Available online at www.sciencedirect.com
SCIENCE DIRECT®
ELSEVIER
European Economic Review 49 (2005) 1137–1163
EUROPEAN ECONOMIC REVIEW
www.elsevier.com/locate/econbase

Price stickiness and the contractionary effect of technology shocks

Domenico J. Marchetti[a], Francesco Nucci[b,*]

[a] *Bank of Italy, Research Department, Via Nazionale 91, Rome 00184, Italy*
[b] *Facoltà di Scienze Statistiche, Università "La Sapienza", P.le A. Moro 5, Rome 00185, Italy*

Received 2 August 2001; accepted 15 May 2003

Abstract

We derive a measure of technological change from a dynamic cost minimization model that controls for imperfect competition, increasing returns and unobserved factor utilization. We estimate this measure using highly detailed panel data of a representative sample of Italian manufacturing firms for the period 1984–1997. Our key finding is that technological improvements result in a contraction of labor input on impact. In principle, this result can be reconciled with the transmission mechanism of flexible-price models by resorting to reorganization and reallocation effects. On the other hand, however, it is consistent with the predictions of a sticky-price model. Using survey information on the frequency of price revisions, we corroborate the latter interpretation, by showing that the contractionary effect of technology shocks is much stronger for firms with stickier prices.

JEL classification: D24; E32

Keywords: Technology shocks; Price stickiness; Business cycle

1. Introduction

Business cycle models are typically evaluated on the basis of their ability to match patterns of comovements observed in the data of selected macroeconomic variables. Recently, attention has been drawn to the correlation between technology shocks and labor input. In particular, Basu et al. (1998) and Galí (1999a) have documented for the U.S. and other G7 economies a negative correlation between technology shocks, identified under different assumptions, and several measures of labor and other inputs.

* Corresponding author. Tel.: +39-06-49910847; fax: +39-06-4453246.
E-mail address: francesco.nucci@uniroma1.it (F. Nucci).

0014-2921/$ - see front matter
doi:10.1016/j.euroecorev.2003.08.012

They interpret this finding, which is hard to reconcile with the predictions of a standard flexible-price model, as evidence in favor of sticky-price models. For example, Galí (1999a) shows that in a model economy with sticky prices and a money supply less than fully responsive to technological shocks, a technology improvement has a negative short-run effect on hours. In his view, in the wake of a technology expansion nominal rigidities prevent prices from falling and thus aggregate demand does not increase; therefore, firms produce the same amount of output with a smaller volume of inputs, which have become more productive.

However, a number of subsequent contributions have qualified Galí's claim, suggesting that the interpretation of his results hinges crucially on the response of the monetary authorities to technology shocks. In particular, Dotsey (1999) shows that if the central bank follows the optimal monetary policy or a Taylor (1993) or Clarida et al. (2000) rule, then the effect of technology shocks on employment is no longer negative. The reason is that monetary policy, by responding to deviations of inflation from target and to deviations of output from its natural level, would reduce the policy rate so as to accommodate the shock fully. Consequently, with these specifications of monetary policy, sticky- and flexible-price models would be observationally equivalent with respect to the predicted comovement of productivity and labor, and no inference on the prevailing price setting behavior could be drawn from the data.

However, the models developed by Dotsey and the other authors typically assume, either explicitly or implicitly, that the technology shocks are the same for all firms. To the extent that technology impulses exhibit a significant degree of heterogeneity across firms, the relevance of monetary policy for the issue at hand is largely reduced, since monetary policy may react only to aggregate technological shocks and cannot respond to firm-specific productivity disturbances, unless they are perfectly or strongly correlated. These considerations motivate the use of firm-level data for assessing the empirical relevance of flexible- versus sticky-price models, based on the observed relationship between technology shocks and labor input. For this purpose, we use highly detailed panel data of a representative sample of Italian manufacturing firms for the period 1984–1997. Beside the advantage of providing empirical patterns that are independent of how monetary policy is conducted, the use of firm-level data prevents individual idiosyncrasies from being washed out in the aggregation process, thus avoiding a potentially serious bias in the estimates. [1]

Following Basu and Kimball (1997), we derive a measure of technology change from a theoretical model based on a dynamic cost minimization setup that controls for imperfect competition, increasing returns and variable intensity in the use of labor and capital. Estimations are conducted using the generalized method of moment (GMM) estimator for panel data developed by Arellano and Bond (1991). A highly refined estimate of technology change is obtained, where all the "non-technology" components

[1] There is an additional reason why these data are very suitable for our purposes. Italian monetary policy in the second half of the 1980s and the early 1990s was severely constrained by the external objective of maintaining a stable exchange rate vis-à-vis the German mark (see, e.g., Clarida et al., 1998). Therefore, even if the technology shocks faced by the firms in our sample had been highly correlated (which turns out not to have been the case), they could not have been fully accommodated by the monetary authorities.