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Technology shocks and labor market dynamics: Some evidence and theory ☆

Zheng Liu[a,b,*], Louis Phaneuf[b,c]

[a]*Emory University, USA*
[b]*CIRPÉE, Canada*
[c]*University of Quebec at Montreal, Canada*

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Abstract

A positive technology shock may lead to a rise or a fall in per capita hours, depending on how hours enter the empirical VAR model. We provide evidence that, independent of how hours enter the VAR, a positive technology shock leads to a weak response in nominal wage inflation, a modest decline in price inflation, and a modest rise in the real wage in the short-run and a permanent rise in the long-run. We then examine the ability of several competing theories to account for this VAR evidence. Our preferred model features sticky prices, sticky nominal wages, and habit formation. The same model also does well in accounting for the labor market evidence in the post-Volcker period.

JEL classification: E31; E32; E52

Keywords: Technology shock; Labor market; Nominal rigidities; Business cycle

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*Corresponding author. Emory University, USA. Tel.: +1 404 727 1128; fax: +1 404 727 4639.
E-mail address: zheng.liu@emory.edu (Z. Liu).

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1. Introduction

Understanding labor market dynamics has been an important goal for business cycle studies, at least since Dunlop (1938) and Tarshis (1939). While the historical debates have focused on the cyclical behavior of wages, a more recent strand of literature has focused on the effects of technology shocks on per capita hours, with starkly different empirical conclusions.

One side of the empirical literature suggests that a positive technology shock leads to a short-run *fall* in per capita hours. This result has been obtained from structural vector autoregression (SVAR) models, where a technology shock is identified as the only shock that affects long-run labor productivity (e.g., Gali, 1999; Francis and Ramey, 2005).[1] A similar result has also been obtained with technology shocks measured by a "purified Solow residual" that controls for non-technological factors that may affect measured total factor productivity (e.g., Basu, Fernald, and Kimball (BFK), Basu et al., 2006). Yet another line of research argues that a positive technology shock triggers a *rise*, not a fall, in per capita hours, even when the technology shock is identified using the same long-run restrictions as in Gali (1999) (e.g., Christiano, Einchebaum and Vigfusson (CEV), Christiano et al., 2004). The difference in conclusions arises from different treatments of hours in the SVAR: whether hours rise or fall following a positive technology shock depends on whether hours enter the SVAR in log-levels or log-differences.[2]

The lack of consensus in empirical findings renders it difficult to assess competing macroeconomic theories based upon the effects of technology shocks on hours. If a technology improvement indeed leads to a fall in hours, then such evidence would cast doubt on the empirical relevance of the standard real business cycle (RBC) theory, which predicts that hours and output should be positively correlated following a technology shock. This evidence, however, seems to be consistent with the predictions of a sticky-price (SP) model with weak monetary-policy accommodation to technology shocks (e.g., Gali, 1999; BFK, 2006), or an RBC model augmented with habit formation and investment-adjustment costs (e.g., Francis and Ramey, 2005). If, on the other hand, a positive technology shock indeed leads to a rise in hours, then the standard RBC model (without habit formation) would do just fine and, as we show below, so would a pure sticky-wage (SW) model.

The present paper proposes a way out of this dilemma. We go a step further in exploring the empirical evidence—from a broader perspective of the labor market. In particular, we examine the effects of technology shocks not only on hours but also on wages and prices. We present in Section 2 a four-variable SVAR model that includes the growth rate of average labor productivity, per capita hours, nominal wage inflation, and price inflation. We allow hours to enter in either log-differences or log-levels. This approach allows us to avoid taking a stand on the debate between the difference specification vs. the level

[1]The approach to identifying technology shocks based on such long-run restrictions takes its root in Blanchard and Quah (1989) and Shapiro and Watson (1988).

[2]Some recent contributions to the technology-hours debate include Fisher (2006), who finds that investment-specific technology shocks lead to different responses of hours than do neutral technology shocks; and Fernald (2005), who shows that if one allows for plausible trend breaks in labor productivity, then hours worked fall on impact of a positive technology shock, regardless of whether hours are measured in differences or in levels. See Gali and Rabanal (2004) for a survey of this literature. See also Chari et al. (2005) and Christiano et al. (2006) for an interesting exchange on some general issues concerning the SVAR approach.