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Labor share dynamics: a survey of the theory

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Labor Share Dynamics: A Survey of the Theory.

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Abstract

The present paper presents a survey of the main works that analyze labor share dynamics from a theoretical point of view. It tries also to reconcile the different approaches to the issue into a unifying framework represented by the so called SK schedule.

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1 Introduction

Labor share dynamics has been viewed as a minor concern in the years before the actual crisis. Despite in many European countries income distribution was increasingly favouring capital, this fact got little attention since in the neoclassical view factor share stability was considered, quoting Bentolila and Saint-Paul (2003) "as a granted stylized fact of growth".

The wake and upsurge of the current global crisis has brought back to the front stage the need for a fine tuning of the demand level. In this context monetary policy proved to be ineffective after years of primacy over fiscal policy and of interest rate downhill run pursued to fight previous recessions. There is little room left for a bounceback of investments driven by reduced money cost since the economy already hit the "zero lower bound" for interest rates. The stimulus for a recover in economic activity then, must come also from an increase in private consumption. Indeed increases in public spending find sever limitations in the need to rein in debt growth. It is worth then, to consider which operating leverage are available for an increase in families' disposable income and for a rebalancing of income functional distribution that promotes a resurgence in private consumption.

The paper has the following structure. Section 1 introduces the notion of SK schedule which represent the main tool used in the analysis. Section 2 to 4 describe the labor share dynamics in the long, in the medium and in the short run. Section 5 reports some criticism and improvement to the approach adopted. Section 6 discusses the main issues related to international trade. Section 7 duly concludes.

2 The SK Schedule

The determinants of labor share in the long-run general equilibrium, are described by Bentolila and Saint-Paul (2003). These authors prove the existence of a one-for-one relation between the labor share and the capital-output ratio under the benchmark hypothesis of competitive markets, constant return to scale production function and labor augmenting technical progress.

The relevance of the previous result, the so called SK schedule, relies on the fact that it allows linking labor share movements to the variations of an observed variable. The relation is unaltered by changes in factor prices (wage and rental cost of capital), in quantities and by the effects of labor augmenting technical progress; such variations result into movements along SK schedule.

Consider now how the SK schedule is derived. Start from the production function that is defined as follows:

$$Y = f(K, L \cdot B)$$

where Y is total output, K and L are respectively the capital and the labor stock employed in the production process, B is the labor augmenting technical progress.

Exploiting the constant return to scale property it possible to adopt the intensive form for the production function:

$$Y = K \cdot f\left(1, \frac{L \cdot B}{K}\right) = K \cdot f(l)$$

where $l = \frac{L \cdot B}{K}$ is the ratio between labor in efficiency units and capital.

From the competitive markets hypothesis follows that in equilibrium the equality:

$$\frac{\delta P \cdot Y}{\delta L} = P \cdot K \cdot f^{'}(l) \cdot \frac{B}{K} = W$$

must hold, so that

$$\frac{W}{P} = B \cdot f^{'}(l)$$

where P is a price index. The labor share then, is defined as:

$$S_L = \frac{L}{Y} \cdot \frac{W}{P} = \frac{L \cdot B}{K \cdot f(l)} f^{'}(l) = l \cdot \frac{f^{'}(l)}{f(l)}$$

Consider now the capital-output ratio. It is the case that:

$$k = \frac{K}{Y} = \frac{1}{f(l)}$$

Since the function $f(l)$ is monotonic, it is also invertible and this allows defining l as a function of k so that:

$$l = f^{-1}\left(\frac{1}{k}\right) = h(k)$$

Substituting for the previous expression in the equation of the labor share gives:

$$S_L = h(k) \cdot f^{'}(h(k)) \cdot k$$

that is a sole function of the capital-output ratio and defines the SK schedule.

Characterizing how the labor share responds to variation in k, is a relevant issue for the analysis and requires considering the first derivative of S_L with respect to k:

$$\frac{\delta S_L}{\delta k} = f^{'}(h(k)) \cdot h(k) + f^{'}(h(k)) \cdot h^{'}(k) \cdot k + k \cdot h(k) \cdot f^{''}(h(k)) \cdot h^{'}(k)$$

or using l as the main variable:

$$\frac{\delta S_L}{\delta k} = f^{'}(l) \cdot l + \frac{f^{'}(l)}{f(l)} \cdot \frac{\delta l}{\delta k} + l \cdot \frac{f^{''}(l)}{f(l)} \cdot \frac{\delta l}{\delta k}$$

Since it is $\frac{\delta l}{\delta k} = -\frac{[f(l)]^2}{f^{'}(l)}$ substituting the previous expression into the equation defining $\frac{\delta S_L}{\delta k}$ gives:

$$\frac{\delta S_L}{\delta k} = f^{'}(l) \cdot l - f(l) - l \cdot f(l) \cdot \frac{f^{''}(l)}{f^{'}(l)}$$

The elasticity of substitution between labor and capital, σ, is defined as follows:

$$\sigma = \frac{f^{'}(l)}{l \cdot f^{''}(l)} \left[1 - l \cdot \frac{f^{'}(l)}{f(l)}\right]$$

It is possible then, to express $\frac{\delta S_L}{\delta k}$ in terms of the previous variable since it is:

$$\frac{\delta S_L}{\delta k} = -f(l) \left[1 + l \cdot \frac{f^{''}(l)}{f^{'}(l)} - \frac{f^{'}(l)}{f(l)} \cdot l\right]$$

or

$$\frac{\delta S_L}{\delta k} = -f(l) \cdot l \cdot \frac{f^{''}(l)}{f^{'}(l)} \left\{1 + \frac{f^{'}(l)}{l \cdot f^{''}(l)} \left[1 - l \cdot \frac{f^{'}(l)}{f(l)}\right]\right\}$$

Substituting σ in the equation above gives:

$$\frac{\delta S_L}{\delta k} = -f(l) \cdot l \cdot \frac{f^{''}(l)}{f^{'}(l)} (1 + \sigma)$$

The relation between the labor share and the capital output ratio crucially depends on the elasticity of substitution between productive factors; in particular, it is the case that, being $f^{''}(l) \leq 0$, if $|\sigma| \geq 1$, i.e. if there is low complementarity between capital and labor, the SK schedule has a negative slope. Instead when there is strong complementarity and $|\sigma| < 1$, the SK schedule has a positive slope.

3 Long-Run Dynamics

In the long-run then, variations in the values of the labor share across countries or sectors are explained by different steady state levels of the capital-output ratio and by different elasticities of substitution between labor and capital. The variables k and σ represent the main determinants of the SK schedule

The previous statement clearly holds if no shocks occurs affecting the technical features of the production function; these shocks indeed, cause a shift in the SK schedule if they change the characteristics of $f(l)$ in a non labor augmenting way. The most important factors that may cause a new SK schedule to emerge are capital augmenting technical progress and shocks on the price of imported goods employed in the production.

In the first case the production function becomes $Y = f(K \cdot A, L \cdot B)$ where A denotes capital augmenting technical progress; the labor share reformulated is then:

$$S_L = h(Ak) \cdot f^{'}(h(Ak)) \cdot Ak$$

It is easy to see that variations in the value of A shift the SK schedule.

Analogous results are found if imported intermediate goods, I, are included in the production function:

$$Y = f(K, L \cdot B, I)$$

since the labour share is not a sole function of the capital-output ratio any more, but depends also on the real price of I.

4 Medium-Run Dynamics

The analysis of labor share movements in the medium and in the short run requires considering additional factors other than capital augmenting technological progress and international price of imported goods. This is due to the fact that if a short time span is considered, markets are hardly described as competitive. Monopolistic competition prevails in the final good market while the bargaining between firms and trade unions defines the wage setting process in the labor market.

It is the case then, that a wedge might temporarily exist between the marginal product of labor and the real wage. Any variation in the difference between these two variables causes the economy to move off the original SK schedule. Only over time free entry on the good markets allows restoring the perfect competition conditions.

The transition between different short or medium run equilibria is driven, according to Bentolila and Saint-Paul (2003), by three types of variables that are responsible for temporary movements of the economy off the SK schedule and namely:

- Variations in the markup that firms apply on marginal costs.

- Changes in the bargaining power of workers relative to that detained by firms.
- Labor adjustment costs.

Different authors did study in detail the effects of each of these shocks. Blanchard (1997 and 1998) provides a simple and though effective framework that allows an exhaustive analysis. based on the paper by Caballero and Hammour (1997) and on the results of Phelps (1994).

The analysis adopts a simple model of monopolistic competition where firms bargain with workers over the wage rate, W, but detain the right to manage their employment level. This means that first the level of W is set and then firms adjust employment, acting as wage-takers.

It is the case then that labor demand can be derived from firms' first order condition:

$$\frac{W}{P}(1+\mu) = B \cdot f^{'}(l)$$

where μ indicates the medium run level of the markup. This variable depends on the absolute price elasticity for firm output, η, and is defined as:

$$\mu = \frac{1}{\eta - 1}$$

The wage rate then, is no more equal to labor marginal productivity and the difference among the two quantities depends on the size of μ. Since is $f^{''}(l) \leq 0$ the labor demand function has the usual negative slope.

Consider how the wage rate is set. The bargaining process is characterized as an asymmetric Nash bargaining whose outcome is the solution of the following maximization problem:

$$Max_W \quad (V - V^o)^z (\Pi - \Pi^o)^{1-z}$$

subject to:

$$\frac{W}{P}(1+\mu) = B \cdot f^{'}(l)$$

that is the optimality condition derived from the next stage where firms decide the employment level; the variable z is a measure of the relative bargaining power of workers, V is the aggregate workers' utility, Π stands for firm profits, and the superscript o denotes the outside option available to the agents. It is usually assumed that $\Pi^o = 0$ while $V - V^o$ is defined as follows:

$$V - V^o = [u(W) - u^o] L$$

where $u(W)$ is individual utility from labor income and u^o is the utility from fully consuming the individual leisure endowment.

In order to describe this situation Blanchard (1997 and 1998) adopts the following specification for the labor supply schedule:

$$\frac{W}{P \cdot B} = g(L, z)$$

such that $g_L > 0$ and $g_z > 0$.

A labor market equilibrium therefore, is characterized by:

$$\frac{f^{'}(l)}{1+\mu} = g(L,z) = \frac{W}{P \cdot B}$$

For given values of μ and z it is possible to derive a SK schedule defining a stable relation between S_L and k with the following characteristics:

$$S_L = \frac{1}{1+\mu} \cdot h(k) \cdot f^{'}(h(k)) \cdot k$$

such that:

$$\frac{\delta S_L}{\delta k} = -f(l) \cdot l \cdot \frac{f^{''}(l)}{f^{'}(l)} \cdot \frac{1+\sigma}{1+\mu}$$

Consider now what happens in the labor market following a labor supply shock, i.e. a change in the value of z. A variation in the workers bargaining power results ultimately in a change in the relative price of labor with respect to capital. If factor proportions are varied without incurring in adjustment costs, this induces firms to adjust $l = \frac{L \cdot B}{K}$ until the previous equality holds again.

Suppose for instance that z rises. Employment, L, then is reduced causing both an increase in $f^{'}(l)$ and a decrease in $g(L,z)$; the opposite holds if z is reduced. It is the case then, a change in factor prices simply causes a movement along the SK schedule towards a different equilibrium value of k; in particular since it is $f\left(\frac{L \cdot B}{K}\right) = \frac{Y}{K} = \frac{1}{k}$ if $\frac{L}{K}$ increases, k decreases while the opposite happens if the labor-capital ratio decreases. The previous outcome crucially depends on the assumption that the firms are wage-takers so that the wage rate is always proportional to the marginal product of labor.

What can cause a shift of the SK schedule in this setting is a labour demand shock[1]. It is easy to see that an increase in the markup causes a decrease of the medium-run labor share for every given level of k; the opposite obviously happens if μ decreases. The slope of the schedule again depends on the elasticity of substitution between productive factors.

The previous results are obtained under the crucial hypothesis that firms can immediately and costlessly adjust factor proportions following a change in the relative prices of capital and labor; this assumption is reasonable if a sufficiently large time span is considered.

It is required further that monopolistic competition prevails in the final good market, a circumstance that it is never verified in the long run where the free entry condition drives the markup down to zero.

The analysis combines then, elements that evoke the short run and others that better fit the long run; this characteristic restricts its application to a period in time that adopting Blanchard's definition[2], corresponds to the medium run.

[1] An analysis of variations in μ due tp labor demand shocks is included in Phelps (1994). More recently Ottaviano et al. (2002) and Melitz and Ottaviano (2008) study the role respectively of market concentration and openess to trade in the definition of the markup level.

[2] See Blanchard (1997).

5 Short-Run Dynamics

In real world economies adjustment costs are recognized as major determinants of movement of the labor share[3] and in particular, are deemed responsible for the movement off the SK schedule that take place in the short run during the transition between two different points on it.

An exhausting analysis of their effects is provided by the influential work by Caballero and Hammour (1997), that introduce the hypothesis of putty-clay technology in the previous setting. Firms face an ex-ante technological menu at time t characterized by a CES production function with labor augmenting technical progress:

$$f\left(K, L\cdot B\right)=d\left[\alpha K^{1-\frac{1}{\sigma}}+\left(1-\alpha\right)\left(B\left(t\right)L\right)^{1-\frac{1}{\sigma}}\right]^{\frac{1}{\left(1-\frac{1}{\sigma}\right)}}$$

so that is

$$f\left(l\right)=\frac{f\left(K, L\cdot B\right)}{K}=d\left[\alpha+\left(1-\alpha\right)\left(l\left(t\right)\right)^{1-\frac{1}{\sigma}}\right]^{\frac{1}{\left(1-\frac{1}{\sigma}\right)}}$$

The previous expression can be thought as the envelope of many Leontief production functions; each of them represents the ex-post production possibilities of an individual firm.

In the short run then, the capital-labor ratio is fix and a change in factor proportions is possible only over time when new investments replace vintage capital. Labor demand is inelastic and gives the opportunity to trade unions to extract rents from the wage setting process. In particular, labor can "appropriate" a part of the remuneration due to capital exploiting limited factor substitutability.

A simple way to look at this problem is to consider how the markup applied to the real wage varies when workers bargaining power changes. Denote with $\bar{l}$ and $\bar{L}$ respectively the fix values of the capital-labor ratio and of labor demand; define then, μ_{sr} the short run level of the markup such that $\frac{f^{'}\left(\bar{l}\right)}{1+\mu_{sr}}=g\left(\bar{L}, z\right)$, i.e.:

$$\mu_{sr}=\frac{f^{'}\left(\bar{l}\right)}{g\left(\bar{L}, z\right)}-1$$

As z increases μ_{sr} must decrease to restore the equilibrium in the labor market and vice versa if workers' bargaining power declines. A relevant feature of the short run equilibrium is that the markup level does not depend only on the characteristics of the demand for the final good but is also determined in the labor market.

In this context, a labor-supply shock causing a sudden rise in the wage rate produces an increase in the labor share for a given k and a movement off the medium run SK schedule. Firms start an adjustment process of the capital-labour ratio in response to that, choosing among the options available in the

[3] See Blanchard (1997 and 1998) and Caballero and Hammour (1997).

technological menu, those less labor intensive; this reduces workers' appropriation possibilities through a reduction in employment L and brings back the economy to the original SK schedule. The opposite happens when a positive shock on labor supply takes place. The charts below display the effects of such circumstances.

Figure 2A: Adverse labor supply shock

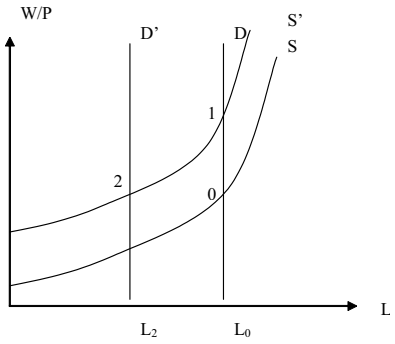
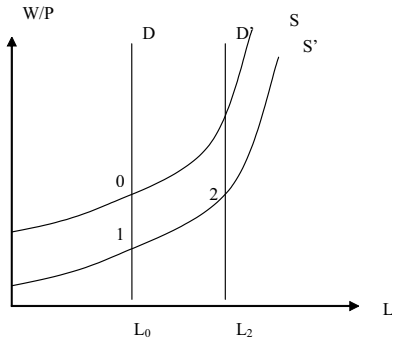


Figure 2B: Favourable labor supply shock



Blanchard (1997 and 1998) provides a description of the dynamics of transition for an economy hit by labor demand and labor supply shocks under the hypothesis of an elasticity of substitution between labor and capital equal or greater than one; adjustment costs are characterized by a convex function that is meant to approximate the effects of a putty-clay technology. In the next paragraph we report Blanchard's results and extend the analysis to the case $|\sigma| < 1$.

Consider initially, the case of an increase in μ. In the medium-run this implies that the SK schedule is shifted down so that for the same capital-output ratio the labor share decreases.

Look now at what happens in the short-run. $\bar{L}$ immediately decreases causing an increase in unemployment, in the capital share and in the profit rate. The latter element triggers capital accumulation and produces a full recover in employment in the medium run.

At the end of the transition the economy ends up on a lower SK schedule with a higher capital-output ratio. If $|\sigma| \geq 1$ the outcome is unambiguous: the labor share decreases; if instead, $|\sigma| < 1$ this is no more the case and the variation in S_L depends on the form of the new SK schedule.

Figure 3A: $|\sigma| > 1$, adverse labor demand shock

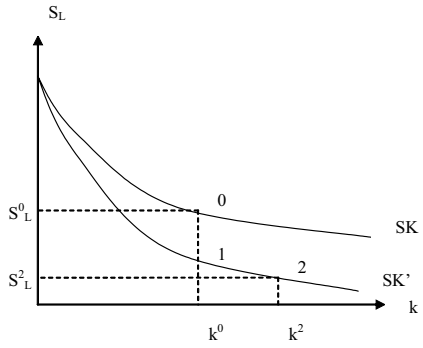
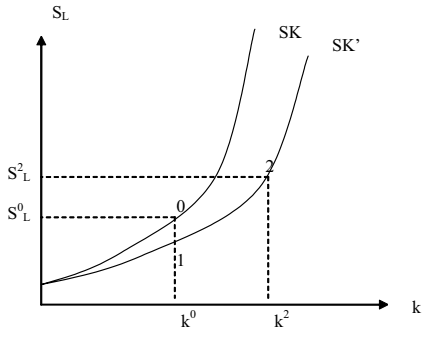


Figure 3B: $|\sigma| < 1$, adverse labor demand shock



If the markup instead decreases the economy will experience in the medium-run an upward shift of the SK schedule; for any given k then, S_L is now lower.

The short-run adjustment dynamics entail an increase in employment followed by a decrease in the capital share and in the profit rate. A capital decumulation process starts due to that and along time this causes a return to the previous employment level.

Eventually the economy ends up on a higher SK schedule with a lower capital-output ratio. When $|\sigma| \geq 1$ this means that the labor share increases; if instead, $|\sigma| < 1$ the outcome of the transition is ambiguous.

Figure 4A: $|\sigma| > 1$, favourable labor demand shock

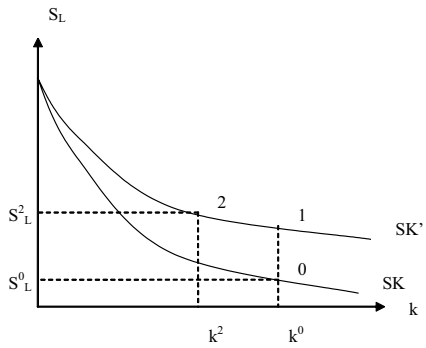
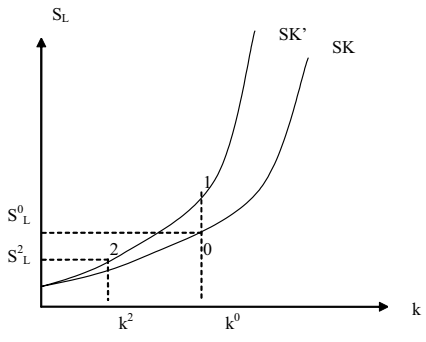


Figure 4B: $|\sigma| < 1$, favourable labor demand shock



Consider now what happens if a shock hits labor supply. Suppose for instance, that trade unions gain power for some reason and that the parameter z increase; for any given $\frac{W}{P}$ labor supply is now smaller. Given that the instanta-

neous labor demand is vertical, the increase in the wage rate causes an increase also in the labor-share, a fall in the profit rate and in μ_{sr}. The shift in the relative price of labor induces firms to adopt more capital intensive technology in response to increased rent appropriation by labor. This allows a recovery in profits.

When the capital deepening process is over, the transition ends and the economy is left with a higher capital-output ratio; this means further that if $|\sigma| \geq 1$ labor share is reduced. S_L increases if instead, $|\sigma| < 1$. Opposite effects are induced by a reduction in the bargaining power of workers.

Figure 5A: |σ| > 1, adverse labor supply shock

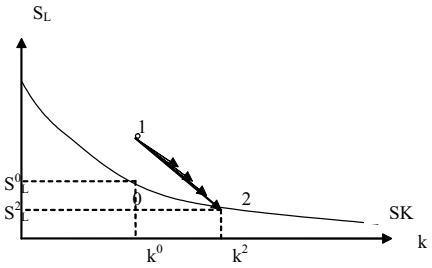


Figure 5C: |σ| < 1, adverse labor supply shock

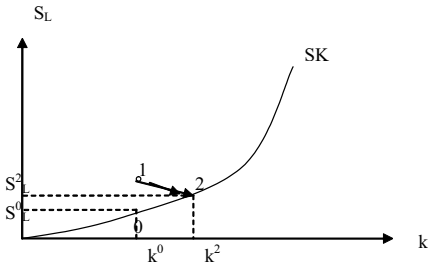


Figure 5B: |σ| > 1, favorable labor supply shock

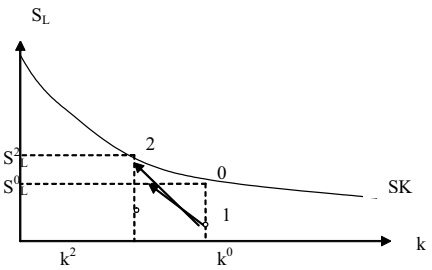
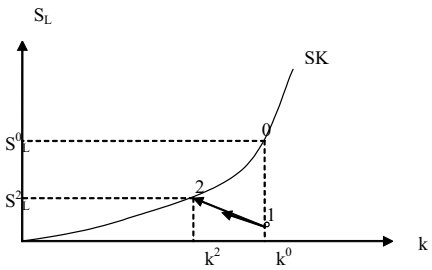


Figure 5D: |σ| < 1, favorable labor supply shock



Qualitatively similar results are obtained if the hypothesis of putty-clay technology is substituted with different forms of adjustment costs.

Giammarioli et al. (2002) for instance consider the role of firing and hiring costs in explaining the counter-cyclical behavior of the labor share over the business cycle; the discounted value of these adjustment costs introduces a wedge between marginal productivity of labor and the wage that ultimately affects the actual level of the markup in the short run. In particular during a recession, firms hoard labor and choose L in such a way that:

$$\frac{W}{P}(1+\mu) - \omega = B \cdot f^{'}(l)$$

holds, where ω is the present value of firing costs, or

$$\frac{W}{P}\left(1+\mu-\omega\cdot\frac{P}{W}\right)=B\cdot f^{'}\ (l)$$

The short run level of the markup then is:

$$\mu_{sr}=\mu-\omega\cdot\frac{P}{W}<\mu$$

and the SK schedule temporarily shifts upward.

Labour demand instead, rises by less than output during upswings because the discounted value of firing costs enters in the equation defining labor market equilibrium with a positive sign; the value of the markup then is $\mu_{sr}=\mu+\omega\cdot\frac{P}{W}>\mu$ and the SK schedule is temporarily shifted downward.

5.1 A Special Case: Transition Dynamics with Capital-Augmenting Technological Progress

A special case of transition toward a different type of technology is described in a recent paper by Acemoglu (2003) that develops a theoretical model where firms adopt both labour and capital augmenting technologies through R&D expenditures. Firm decision to invest in innovations that improve the efficiency of either type of factors depend on the relative prices of capital and labour intensive intermediate goods. The R&D sector generates the relevant adjustment costs.

Under the hypothesis of an elasticity of substitution between capital and labor smaller than one, it is possible to characterize a steady state equilibrium where firm invest only in labor augmenting technological change and also the value of the labor share is steady. In particular it is the case that on a balanced growth path the ratio between labor and capital in efficiency unit is constant so that:

$$\frac{A\cdot K}{B\cdot L}=c$$

where c is a positive constant. This is due to the fact that A does not vary across time while capital accumulation and the growth rate of labor in efficiency unit are equal; this implies further that also l and k are constant.

In this context capital augmenting technological process is generated only during the transition between different equilibria and as expected, produces a permanent shift in the SK schedule. It comes out that different perturbations affecting the economy have different effects on the labor share dynamics depending on which type of R&D investments they trigger; this marks a difference with the models considered up until now where adjustment costs have only temporary effect on the SK schedule.

Consider more in detail the last issue. If an adverse labor supply shock occurs, the economy moves temporarily along the SK schedule and then, returns to the initial steady state equilibrium. In the short run indeed, as the wage

increases, employment falls for a given level of capital stock thus reducing the level of k and causing the labor share to increase. A decrease in the interest rate occurs that slows down capital accumulation and provides incentives to the R&D sector to improve the efficiency of the labor stock.

The ratio $\frac{A \cdot K}{B \cdot L}$ then, initially jumps because employment is reduced but immediately starts to decrease since the growth rate of B exceeds that of K. The transition is over when interest rate, capital accumulation, and the growth rate of labor augmenting technical progress are back to their initial level. The economy ends up with a lower employment level but with the same capital-labor and capital-output ratios; since the adjustment process is driven by variations in B that do not shift the SK schedule also the labor share returns to its long run equilibrium level.

Consider now the case of a favorable shock that hits labor supply inducing an increase in the employment level and in the interest rate; this supplies the incentives for the R&D sector to invest in new intermediate goods that improve the capital stock efficiency. Initially then, the level of k drops together with the capital-labor ratio causing a decrease in the labor share. During the transition capital accumulation increases its pace and the growth rate of A is positive resulting in an increase of the $\frac{A \cdot K}{B \cdot L}$ ratio; as the interest rate decreases, also the growth of the numerator slows down until it reaches the equilibrium level where labor in efficiency unit and the stock of capital grow at the same rate.

The adjustment process involves variations in A that shift the SK schedule; the economy thus, ends up with higher employment level and a permanent increase in the equilibrium level of the labor share.

6 Criticism and Improvements

The model introduced above provides a useful insight on labor share movements but has been subject to some criticism. In particular the main drawback attains the description of the wage setting process. Two objections have been raised.

The first deals with the behavior of trade unions and the characterization of the wage setting process. Rowthorn (1999) indeed points the fact that these agents are myopic because discard the effect of wage setting over employment decisions of individual firms; this leads to conclude that trade union objective function is not well specified.

In his model, based on Layard et al. (1991), the previous author introduces the assumption that trade unions care only about those workers that are insiders at the time when the bargaining process takes place; this clearly marks a difference with the previous setting where, instead, they maximize the aggregate utility of those who will be employed between two rounds of bargaining. A first consequence is that insider "survival" probability (i.e. the probability that a worker is not fired by her present employer) becomes pivotal in the bargaining process. The results in terms of labor share movements though do not differ significantly from those obtained in the standard setting when variations in the capital-labor ratio are considered.

Another work that considers explicitly individual firm behavior in the wage setting process is the paper by Hornstein et al. (2007). These author introduce some modifications in the benchmark Caballero and Hammour (1997) setting to study the adjustment process involving the labor share when there is labor-augmenting technical progress. In particular the focus is on the movement along the SK schedule caused by labor market frictions depending on the regulatory framework adopted in each economy; this is what previous author define the technology-policy interaction.

The model combines the assumptions of a Leontief production function[4] and of capital-embodied, labor-augmenting technical progress with a Diamond - Mortensen - Pissarides matching function describing labor market functioning; this latter element in particular, causes the outside option of firms and workers in the Nash bargaining to become endogenous. In this setting an increase in the rate of technological obsolescence (an acceleration in technical progress growth rate) causes a drop in the labor share; the decrease follows from a reduction in the value of workers' outside option and from the simultaneous increase of firms' threat point. In economies characterized by small frictions in the labor market the adjustment takes place both through variations in wage and unemployment rate. In economies with consistent frictions the adjustment involves mainly quantities causing an increase in unemployment duration and a fall in the employment-vacancy ratio. In both cases the results are coherent with those of a SK schedule characterized by a negative slope.

The second source of criticism points instead, on the efficiency of the outcomes generated by the right-to-manage specification. The combination of employment and wage rate that results from the bargaining between workers and firms indeed, is not on the contract curve and both could be better off choosing a different solution. Several models did respond to this point by characterizing the wage setting process as an asymmetric Nash bargaining over both the wage rate and employment. The so called efficient bargaining produces outcomes that are a solution of the following maximization problem:

$$Max_{W,L} \quad (V - V^o)^z (\Pi - \Pi^o)^{1-z}$$

It is easy to see that this formulation gets rid of the hypothesis that firms are wage takers while taking employment decisions; this means further that even if we consider a given level of the markup μ, a variation in workers bargaining power results now in a shift of the SK schedule rather then in a movement along it. In particular, the previous setting accounts for the circumstance where if workers get stronger, they can obtain a larger share of production rents without suffering a decrease in employment.

There are then, compelling reasons to look closer at the determinants of the relative position of workers and firms during the wage setting process; this is precisely the aim of two recent papers by Blanchard and Giavazzi (2003) and by Jayadev (2007).

[4] In this setting though, there are no difference in the technology menu available to individual firms in the long and in the short run.

The first paper describes the effects of markets deregulation both in the short and in the long run. In general equilibrium what marks the difference between the two situations is the total number of firms operating in the economy. No entries indeed, are possible in the short-run while new comers enter the market in the long-run paying a fix cost e; the entry process defines the size of the markup applied by individual firms in the goods market through the value of demand elasticity. There is no capital in the economy and the production function of firm i is simply

$$Y_i = N_i$$

where N_i is labor supply expressed in working hours. Labor marginal productivity then is constant and equal to one. The previous setting is used to study labor share movements in three different circumstances and namely after a good market reform producing higher integration and a reduction in the entry cost faced by potential entrants and after labor market deregulation reducing workers bargaining power, z.

The first two cases involve labor demand shocks affecting the size of the markup and ultimately the amount of quasi-rents accruing to individual firms for given level of z. The outcomes of the analysis in terms of labor share variations are qualitatively similar to that described in Bentolila and Saint-Paul (2003) and in Blanchard (1997 and 1998) when $|\sigma| > 1$; the contribution of the paper is on the side of the characterization of the transition that starts after the previous shocks.

It is the case that higher market integration increases competition between domestic and overseas firms and causes a rise in the price elasticity of demand, η, driving down the markup. In the short run this causes as expected, an upward shift in the SK schedule, an increase in the wage rate, in employment and in the labor share. In the long run though the equilibrium level of μ depends on the entry cost (for given z); this means that after goods market deregulation the total number of individual firms must decrease to allow a recover in the markup that shifts back the SK schedule in its primitive position and causes S_L to be unchanged in the long run.

A regulatory intervention that reduces the level of e instead, produces a permanent change in the equilibrium value of μ and thus causes a shift in the long run SK schedule. In particular, as the entry cost drops new firms enter the market reducing progressively the markup and causing at the same time an increase in the wage rate, in total employment and in the labor share.

Consider now what happens if labor market deregulation reduces permanently workers bargaining power and expands firms opportunities to appropriate the quasi-rents generated by the production process.

In the short run, the wage rate decreases, employment remains constant and the labor share shrinks. The rise in the profit rate that follows attracts new entrants causing a decrease in μ.

In the long run equilibrium the shift in the SK schedule induced by the drop in z is completely offset through the effects of a lower markup. Total employment though increases, and so does labor share. A trade-off then arises

between workers present condition and their future perspectives.

Also in this case then, the outcomes are similar to those obtained in the previous benchmark model when a favorable labor supply shock hits the economy and $|\sigma| > 1$.

The paper by Jayadev (2007) focus on the effects of one of the most relevant aspects of the current globalization process: increased capital mobility; his work is based on the model by Mezzetti and Dinopoulos (1991) where in facts there is no capital and firm mobility is assumed to be equivalent to capital mobility. In this context the asymmetric Nash bargaining that defines the equilibrium wage rate and employment level is modified to account for the option to relocate in other countries that firm can exert in case no agreement is reached with workers. The outcome of the process solves the following maximization problem:

$$Max_{W,L} \quad (V - V^o)^z (\Pi - \phi \cdot \rho)^{1-z}$$

where ρ is the return from relocation and $\phi \leq 1$, captures the effects of imperfect capital mobility. The increase in the threat point of individual firms enhances firm appropriation possibilities thus reducing the labor share and causing the SK schedule to shift downward[5].

Despite increased sophistication, it turns out that the simple model introduced by Blanchard (1997 and 1998) supplies a reliable insight on labor share movements if combined with the long run analyses provided by Bentolila and Saint-Paul (2003). In this context, apart from changes in the technical features of the production function (deriving both from capital augmenting labor supply or by fluctuations in the price of imported materials), labor market dynamics is one of the main determinants of actual shifts in the SK schedule. In particular, it is possible to identify two categories of factors responsible for that:

1. Globalization
2. Labor market regulatory framework

In the first category we include the effects of both increased goods market integration that, affects mainly labor demand, and increased capital and firms mobility that affects labor supply by changing the relative bargaining power of firms and workers.

The second category instead, stands for the regulatory framework that defines the wage setting process and ultimately the characteristics of the labor supply .

7 International Trade and the Labor Share

Up until now we did focus on a simplified economy where a unique good is produced; this prevents to consider a relevant element in labor share dynamics,

[5] A slightly different setting where firm detain the right to manage employment level, Choi (2001) obtains similar results considering the role of foreign direct investments. In this setting foreign direct investments supply more opportunity of increasing profit level abroad and increase firm bargaining power.

i.e. variations in international trade patterns.

In spite of its relevance for the analysis, it is not easy to define a clear relationship between international trade and labor share movements. Referring to models with increasing returns to scale and imperfect competition or to models that focus on intrafirm differences in productivity and export within industries we incur into major problems; quoting Krugman (2008) indeed "It is not clear however, how to apply the insights of either sets of ideas to the question of distributional effects of developing-country exports".

We need then, to appeal to the traditional models of perfectly competitive markets to recover this piece of informations. In particular, the Heckscher-Ohlin model supplies some unambiguous predictions over the determinants of labor share dynamics, when specific hypothesis are introduced.

Provided that we assume that developed countries are capital abundant, in a simple model with two goods and two factors, they specialize in the production of capital intensive goods[6]; an increase in trade with labor abundant developing countries then, leads to the decrease in the international price of labor intensive goods and to the reduction in the labor share predicted by the Stolper-Samuelson Theorem[7]. The validity of the initial assumption is questioned by several studies starting from the seminal contribution of Leontief (1953), but no decisive argument is provided against it.

A wider agreement exists on the statement that developed countries are abundant in human capital and export mainly skill-intensive goods and import less sophisticated goods from developing countries. If this is the case, an increase in international trade causes the labor share of unskilled workers to shrink and that of skilled workers to increase.

Several authors studied the effects of fragmentation, offshoring and outsourcing in the production process that follows from globalization adopting oftentimes modified versions of the standard Heckscher-Ohlin model[8].Gaining some insight over the dynamics of the labor share from their results though is not an easy task. Most of these studies indeed, aim primarily to provide a rationale for the observed increased wage gap between skilled and unskilled workers; it is not always straightforward then, to derive unambiguous predictions on the dynamics of the labor share even if some of them could be re-framed using labor and capital instead. A second set of problems derives from the fact that the results are sometimes contradictory[9].

The previous difficulties suggest to limit the analysis to the well established results obtained in the Heckscher-Ohlin model.

It is possible to get some insight from a simple model with two sectors, 1 and 2, producing respectively a skill intensive good and a non-skill-intensive

[6] See the Heckscher-Ohlin Theorem whose sources are Heckscher (1919) and Ohlin (1933).

[7] See Stolper and Samuelson (1941).

[8] See for instance, Grossman and Rossi-Hansberg (2006), Arndt (1997), Feenstra and Hanson (1996).

[9] A general tractation of this issue is attempted by Kohler (2003) whose general results can explain the dynamics in the remuneration of any productive factor.

good, and two productive factors, skilled (s) and unskilled (u) labor[10]; in this framework international trade leads to the equalization in good prices and more specifically causes the price of skill-intensive good, p_1, to increase in developed countries while that of the other good, p_2, decreases. The reverse happens in developing countries that are characterized by abundance in non-skilled workers.

Consider now the dynamics of the labor share and analyze the equations that define the Stolper-Samuelson Theorem[11]. Variations in the unit cost and hence in the price of each commodity are a weighted average of the changes in the two factor prices (W_s and W_u); the weights, $\theta_{j,i}$ ($j = s, u$, $i = 1, 2$) are the distributive shares of the two factors in the sector concerned and a circumflex denotes a proportional change:

$$\begin{aligned} \theta_{s,1}\hat{W}_s + \theta_{u,1}\hat{W}_u &= \hat{p}_1 \\ \theta_{s,2}\hat{W}_s + \theta_{u,2}\hat{W}_u &= \hat{p}_2 \end{aligned}$$

Summing the two equations allows getting the variation in the average wage:

$$\hat{W} = \theta_{s,1}\hat{W}_s + \theta_{u,1}\hat{W}_u + \theta_{s,2}\hat{W}_s + \theta_{u,2}\hat{W}_u = \hat{p}_1 + \hat{p}_2$$

Since there is full employment, it is the case that when $\hat{p}_1 + \hat{p}_2 < 0$ holds, the aggregate labor share shrinks; if instead, $\hat{p}_1 + \hat{p}_2 \geq 0$, the labor share increases. In developed countries then, whenever the proportional increase in the price of the skill-intensive good exceeds the proportional decrease in the price of the other good, international trade has a positive impact over the labor share. The reverse is true otherwise.

A description of the pattern of trade between developed and developing countries then, is required to sort through the previous sets of assumptions and to define which one fits better to real world circumstances. A recent paper by Krugman (2008) provides an accurate overview of the evolution of trade dividing the last thirty years in three distinct periods.

When the international trade pattern in the 70s is considered, a good approximation is a situation where developing countries export mainly primary goods and capital-abundant, developed countries specialize in manufactured goods. During the 80s, the weight of manufactured goods on total export from developing countries increases and country specialization is mainly defined by the relative endowment of human capital, i.e. skilled labor.

The period from 1980 to circa 2005 is split in two. In a first phase international trade is characterized by limited volumes and involves mainly countries whose wage gap with developed countries is wide but not extreme; exports from developing economies moreover, involves mainly non-sophisticated goods, i.e. it is concentrated in the less skill-intensive sectors.

After the late 90s a major transformation in international trade pattern is observed. Export volumes from developing countries face a steep increase while

[10] If we assume perfect international markets and perfect mobility of capital, no country can be capital abundant and the rental price must be the same across countries.

[11] See Jones and Neary (1984).

new actors appear on the scene, China on top of the list, that are substantially lower wage than before. Besides, the sophistication of exported goods increases and involves also skill-intensive sectors, in particular, the electronic industry.

This apparently puzzling evidence has risen a debate over the true nature of the observed increased export sophistication of developing countries. A first view supported by Lawrence (2008), considers the previous piece of informations as a sign of an actual transformation of the pattern of international trade. Krugman (2008) argues instead, that it is just a statistical illusion due to a lack of detailed data on the factor contents of trade.

According to Krugman's interpretation of existing informations on specialization within industries and in particular, vertical specialization, developing countries are taking over labor-intensive portions of skill-intensive sectors; no qualitative change is occurring then, in the pattern of trade between developed and developing economies whose specialization remain respectively in skill-intensive goods and in labor-intensive goods.

Summing up, providing a description of the effects of international trade over the labor share represents an hard task and requires a non-trivial simplification of the analysis; nonetheless some general conclusions can be drawn based on the description of trade pattern by Krugman (2008).

During the 70s, international trade is likely to affect negatively the labor share of developed country whose abundant factor is capital, and positively that of developing countries. In the next decade variations in the labor share depend upon the changes in the relative prices of skill-intensive and non-skill-intensive goods.

The same relation drives also its dynamics in recent years if Krugman's statement over the evolution of the pattern of trade is deemed correct; in this context the steep increase in the wage gap and in the volumes of trade are likely to affect negatively the labor share of developed countries. No clear predictions are derived from the theory if instead, the thesis of Lawrence (2008) is adopted.

8 Final Remarks

The SK schedule provides a useful framework to analyze labor share dynamics and to define the causes of its fluctuations. These can be classified into four categories:

- Technology related factors
- Factors related to the institutional design of the economy
- Change in prices

In the first category are placed the effects induced by labor and capital augmenting technical progress which are responsible respectively of long run movement along the SK schedule and of permanent displacements of it.

The second class includes instead, all those factors that in the short and in the medium run define the size of the rents accruing to firms and how they are

subsequently divided between labor and capital remuneration. This is also the ambit where policy can effectively intervene to sustain the labor share growth reducing firms bargaining power and managing the negative effects introduced by globalization.

The last class includes both the variation in the relative price of factors deriving by shocks hitting financial market, or the economy endowment of labour and capital, and by change in the international prices of imported intermediate goods and of exported final goods and services.

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