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Do factor shares reflect technology? ☆

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Abstract

This note demonstrates that it is still poscsible to identify the economy's technology from national income accounting data when wages are set through a bargaining process rather than the usual competitive mechanism. Applying the method to US data, we obtain that the output elasticity with respect to capital exceeds 0.5.

JEL classification: E23; E25

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1. Introduction

In many macro models, it is standard to associate labor and capital shares of national income with technological parameters of the aggregate production function. In particular, in the Cobb-Douglas formulation, these shares are simply the respective exponents of capital and labor. Since the labor share in national income is approximately 70% in most industrialized nations, it is common to use an exponent of about 0.3 for capital in such a formulation. This association is, of course, based on the assumption that factors are paid

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their respective marginal products. However, the labor share that emerges from direct estimates of aggregate production functions under the competitive pricing mechanism, tends to be significantly lower than the above 70%. For example, the production function estimates of Duffy and Papageorgiou (2000), imply that labor shares in the developed countries cannot exceed 0.32 under competitive factor markets. This is, of course, the share usually associated with capital.[1]

In this note, we replace the competitive market mechanism of wage determination with a Nash bargaining process as is commonly done in the labor literature (see e.g., Pissarides (2000) and the literature therein). As a result, labor share reflects the bargaining power of labor rather than technology. Consequently, the introduction of bargaining as a wage setting mechanism resolves the aforementioned tension between labor shares implied by the estimated technology parameters and actual labor shares.

Despite the fact that labor shares can no longer be used to identify technology parameters, the latter can still be identified from the national income accounts. We use the Cobb-Douglas production function to illustrate this point and provide the appropriate transformations needed to compute the capital elasticity of output. Not surprisingly, that elasticity differs from the capital share in income.[2] Specifically, for the U.S. data we use, we obtain that the capital elasticity of output exceeds 0.5.

2. The model

We consider an economy populated by identical workers on a continuum of measure 1. Potential firms are drawn from the real line. Firms own a production technology that employs capital and one unit of labor where both inputs are essential.[3] Let $f(k)$ denote the output per worker, where k represents capital per worker, and assume that $f(k)$ satisfies the Inada conditions. Firms incur a firm-specific setup cost of $z(i)$ upon entering the market where i indexes the firm.[4] Without loss of generality, we order the potential entrants according to their setup costs in an ascending order, i.e. $z'(i) > 0$. Moreover, we assume $z(0) = 0$ and $z'' > 0$.[5]

The sequence of events is as follows. Upon entering each firm incurs the setup costs. Next, it hires capital taking the rental rate r (which includes depreciation allowance) as given. Third, firms are matched with workers. For parsimony, we assume that while every worker is matched with a firm, the reverse is not necessarily true. We denote by p the

[1] Duffy and Papageorgiou estimate a production function of the form $Y = A[\delta K^{-\rho} + (1-\delta)L^{-\rho}]^{-\frac{1}{\rho}}$. For this specification, the labor share is $\frac{(1-\delta)k^{\rho}}{\delta+(1-\delta)k^{\rho}}$, where k is the capital labor ratio. The implication follows from the parameter values estimated for developed countries, $\rho = -0.08$ (with marginal significance) and $\delta = 0.68$ (highly significant, see Table 3, page 109).

[2] We are not the first to observe that bargaining may cause deviations from marginal value of product pricing. For example, Bentolila and Saint-Paul (2003), as well as Blanchard (2004) invoke bargaining power as one of the explaining factors for movements in labor shares in Europe (see also Spector, 2004).

[3] For parsimony, we assume that every firm can employ at most one worker. One could relax the requirement as long as there is an upper bound on the number of workers a firm can hire.

[4] These costs may consist of effort and time in the spirit of McGrattan and Prescott (2005). As pointed out by these authors, such costs (refereed to as "sweat equity") are not captured by NIPA but are nevertheless quantitatively important.

[5] The role of this assumption is to endogenize the number of entering firms. We could also have all firms face identical entry costs that increase with the number of entrants, for example due to congestion.