates at its NIRCU if no price change is expected to occur in the next three months and its current production capacity is sufficient, considering its current order books and the expected change in demand.

A time-series of the percentage of firms that operate at NIRCU for Turkish manufacturing sector is plotted in Fig. 1. As seen in this figure, the percentage of firms that operate at NIRCU trends slightly upward since the dramatic drop in January 2009 in the aftermath of the crisis; on average, 45% of the firms operate at a NIRCU.

[1] Köberl and Lein (2011) condition both on the current and the subsequent period's price adjustment, but since we do not have a question about current price adjustment at the BTS, only we condition on the subsequent period's price adjustment.

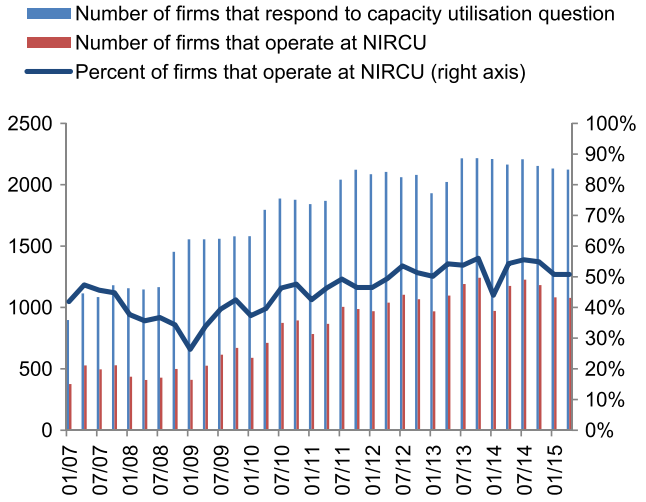


**Fig. 1.** Percentage of firms that operate at NIRCU.

Firm-level NIRCU's are aggregated with a two-stage weighting scheme to obtain a NIRCU for the manufacturing sector (macro NIRCU), which is defined as

$$NIRCU_t = \sum_{j=1}^{24} s_j \sum_i w_{ijt} * NIRCU_{ijt}$$

$$w_{it} = \frac{E_{it}}{\sum_i E_{it}}$$

where $E_{it}$ is the number of employees at firm $i$ at time $t$ and $s_j$ is the sectoral weight (production values) of the two-digit level NACE Rev 2. Classification. Thus, each firm is weighted in relation to the proportion of the firm's employment size and sectoral weights to obtain a macro NIRCU. Finally, the capacity utilisation gap is calculated by taking the difference between the actual capacity utilisation rate and the macro NIRCU.

$$CU\_GAP_t = CU_t - NIRCU_t.$$

Fig. 2 shows the capacity utilisation rate and the estimated NIRCU, and Fig. 3 displays the capacity utilisation gap. According to these figures, after the recent global crisis the gap between actual and potential capacity utilisation started to widen and reached its maximum in the first quarter of 2009; afterwards, with the recovery of the economy, the capacity utilisation gap started to narrow. However, the actual capacity utilisation rate has never exceeded the NIRCU, and the average capacity utilisation gap was around −1.5 for the period 2009:Q3–2014:Q4.

## 3. Evaluating the performance of the capacity utilisation gap

After estimating the capacity utilisation gap, we compare its performance with alternative output gap measures for Turkey. As an alternative output gap measure, first we estimate potential output by applying the HP filter to the quarterly seasonally adjusted real GDP and calculate the corresponding output gap. The second output gap measure is estimated by Alp et al. (2012) using