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Shifts and twists in the relative productivity of skilled labor

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Abstract

Skill-biased technical change is usually interpreted in terms of the efficiency parameters of skilled and unskilled labor. This implies that the relative productivity of skilled workers changes proportionally in all tasks. In contrast, we argue that technical changes also affect the curvature of the distribution of relative productivity. Building on Rosen (1978) [Rosen, S., 1978. Substitution and the division of labor. Economica 45, 235–250] tasks assignment model, this implies that not only the efficiency parameters of skilled and unskilled workers change, but also the elasticity of substitution between skill types of labor. Using data for the United States between 1963 and 2002, we find significant empirical support for a decrease in the elasticity of substitution at the end of the 1970s followed by an increase at the beginning of the 1990s. This pattern of the elasticity of substitution has contributed to the labor productivity slowdown in the mid-1970s through the 1980s and to a *speedup* in the 1990s.

JEL classification: J20; J31; O30; O40

Keywords: Assignment; SBTC; Output growth; Cointegration and change in regime

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1. Introduction

The skill premium of college graduates has increased in most developed countries in the last decades and especially in the US. Since the relative supply of college graduates increased at the same time, this means that the relative demand for college graduates increased even faster than the relative supply. In the literature on wage inequality, these demand shifts in favor of skilled labor are interpreted as the ensuing effects of technical changes. Recent new technologies have increased the marginal productivity of skilled relative to unskilled labor. These productivity shifts are usually associated with changes in the relative efficiency parameters of skilled and unskilled workers (Katz and Murphy, 1992) such that it is implicitly assumed that the relative productivity of skilled workers increased proportionally in every task.

The main contribution of this paper is two-fold. In the theoretical part we take a closer look at the possible effects of skill-biased technical change in the labor market, by analyzing how skill-biased technical change may affect the productivity of skilled workers relative to unskilled workers in a continuum of tasks. To this aim we use (Rosen's, 1978) tasks assignment model that not only offers a microfoundation for the CES production function, the workhorse model in the SBTC and growth literature, but also reveals a relationship between the elasticity of substitution across workers types and the slope of their productivity schedule across tasks. In this model, skill-biased technical change may lead to shifts and twists in the productivity schedule of skilled versus unskilled workers. Shifts correspond to increases in the relative efficiency parameter that are commonly associated with skill-biased technical change. Twists reflect changes in the elasticity of substitution between skilled and unskilled workers that have been absent in the skill-biased technical change literature.

The second contribution is that investigating for the stability of the parameters of a generalized (Katz and Murphy, 1992) framework, we show empirical evidence that the elasticity of substitution between skilled and unskilled labor has changed over time. This variability of the elasticity of substitution over time is of importance as it (*twist*) explains (i) a significant part of the rise in the skill premium after 1977 but also (ii) part of the productivity slowdown observed in the 1970s and 1980s and acceleration in the 1990s as the magnitude of the elasticity of substitution between inputs is directly linked to the growth rate of income per capita as already recognized in the literature on economic growth.[1]

This paper relates to the standard literature on skill-biased technical change (e.g. Katz and Murphy, 1992) by releasing the implicit assumption that the relative productivity of skilled workers increased proportionally in every task. In practice, indeed, new technologies will not necessarily increase the productivity of skilled relative to unskilled workers equally in all tasks and recent empirical evidence points into that direction. For instance, Autor et al. (2003) investigated the impact of recent technical change on the demand for skilled labor and found that although computers substitute for workers performing routine tasks, computers complement workers performing non-routine tasks: "the

[1] Solow (1956) first showed that for an elasticity of substitution between labor and capital of 2, income per head could grow forever if the saving rate s were to be larger than the threshold $s = n/a^2$ where n is population growth and a is the relative efficiencies of capital. De La Grandville (1989) generalized this finding and showed that the value of the threshold was of the form: $s = n\beta(\sigma)^{\sigma/(1-\sigma)}$. More recently, Klump and de La Grandville (2000) have proved that the higher σ the higher income per head.